

PROJECT MANUAL

West Quad 6 Unit Box Hangar Phase 2

Terre Haute Regional Airport - HUF

AIP Project No. 3-18-0082-057-2024

Terre Haute Airport Authority

Issued for Bid

Prepared by: Christopher J. Snyder

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PART 1: GENERAL



PROFESSIONAL CERTIFICATIONS

I, Christopher J Snyder, PE, hereby state that the following items are approved under my Professional Engineer Seal.

LIST OF SPECIFICATIONS

PART 1: GENERAL

- Engineer's Certifications
- Notice to Bidders
- Instruction to Bidders

PART 2: BIDDING DOCUMENTS

- Bid Proposal Form
- Bid Bond/Security
- Contractor Information
- Qualifications/Prequalification Statement
- List of Subcontractors
- Disadvantaged Business Utilization Commitment
- DBE Participation Form
- Equal Employment Opportunity Report Statement
- Buy America Certifications

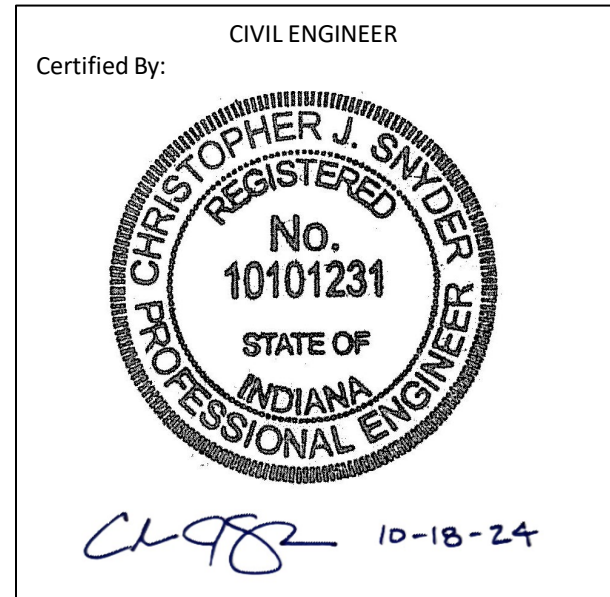
- Certification Of Compliance With FAA Buy American Preference - Construction Projects
- Certification Of Compliance With FAA Buy American Preference – Equipment/Building Projects
- Buy American Waiver Request
- Buy American Product Content Percentage Worksheet
- FAA Buy American Preference Construction Project Content Percentage Worksheet
- Buy American Preference-Final Assembly Questionnaire
- Buy America Conformance Listing
- Certification Regarding Domestic Preferences For Procurements
- Certification Of Offeror/Bidder Regarding Debarment
- Certification Of Lower Tier Contractors Regarding Debarment
- Certification Regarding Lobbying
- Certification Of Offeror/Bidder Regarding Tax Delinquency And Felony Convictions
- Trade Restriction Certification
- Non-Collusion Affidavit
- Bid Proposal Summary

PART 3: CONTRACT DOCUMENTS

- Construction Agreement
- Performance and Payment Bonds
- Performance Bond Form
- Payment Bond Form

PART 4: FAA AC 150/5370-10H: GENERAL PROVISIONS

- Section 10 – Definition of Terms
- Section 20 – Proposal Requirements and Conditions
- Section 30 – Award and Execution of Contract
- Section 40 – Scope of Work
- Section 50 – Control of Work
- Section 60 – Control of Materials
- Section 70 – Legal Regulations and Responsibility to Public
- Section 80 – Execution and Progress





Section 90 – Measurement and Payment

PART 5: SPECIAL PROVISIONS

Federal Provisions

State Provisions

Local Provisions

PART 6: WAGE RATES

Davis Bacon Wage Rates (or State)

PART 7: SAFETY DOCUMENTS

Construction Safety and Phasing Plan (CSPP)

Construction Safety and Phasing Compliance Document (CSPCD)

PART 8: FAA TECHNICAL SPECIFICATIONS

ITEM C-102 TEMPORARY AIR AND WATER POLLUTIONS, SOIL EROSION, AND SILTATION CONTROL

ITEM C-105 MOBILIZATION

ITEM P-101 PREPARATION AND REMOVAL OF EXISTING PAVEMENTS

ITEM P-152 EXCAVATION, SUBGRADE, AND EMBANKMENT

ITEM P-153 CONTROLLED LOW-STRENGTH MATERIAL

ITEM P-156 TEMPORARY AIR AND WATER POLLUTION, SOIL EROSION, AND SILTATION CONTROL

ITEM P-605 JOINT SEALANTS FOR PAVEMENTS

ITEM P-610 CONCRETE FOR MISCELLANEOUS STRUCTURES

ITEM P-620 RUNWAY AND TAXIWAY MARKING

ITEM D-701 PIPE FOR STORM DRAINS AND CULVERTS

ITEM D-702 SLOTTED DRAINS

ITEM D-751 MANHOLES, CATCH BASINS, INLETS AND INSPECTION HOLES

ITEM T-901 SEEDING

ITEM T-905 TOPSOIL

ITEM T-908 MULCHING

ITEM L-110 AIRPORT UNDERGROUND ELECTRICAL DUCT BANKS AND CONDUITS

ITEM L-125 AIRPORT LIGHTING SYSTEMS

PART 9: SUPPLEMENTAL TECHNICAL SPECIFICATIONS

C-95 CONSTRUCTION ENGINEERING

C-115 MAINTENANCE OF TRAFFIC

INDOT 301 AGGREGATE BASE

INDOT 402 HMA PAVEMENT

INDOT 406 TACK COAT

UT-00 FIRE HYDRANTS AND WATER DISTRIBUTION

UT-01 WATER LINE

UT-02 SANITARY SEWER

SP-01 LABOR AGREEMENT

SP-02 WHEEL STOPS



I, Jill Elder, Architect, hereby state that the following items are approved under my Architect Seal.

LIST OF SPECIFICATIONS

PART 9: SUPPLEMENTAL TECHNICAL SPECIFICATIONS

- SECTION 054000 – Cold-Formed Metal Framing
- SECTION 074116 – Insulated Metal Roof Panels
- SECTION 074213 – Insulated Metal Wall Panels
- SECTION 074293 – Soffit Panels
- SECTION 076200 – Sheet Metal Flashing and Trim
- SECTION 078413 – Penetration Fire stopping
- SECTION 079200 – Joint Sealants
- SECTION 081113 – Hollow Metal Doors and Frames
- SECTION 083430 – Vertically Bi-Fold Hangar Door
- SECTION 083613 – Sectional Overhead Doors
- SECTION 087100 – Door Hardware
- SECTION 088000 – Glazing
- SECTION 092900 – Gypsum Board
- SECTION 099123 – Painting





I, Luke Kistner, PE, hereby state that the following items are approved under my Professional Engineer Seal.

LIST OF SPECIFICATIONS

PART 9: SUPPLEMENTAL TECHNICAL SPECIFICATIONS

- SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
- SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
- SECTION 260529 - Hangers and Supports for Electrical Systems
- SECTION 260533 SF - Raceways and Boxes for Electrical Systems
- SECTION 260543 SF - Underground Ducts and Raceways for Electrical Systems
- SECTION 260544 SF - Sleeves and Sleeve Seals for Electrical Raceways and Cabling
- SECTION 260553 SF - Identification for Electrical Systems
- SECTION 260923 SF - Lighting Control Devices
- SECTION 262416 SF - Panelboards
- SECTION 262713 SF - Electricity Metering
- SECTION 262716 SF - Wiring Devices
- SECTION 262813 SF - Fuses
- SECTION 262816 SF - Enclosed Switches and Circuit Breakers
- SECTION 265119 SF - LED Interior Lighting
- SECTION 265213 SF - Emergency and Exit Lighting
- SECTION 265619 SF - LED Exterior Lighting

ELECTRICAL ENGINEER

Certified By:





I, Stephen Schibler, PE, hereby state that the following items are approved under my Professional Engineer Seal.

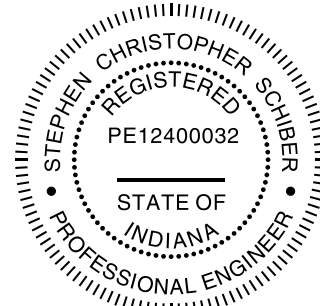
LIST OF SPECIFICATIONS

PART 9: SUPPLEMENTAL TECHNICAL SPECIFICATIONS

SECTION 220000 – General Plumbing
SECTION 230513 – Common Motor
Requirements for HVAC Equipment
SECTION 231123 – Natural Gas Piping
SECTION 235123 – Gas Vents
SECTION 235533.16 – Gas-Fired Unit Heaters

MECHANICAL ENGINEER

Certified By:



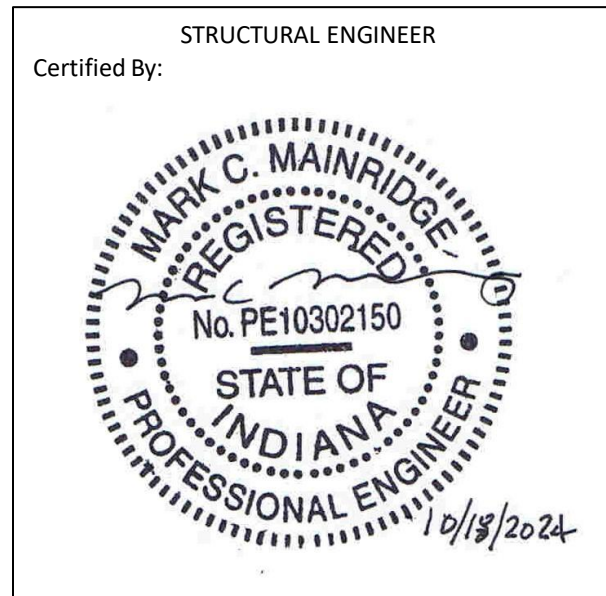
Stephen Schiber
10/18/2024



I, Mark Mainridge, PE, hereby state that the following items are approved under my Professional Engineer Seal.

LIST OF SPECIFICATIONS

PART 9: SUPPLEMENTAL TECHNICAL SPECIFICATIONS
SECTION 033000 – CAST-IN-PLACE CONCRETE
SECTION 133419 – METAL BUILDING SYSTEMS





NOTICE TO BIDDERS

Terre Haute Regional Airport - HUF
Terre Haute, Indiana
West Quad 6 Unit Box Hangar Phase 2
AIP Project No. 3-18-0082-057-2024

Project Bids, subject to the conditions contained herein, for improvements to the Terre Haute Regional Airport - HUF, Terre Haute, Indiana, AIP Project No. 3-18-0082-057-2024 will be received by the **Terre Haute Regional Airport, 581 S Airport St, Terre Haute, IN 47803, until Friday, November 5th, 2024, at 12:00 p.m., E.T.** Bids to be mailed shall be addressed to the attention of the Terre Haute Airport Authority, Craig Maschino, 581 S Airport St, Terre Haute, IN 47803, and will be clearly marked "Sealed Bids: West Quad 6 Unit Box Hangar Phase 2. DO NOT OPEN". At the time listed above, the received sealed bids will be publicly opened and read aloud immediately in the aforementioned location that they were received.

The bidding documents are available at <https://woolpert.com/bid> and/or www.questcdn.com - **Reference Quest Number 9346386**. To be considered a plan holder for bids, register with QuestCDN.com for a free Regular membership and download the bidding documents in digital form at a cost of \$22. Downloading the documents and becoming a plan holder is recommended as plan holder's receive automatic notice of addenda, other bid updates. Contact QuestCDN Customer Support at 952-233-1632 or Support@QuestCDN.com for assistance in membership registration or downloading digital bidding documents. Interested parties may view the contract documents at no cost prior to deciding to become a plan holder.

In order to submit a responsive bid as a Prime Contractor and to receive all necessary addendum(s) for this project, you must be on the Planholder's List. It is the planholder's responsibility to review the site for addendums and changes before submitting their proposal. This includes review for environmental changes. Environmental changes during construction could take up to three months for approval. For additional information, please contact us via email at bid.info@woolpert.com.

The work involved will include the following:

- INDOT asphalt parking lot and taxilane. This includes the necessary grading, drainage, and utility site work. There is no airfield electrical work on this project.
- Pre-Engineered Steel Building System for 12,000 SFT aircraft hangar (Base Bid) or 24,000 SFT aircraft hangar (Alternate Bid) with INDOT concrete stoop.
- Aircraft Hangar Mechanical, Electrical, and Plumbing System work.

Pre-Bid Conference. A voluntary pre-bid conference for this project will be held on Wednesday, **October 23rd, 2024 at 9:00 a.m.**, in the Terre Haute Regional Airport conference room at the Terre Haute Regional Airport - HUF, as a virtual and in-person conference. Virtual Conference information shown below:

Please reach out to Justin Bessler at Justin.Bessler@woolpert.com for the Microsoft TEAMS link.

Bid Conditions. All bidders shall make arrangements with the Terre Haute Regional Airport - HUF to examine the site to become familiar with all site conditions prior to submitting their bid.



The bidder is required to provide all information as required within the Contract Documents. The bidder is required to bid on all items of every schedule or as otherwise detailed in the Instructions to Bidders.

Bids may be held by Sponsor for a period not to exceed 15 calendar days from the date of the bid opening for the purpose of evaluating bids prior to award of contract.

No Bidder may withdraw its bid after the bid has been opened. The Terre Haute Airport Authority reserves the right to waive any informality in bidding and to reject any and all bids.

All questions regarding the bid are to be directed to Justin Bessler, 333 North Alabama Street, Indianapolis, IN, 46204, Justin.Bessler@Woolpert.com.

Bid Bond. Guarantee will be required with each bid as a certified check on a solvent bank or a Bid Bond in the amount of five (5) % of the total amount of the bid, made payable to the Terre Haute Airport Authority.

Performance & Payment Bond. The successful bidder will be required to furnish separate performance and payment bonds each in an amount equal to 100% of the contract price.

FEDERAL LANGUAGE REQUIRED FOR SOLICITATIONS:

FAA BUY AMERICAN PREFERENCE:

The Contractor certifies that its bid/offer is in compliance with 49 USC § 50101, BABA and other related Made in America Laws, U.S. statutes, guidance, and FAA policies, which provide that Federal funds may not be obligated unless all iron, steel and manufactured goods used in AIP funded projects are produced in the United States, unless the Federal Aviation Administration has issued a waiver for the product; the product is listed as an Excepted Article, Material Or Supply in Federal Acquisition Regulation subpart 25.108; or is included in the FAA Nationwide Buy American Waivers Issued list.

The bidder or offeror must complete and submit the certification of compliance with FAA's Buy American Preference, BABA and Made in America laws included herein with their bid or offer. The Airport Sponsor/Owner will reject as nonresponsive any bid or offer that does not include a completed certification of compliance with FAA's Buy American Preference and BABA.

The bidder or offeror certifies that all constructions materials, defined to mean an article, material, or supply other than an item of primarily iron or steel; a manufactured product; cement and cementitious materials; aggregates such as stone, sand, or gravel; or aggregate binding agents or additives that are or consist primarily of: non-ferrous metals; plastic and polymer-based products (including polyvinylchloride, composite building materials, and polymers used in fiber optic cables); glass (including optic glass); lumber; or drywall used in the project are manufactured in the U.S.

TITLE VI SOLICITATION NOTICE:

The Terre Haute Airport Authority, in accordance with the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 USC §§ 2000d to 2000d-4) and the Regulations, hereby notifies all bidders or offerors that it will affirmatively ensure that for any contract entered into pursuant to this advertisement, select businesses, or disadvantaged business enterprises will be afforded full and fair opportunity to submit bids in response to this invitation and no businesses will be discriminated against on the grounds of race, color, national origin (including limited English proficiency), creed, sex (including sexual orientation and gender identity), age, or disability in consideration for an award.

TRADE RESTRICTION CERTIFICATION:

By submission of an offer, the Offeror certifies that with respect to this solicitation and any resultant contract, the Offeror –



1. is not owned or controlled by one or more citizens of a foreign country included in the list of countries that discriminate against U.S. firms as published by the Office of the United States Trade Representative (USTR);
2. has not knowingly entered into any contract or subcontract for this project with a person that is a citizen or national of a foreign country included on the list of countries that discriminate against U.S. firms as published by the USTR; and
3. has not entered into any subcontract for any product to be used on the Federal project that is produced in a foreign country included on the list of countries that discriminate against U.S. firms published by the USTR.

This certification concerns a matter within the jurisdiction of an agency of the United States of America and the making of a false, fictitious, or fraudulent certification may render the maker subject to prosecution under Title 18 USC § 1001.

The Offeror/Contractor must provide immediate written notice to the Owner if the Offeror/Contractor learns that its certification or that of a subcontractor was erroneous when submitted or has become erroneous by reason of changed circumstances. The Contractor must require subcontractors provide immediate written notice to the Contractor if at any time it learns that its certification was erroneous by reason of changed circumstances.

Unless the restrictions of this clause are waived by the Secretary of Transportation in accordance with 49 CFR § 30.17, no contract shall be awarded to an Offeror or subcontractor:

- 1) who is owned or controlled by one or more citizens or nationals of a foreign country included on the list of countries that discriminate against U.S. firms published by the USTR; or
- 2) whose subcontractors are owned or controlled by one or more citizens or nationals of a foreign country on such USTR list; or
- 3) who incorporates in the public works project any product of a foreign country on such USTR list.

Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render, in good faith, the certification required by this provision. The knowledge and information of a contractor is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

The Offeror agrees that, if awarded a contract resulting from this solicitation, it will incorporate this provision for certification without modification in all lower tier subcontracts. The Contractor may rely on the certification of a prospective subcontractor that it is not a firm from a foreign country included on the list of countries that discriminate against U.S. firms as published by USTR, unless the Offeror has knowledge that the certification is erroneous.

This certification is a material representation of fact upon which reliance was placed when making an award. If it is later determined that the Contractor or subcontractor knowingly rendered an erroneous certification, the Federal Aviation Administration (FAA) may direct through the Owner cancellation of the contract or subcontract for default at no cost to the Owner or the FAA.

FEDERAL FAIR LABOR STANDARDS ACT (FEDERAL MINIMUM WAGE):

All contracts and subcontracts that result from this solicitation incorporate by reference the provisions of 29 CFR part 201, et seq, the Federal Fair Labor Standards Act (FLSA), with the same force and effect as if given in full text. The FLSA sets minimum wage, overtime pay, recordkeeping, and child labor standards for full and part-time workers.



The Contractor has full responsibility to monitor compliance to the referenced statute or regulation. The Contractor must address any claims or disputes that arise from this requirement directly with the U.S. Department of Labor – Wage and Hour Division.

NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION to ENSURE EQUAL EMPLOYMENT OPPORTUNITY:

1. The Offeror's or Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Opportunity Construction Contract Specifications" set forth herein.
2. The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

Timetables

Goals for minority participation for each trade: 3.1%

Goals for female participation in each trade: 6.9%

These goals are applicable to all of the Contractor's construction work (whether or not it is Federal or federally assisted) performed in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the Contractor also is subject to the goals for both its federally involved and non-federally involved construction.

The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a) and its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, the Executive Order and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

3. The Contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs (OFCCP) within 10 working days of award of any construction subcontract in excess of \$10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address, and telephone number of the subcontractor; employer identification number of the subcontractor; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the subcontract is to be performed.
4. As used in this notice and in the contract resulting from this solicitation, the "covered area" is Indiana, Vigo, Terre Haute.

PROCUREMENT OF RECOVERED MATERIALS:

Contractor and subcontractors agree to comply with Section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act, and the regulatory provisions of 40 CFR Part 247. In the performance of this contract and to the extent practicable, the Contractor and subcontractors are to use products containing the highest percentage of recovered materials for items designated by the Environmental Protection Agency (EPA) under 40 CFR Part 247.

DBE PARTICIPATION:

The requirements of 49 CFR part 26 apply to this contract. It is the policy of the Terre Haute Airport Authority to practice nondiscrimination based on race, color, sex, or national origin in the award or performance of this contract. The Terre Haute Airport Authority encourages participation by all firms qualifying under this solicitation regardless of business size or ownership.



Information Submitted as a matter of bidder responsiveness:

The Sponsor's award of this contract is conditioned upon Bidder or Offeror satisfying the good faith effort requirements of 49 CFR § 26.53.

As a condition of responsiveness, the Bidder or Offeror must submit the following information with its proposal on the forms provided herein:

1. The names and addresses of Disadvantaged Business Enterprise (DBE) firms that will participate in the contract;
2. A description of the work that each DBE firm will perform;
3. The dollar amount of the participation of each DBE firm listed under (1);
4. Written statement from Bidder or Offeror that attests their commitment to use the DBE firm(s) listed under (1) to meet the Sponsor's project goal;
5. Written confirmation from each listed DBE firm that it is participating in the contract in the kind and amount of work provided in the prime contractor's commitment; and
6. If Bidder or Offeror cannot meet the advertised project DBE goal, evidence of good faith efforts undertaken by the Bidder or Offeror as described in appendix A to 49 CFR part 26. The documentation of good faith efforts must include copies of each DBE and non-DBE subcontractor quote submitted to the bidder when a non-DBE subcontractor was selected over a DBE for work on the contract.

Contractor shall provide a certified statement signed by the subcontractors, indicating actual amounts paid to the Disadvantaged Business Enterprise (DBE) subcontractors and/or suppliers that were used on the project through race neutral means.

OTHER FEDERAL PROVISIONS:

Award of contract is also subject to the following Federal Provisions:

- Lobbying Federal Employees
- Davis Bacon
- Debarment and Suspension
- Drug-Free Workplace Act of 1988 (41 USC § 8101-8106, as amended)
- Other Federal Provisions included in Part A of the Special Provisions

Terre Haute Regional Airport Authority
Terre Haute, Indiana



INSTRUCTION TO BIDDERS

Hereinafter in these Contract Documents including these Instructions to Bidders, Sponsor/Owner refers to Terre Haute Airport Authority, Engineer refers to the Design Firm Woolpert, 333 North Alabama Street, Indianapolis, IN, 46204, 333 North Alabama Street, Indianapolis, IN, 46204 and Resident Project Representative (RPR) refers to Sponsor's chosen construction manager or representative, which may be the same as the Engineer.

1) Bidding Documents

- a) Complete sets of the Bidding Documents may be obtained in the number and format stated in the Notice to Bidders.
- b) Complete sets of Bidding Documents shall be used in preparing Bids; neither Sponsor nor Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.
- c) Sponsor and Engineer, in making copies of Bidding Documents available on the above terms, do so only for the purpose of obtaining Bids for the Work and do not authorize or confer a license for any other use.

2) Qualifications of Bidders:

- a) Qualifications shall be furnished as described in Division 2, "Qualifications Statement" with the bid proposal.

3) Site and Other Areas; Existing Site Conditions; Examination of Site; Sponsor's Safety Program; Other Work at the Site

- a) The Site is identified in the Bidding Documents. By definition, the Site includes rights-of-way, easements, and other lands furnished by Sponsor for the use of the Contractor. Any additional lands required for temporary construction facilities, construction equipment, or storage of materials and equipment, and any access needed for such additional lands, are to be obtained and paid for by Contractor.
- b) Existing Site Conditions
 - i) Subsurface and Physical Conditions; Hazardous Environmental Conditions
 - ii) The Supplementary Information, if available, consists of:
 - (1) those reports known to Sponsor of explorations and tests of subsurface conditions at or adjacent to the Site.
 - (2) those drawings known to Sponsor of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).
 - (3) reports and drawings known to Sponsor relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site.
 - (4) Technical Data contained in such reports and drawings.
 - iii) Sponsor will make copies of reports and drawings referenced above available to any Bidder on request. These reports and drawings are not part of the Contract Documents, but the Technical Data contained therein upon whose accuracy Bidder is entitled to rely has been identified and established in the contract documents. Bidder is responsible for any interpretation or conclusion Bidder draws from the Supplementary Information or any other data, interpretations, opinions, or information contained in such reports or drawings.
- c) Project Geotechnical Report:
 - i) If available, Sponsor will make available along with the Contract Documents a copy of the Project Geotechnical Report (PGR). The PGR describes certain select subsurface conditions that are anticipated to be encountered by Contractor during construction in specified locations. The PGR is a Contract Document.
 - ii) The baseline conditions in the PGR are intended to reduce uncertainty and the degree of contingency in submitted Bids. However, Bidders cannot rely solely on these conditions. Bids should be based on a comprehensive approach that includes an independent review and analysis of the PGR, all other Contract Documents, Technical Data, other available information, and observable surface conditions. Not all potential subsurface conditions are identified.



- iii) Nothing in the PGR is intended to relieve Bidders of the responsibility to make their own determinations regarding construction costs, bidding strategies, and Bid prices, nor of the responsibility to select and be responsible for the means, methods, techniques, sequences, and procedures of construction, and for safety precautions and programs incident thereto.
- d) Underground Facilities: Information and data shown or indicated in the Bidding Documents with respect to existing Underground Facilities at or adjacent to the Site are set forth in the Contract Documents and are based upon information and data furnished to Sponsor and Engineer by owners of such Underground Facilities, including Sponsor, or others.
- e) Adequacy of Data: Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to subsurface conditions, hazardous materials, environmental conditions, uncharted subsurface utilities, and other physical conditions and possible changes in the Bidding Documents due to differing or unanticipated subsurface or physical conditions shall be addressed as Extra Work under General Provision 40-04.

4) Site Visit and Testing by Bidder

- a) Bidder shall conduct the required Site visit during normal working hours and shall not disturb any ongoing operations at the Site.
 - i) On request, and to the extent Sponsor has control over the Site, and schedule permitting, the Sponsor will provide Bidder access to the Site to conduct such additional examinations, investigations, explorations, tests, and studies as Bidder deems necessary for preparing and submitting a successful Bid. Sponsor will not have any obligation to grant such access if doing so is not practical because of existing operations, security or safety concerns, or restraints on Sponsor's authority regarding the Site.
 - ii) Bidder shall comply with all applicable Laws and Regulations regarding excavation and location of utilities, obtain all permits, and comply with all terms and conditions established by Sponsor or by property owners or other entities controlling the Site with respect to schedule, access, existing operations, security, liability insurance, and applicable safety programs.
- b) Bidder is not required to conduct any subsurface testing, or exhaustive investigations of Site conditions.
 - i) Bidder shall fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies.

5) Sponsor's Safety Program

- a) Site visits and work at the Site may be governed by a Sponsor safety program. Refer to the Construction Safety and Phasing plans and document as noted in the Supplementary Conditions.

6) Other Work at the Site

- a) Reference is made to the Supplementary Conditions for the identification of the general nature of other work of which Sponsor is aware (if any) that is to be performed at the Site by Sponsor or others (such as utilities and other prime contractors) and relates to the Work contemplated by these Bidding Documents. If Sponsor is party to a written contract for such other work, then on request, Sponsor will provide to each Bidder access to examine such contracts (other than portions thereof related to price and other confidential matters), if any.

7) Bidder's Representations: It is the responsibility of each Bidder before submitting a Bid to:

- a) examine and carefully study the Bidding Documents, and any data and reference items identified in the Bidding Documents;
- b) visit the Site, conduct a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and satisfy itself as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work;
- c) become familiar with and satisfy itself as to all Laws and Regulations that may affect cost, progress, and performance of the Work;
- d) carefully study all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such



reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings;

- e) consider the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder; and (3) Bidder's safety precautions and programs;
- f) agree, based on the information and observations referred to in the preceding paragraph, that at the time of submitting its Bid no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at the price bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents;
- g) become aware of the general nature of the work to be performed by Sponsor and others at the Site that relates to the Work as indicated in the Bidding Documents;
- h) promptly give Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by Engineer is acceptable to Bidder;
- i) determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance and furnishing of the Work; and
- j) agree that the submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article, that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

8) Pre-Bid Conference

- a) A pre-Bid conference will be held at the time and location stated in the notice to bidders. Representatives of Sponsor and Engineer will be present to discuss the Project. Bidders are encouraged to attend and participate in the conference. Engineer will transmit to all prospective Bidders of record such Addenda as Engineer considers necessary in response to questions arising at the conference. Oral statements may not be relied upon and will not be binding or legally effective.

9) Interpretations and Addenda

- a) All questions about the meaning or intent of the Bidding Documents are to be submitted to Engineer in writing. Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda delivered to all parties recorded as having received the Bidding Documents. Questions received less than seven days prior to the date for opening of Bids may not be answered. Only questions answered by Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.
- b) Addenda may be issued to clarify, correct, supplement, or change the Bidding Documents.

10) Bid Security

- a) A Bid must be accompanied by Bid security made payable to Sponsor in an amount of 5% percent of Bidder's maximum Bid price (determined by adding the base bid and all alternates) when (1) the total amount of your accumulative bid is more than \$20,000 or (2) is required elsewhere in this solicitation
- b) Bid Security shall be in the form of a certified check, bank money order, or a Bid bond (on the form included in the Bidding Documents) issued by a surety.
- c) The Bid security of the apparent Successful Bidder will be retained until Sponsor awards the contract to such Bidder, and such Bidder has executed the Contract Documents, furnished the required contract security, and met the other conditions of the Notice of Award, whereupon the Bid security will be released. If the Successful Bidder fails to execute and deliver the Contract Documents and furnish the required contract security within 15 days after the Notice of Award, Sponsor may consider Bidder to be in default, annul the Notice of Award, and the Bid security of that Bidder will be forfeited. Such forfeiture shall be Sponsor's exclusive remedy if Bidder defaults.
- d) The Bid security of other Bidders that Sponsor believes to have a reasonable chance of receiving the award



may be retained by Sponsor until the earlier of seven days after the Effective Date of the Contract or 61 days after the Bid opening, whereupon Bid security furnished by such Bidders will be released.

- e) Bid security of other Bidders that Sponsor believes do not have a reasonable chance of receiving the award will be released within seven days after the Bid opening.

11) Contract Times

- a) The number of days within which, or the dates by which, the Work is to be substantially completed, and completed and ready for final payment, are set forth in the Agreement.

12) Substitute and “Or-Equal” Items

- a) The Contract for the Work, as awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents without consideration during the bidding and Contract award process of possible substitute or “or-equal” items. In cases in which the Contract allows the Contractor to request that Engineer authorize the use of a substitute or “or-equal” item of material or equipment, application for such acceptance may not be made to and will not be considered by Engineer until after the Effective Date of the Contract.
- b) All prices that Bidder sets forth in its Bid shall be based on the presumption that the Contractor will furnish the materials and equipment specified or described in the Bidding Documents, as supplemented by Addenda. Any assumptions regarding the possibility of post-Bid approvals of “or-equal” or substitution requests are made at Bidder’s sole risk.

13) Subcontractors, Suppliers, and Others

- a) Federal Contract Provisions
 - i) Federal laws and regulations require that the Sponsor as a recipient of federal funding for the proposed project include specific contract provisions in all Sponsor contracts including subcontracts. In general, the Sponsor must incorporate applicable contract provisions in each contract either by the physical incorporation of the full text within the contracts or incorporate applicable contract provisions by reference provided the Sponsor indicates that the reference has the same force and effect as if given in full text.
 - ii) Furthermore, the successful bidder as Prime Contractor must:
 - (1) Insert the applicable contract provisions in each lower tier contract such as subcontractor contracts and agreements;
 - (2) Incorporate the applicable requirements contained within the contract provisions by reference for work done under any purchase orders, rental agreements, and other agreements for supplies or services;
 - (3) Require that the Prime Contractor be responsible for compliance with these contract provisions by any subcontractor, lower-tier subcontractor, or service provider;
 - (4) Verify that any required local or State contract provision does not conflict with, or alter, a federal law or regulation.
 - iii) The Federal Provisions, including their source law or regulation and contract applicability, is included in these project Contract Documents as Part 5: Special Provisions.
- b) A Bidder shall be prepared to retain specific Subcontractors, Suppliers, or other individuals or entities for the performance of the Work if required by the Bidding Documents (most commonly in the Specifications) to do so. If a prospective Bidder objects to retaining any such Subcontractor, Supplier, or other individual or entity, and the concern is not relieved by an Addendum, then the prospective Bidder should refrain from submitting a Bid.
- c) Subsequent to the submittal of the Bid, Sponsor may not require the Successful Bidder or Contractor to retain any Subcontractor, Supplier, or other individual or entity against which Contractor has reasonable objection.
- d) The apparent Successful Bidder, and any other Bidder so requested, **shall within five days** after Bid opening, submit to Sponsor a list of the Subcontractors or Suppliers proposed for all of the Work.
- e) If requested by Sponsor, such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier, or other individual or entity. If Sponsor or Engineer, after due investigation, has reasonable



objection to any proposed Subcontractor, Supplier, individual, or entity, Sponsor may, before the Notice of Award is given, request apparent Successful Bidder to submit an acceptable substitute, in which case apparent Successful Bidder shall submit a substitute, Bidder's Bid price will be increased (or decreased) by the difference in cost occasioned by such substitution, and Sponsor may consider such price adjustment in evaluating Bids and making the Contract award.

- f) If apparent Successful Bidder declines to make any such substitution, Sponsor may award the Contract to the next lowest Bidder that proposes to use acceptable Subcontractors, Suppliers, or other individuals or entities. Declining to make requested substitutions will constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor, Supplier, individual, or entity so listed, and against which Sponsor or Engineer makes no written objection prior to the giving of the Notice of Award, will be deemed acceptable to Sponsor and Engineer subject to subsequent revocation of such acceptance.

14) Preparation of Bid

- a) All blanks on the Bid Form shall be completed in ink and the Bid Form signed in ink. Erasures or alterations shall be initialed in ink by the person signing the Bid Form. A Bid price shall be indicated for each section, Bid item, alternate, adjustment unit price item, and unit price item listed therein.
- b) If the Bid Form expressly indicates that submitting pricing on a specific alternate item is optional, and Bidder elects to not furnish pricing for such optional alternate item, then Bidder may enter the words "No Bid" or "Not Applicable."
- c) A Bid by a corporation shall be executed in the corporate name by a corporate officer (whose title must appear under the signature), accompanied by evidence of authority to sign. The corporate address and state of incorporation shall be shown.
- d) A Bid by a partnership shall be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The partnership's address for receiving notices shall be shown.
- e) A Bid by a limited liability company shall be executed in the name of the firm by a member or other authorized person and accompanied by evidence of authority to sign. The state of formation of the firm and the firm's address for receiving notices shall be shown.
- f) A Bid by an individual shall show the Bidder's name and address for receiving notices.
- g) A Bid by a joint venture shall be executed by an authorized representative of each joint venture in the manner indicated on the Bid Form. The joint venture's address for receiving notices shall be shown.
- h) All names shall be printed in ink below the signatures.
- i) The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers of which shall be filled in on the Bid Form.
- j) Postal and e-mail addresses and telephone number for communications regarding the Bid shall be shown.
- k) The Bid shall contain evidence of Bidder's authority and qualification to do business in the state where the Project is located, or Bidder shall covenant in writing to obtain such authority and qualification prior to award of the Contract and attach such covenant to the Bid. Bidder's state contractor license number, if any, shall also be shown on the Bid Form.

15) Basis of Bid

- a) Base Bid with Alternates
 - i) Bidders shall submit a Bid on a lump sum basis for the base Bid and include a separate price for each alternate described in the Bidding Documents, as applicable, and as provided for in the Bid Form. The price for each alternate will be the amount added to or deleted from the base Bid if Sponsor selects the alternate.
 - ii) In the comparison of Bids, alternates will be applied in the same order of priority as listed in the Bid Form.
- b) Unit Price
 - i) Bidders shall submit a Bid on a unit price basis for each item of Work listed in the unit price section of the Bid Form.
 - ii) The "Bid Price" (sometimes referred to as the extended price) for each unit price Bid item will be the product of the "Estimated Quantity" (which Sponsor or its representative has set forth in the Bid Form) for the item and the corresponding "Bid Unit Price" offered by the Bidder. The total of all unit



price Bid items will be the sum of these "Bid Prices"; such total will be used by Sponsor for Bid comparison purposes. The final quantities and Contract Price will be determined in accordance with Paragraph 30- 02 of the General Provisions.

- iii) Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.

16) Submittal of Bid

- a) With each copy of the Bidding Documents, a Bidder is furnished one separate unbound copy of the Bid Form, and, if required, the Bid Bond Form. The unbound copy of the Bid Form is to be completed and submitted with the Bid security and the other documents required to be submitted under the terms of Item 7 of the Bid Proposal Form.
- b) A Bid shall be received no later than the date and time prescribed and at the place indicated in the advertisement or invitation to bid and shall be enclosed in a plainly marked package with the Project title (and, if applicable, the designated portion of the Project for which the Bid is submitted), the name and address of Bidder, and shall be accompanied by the Bid security and other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid shall be enclosed in a separate package plainly marked on the outside with the notation "BID ENCLOSED." A mailed Bid shall be addressed to the attention of the Terre Haute Airport Authority, Justin Bessler, 581 S Airport St, Terre Haute, IN 47803.
- c) Bids received after the date and time prescribed for the opening of bids, or not submitted at the correct location or in the designated manner, will not be accepted and will be returned to the Bidder unopened.

17) Late Bids/Late Modifications of Bids

- a) Bids received after the exact time set for opening are considered "late bids" and will not be accepted by the Bid Opening Official. Bidders are solely responsible for ensuring their bids arrive on time and to the place of bids specified in the Invitation For Bid.
- b) The Sponsor will not consider a late bid or modification of bid unless:
 - i) There is conclusive evidence that the bid was submitted on time and was mishandled by the Terre Haute Regional Airport - HUF (i.e., lost or misplaced) staff responsible for handling/receiving bids. Mishandling by other units or offices at the Terre Haute Regional Airport - HUF does not constitute airport staff.
 - ii) Or, it was the only bid received.

18) Modification and Withdrawal of Bid

- a) A Bid may be withdrawn by an appropriate document duly executed in the same manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids. Upon receipt of such notice, the unopened Bid will be returned to the Bidder.
- b) If a Bidder wishes to modify its Bid prior to Bid opening, Bidder must withdraw its initial Bid in the manner specified and submit a new Bid prior to the date and time for the opening of Bids.
- c) If within 24 hours after Bids are opened any Bidder files a duly signed written notice with Sponsor and promptly thereafter demonstrates to the reasonable satisfaction of Sponsor that there was a material and substantial mistake in the preparation of its Bid, that Bidder may withdraw its Bid, and the Bid security will be returned. Thereafter, if the Work is rebid, that Bidder will be disqualified from further bidding on the Work.
- d) When it appears from a review of the bid that a mistake has been made, the bidder may be requested to confirm their bid. Situations in which the confirmation may be requested include obvious, apparent errors on the face of the bid or a bid unreasonably lower than the other bids submitted. All mistakes in bids will be handled in accordance with the Terre Haute Airport Authority/Terre Haute Regional Airport - HUF policy.

19) Opening of Bids

- a) Bids will be opened at the time and place indicated in the advertisement or invitation to bid and, unless obviously non-responsive, read aloud publicly. An abstract of the amounts of the base Bids and major alternates, if any, will be made available to Bidders after the opening of Bids.



20) Bids to Remain Subject to Acceptance

- a) The Sponsor is cognizant of the time limitation for awarding contracts and giving Notice to Proceed pursuant to the contract documents. However, due to the time requirements anticipated for obtaining approval of appropriate public agencies, grant funding and other required procedures, it is anticipated that the contract cannot be finally executed and Notice to Proceed be given until **60 calendar days** following the opening of the bids.
- b) The Contractor will receive a written Notice to Proceed by the date requested by the Contractor at or around the time of the required Pre-Construction Conference.
- c) All Bids will remain subject to acceptance for the period of time stated in the Bid Form, but Sponsor may, in its sole discretion, release any Bid and return the Bid security prior to the end of this period.

21) Evaluation of Bids and Award of Contract

- a) The Sponsor intends to award a contract resulting from this solicitation to the lowest, responsive, responsible bidder, whose offer, conforming to the solicitation, will be most advantageous to, and in the best interest of, the Sponsor, cost or price and other factors considered.
- b) Sponsor reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Sponsor will reject the Bid of any Bidder that Sponsor finds, after reasonable inquiry and evaluation, to not be responsible. If Bidder purports to add terms or conditions to its Bid, takes exception to any provision of the Bidding Documents, or attempts to alter the contents of the Contract Documents for purposes of the Bid, then the Sponsor will reject the Bid as nonresponsive; provided that Sponsor also reserves the right to waive all minor informalities not involving price, time, or changes in the Work.
- c) Evaluation of Bids
 - i) In evaluating Bids, Sponsor will consider whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices, and other data, as may be requested in the Bid Form or prior to the Notice of Award.
 - ii) In the comparison of Bids, alternates will be applied in the same order of priority as listed in the Bid Form. To determine the Bid prices for purposes of comparison, Sponsor shall announce to all bidders a "Base Bid plus alternates" budget after receiving all Bids, but prior to opening them. For comparison purposes alternates will be accepted, following the order of priority established in the Bid Form, until doing so would cause the budget to be exceeded. After determination of the Successful Bidder based on this comparative process and on the responsiveness, responsibility, and other factors set forth in these Instructions, the award may be made to said Successful Bidder on its base Bid and any combination of its additive alternate Bids for which Sponsor determines funds will be available at the time of award.
 - iii) For the determination of the apparent low Bidder when unit price bids are submitted, Bids will be compared on the basis of the total of the products of the estimated quantity of each item and unit price Bid for that item, together with any lump sum items.
- d) In evaluating whether a Bidder is responsible, Sponsor will consider the qualifications of the Bidder and may consider the qualifications and experience of Subcontractors and Suppliers proposed for those portions of the Work for which the identity of Subcontractors and Suppliers must be submitted as provided in the Bidding Documents.
- e) Sponsor may conduct such investigations as Sponsor deems necessary to establish the responsibility, qualifications, and financial ability of Bidders and any proposed Subcontractors or Suppliers.
- f) Total bid will be evaluated and awarded as follows: It is the Sponsor's intent to award this bid based on the TOTAL BASE BID FOR ALL AWARDED SCHEDULES, split awards will not be made.
- g) The Sponsor will determine which Schedules and/or Bid Alternates will be awarded based on the received total bid amount for the schedules and/or Bid Alternates (based on unit prices and estimated quantities) and available funding. The project award will be based on the low bid sum of the Federally Eligible Schedules and Bid Alternates awarded by the Sponsor. Not all Schedules and/or Bid Alternates may be awarded. A combination of Schedules and Bid Alternates may be awarded, including only a single Schedule. The numbering of the Schedules or Bid Alternates does not necessarily indicate the order of award. The project award is contingent on the availability of funding.



*Note: The low Bidder, for purposes of award, shall be the responsive Bidder offering the low aggregate amount for the Base Bid within funds available for the project. The low bid will be calculated in the following order within the funds available: the first check is Base Bid, then Alternative Bid will take precedence.

22) Minor Informalities/Irregularities in Bids

- a) A minor informality or irregularity is one that is merely a matter of form and not of substance. It also pertains to some immaterial defect in a bid or variation of a bid from the exact requirements of the invitation that can be corrected or waived without being prejudicial to other bidders. The defect or variation is considered immaterial when the effect on price, quantity, quality, or delivery is negligible when contrasted with the total cost or scope of the services being acquired.
- b) If the Sponsor determines that the bid submitted contains a minor informality or irregularity, then the Director shall give the bidder an opportunity to cure any deficiency resulting from a minor informality or irregularity in a bid, or waive the deficiency, whichever is to the advantage of the Sponsor. In no event will the bidder be allowed to change the bid amount. Examples of minor informalities or irregularities include but are not limited to the following:
 - i) Bidder fails to sign the Bid, but only if the unsigned bid is accompanied by other material evidence, which indicates the bidder's intention to be bound by the unsigned bid. (Such as Bid Bond, or signed cover letter which references the bid and amount of bid).
 - ii) Bidder fails to acknowledge an Addendum - this may be considered a minor informality only if the Addendum, which was not acknowledged, involves only a matter of form or has either no effect or merely a negligible effect on price, quantity, quality, or delivery of the item or services bid upon.

23) Rejection of Bids and Quantity Alterations

- a) Bidders are hereby notified that all bids may be rejected if the lowest responsive bids received exceed the Sponsor's ability to fund the project. The Sponsor retains the right to alter the project quantities as necessary to obtain a fundable project based on Section 40 of the General Provision of these Contract Documents. The lowest responsive and responsible bidder will be determined based on the contract unit price per bid proposal and the fundable project quantities, not necessarily the exact bid proposal quantities.
- b) Any bid that does not conform to the applicable specifications shall be rejected unless the invitation authorizes the submission of alternate bids and the items or services offered as alternates meet the requirements specified in the invitation for bids.
- c) The quantities listed for each of the items in the bid schedule are only estimated quantities. Contractors are required to bid a firm unit cost for each item specified. The actual quantities ordered may fluctuate up or down. The unit prices proposed by each bidder will remain firm and will not be re-negotiated if the estimated quantities are not met or are exceeded, unless the actual quantity varies more than 25% from the bid quantity. For bidding purposes, if there is a conflict between the extended total of an item and the Unit Price, the Unit Price shall prevail and be considered as the amount of the bid.
- d) A bid shall be rejected when the bidder imposes conditions that would modify requirements of the invitation or limit the bidder's liability to the Sponsor, since to allow the bidder to impose such conditions would be prejudicial to other bidders. For example, bids shall be rejected in which the bidder:
 - i) Protects against future changes in conditions, such as increased costs, if total possible costs to the Sponsor cannot be determined.
 - ii) Fails to state a price and indicates that price shall be "price in effect at time of delivery".
 - iii) States a price but qualifies it as being subject to "price in effect at time of delivery".
 - iv) Takes exceptions to the invitation for bids terms and conditions.
 - v) Inserts the bidder's terms and conditions.
 - vi) Limits the rights of the Sponsor under any contract/invitation for bid clause.

24) Bonds and Insurance

- a) The FAA General Provisions and Supplementary Provisions sets forth Sponsor's requirements as to performance and payment bonds and insurance. When the Successful Bidder delivers the Agreement (executed by Successful Bidder) to Sponsor, it shall be accompanied by required bonds and insurance documentation.



- b) The Contractor shall provide a one (1) year warranty (4 years for LED fixtures) against defective materials or workmanship in the work covered under the contract effective upon the date of final acceptance by the Sponsor. Final acceptance will be considered as the date of the final acceptance letter or as the date of the final inspection meeting if no letter is prepared.
- c) The Contractor shall provide a warranty bond to cover the one (1) year warranty period (4 years for LED fixtures) as a condition of final acceptance of the project by the Sponsor as a part of the work at no additional cost to the Sponsor.

25) Signing of Agreement

- a) When Sponsor issues a Notice of Award to the Successful Bidder, it shall be accompanied by the unexecuted counterparts of the Agreement along with the other Contract Documents as identified in the Agreement. Within 30 days thereafter, Successful Bidder shall execute and deliver the required number of counterparts of the Agreement (and any bonds and insurance documentation required to be delivered by the Contract Documents) to Sponsor. Within ten days thereafter, Sponsor shall deliver one fully executed counterpart of the Agreement to Successful Bidder.

26) Notice to Proceed

- a) Work may not start under any awarded contract until a written Notice to Proceed is issued by the Sponsor. The Sponsor may issue the Notice to Proceed any time after the contract is signed and, if required, insurance and bonds have been provided.

27) Sales and Use Taxes

- a) Sponsor is exempt from Indiana state sales and use taxes on materials and equipment to be incorporated in the Work. (Exemption No. 0022015690-014). Said taxes shall not be included in the Bid.

28) Bid Protests

- a) Bidders are notified, that in accordance with FAA policy, bid protests based on an allegedly defective bid solicitation, shall be in writing and received by the Sponsor prior to the bid opening.
- b) For bid protests based on an alleged improper evaluation of bids, a protest must be received by the Sponsor in writing within 10 days after the Notice of Award to the winning bidder is issued. It is the responsibility of the protesting bidder to keep apprised of when the Notice of Award is issued by calling or emailing the Sponsor for updates.

29) Bidder Questions

- a) If a Bidder finds discrepancies in, or omissions from, the Contract Documents, or if he is in doubt as to their meaning, he shall at once notify the Engineer in writing. Such notification must be made at least seven (7) consecutive calendar days prior to the bid date. Neither the Sponsor nor the Engineer will accept telephone calls regarding questions about the Contract Documents. All inquiries must be in writing. All interpretations of the Contract Documents will be issued via addenda to all bidders. All addenda issued will become a part of the Contract. The Sponsor will not be responsible for any other explanation or interpretation of the Contract Documents.

The questions should be delivered to Justin Bessler, Woolpert, Inc., at the Pre-Bid Conference, or emailed to Justin.Bessler@Woolpert.com.



PART 2: BIDDING DOCUMENTS



BID PROPOSAL FORM

TO: Terre Haute Regional Airport - HUF
Terre Haute, Indiana

1. The undersigned hereby certifies that they have examined the form of contract, plans and specifications and other associated Contract Documents for the improvement of Terre Haute Regional Airport - HUF, Project No. 3-18-0082-057-2024. The undersigned further certifies that he/she has examined the site of the work, has determined for himself/herself the conditions affecting the work and subject to acceptance of the proposal, agrees to provide at his or her expense, all labor, insurance, superintendence, machinery, plant, equipment, tools, apparatus, appliances, and means of construction, and all materials and supplies complete the entire work, including work incidental thereto, in conformance with the plans, specifications, and associated Contract Documents.
2. The undersigned acknowledges that the Contract Documents consist of the Notice to Bidders, Instruction to Bidders, all issued Addenda, Proposal, Statement of Qualifications, Anticipated Sub-Contracts, Form of Proposal Guaranty, Notice of Award, Construction Agreement, Performance & Payment Bonds, Notice to Proceed, Notice of Contractor's Settlement, Wage Rates, General Provisions, Special Provisions, Plans, Project Manual including Technical Specifications, Federal Contract Provisions, and Drug-free Workplace, and all other appendices and reference items included in the Project Manual and plans.
3. The undersigned, in compliance with your Notice to Bidders dated October 18th, hereby proposes to do the work called for in said contract and specifications and shown on said plans and to furnish all materials, tools, labor, and all appliances and appurtenances necessary for the said work at the following unit rates and prices:

Bid Spreadsheet begins on page 70.

4. The undersigned understands that the above quantities of work to be done are approximate only and are intended principally to serve as a guide in evaluating the bids. Final project payments will be made on actual quantities and unit prices.
5. It is understood that the schedule of minimum wage rates, as established by the Secretary of Labor and included in the Specifications, are to govern on this project, and the undersigned certifies that he/she has examined this schedule of wage rates and that the prices bid are based on such established wage rates.
6. The undersigned prime contractor, if not a certified DBE, hereby assures that they will make sufficient and reasonable efforts to meet the DBE goals, that they will subcontract 5% of the dollar value of the prime contract to DBE firms, and that they will include the DBE clauses required by the sponsor's DBE Program in all subcontracts which offer subcontracting opportunities. The undersigned will complete and submit with the bid the attached DBE Participation Form. If unable to meet the project goal, the undersigned shall submit a demonstration of good faith effort in accordance with Part 5 Special Provisions, DBE Award Documentation and Procedure.
7. The undersigned agree upon written notice of the acceptance of this bid, that within thirty (30) days after the award, that he/she will execute the contract in accordance with the bid as accepted and give contract (Performance and Payment) bonds on attached forms.
8. The undersigned further agrees that if awarded the contract, he/she will commence the work within ten (10) calendar days after the receipt of a Notice to Proceed and that he/she will complete the work within the calendar days as shown in the Construction Safety Phasing Plans.



9. As evidence of good faith in submitting this proposal, the undersigned encloses a certified check or Bid Bond in the amount of:

_____ Dollars

(\$ _____)

which, in case the undersigned refuses or fails to accept an award and to enter into a contract and file the required bonds within the prescribed time, shall be forfeited to the Terre Haute Regional Airport - HUF, Terre Haute, Indiana, as liquidated damages.

10. By entering into this contract, the Contractor certifies that neither it (nor he/she) nor any person or firm who has an interest in the Contractor's firm is a person or firm ineligible to be awarded government contracts by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).
11. No part of this contract shall be subcontracted to any person or firm ineligible for award of a government contract by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).
12. The undersigned hereby declares that the only parties interested in this proposal are named herein, that this proposal is made without collusion with any other person, or corporation. That no member of the council, officer or agent of Sponsor, is directly or indirectly financially interested in this bid.
13. The undersigned acknowledges receipt of the following Addendums:

Addendum No. _____

Date Received: _____

Addendum No. _____

Date Received: _____

Addendum No. _____

Date Received: _____

Addendum No. _____

Date Received: _____

SIGNATURE OF BIDDER:

By:

Name and Title of Authorized Agent

Name of Company

Address of Company



BID BOND/SECURITY

KNOW ALL MEN BY THESE PRESENTS, that

as Principal, hereinafter called Contractor, and _____

_____,

licensed to do business as such in the State of Indiana, as Surety, hereby bind themselves and their respective heirs, executors, administrators, successors, and assigns, unto Sponsor, State, as Obligee, in the penal sum of

_____ Dollars

(\$_____)

for the payment whereof Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, by these presents.

WHEREAS,

The Contractor has submitted to the Obligee, a contract bid dated the _____ day of _____, 2022 for the following contract:

Terre Haute Regional Airport - HUF
Terre Haute, Indiana
AIP Project No. 3-18-0082-057-2024
West Quad 6 Unit Box Hangar Phase 2

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if the Contractor bid is accepted by the Obligee and the Contractor is awarded the contract in whole or in part, the Contractor shall enter into the Contract with the Obligee in accordance with the terms of such bid, give such Payment and Performance Bonds as may be specified in the Contract Documents with good and sufficient surety for the faithful performance of such Contract and for the prompt payment of labor and materials furnished in the prosecution thereof, or in the event of failure of the Contractor to enter such Contract and give such bond or bonds, if the Contractor shall promptly pay the Obligee the amount of this bond as set forth herein above, then the obligation shall be null and void, otherwise this obligation will remain in full force and effect.



IN WITNESS WHEREOF, the above parties have executed this instrument, the _____ day of _____, 2024.

SIGNATURE OF PRINCIPAL (as applicable)

A. Individual, partnership or joint venture:
partner)

(Signature of sole proprietor or general

B. Corporation

Name of Corporate Principal

Attest: _____
Secretary (affix seal)

By

SIGNATURE OF SURETY

Name and address of Corporate Surety

By

_____(seal)
Attorney in Fact (attach power of attorney)

ACCEPTANCE BY

The foregoing bond is approved.

Date: _____

By:

The foregoing bond is in due form according to law and is approved.

Date: _____

By:



CONTRACTOR INFORMATION

1. Name of Bidder/Contractor: _____

2. Type of Business Entity: _____

NOTE: If bidder is **partnership** or **joint venture**, give full names of all partners or joint ventures. Bid must be signed by all Joint Ventures. If bidder is a **limited liability company**, bid must be signed by an authorized manager (may be signed by member-manager if LLC is organized to allow management by members).

3. Address of Contractor: _____

4. Telephone: _____ Fax: _____

E-mail: _____

5. Established where and when: _____

6. Contractor's Banking Information: _____

7. Principal Officers of Contractor (managers and members if LLC):

Name: _____ Name: _____

Title: _____ Title: _____

Name: _____ Name: _____

Title: _____ Title: _____

Name: _____ Name: _____

Title: _____ Title: _____

8. Bidder's/Contractor's state of incorporation (state of organization if an LLC or Partnership):

9. Bidder's Surety: _____

10. Surety's State of Incorporation: _____



11. Name and Address of person to receive payment

12. If the Bidder/Contractor is a Joint Venture, it shall attach a certified copy of the Joint Venture Agreement. The Joint Venture Agreement will not be included as part of the Contract Documents.

13. The Bidder/Contractor shall identify all applicable labor agreements (if any) to be used in the performance of the work:



QUALIFICATIONS STATEMENT

Terre Haute Regional Airport - HUF
Terre Haute, Indiana
West Quad 6 Unit Box Hangar Phase 2
Project No. 3-18-0082-057-2024

1) SPECIAL CLASSIFICATION (if applicable)

Certified By & Date:

Minority Business Enterprise

Women Business Enterprise

Veteran Business Enterprise

Small Business Enterprise

Other (_____)

2) BONDING INFORMATION

Bonding Company:

Address:

Bonding Agent:

Address:

Contact Name:

Phone:

Aggregate Bonding Capacity:

Available Bonding Capacity as
of date of this submittal:

3) FINANCIAL INFORMATION

Financial Institution:

Address:

Account Manager:

Phone:

Email:

4) QUESTIONNAIRE:



I HEREBY CERTIFY THAT THE INFORMATION SUBMITTED HERewith, INCLUDING ANY ATTACHMENTS, IS TRUE TO THE BEST OF MY KNOWLEDGE AND BELIEF.

NAME OF ORGANIZATION: _____

BY: _____

TITLE: _____

DATED: _____

NOTARY ATTEST:

SUBSCRIBED AND SWORN TO BEFORE ME THIS _____ DAY OF _____, 20____

NOTARY PUBLIC - STATE OF _____

MY COMMISSION EXPIRES: _____

REQUIRED ATTACHMENTS

Schedule A: Current Experience/Project List).

Schedule B: Experience/Project List for Past 3-years).

Schedule C: Equipment List – Available for this Project).

Schedule D: List of Key Personnel – Available for this Project).

Schedule E: Financial Responsibility Statement (Refer to General Provisions, Section 20), or
Proof of Current Prequalification with the State Highway Department/Division.



LIST OF SUBCONTRACTORS

The bidder shall provide information on all subcontractors/material suppliers bidding or quoting on subcontracts for this project.

Name of Firm	Address	Type of Work to be Performed on Contract	Contractors License (State & No.)	Certified DBE (Yes/No)	Certification Number	Bid Amount	Date Firm Established	*GRS

***GRS - Annual Gross Receipts**

- Enter 1 for less than \$1 million
- Enter 2 for more than \$1 million but less than \$5 million
- Enter 3 for more than \$5 million but less than \$10 million
- Enter 4 for more than \$10 million but less than \$15 million
- Enter 5 for more than \$15 million



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DISADVANTAGED BUSINESS UTILIZATION COMMITMENT

_____ The bidder agrees to expend at least 5 DBE utilization on this project.

_____ The bidder (if unable to meet the goal of 5 DBE) is committed to a minimum of _____% DBE utilization on this project and has submitted documentation showing good faith effort.

NOTE: Failure to submit a "Good Faith Effort" at the time of the Bid opening may result in the bid being considered as non-responsive.

For the purposes of this commitment, the term "Disadvantaged Business Enterprise" shall mean a business:

- a. Which is at least 51 % owned by one or more minorities or women, or in the case of a publicly owned business, at least 51 % of the stock of which is owned by one or more minorities or women; and
- b. Whose management and daily business operations are controlled by one or more such individuals.

"Disadvantaged Group Member" or "Disadvantaged" means a person who is a citizen or lawful, permanent resident of the United States, and who is:

- a. Black (a person having origins in any of the black racial groups of Africa);
- b. Hispanic (a person of Spanish or Portuguese culture, with origins in Mexico, South or Central America, or the Caribbean Islands, regardless of race);
- c. Asian American (a person having origins in any of the original peoples of the Far East, Southeast Asia, the Indian subcontinent, or the Pacific Islands);
- d. American Indian or Alaskan Native (a person having origins in any of the original peoples of North America);
- e. Member of other groups, or other individuals, found to be economically and socially disadvantaged by the Small Business Administration under Section 8(a) of the Small Business Act, as Amended 15 U.S.C. 637 (a);
- f. A female person who requests to be considered as a DBE, and who "owns" and "controls" a business as defined herein.

Disadvantaged Business Enterprises may be employed as contractors, subcontractors, or suppliers.

NAME OF ORGANIZATION: _____

BY: _____

TITLE: _____

DATED: _____



DBE PARTICIPATION FORM

The undersigned, hereby assures that he/she will ensure DBE participation for the amount(s) shown, if awarded a contract for this project in the amount of \$: _____.

All eligible DBE firms must be certified by the State Department of Transportation prior to bid opening.

Name of DBE Firm: _____			
DBE contract amount: \$ _____		% of total contract: _____	
_____ %			
DBE Firm Address: _____			

DBE contact person:		Name: _____	
		Phone: _____	
The DBE is a:	<input type="checkbox"/> Prime Contractor	<input type="checkbox"/> Subcontractor	<input type="checkbox"/> Manufacturer
			<input type="checkbox"/> Supplier
Category of DBE:	<input type="checkbox"/> Native American	<input type="checkbox"/> Hispanic	<input type="checkbox"/> Asian Pacific
	<input type="checkbox"/> Non minority Woman	<input type="checkbox"/> Other	<input type="checkbox"/> Black
Work to be performed by DBE: _____			

DBE certification Agency: _____			
Expiration Date: _____			
(Please include a copy of the latest DBE certification)			



Name of DBE Firm: _____				
DBE contract amount: \$ _____		% of total contract: _____		
_____ %				
DBE Firm Address: _____				

DBE contact person:		Name: _____		
		Phone: _____		
The DBE is a:	<input type="checkbox"/> Prime Contractor	<input type="checkbox"/> Subcontractor	<input type="checkbox"/> Manufacturer	<input type="checkbox"/> Supplier
Category of DBE:	<input type="checkbox"/> Native American	<input type="checkbox"/> Hispanic	<input type="checkbox"/> Asian Pacific	<input type="checkbox"/> Black
	<input type="checkbox"/> Non minority Woman	<input type="checkbox"/> Other		
Work to be performed by DBE: _____				

DBE certification Agency: _____				
Expiration Date: _____				
(Please include a copy of the latest DBE certification)				

Name of DBE Firm: _____				
DBE contract amount: \$ _____		% of total contract: _____		
_____ %				
DBE Firm Address: _____				

DBE contact person:		Name: _____		
		Phone: _____		
The DBE is a:	<input type="checkbox"/> Prime Contractor	<input type="checkbox"/> Subcontractor	<input type="checkbox"/> Manufacturer	<input type="checkbox"/> Supplier
Category of DBE:	<input type="checkbox"/> Native American	<input type="checkbox"/> Hispanic	<input type="checkbox"/> Asian Pacific	<input type="checkbox"/> Black
	<input type="checkbox"/> Non minority Woman	<input type="checkbox"/> Other		
Work to be performed by DBE: _____				

DBE certification Agency: _____				
Expiration Date: _____				
(Please include a copy of the latest DBE certification)				



	\$ Amount		\$ DBE Credit Participation	% DBE
DBE Prime Contractor	\$		\$	%
DBE Subcontractor	\$		\$	%
DBE Supplier*	\$	x 0.60 =	\$	%
DBE Manufacturer	\$		\$	%
Total Amount DBE			\$	%
DBE Goal			\$	%

* Only 60% credit allowed for DBE suppliers

If the total DBE participation shown is less than the DBE goal required by the specifications, you must attach documentation of your good faith efforts to achieve the goal.

The bidder agrees to certify that the disadvantaged firm(s) engaged to provide materials or services in the completion of this project:

- a. is a bona fide Disadvantaged Business Enterprise, and;
- b. has executed a binding contract to provide specific materials or services for a specific dollar amount.

The bidder will provide written notice to Sponsor indicating the Disadvantaged Business Enterprise(s) it intends to use in conjunction with this contract. This written notice is to be submitted with the bid proposal. Certification that the Disadvantaged Business Enterprise(s) has executed a binding contract with the bidder for materials or services should be provided to Sponsor. Breach of this commitment constitutes a breach of the bidder's contract if awarded.

The undersigned hereby certifies that he or she has read the terms of this commitment and is authorized to bind the bidder to this commitment.

NAME OF ORGANIZATION: _____

BY: _____

TITLE: _____

DATED: _____



EQUAL EMPLOYMENT OPPORTUNITY REPORT STATEMENT

Each bidder shall complete and sign the Equal Employment Opportunity Report Statement. A bid may be considered unresponsive and may be rejected, in the Sponsor's sole discretion, if the bidder fails to provide the fully executed statement or fails to furnish the required data. The bidder shall also, prior to award, furnish such other pertinent information regarding its own employment policies and practices as well as those of its proposed subcontractors as the Federal Aviation Administration (FAA), the Sponsor, or the Executive Vice Chairman of the President's Committee may require.

The bidder shall furnish similar statements executed by each of its first-tier and second-tier subcontractors and shall obtain similar compliance by each subcontractor, before awarding subcontracts. No subcontract shall be awarded to any non-complying subcontractor.

EQUAL EMPLOYMENT OPPORTUNITY REPORT STATEMENT

As Required in 41 CFR 60-1.7(b)

The bidder shall complete the following statements by checking the appropriate blanks. Failure to complete these blanks may be grounds for rejection of the bid:

- . The bidder has ____ has not ____ developed and has on file at each establishment affirmative action programs pursuant to 41 CFR 60-1.40 and 41 CFR 60-2.
- . The bidder has ____ has not ____ participated in any previous contract or subcontract subject to the equal opportunity clause prescribed by Executive order 11246, as amended.
- . The bidder has ____ has not ____ filed with the Joint Reporting Committee the annual compliance report on Standard Form 100 (EEO-1 Report).
- . The bidder does ____ does not ____ employ fifty or more employees.

NAME OF ORGANIZATION: _____

BY: _____

TITLE: _____

DATED: _____



Build America, BUY AMERICA (BABA) ACT

(Title 49 U.S.C. Section 50101)

The Buy American Preference incorporates statutory requirements and policies outlined in the in 49 USC § 50101, Executive Order 14005, and BABA.

Section 50101 of 49 USC requires that all steel and manufactured goods used on AIP projects be produced in the United States. This section also gives the FAA the ability to issue a waiver to a Sponsor to use non-domestic material on an AIP funded project subject to meeting certain conditions. A Sponsor may request that the FAA issue a waiver from the Buy American Preference requirements if the FAA finds that:

- . Applying the provision is not in the public interest.
- . The steel or manufactured goods are not available in sufficient quantity or quality in the United States.
- . The cost of components and subcomponents produced in the United States is more than 60 percent of the total components of a facility or equipment, and final assembly has taken place in the United States. Items that have an FAA standard specification item number (such as specific airport lighting equipment) are considered the equipment.
- . Applying this provision would increase the cost of the overall project by more than 25 percent.

Executive Order 14005 advances the Administration's priority to use terms and conditions of Federal financial assistance awards to maximize the use of goods, products, and materials produced in, and services offered in, the United States. The Order directs, to the extent appropriate and consistent with applicable law, agencies shall partner with the Hollings Manufacturing Extension Partnership (MEP) to conduct supplier scouting in order to identify American companies that are able to produce goods, products, and materials in the United States that meet Federal procurement needs, prior to consideration of using non-domestic products.

The Bipartisan Infrastructure Law, Build America, Buy America (BABA) Act strengthens Made in America Laws and bolsters America's industrial base, protects national security, and supports high-paying jobs. Under BABA, iron, steel and certain construction materials are required to be 100% produced in the United States.

Under the Bipartisan Infrastructure Law (Pub. L. No. 117-58) BABA three waivers are available for iron and steel, manufactured products, and construction materials when a Federal agency finds that –

- . Applying the domestic content procurement preference would be inconsistent with the public interest (a "public interest waiver");
- . Types of iron, steel, manufactured products, or construction materials are not produced in the United States in sufficient and reasonably available quantities or of a satisfactory quality (a "nonavailability waiver"); or
- . The inclusion of iron, steel, manufactured products, or construction materials produced in the United States will increase the cost of the overall project by more than 25 percent (an "unreasonable cost waiver").

BABA defines construction materials, items that are or consists primarily of non-ferrous metals, plastic and polymer-based products (including polyvinylchloride, composite building materials, and polymers used in fiber optic cables), glass (including optic glass), lumber or drywall.

Items that consist of two or more of the aforementioned materials that have been combined together through a manufacturing process, and items that include at least one of the listed materials combined with a material that is not listed through a manufacturing process, should be treated as manufactured products, rather than as construction materials. For example, a plastic framed sliding window should be treated as a manufactured product while plate glass should be treated as a construction material.



The Buy America Preference requirements flow down from the Sponsor to first tier contractors, who are responsible for ensuring that lower tier contractors and subcontractors are also in compliance.

Note: The Buy American Preference does not apply to temporary equipment a contractor uses as a tool of its trade and which does not remain as part of the project.

Required Documentation. The FAA Buy American Requests. All applications (requests) for an FAA Buy American Preference Waiver includes, at minimum, a completed Content Percentage Worksheet and Final Assembly Questionnaire. Additional information may be requested from the applicant by the FAA. Airport Sponsors, consultants, construction contractors, or equipment manufacturers are responsible for completing and submitting waiver applications. The FAA is unable to make a determination on waiver requests with incomplete information. Sponsors must confirm with the bidder or offeror to assess the adequacy of the waiver request and associated information prior to forwarding a waiver request to the FAA for action. All FAA waivers forms are available from the FAA Buy American Requirements webpage, located here: https://www.faa.gov/airports/aip/buy_american/

Propriety Confidentiality. Exemption 4 of the Freedom of Information Act protects "trade secrets and commercial or financial information obtained from a person [that is] privileged or confidential. Proprietary manufacturing and design information submitted to the Federal Aviation Administration for the purposes of receiving a Buy American Waiver shall not be disclosed outside the FAA. The FAA will provide a written notification to the Airport Sponsor, manufacturer(s), contractor(s) or supplier(s) when a waiver determination is complete.

Timing of Waiver Requests. Sponsors desiring a Type 2 waiver should submit their waiver request, with justification, before issuing a solicitation for bids or a request for proposal for a project.

The Sponsor must submit a Type 2, Type 3, or Type 4 waiver request prior to executing the contract. The FAA will generally not consider waiver requests after execution of the contract except where extraordinary and extenuating circumstances exist.

The Buy American Notice of Determination (NOD) Process. The FAA Reauthorization Act of 2018 requires that all approved waivers must be posted to the FAA's website and remain posted for public comment for 10 days, before becoming effective. All FAA waivers must complete the NOD process. Sponsors are encouraged to wait until approved waivers become effective before executing AIP projects.

Buy American Conformance Lists. The FAA Office of Airports maintains listings of projects and products that have received a waiver from the Buy American Preference requirements for project specific and nationwide use. Each of these conformance lists is available online at www.faa.gov/airports/aip/buy_american/. Products listed on the FAA Nationwide Buy American Conformance list do not require additional submittal of domestic content information. Nationwide waivers expire five years from the date issued, unless revoked earlier by the FAA.

Facility Waiver Requests. For construction of a facility, the Sponsor may submit the waiver request after bid opening, but prior to contract execution. Examples of facility construction include terminal buildings, terminal renovation, and snow removal equipment buildings.



CERTIFICATION OF COMPLIANCE WITH FAA BUY AMERICAN PREFERENCE – CONSTRUCTION PROJECTS

As a matter of bid responsiveness, the bidder or offeror must complete, sign, date, and submit this certification statement with its proposal. The bidder or offeror must indicate how it intends to comply with 49 USC § 50101, BABA and other related Made in America Laws, U.S. statutes, guidance, and FAA policies, by selecting one of the following certification statements. These statements are mutually exclusive. Bidder must select one or the other (i.e., not both) by inserting a checkmark or the letter “X”.

- ☐ Bidder or offeror hereby certifies that it will comply with 49 USC § 50101, BABA and other related U.S. statutes, guidance, and policies of the FAA by:
- . Only installing iron, steel and manufactured products produced in the United States;
 - . Only installing construction materials defined as: an article, material, or supply – other than an item of primarily iron or steel; a manufactured product; cement and cementitious materials; aggregates such as stone, sand, or gravel; or aggregate binding agents or additives that are or consist primarily of non-ferrous metals; plastic and polymer-based products (including polyvinylchloride, composite building materials, and polymers used in fiber optic cables); glass (including optic glass); lumber or drywall that have been manufactured in the United States;
 - . Installing manufactured products for which the Federal Aviation Administration (FAA) has issued a waiver as indicated by inclusion on the current FAA Nationwide Buy American Waivers Issued listing; or
 - . Installing products listed as an Excepted Article, Material or Supply in Federal Acquisition Regulation Subpart 25.108.

By selecting this certification statement, the bidder or offeror agrees:

- a. To provide to the Airport Sponsor or the FAA evidence that documents the source and origin of the iron, steel, and/or manufactured product.
 - b. To faithfully comply with providing U.S. domestic products.
 - c. To refrain from seeking a waiver request after establishment of the contract, unless extenuating circumstances emerge that the FAA determines justified.
 - d. Certify that all construction materials used in the project are manufactured in the U.S.
- ☐ The bidder or offeror hereby certifies it cannot comply with the 100 percent Buy American Preferences of 49 USC § 50101(a) but may qualify for a Type 3 or Type 4 waiver under 49 USC § 50101(b). By selecting this certification statement, the apparent bidder or offeror with the apparent low bid agrees:
- a. To submit to the Airport Sponsor or FAA within 15 calendar days of being selected as the responsive bidder, a formal waiver request and required documentation that supports the type of waiver being requested.
 - b. That failure to submit the required documentation within the specified timeframe is cause for a non-responsive determination that may result in rejection of the proposal.
 - c. To faithfully comply with providing U.S. domestic products at or above the approved U.S. domestic content percentage as approved by the FAA.
 - d. To furnish U.S. domestic product for any waiver request that the FAA rejects.
 - e. To refrain from seeking a waiver request after establishment of the contract, unless extenuating circumstances emerge that the FAA determines justified.



Required Documentation

Type 2 Waiver (Nonavailability) - The iron, steel, manufactured goods or construction materials or manufactured goods are not available in sufficient quantity or quality in the United States. The required documentation for the Nonavailability waiver is:

- a. Completed Content Percentage Worksheet and Final Assembly Questionnaire form;
- b. Record of thorough market research, consideration where appropriate of qualifying alternate items, products, or materials including;
- c. A description of the market research activities and methods used to identify domestically manufactured items capable of satisfying the requirement, including the timing of the research and conclusions reached on the availability of sources.

Type 3 Waiver – The cost of components and subcomponents produced in the United States is more than 60 percent of the cost of all components and subcomponents of the “facility/project.” The required documentation for a Type 3 waiver is:

- a. Completed Content Percentage Worksheet and Final Assembly Questionnaire including;
- b. Listing of all manufactured products that are not comprised of 100 percent U.S. domestic content (excludes products listed on the FAA Nationwide Buy American Waivers Issued listing and products excluded by Federal Acquisition Regulation Subpart 25.108; products of unknown origin must be considered as non-domestic products in their entirety);
- c. Cost of non-domestic components and subcomponents, excluding labor costs associated with final assembly and installation at project location;
- d. Percentage of non-domestic component and subcomponent cost as compared to total “facility” component and subcomponent costs, excluding labor costs associated with final assembly and installation at project location.

Type 4 Waiver (Unreasonable Costs) - Applying this provision for iron, steel, manufactured goods or construction materials would increase the cost of the overall project by more than 25 percent. The required documentation for this waiver is:

- a. A completed Content Percentage Worksheet and Final Assembly Questionnaire form;
- b. At minimum two comparable equal bids and/or offers;
- c. Receipt or record that demonstrates that supplier scouting called for in Executive Order 14005, indicates that no domestic source exists for the project and/or component;
- d. Completed waiver applications for each comparable bid and/or offer.

False Statements: Per 49 USC § 47126, this certification concerns a matter within the jurisdiction of the Federal Aviation Administration and the making of a false, fictitious, or fraudulent certification may render the maker subject to prosecution under Title 18, United States Code.

NAME OF ORGANIZATION: _____

BY: _____

TITLE: _____

DATED: _____



CERTIFICATION OF COMPLIANCE WITH FAA BUY AMERICAN PREFERENCE – EQUIPMENT/BUILDING PROJECTS

As a matter of bid responsiveness, the bidder or offeror must complete, sign, date, and submit this certification statement with their proposal. The bidder or offeror must indicate how they intend to comply with 49 USC § 50101, and other Made in America Laws, U.S. statutes, guidance, and FAA policies by selecting one on the following certification statements. These statements are mutually exclusive. Bidder must select one or the other (not both) by inserting a checkmark or the letter “X”.

- ☐ Bidder or offeror hereby certifies that it will comply with 49 USC § 50101, BABA and other related U.S. statutes, guidance, and policies of the FAA by:
- Only installing steel and manufactured products produced in the United States;
 - Only installing construction materials defined as: an article, material, or supply – other than an item of primarily iron or steel; a manufactured product; cement and cementitious materials; aggregates such as stone, sand, or gravel; or aggregate binding agents or additives that are or consist primarily of non-ferrous metals; plastic and polymer-based products (including polyvinylchloride, composite building materials, and polymers used in fiber optic cables); glass (including optic glass); lumber or drywall that have been manufactured in the United States;
 - Installing manufactured products for which the Federal Aviation Administration (FAA) has issued a waiver as indicated by inclusion on the current FAA Nationwide Buy American Waivers Issued listing; or
 - Installing products listed as an Excepted Article, Material or Supply in Federal Acquisition Regulation Subpart 25.108.

By selecting this certification statement, the bidder or offeror agrees:

- To provide to the Airport Sponsor or FAA evidence that documents the source and origin of the steel and manufactured product;
 - To faithfully comply with providing U.S. domestic product;
 - To furnish U.S. domestic product for any waiver request that the FAA rejects;
 - To refrain from seeking a waiver request after establishment of the contract, unless extenuating circumstances emerge that the FAA determines justified.
- ☐ The bidder or offeror hereby certifies it cannot comply with the 100 percent Buy American Preferences of 49 USC § 50101(a) but may qualify for a Type 3 waiver under 49 USC § 50101(b). By selecting this certification statement, the apparent bidder or offeror with the apparent low bid agrees:
- To submit to the Airport Sponsor or FAA within 15 calendar days of being selected as the responsive bidder, a formal waiver request and required documentation that supports the type of waiver being requested;
 - That failure to submit the required documentation within the specified timeframe is cause for a non-responsive determination that may result in rejection of the proposal;
 - To faithfully comply with providing U.S. domestic products at or above the approved U.S. domestic content percentage as approved by the FAA;
 - To refrain from seeking a waiver request after establishment of the contract, unless extenuating circumstances emerge that the FAA determines justified.



Required Documentation

Type 2 Waiver (Nonavailability) - The iron, steel, manufactured goods or construction materials are not available in sufficient quantity or quality in the United States. The required documentation for the Nonavailability waiver is:

- a. Completed Content Percentage Worksheet and Final Assembly Questionnaire form;
- b. Record of thorough market research, consideration where appropriate of qualifying alternate items, products, or materials including;
- c. A description of the market research activities and methods used to identify domestically manufactured items capable of satisfying the requirement, including the timing of the research and conclusions reached on the availability of sources.

Type 3 Waiver – The cost of the item components and subcomponents produced in the United States is more than 60 percent of the cost of all components and subcomponents of the “item”. The required documentation for a Type 3 waiver is:

- a. Completed Content Percentage Worksheet and Final Assembly Questionnaire form including;
- b. Listing of all product components and subcomponents that are not comprised of 100 percent U.S. domestic content (Excludes products listed on the FAA Nationwide Buy American Waivers Issued listing and products excluded by Federal Acquisition Regulation Subpart 25.108 (products of unknown origin must be considered as non-domestic products in their entirety);
- c. Cost of non-domestic components and subcomponents, excluding labor costs associated with final assembly at place of manufacture;
- d. Percentage of non-domestic component and subcomponent cost as compared to total “item” component and subcomponent costs, excluding labor costs associated with final assembly at place of manufacture.

Type 4 Waiver (Unreasonable Costs) - Applying this provision for iron, steel, manufactured goods or construction materials, would increase the cost of the overall project by more than 25 percent. The required documentation for this waiver is:

- a. Completed Content Percentage Worksheet and Final Assembly Questionnaire form;
- b. At minimum two comparable equal bidders and/or offerors;
- c. Receipt or record that demonstrates that supplier scouting called for in Executive Order 14005, indicates that no domestic source exists for the project and/or component;
- d. Completed waiver applications for each comparable bid and/or offer.

False Statements: Per 49 USC § 47126, this certification concerns a matter within the jurisdiction of the Federal Aviation Administration and the making of a false, fictitious, or fraudulent certification may render the maker subject to prosecution under Title 18, United States Code.

NAME OF ORGANIZATION: _____

BY: _____

TITLE: _____

DATED: _____



BUY AMERICAN WAIVER REQUEST FORMS



U.S. Department of
Transportation
**Federal Aviation
Administration**

FAA Form 5100-136, Buy American Project/Product Content Percentage Calculation – Worksheet

Paperwork Reduction Act Burden Statement

A federal agency may not conduct or sponsor, and a person is not required to respond to, nor shall a person be subject to a penalty for failure to comply with a collection of information subject to the requirements of the Paperwork Reduction Act unless that collection of information displays a currently valid OMB Control Number. The OMB Control Number for this information collection is 2120-0569. Public reporting for this collection of information is estimated to be approximately 8 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, completing and reviewing the collection of information. All responses to this collection of information are required under 49 U.S.C. Section 47105 to retain a benefit and to meet the reporting requirements of 2 CFR 200. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to: Information Collection Clearance Officer, Federal Aviation Administration, 10101 Hillwood Parkway, Fort Worth, TX 76177-1524.

Instructions for FAA Form 5100-136, Buy American Preference - Content Percentage Worksheet

General Instructions/Information

This form is intended for use by applicants (manufacturers, contractors, suppliers) for an FAA Buy American Preference waiver of the requirements of section 70914 of the Build America, Buy America (BABA) Act included in the Infrastructure Investment and Jobs Act (IIJA) (Pub. L. No. 117-58). This form and the Final Assembly Questionnaire (FAA form 137) must be submitted together for all waiver requests. Complete the below sections.

Applicant Information Section

Enter applicant and point-of-contact information.

Project/Product Information Section (The Final Project)

Enter summary information about the specific FAA eligible project for which this waiver is requested, including the calculated costs and percentage information from the project material structure worksheet.

FAA Buy American Preference Compliance Section (“Construction Materials”)

Enter summary cost and percentage information about the presence of non-domestic portions of iron, steel, or other singular “construction materials” that consist primarily of non-ferrous metals; plastic and polymer-based products (including polyvinylchloride, composite building materials, and polymers used in fiber optic cables); glass (including optic glass); lumber; or drywall which are not combined with any of other materials through a manufacturing process.

Use of Non-Domestic Construction Materials Justification Section

Enter a description of your good faith efforts made to locate and secure domestic materials that are not 100% domestically produced in the United States, including the use of the Supplier Scouting by the Manufacturing Extension Partnership (MEP) or market research. This information is required for any non-U.S. portions of structural steel and or iron.

Project Material Structure Worksheet (Manufactured Goods)

Enter onto the worksheet the final project and manufactured component/subcomponent items, prices and total costs, excluding labor and retail markup through level 2 only.

Eligible materials below level two should be included with its associated component or subcomponent. Price multiplied by quantity equals costs.

For additional information on how to complete this form, contact the FAA regional or airport district office associated with the airport worksite, or for assistance for other waivers, contact FAA headquarters via the AIP Buy American Preference Requirements webpage.

Level. Enter material level 0, 1, or 2. Level 0 is the final product, Level 1 is a component, and Level 2 is a sub-component.

Part Number. Enter a reference number used to track the item.

Item Description. Enter a concise but clear description of the item.

Quantity. Enter the quantity of the item described in the product/project.

Unit of Measure. Enter the unit of measure used for the item. Examples: Each, Ton, or Sq. Ft.

Price/Unit of Measure. Enter the price for each unit of the item.

U.S. Origin Price/Unit of Measure. Enter the price for each unit of U.S. origin.

U.S. Origin Cost. Enter the total cost.

Non-U.S. Price/Unit of Measure. Enter the price for each unit not of U.S. origin.

Non-U.S. Cost. Enter the total cost of the item not of U.S. origin.

Country of Non-U.S. Materials. Enter the country or countries of origin for all non-U.S. materials. Enter “Not applicable” if only U.S. materials are used for the item.

Example A – Completed Material Structure Worksheet

On the next page is an illustration of a Project Material Structure Worksheet. In this illustration, the final project and each manufactured component/subcomponent costs, excluding labor and retail mark-up, are listed. The total cost of materials, excluding labor and retail mark-up is \$720,000 (\$565,000 of U.S. costs and \$155,000 Non-U.S. costs). Items [materials] combined through a manufacturing process may be indicated as a manufactured component/subcomponent.

Unit of measure prices are multiplied by the quantity to identify costs. The sum of each component/subcomponents is equal to the amounts in the final project. Eligible materials below level 2 may be included within a manufactured good in levels 1 or 2.

Ineligible or excluded materials should be omitted.

The country of origin of all non-U.S. material are listed by each component and the final product. Other variations of the project components/subcomponents are possible as each manufacturer may produce or apply components/subcomponents differently.

Level (0, 1, 2)	Part Number	Item Description	Quantity	Unit of Measure	Price/Unit of Measure	U.S. Origin Price/Unit of Measure	U.S. Origin Cost	Non-U.S. Price/Unit of Measure	Non-U.S. Cost	Country of Non U.S. Materials
0	Ref #	Final Project	1	Each	\$720,000	\$425,000	\$565,000	\$72,500	\$155,000	Country A, Country B, Country C
1	Ref #	Manufactured Component	4	Ton	\$320,000	\$70,000	\$210,000	\$27,500	\$110,000	Non-U.S. Country A
1	Ref #	Manufactured Component	1	Each	\$100,000	\$100,000	\$100,000	\$0	\$0	Not Applicable
1	Ref #	Manufactured Component	1	Each	\$25,000	\$25,000	\$25,000	\$0	\$0	Not Applicable
1	Ref #	Manufactured Component	1	Sq. Ft.	\$100,000	\$60,000	\$60,000	\$40,000	\$40,000	Non-U.S. Country B
2	Ref #	Manufactured Subcomponent	1	Each	\$25,000	\$20,000	\$20,000	\$5,000	\$5,000	Non-U.S. Country C
1	Ref #	Manufactured Component	1	Each	\$50,000	\$50,000	\$50,000	\$0	\$0	Not Applicable
1	Ref #	Structural Steel Material	1	Tons	\$100,000	\$100,000	\$100,000	\$0	\$0	Not Applicable



U.S. Department of
Transportation
**Federal Aviation
Administration**

OMB CONTROL NUMBER: 2120-
0569 EXPIRATION DATE:
6/30/2023

BUY AMERICAN PROJECT/PRODUCT CONTENT PERCENTAGE CALCULATION – WORKSHEET

Applicant Information

Date of Application: Applicant Name:

Applicant Type (choose one):

☐ Prime Contractor ☐ Manufacturer ☐ Supplier

Point of Contact (First and Last Name):

Applicant Business Address:

Email address:

Telephone:

Extension:

Project/Product Information

FAA Eligible Project: Airport Sponsor: Airport LOCID: FAA

Award Number:

FAA Item Number (FAA Advisory Circular reference,
if applicable): Total Material Cost:

Total U.S. Material Content Cost:	Percentage:	%
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Total Non-U.S. Material Content Cost:	Percentage:	%
--	-------------	---

FAA Buy American Preference (including Buy American Build American) Compliance

Does this project include any iron, steel or any of the following construction materials, not 100% produced in the United States?

Yes ☐ No ☐

If “Yes,” indicate the cost and percentage of the project below.

Steel (e.g., structural steel, rebar)	Cost:	Percentage:	%
Iron	Cost:	Percentage:	%
Non-ferrous metals	Cost:	Percentage:	%
Plastic and polymer-based products	Cost:	Percentage:	%
Glass (including optic glass)	Cost:	Percentage:	%
Lumber	Cost:	Percentage:	%
Drywall	Cost:	Percentage:	%

Use of Non-Domestic Construction Materials Justification

Provide a description of your efforts to locate and secure a domestic source for those “construction materials” or final manufactured goods that are not 100% produced in the U.S., including use of the Manufacturing Extension Partnership (MEP) and market research.

– CONFIDENTIAL –

NOT SUBJECT TO DISCLOSURE UNDER EXEMPTION # 4 OF THE FREEDOM OF INFORMATION ACT

Level (0, 1, 2)	Part Number	Item Description	Quantity	Unit of Measure	Price/Unit of Measure	U.S. Origin Price/Unit of Measure	U.S. Origin Cost (Each)	Non-U.S. Price/Unit of Measure	Non-U.S. Cost (Each)	Country of Non-U.S. Materials

– CONFIDENTIAL –

NOT SUBJECT TO DISCLOSURE UNDER EXEMPTION # 4 OF THE FREEDOM OF INFORMATION ACT

Level (0, 1, 2)	Part Number	Item Description	Quantity	Unit of Measure	Price/Unit of Measure	U.S. Origin Price/Unit of Measure	U.S. Origin Cost (Each)	Non-U.S. Price/Unit of Measure	Non-U.S. Cost (Each)	Country of Non-U.S. Materials

– CONFIDENTIAL –

NOT SUBJECT TO DISCLOSURE UNDER EXEMPTION # 4 OF THE FREEDOM OF INFORMATION ACT

Level (0, 1, 2)	Part Number	Item Description	Quantity	Unit of Measure	Price/Unit of Measure	U.S. Origin Price/Unit of Measure	U.S. Origin Cost (Each)	Non-U.S. Price/Unit of Measure	Non-U.S. Cost (Each)	Country of Non-U.S. Materials

– **CONFIDENTIAL** –

NOT SUBJECT TO DISCLOSURE UNDER EXEMPTION # 4 OF THE FREEDOM OF
INFORMATION ACT

Certification

The undersigned certifies that this information is true and accurate to the best of their knowledge. A false certification represents a violation of 18 U.S.C § 1001 and 49 U.S.C § 47126. Signatory has the burden of proof to establish compliance.

Signature: _____ **Date:** _____

Name: _____

Title: _____

Submit by Email

FOR FAA USE ONLY

(Mark the appropriate Waiver Type & Scope)

Applicable FAA Waiver Type

- ☐ Type I Public Interest (HQ Only)
- ☐ Type II Nonavailability (HQ Only)
- ☐ Type III More than 60% and Final Assembly within the U.S.
- ☐ Type IV Unreasonable Cost (Requires MEP/requires HQ coordination)
- ☐ BABA Iron, Steel, or Construction Material (requires justification) (Apply BABA Flag)

Applicable FAA Waiver Scope

- ☐ Project Specific
- ☐ Nationwide – (General Applicability) (For HQ Only)

Justifications

- ☐ Manufacturing Extension Partnership (MEP) Coordinated

FAA Official's Signature:

End of FAA-Use Only Section



U.S. Department of
Transportation
**Federal Aviation
Administration**

FAA FORM 5100-137, BUY AMERICAN PREFERENCES – FINAL ASSEMBLY QUESTIONNAIRE

Paperwork Reduction Act Burden Statement

A federal agency may not conduct or sponsor, and a person is not required to respond to, nor shall a person be subject to a penalty for failure to comply with a collection of information subject to the requirements of the Paperwork Reduction Act unless that collection of information displays a currently valid OMB Control Number. The OMB Control Number for this information collection is 2120-0569. Public reporting for this collection of information is estimated to be approximately 8 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, completing and reviewing the collection of information. All responses to this collection of information are required under 49 U.S.C. Section 47105 to retain a benefit and to meet the reporting requirements of 2 CFR 200. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to: Information Collection Clearance Officer, Federal Aviation Administration, 10101 Hillwood Parkway, Fort Worth, TX 76177-1524.



-- CONFIDENTIAL --
NOT SUBJECT TO DISCLOSURE UNDER EXEMPTION # 4 OF THE
FREEDOM OF INFORMATION ACT

Buy American Preferences –Final Assembly Questionnaire

To assist the Federal Aviation Administration (FAA) in making the determination of whether final assembly of the product occurs in the United States, please complete and submit this questionnaire when requesting a Buy American Waiver under 49 USC § 50101(b)(3)(A).

Company Name:

Date:

FAA Eligible Item:

FAA Item Number (if applicable):

Address of Final Assembly Location:

1. Provide a description of the assembly process occurring at the specified final location in the United States.
 - . Describe the final assembly process and its various operations.
 - . How long does the final assembly process take to complete?
2. Provide a description of the resources used to conduct the assembly of the product at the specified location in the United States.
 - . How many employees are involved in the final assembly process and what is the general skill level of those employees?
 - . What type of equipment is used during the final assembly process?
 - . What is a rough estimate of the associated cost to conduct final assembly of the product at the specified location in the United States?

The undersigned certifies that this information is true and accurate to the best of their knowledge. A false certification represents a violation of 18 U.S.C § 1001 and 49 U.S.C § 47126. Signatory has the burden of proof to establish compliance.

Signature: _____ Name:



BUY AMERICA CONFORMANCE LISTING

Title 49 U.S.C Section 50101 (b)

For Airfield Development Projects funded under the Airport Improvement Program

Preparation of a Component Cost Calculation Table is not necessary for equipment listed on the FAA national listing:

http://www.faa.gov/airports/aip/buy_american/

Bidder shall submit a listing of equipment it proposes to install on the project that is included on the current National Buy American conformance list.

Equipment Type	Name of Manufacturer	Product Number

Certification Signature:

Bidder hereby certifies that the above listed equipment, which we propose for installation on the subject project, is on the current National Buy America Conformance list as established at: http://www.faa.gov/airports/aip/buy_american/

I hereby certify the above information is accurate and complete.

NAME OF ORGANIZATION: _____

BY: _____

TITLE: _____

DATED: _____



CERTIFICATION REGARDING DOMESTIC PREFERENCES FOR PROCUREMENTS

The Bidder or Offeror certifies by signing and submitting this bid or proposal that, to the greatest extent practicable, the Bidder or Offeror has provided a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States (including, but not limited to, iron, aluminum, steel, cement, and other manufactured products) in compliance with 2 CFR § 200.322.

NAME OF ORGANIZATION: _____

BY: _____

TITLE: _____

DATED: _____



CERTIFICATION OF OFFEROR/BIDDER REGARDING DEBARMENT

By submitting a bid/proposal under this solicitation, the bidder or offeror certifies that neither it nor its principals are presently debarred or suspended by any Federal department or agency from participation in this transaction.

NAME OF ORGANIZATION: _____

BY: _____

TITLE: _____

DATED: _____



CERTIFICATION OF LOWER TIER CONTRACTORS REGARDING DEBARMENT

The successful bidder, by administering each lower tier subcontract that exceeds \$25,000 as a “covered transaction”, must verify each lower tier participant of a “covered transaction” under the project is not presently debarred or otherwise disqualified from participation in this federally assisted project. The successful bidder will accomplish this by:

1. Checking the System for Award Management at website: <http://www.sam.gov>.
2. Collecting a certification statement similar to the Certification of Offerer/Bidder Regarding Debarment above.
3. Inserting a clause or condition in the covered transaction with the lower tier contract.

If the Federal Aviation Administration later determines that a lower tier participant failed to disclose to a higher tier participant that it was excluded or disqualified at the time it entered the covered transaction, the FAA may pursue any available remedies, including suspension and debarment of the non-compliant participant.

NAME OF ORGANIZATION: _____

BY: _____

TITLE: _____

DATED: _____



CERTIFICATION REGARDING LOBBYING

The Bidder or Offeror certifies by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

1. No Federal appropriated funds have been paid or will be paid, by or on behalf of the Bidder or Offeror, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.
3. The undersigned shall require that the language of this certification be included in the award documents for all sub-awards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all sub-recipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

NAME OF ORGANIZATION: _____

BY: _____

TITLE: _____

DATED: _____



CERTIFICATION OF OFFEROR/BIDDER REGARDING TAX DELINQUENCY AND FELONY CONVICTIONS

The applicant must complete the following two certification statements. The applicant must indicate its current status as it relates to tax delinquency and felony conviction by inserting a checkmark or letter "X" in the space following the applicable response. The applicant agrees that, if awarded a contract resulting from this solicitation, it will incorporate this provision for certification in all lower tier subcontracts.

Certifications

1. The applicant represents that it is (☐) is not (☐) a corporation that has any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability.
2. The applicant represents that it is (☐) is not (☐) is not a corporation that was convicted of a criminal violation under any Federal law within the preceding 24 months.

Note: If an applicant responds in the affirmative to either of the above representations, the applicant is ineligible to receive an award unless the sponsor has received notification from the agency suspension and debarment official (SDO) that the SDO has considered suspension or debarment and determined that further action is not required to protect the Government's interests. The applicant therefore must provide information to the Sponsor about its tax liability or conviction to the Sponsor, who will then notify the FAA Airports District Office, which will then notify the agency's SDO to facilitate completion of the required considerations before award decisions are made.

Term Definitions

Felony conviction: Felony conviction means a conviction within the preceding twenty-four(24) months of a felony criminal violation under any Federal law and includes conviction of an offense defined in a section of the U.S. code that specifically classifies the offense as a felony and conviction of an offense that is classified as a felony under 18 U.S.C. § 3559.

Tax Delinquency: A tax delinquency is any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted, or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability.

NAME OF ORGANIZATION: _____

BY: _____

TITLE: _____

DATED: _____



TRADE RESTRICTION CERTIFICATION

By submission of an offer, the Offeror certifies that with respect to this solicitation and any resultant contract, the Offeror:

1. is not owned or controlled by one or more citizens of a foreign country included in the list of countries that discriminate against U.S. firms as published by the Office of the United States Trade Representative (USTR);
2. has not knowingly entered into any contract or subcontract for this project with a person that is a citizen or national of a foreign country included on the list of countries that discriminate against U.S. firms as published by the USTR; and
3. has not entered into any subcontract for any product to be used on the Federal project that is produced in a foreign country included on the list of countries that discriminate against U.S. firms published by the USTR.

This certification concerns a matter within the jurisdiction of an agency of the United States of America and the making of a false, fictitious, or fraudulent certification may render the maker subject to prosecution under Title 18 USC Section 1001.

The Offeror/Contractor must provide immediate written notice to the Sponsor if the Offeror/Contractor learns that its certification or that of a subcontractor was erroneous when submitted or has become erroneous by reason of changed circumstances. The Contractor must require subcontractors provide immediate written notice to the Contractor if at any time it learns that its certification was erroneous by reason of changed circumstances.

Unless the restrictions of this clause are waived by the Secretary of Transportation in accordance with 49 CFR 30.17, no contract shall be awarded to an Offeror or subcontractor:

1. who is owned or controlled by one or more citizens or nationals of a foreign country included on the list of countries that discriminate against U.S. firms published by the USTR; or
2. whose subcontractors are owned or controlled by one or more citizens or nationals of a foreign country on such USTR list; or
3. who incorporates in the public works project any product of a foreign country on such USTR list.

Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render, in good faith, the certification required by this provision. The knowledge and information of a contractor is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

The Offeror agrees that, if awarded a contract resulting from this solicitation, it will incorporate this provision for certification without modification in all lower tier subcontracts. The Contractor may rely on the certification of a prospective subcontractor that it is not a firm from a foreign country included on the list of countries that discriminate against U.S. firms as published by USTR, unless the Offeror has knowledge that the certification is erroneous.



This certification is a material representation of fact upon which reliance was placed when making an award. If it is later determined that the Contractor or subcontractor knowingly rendered an erroneous certification, the Federal Aviation Administration (FAA) may direct through the Sponsor cancellation of the contract or subcontract for default at no cost to the Sponsor or the FAA.

NAME OF ORGANIZATION: _____

BY: _____

TITLE: _____

DATED: _____



NON-COLLUSION AFFIDAVIT

STATE: _____

COUNTY: _____

The undersigned bidder or agent, being duly sworn, on oath, says that he has not, nor has any other member, representative, or agent of the firm, company, corporation or partnership represented by him, entered into any combination, collusion or agreement with any person relative to the price to be bid by anyone at such letting, nor to prevent any person from bidding nor to induce anyone to refrain from bidding, and that this bid is made without reference to any other bid and without any agreement, understanding or combination with any other person in reference to such bidding in any way or manner whatever.

NAME OF ORGANIZATION: _____

BY: _____

TITLE: _____

DATED: _____

NOTARY ATTEST:

SUBSCRIBED AND SWORN TO BEFORE ME THIS _____ DAY OF _____, 20____

NOTARY PUBLIC - STATE OF _____

MY COMMISSION EXPIRES: _____



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BID PROPOSAL SUMMARY

Bidder Name: _____

Base Bid Total: \$ _____

Alternate Bid Total: \$ _____



BID PROPOSAL - BASE BID - WEST QUAD DEVELOPMENT 3 UNIT HANGAR & LOUNGE						
Item No.	Item Description	Unit	Quantity	UNIT PRICE		TOTAL
C-105-6.1	MOBILIZATION & DEMOBILIZATION	LS	1	\$	dollars and cents	\$
C-115-4.1	MAINTENANCE OF TRAFFIC	LS	1	\$	dollars and cents	\$
C-95-4.1	CONSTRUCTION ENGINEERING	LS	1	\$	dollars and cents	\$
C-102-5.1b	INSTALLATION AND REMOVAL OF SILT FENCE	LF	1,680	\$	dollars and cents	\$
C-102-5.1c	INSTALLATION AND REMOVAL OF TEMPORARY INLET PROTECTION	EA	7	\$	dollars and cents	\$
P-101-5.1	COLD MILLING (1.5")	SY	223	\$	dollars and cents	\$
P-101-5.2	REMOVAL OF EXISTING WATERLINE	LF	145	\$	dollars and cents	\$
P-101-5.3	REMOVAL AND SALVAGE OF EXISTING FIRE HYDRANT	EA	1	\$	dollars and cents	\$
P-101-5.4	ASPHALT / ASPHALT INTERFACE JOINT	LF	780	\$	dollars and cents	\$
P-101-5.5	ASPHALT / CONCRETE INTERFACE JOINT	LF	410	\$	dollars and cents	\$
P-152-4.1	UNCLASSIFIED EXCAVATION	CY	2,840	\$	dollars and cents	\$
P-156-8.1	CEMENT SUBGRADE (UNDISTRIBUTED)	SY	8,930	\$	dollars and cents	\$
P-156-8.2	CEMENT (UNDISTRIBUTED)	TON	150	\$	dollars and cents	\$
P-605-5.1	CONCRETE / CONCRETE INTERFACE JOINT	LF	970	\$	dollars and cents	\$
P-610-6.1	CONCRETE	SY	380	\$	dollars and cents	\$



BID PROPOSAL - BASE BID - WEST QUAD DEVELOPMENT 3 UNIT HANGAR & LOUNGE						
Item No.	Item Description	Unit	Quantity	UNIT PRICE		TOTAL
P-620-5.1b	PAVEMENT MARKINGS (ANY COLOR)	SF	970	\$	dollars and cents	\$
P-620-5.1c	REFLECTIVE MEDIA - TYPE III	LB	120	\$	dollars and cents	\$
P-620-5.1d	PAVEMENT MESSAGE MARKING, ADA	EA	2	\$	dollars and cents	\$
D-701-5.1	12 INCH, 16 GAUGE CORRUGATED STEEL PIPE	LF	20	\$	dollars and cents	\$
D-702-5.1	12 INCH, 16 GAUGE SLOTTED DRAIN PIPE	LF	202	\$	dollars and cents	\$
D-751-5.1	TYPE C MANHOLE	EA	1	\$	dollars and cents	\$
D-751-5.2	ADJUST EXISTING STORM STRUCTURE	EA	1	\$	dollars and cents	\$
D-751-5.3	TYPE B INLET	EA	2	\$	dollars and cents	\$
T-901-5.1	SEEDING	KSF	45	\$	dollars and cents	\$
T-908-5.1	MULCHING	SY	4,970	\$	dollars and cents	\$
L-110-5.1	SPLIT CONDUIT, 2" SCH 80 PVC	LF	70	\$	dollars and cents	\$
L-125-4.1	TAXILANE EDGE REFLECTOR	EA	11	\$	dollars and cents	\$
UT-00	REINSTALL FIRE HYDRANT ASSEMBLY	EA	1	\$	dollars and cents	\$
UT-00	8" C900 PVC FIRE PROTECTION LINE	LF	20	\$	dollars and cents	\$
UT-01	2" C900 PVC DOMESTIC WATERLINE	LF	270	\$	dollars and cents	\$



BID PROPOSAL - BASE BID - WEST QUAD DEVELOPMENT 3 UNIT HANGAR & LOUNGE						
Item No.	Item Description	Unit	Quantity	UNIT PRICE		TOTAL
UT-01	1.5" METER PIT	EA	1	\$	dollars and cents	\$
UT-02	6 INCH SDR 35 PVC SANITARY LATERAL	LF	290	\$	dollars and cents	\$
UT-02	48" MANHOLE, TYPE C	EA	1	\$	dollars and cents	\$
UT-02	SANITARY CLEANOUT	EA	2	\$	dollars and cents	\$
INDOT 301	COMPACTED AGGREGATE, NO. 53 BASE	CY	1,000	\$	dollars and cents	\$
INDOT 402	HMA TYPE B, 58S, BASE, 19.0MM	TON	650	\$	dollars and cents	\$
INDOT 402	HMA TYPE B, 58S, SURFACE, 12.5MM	TON	520	\$	dollars and cents	\$
INDOT 406	ASPHALT FOR TACK COAT	SY	5,340	\$	dollars and cents	\$
P-620-5.1d	PAVEMENT MESSAGE MARKING, ADA	EA	2	\$	dollars and cents	\$
SP-02-1.1	WHEEL STOPS	EA	26	\$	dollars and cents	\$
133419	HANGAR BUILDING	SF	12,285	\$	dollars and cents	\$
33000	HANGAR BUILDING - SPECIALIZED FOUNDATIONS	LS	1	\$	dollars and cents	\$
TOTAL						\$



BID PROPOSAL - ALTERNATE BID - WEST QUAD DEVELOPMENT 6 UNIT HANGAR & LOUNGE						
Item No.	Item Description	Unit	Quantity	UNIT PRICE		TOTAL
C-105-6.1	MOBILIZATION & DEMOBILIZATION	LS	1	\$	dollars and cents	\$
C-115-4.1	MAINTENANCE OF TRAFFIC	LS	1	\$	dollars and cents	\$
C-95-4.1	CONSTRUCTION ENGINEERING	LS	1	\$	dollars and cents	\$
C-102-5.1b	INSTALLATION AND REMOVAL OF SILT FENCE	LF	1,680	\$	dollars and cents	\$
C-102-5.1c	INSTALLATION AND REMOVAL OF TEMPORARY INLET PROTECTION	EA	7	\$	dollars and cents	\$
P-101-5.1	COLD MILLING (1.5")	SY	220	\$	dollars and cents	\$
P-101-5.2	REMOVAL OF EXISTING WATERLINE	LF	145	\$	dollars and cents	\$
P-101-5.3	REMOVAL AND SALVAGE OF EXISTING FIRE HYDRANT	EA	1	\$	dollars and cents	\$
P-101-5.4	ASPHALT / ASPHALT INTERFACE JOINT	LF	780	\$	dollars and cents	\$
P-101-5.5	ASPHALT / CONCRETE INTERFACE JOINT	LF	780	\$	dollars and cents	\$
P-152-4.1	UNCLASSIFIED EXCAVATION	CY	2,840	\$	dollars and cents	\$
P-156-8.1	CEMENT SUBGRADE (UNDISTRIBUTED)	SY	8,930	\$	dollars and cents	\$
P-156-8.2	CEMENT (UNDISTRIBUTED)	TON	150	\$	dollars and cents	\$
P-605-5.1	CONCRETE / CONCRETE INTERFACE JOINT	LF	970	\$	dollars and cents	\$
P-610-6.1	CONCRETE	SY	730	\$	dollars and cents	\$



BID PROPOSAL - ALTERNATE BID - WEST QUAD DEVELOPMENT 6 UNIT HANGAR & LOUNGE						
Item No.	Item Description	Unit	Quantity	UNIT PRICE		TOTAL
P-620-5.1b	PAVEMENT MARKINGS (ANY COLOR)	SF	970	\$	dollars and cents	\$
P-620-5.1c	REFLECTIVE MEDIA - TYPE III	LB	120	\$	dollars and cents	\$
P-620-5.1d	PAVEMENT MESSAGE MARKING, ADA	EA	2	\$	dollars and cents	\$
D-701-5.1	12 INCH, 16 GAUGE CORRUGATED STEEL PIPE	LF	20	\$	dollars and cents	\$
D-702-5.1	12 INCH, 16 GAUGE SLOTTED DRAIN PIPE	LF	390	\$	dollars and cents	\$
D-751-5.1	TYPE C MANHOLE	EA	1	\$	dollars and cents	\$
D-751-5.2	ADJUST EXISTING STORM STRUCTURE	EA	1	\$	dollars and cents	\$
D-751-5.3	TYPE B INLET	EA	2	\$	dollars and cents	\$
T-901-5.1	SEEDING	KSF	30	\$	dollars and cents	\$
T-908-5.1	MULCHING	SY	3,330	\$	dollars and cents	\$
L-110-5.1	SPLIT CONDUIT, 2" SCH 80 PVC	LF	70	\$	dollars and cents	\$
L-125-4.1	TAXILANE EDGE REFLECTOR	EA	11	\$	dollars and cents	\$
UT-00	REINSTALL FIRE HYDRANT ASSEMBLY	EA	1	\$	dollars and cents	\$
UT-00	8" C900 PVC FIRE PROTECTION LINE	LF	20	\$	dollars and cents	\$
UT-01	2" C900 PVC DOMESTIC WATERLINE	LF	270	\$	dollars and cents	\$



BID PROPOSAL - ALTERNATE BID - WEST QUAD DEVELOPMENT 6 UNIT HANGAR & LOUNGE						
Item No.	Item Description	Unit	Quantity	UNIT PRICE		TOTAL
UT-01	1.5" METER PIT	EA	1	\$	dollars and cents	\$
UT-02	6 INCH SDR 35 PVC SANITARY LATERAL	LF	110	\$	dollars and cents	\$
UT-02	48" MANHOLE, TYPE C	EA	1	\$	dollars and cents	\$
UT-02	SANITARY CLEANOUT	EA	1	\$	dollars and cents	\$
INDOT 301	COMPACTED AGGREGATE, NO. 53 BASE	CY	1,000	\$	dollars and cents	\$
INDOT 402	HMA TYPE B, 58S, BASE, 19.0MM	TON	650	\$	dollars and cents	\$
INDOT 402	HMA TYPE B, 58S, SURFACE, 12.5MM	TON	520	\$	dollars and cents	\$
INDOT 406	ASPHALT FOR TACK COAT	SY	5,340	\$	dollars and cents	\$
P-620-5.1d	PAVEMENT MESSAGE MARKING, ADA	EA	2	\$	dollars and cents	\$
SP-02-1.1	WHEEL STOPS	EA	26	\$	dollars and cents	\$
133419	HANGAR BUILDING	SF	23,441	\$	dollars and cents	\$
33000	HANGAR BUILDING - SPECIALIZED FOUNDATIONS	LS	1	\$	dollars and cents	\$
TOTAL						\$



PART 3: CONTRACT DOCUMENTS



CONSTRUCTION AGREEMENT

Terre Haute Regional Airport - HUF
Terre Haute, Indiana
West Quad 6 Unit Box Hangar Phase 2
Project No. 3-18-0082-057-2024

THIS AGREEMENT, made and entered into this _____ day of _____, 20____, by and between Terre Haute Airport Authority, Party of the First Part, hereinafter referred to as the "Sponsor", and _____, Party of the Second Part, hereinafter referred to as the "Contractor," for the construction of airport improvements including West Quad 6 Unit Box Hangar Phase 2, AIP No. 3-18-0082-057-2024 at the Terre Haute Regional Airport - HUF.

WITNESSETH THAT the Contractor and Sponsor for the consideration stated herein agree as follows:

ARTICLE 1: SCOPE OF WORK. It is hereby mutually agreed that for and in consideration of the payments as provided for herein to the Contractor by the Sponsor, the Contractor shall furnish all labor, utilities, transportation services, tools, equipment, and material and shall perform all work necessary including all incidental and appurtenant work to complete the improvements in a good and substantial manner, ready for use in strict accordance with this Contract, a copy of which is filed pursuant to law in the office of the legal representative of the Sponsor.

ARTICLE 2: NOTICE TO PROCEED. The Contractor agrees to commence work within ten (10) calendar days after the date indicated within the Notice to Proceed. Contract times commence to run as provided in paragraph 80-07 of General Provisions and will continue to be counted until the project is accepted and complete, including punch list and administrative closeout submittals. Contractor further agrees to complete said work within
Base Bid - 149 Calendar Days Alternative - 199 Calendar Days
Base Bid - 149 Calendar Days Alternative - 199 Calendar Days. Extensions of the Contract time may only be permitted execution of a formal modification to Contract Agreement as approved by the Sponsor.

ARTICLE 3: COMPENSATION. In consideration of the completion of the work described herein and in fulfillment of all stipulations of this Contract to the satisfaction and acceptance of the Engineer and the Sponsor, the Sponsor shall pay and the said Contractor further agrees to receive and accept payment based on the contract price bid per unit as full compensation for furnishing all the equipment, labor, incidentals, and materials, and for the costs of all premiums on insurance and bonds and for doing all work contemplated and specified in this Contract; also for all loss or damage arising out of the nature of the work aforesaid, or from any unforeseen obstructions or difficulties which may be encountered in the prosecution of the same; and for all risks of every description connected with the work; and for well and faithfully completing the work and the whole thereof, in full compliance with the Contract Documents and the requirements of the Engineer under them.

Payments are to be made to the Contractor in accordance with and subject to the provisions embodied in the Contract documents hereto attached.

Bid Tabulation to be inserted once the notice to award has been granted.

The amount of money appropriated will be equal to or in excess of the contract amount as forth in the notice(s) to proceed. Change orders requiring additional compensable work to be performed, which cause the aggregate amount payable under the contract to exceed the amount appropriated for the original contract, are prohibited unless the contractor is given written assurance by Sponsor that lawful appropriations to cover costs of the additional work have been made or unless such work is covered under a remedy granting provision of the contract.



Notwithstanding anything to the contrary in the Contract Documents the Contractor hereby acknowledges and agrees that Sponsor's performance under the contract is subject to receipt of funds from the FAA and further is subject to annual appropriation by the Sponsor in accordance with a budget adopted by the Terre Haute Airport Authority. Sponsor may issue multiple Notice(s) to Proceed in incremental stages as funding becomes available.

Inasmuch as this Contract is executed pursuant to the laws of the State of Indiana, pertaining to airports and payment of the contract unit price shall be made solely from special account established for this project.

ARTICLE 4: PAYMENT BY SPONSOR. It is hereby further agreed that, at the completion of the work and its acceptance by the Sponsor, all sums due the Contractor by reason of his faithful performance of the work, taking into consideration additions to or deductions from the Contract price by reason of alterations or modifications of the original Contract or by reason of "Extra Work" authorized under this Contract, will be paid the Contractor by the Sponsor after said completion and acceptance.

ARTICLE 5: LIQUIDATED DAMAGES. Contractor and Sponsor recognize that time is of the essence and that Sponsor will suffer financial and other losses if the Work is not completed and Milestones not achieved within the Contract Times, as duly modified. The parties also recognize the delays, expense, and difficulties involved in proving, in a legal or arbitration proceeding, the actual loss suffered by Sponsor if the Work is not completed on time.

Accordingly, instead of requiring any such proof, Sponsor and Contractor agree that as liquidated damages for delay (but not as a penalty) if Contractor neglects, refuses, or fails to complete the remaining Work within the Contract Times (as duly adjusted pursuant to the Contract) for acceptance, completion and readiness for final payment. Contractor shall pay Sponsor damages as outlined in the General Provisions 80-08 and Local Provisions, "Liquidated Damages" for each day that expires after such time until the Work is completed and ready for final payment.

Liquidated damages for failing to timely attain Milestones, Substantial Completion, and final completion are not additive, and will not be imposed concurrently. If Sponsor recovers liquidated damages for a delay in completion by Contractor, then such liquidated damages are Sponsor's sole and exclusive remedy for such delay, and Sponsor is precluded from recovering any other damages, whether actual, direct, excess, or consequential, for such delay, except for special damages (if any) specified in this Agreement.

ARTICLE 6: SPECIAL DAMAGES. Contractor shall reimburse Sponsor for any fines or penalties imposed on Sponsor as a direct result of the Contractor's failure to attain Substantial Completion according to the Contract Times, and for the actual costs reasonably incurred by Sponsor for engineering, construction observation, inspection, and administrative services needed after the contract time expires. The special damages imposed in this paragraph are supplemental to any liquidated damages for delayed completion established in this Agreement.

ARTICLE 7: CONTRACT DOCUMENTS. It is hereby further agreed that any references herein to the "Contract" shall include "Contract Documents" as the same as defined in Paragraph 10-16, Section 10 of the General Provisions and as listed in the Table of Contents of this Project Manual. The "Contract" shall consist of:

- All issued Addenda
- Notice to Bidders
- Instruction to Bidders
- Part 2: Bidding Documents
 - Bid proposal is excluded. Awarded schedules and corrected pay items are incorporated into this agreement.
- Part 3: Contract Documents
- Part 4: FAA General Provisions
- Part 5: Special Provisions
- Part 6: Wage Rates
- Part 7: Safety Documents
- Part 8: FAA Technical Specifications
- Part 9: Supplemental Technical Specifications



- Construction Drawings
- Project Manual
- Attached appendices and all documents incorporated by reference.

Said “Contract Documents” are made a part of the Contract as if set out at length herein.

ARTICLE 8: UNIT PRICES. The Contractor agrees to perform all the work described in the Contract Documents for the unit prices and lump sums as submitted in the Bid and incorporated herein, taking into consideration additions to or deductions from the Total Bid by reason of actual quantities measured, alterations or modifications of the original estimated quantities or by reason of “Extra Work” authorized under this Agreement in accordance with the provisions of the Contract Documents.

ARTICLE 9: BREACH OF CONTRACT TERMS. Any violation or breach of terms of this contract on the part of the Contractor or its subcontractors may result in the suspension or termination of this contract or such other action that may be necessary to enforce the rights of the parties of this agreement.

Sponsor will provide Contractor written notice that describes the nature of the breach and corrective actions the Contractor must undertake in order to avoid termination of the contract. Sponsor reserves the right to withhold payments to Contractor until such time the Contractor corrects the breach or the Sponsor elects to terminate the contract. The Sponsor’s notice will identify a specific date by which the Contractor must correct the breach. Sponsor may proceed with termination of the contract if the Contractor fails to correct the breach by the deadline indicated in the Sponsor’s notice.

The duties and obligations imposed by the Contract Documents and the rights and remedies available thereunder are in addition to, and not a limitation of, any duties, obligations, rights and remedies otherwise imposed or available by law.

ARTICLE 10: CONTRATOR REPRESENTATIONS. In order to induce Sponsor to enter into this Contract, Contractor makes the following representations:

- Contractor has examined and carefully studied the Contract Documents, including Addenda.
- Contractor has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
- Contractor is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work.
- Contractor has carefully studied the reports of explorations and tests of subsurface conditions at or adjacent to the Site and the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, with respect to the Technical Data in such reports and drawings.
- Contractor has carefully studied the reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, with respect to Technical Data in such reports and drawings.
- Contractor has considered the information known to Contractor itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Technical Data identified in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on the cost, progress, and performance of the Work; the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor; and Contractor’s safety precautions and programs.
- Based on the information and observations referred to in the preceding paragraph, Contractor agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.



- Contractor is aware of the general nature of work to be performed by Sponsor and others at the Site that relates to the Work as indicated in the Contract Documents.
- Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and of discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.
- The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
- Contractor's entry into this Contract constitutes an incontrovertible representation by Contractor that without exception all prices in the Agreement are premised upon performing and furnishing the Work required by the Contract Documents.

IN WITNESS WHEREOF, the Party of the First Part and the Party of the Second Part, respectively, have caused this Agreement to be duly executed in day and year first herein written. All copies of this agreement for all intents and purposed shall be considered as the original.

CONTRACTOR, Party of the Second Part

SPONSOR, Party of the First Part

By: _____

By: _____

(Office or Position of Signer)

(Office or Position of Signer)

(SEAL)

(SEAL)

ATTEST: _____

ATTEST: _____

(Office or Position of Signer)

(Office or Position of Signer)



PERFORMANCE AND PAYMENT BONDS

GENERAL PROJECT BOND AND INSURANCE INFORMATION

BONDS: Per the Project General Provisions, in addition to the bid guarantee required with submission of the bid proposal, the successful bidder (Contractor) shall submit to the Sponsor through the Engineer three (3) project specific bonds.

INSURANCE: The successful bidder (Contractor) shall submit to the Sponsor through the Engineer a Certificate of Liability Insurance with the Sponsor / Sponsor and Woolpert, Inc. named as additional insured (Certificate Holder) with insurance coverage meeting the requirements set forth in Section V: Special Provisions.

The Bonds and Insurance Certificate may be submitted to the Sponsor through the Engineer by:

US mail: Woolpert, Inc.
ATTN: Justin Bessler
333 North Alabama Street, Indianapolis, IN, 46204

E-mail: Justin.Bessler@Woolpert.com

The surety agent signing each bond shall be a United States resident agent, a non-resident agent licensed in the United States, or an employee of the surety company.

Valid Power of Attorney shall be submitted with each bond and reference each applicable bond.

PERFORMANCE BOND

A surety in the form of a Performance Bond in the full amount of the bid price to guarantee satisfactory completion of the Project by the Contractor shall be submitted to the Sponsor prior to Contract award as requested in the Project Notice of Award.

Failure to submit a Performance Bond that conforms with these instructions and Project General Provisions Section 30-08 Failure to Execute Contract shall be just cause for cancellation of the award and forfeiture of the proposal guarantee.

The Engineer will substitute the sample Performance Bond form in this Section with the actual Performance Bond submitted by the successful Contractor.

PAYMENT BOND

A surety in the form of a Payment Bond in the full amount of the bid price to guarantee that Contractor employees, subcontractors, and material suppliers used on the Project are paid, shall be submitted to the Sponsor prior to Contract award as requested in the Project Notice of Award.

Failure to submit a Payment Bond that conforms with these instructions and Project General Provisions Section 30-08 Failure to Execute Contract shall be just cause for cancellation of the award and forfeiture of the proposal guarantee.

The Engineer will substitute the sample Payment Bond form in this Section with the actual Performance Bond submitted by the successful Contractor.



WARRANTY BOND

A surety in the form of a Warranty Bond in the full amount of the bid price to guarantee the quality of the Contractor's work, materials, and equipment against defects for the one (1) year warranty period (four (4) year for electrical) shall be submitted to the Sponsor prior to Project acceptance and request for close-out.

Failure to submit a Warranty Bond that conforms with these instructions and Project General Provisions Section 90-11 Contractor Final Project Documentation shall be just cause for forfeiture of any final payments due to the Contractor.

The sample Warranty Bond form located in the Project Closeout Section of this Project Manual shall be replaced with the actual Warranty Bond submitted by the Contractor after Project substantial completion.



Performance Bond Form

Contractor Name: [Full formal name of Contractor] Address (principal place of business): [Address of Contractor's principal place of business]	Surety Name: [Full formal name of Surety] Address (principal place of business): [Address of Surety's principal place of business]
Sponsor Name: [Full formal name of Sponsor] Mailing address (principal place of business): [Address of Sponsor's principal place of business]	Contract Description (name and location): [Sponsor's project/contract name, and location of the project] Contract Price: [Amount from Contract] Effective Date of Contract: [Date from Contract]
Bond Bond Amount: [Amount] Date of Bond: [Date] <i>(Date of Bond cannot be earlier than Effective Date of Contract)</i> Modifications to this Bond form: <input type="checkbox"/> None <input type="checkbox"/> See Paragraph 16	
Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth in this Performance Bond, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.	
Contractor as Principal	Surety
By: _____ <i>(Full formal name of Contractor)</i> By: _____ <i>(Signature)</i> Name: _____ <i>(Printed or typed)</i> Title: _____ Attest: _____ <i>(Signature)</i> Name: _____ <i>(Printed or typed)</i> Title: _____	By: _____ <i>(Full formal name of Surety) (corporate seal)</i> By: _____ <i>(Signature)(Attach Power of Attorney)</i> Name: _____ <i>(Printed or typed)</i> Title: _____ Attest: _____ <i>(Signature)</i> Name: _____ <i>(Printed or typed)</i> Title: _____
Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Sponsor, or other party is considered plural where applicable.	

1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Sponsor for the performance of the Construction Contract, which is incorporated herein by reference.
2. If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Paragraph 3.
3. If there is no Sponsor Default under the Construction Contract, the Surety's obligation under this Bond will arise after:
 - 3.1. The Sponsor first provides notice to the Contractor and the Surety that the Sponsor is considering declaring a Contractor Default. Such notice may indicate whether the Sponsor is requesting a conference among the Sponsor, Contractor, and Surety to discuss the Contractor's performance. If the Sponsor does not request a conference, the Surety may, within five (5) business days after receipt of the Sponsor's notice, request such a conference. If the Surety timely requests a conference, the Sponsor shall attend. Unless the Sponsor agrees otherwise, any conference requested under this Paragraph 3.1 will be held within ten (10) business days of the Surety's receipt of the Sponsor's notice. If the Sponsor, the Contractor, and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement does not waive the Sponsor's right, if any, subsequently to declare a Contractor Default;
 - 3.2. The Sponsor declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and
 - 3.3. The Sponsor has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.
4. Failure on the part of the Sponsor to comply with the notice requirement in Paragraph 3.1 does not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.
5. When the Sponsor has satisfied the conditions of Paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:
 - 5.1. Arrange for the Contractor, with the consent of the Sponsor, to perform and complete the Construction Contract;
 - 5.2. Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;
 - 5.3. Obtain bids or negotiated proposals from qualified contractors acceptable to the Sponsor for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Sponsor and a contractor selected with the Owners concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Sponsor the amount of damages as described in Paragraph 7 in excess of the Balance of the Contract Price incurred by the Sponsor as a result of the Contractor Default; or
 - 5.4. Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and with reasonable promptness under the circumstances:
 - 5.4.1 After investigation, determine the amount for which it may be liable to the Sponsor and, as soon as practicable after the amount is determined, make payment to the Sponsor; or
 - 5.4.2 Deny liability in whole or in part and notify the Sponsor, citing the reasons for denial.
6. If the Surety does not proceed as provided in Paragraph 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Sponsor to the Surety demanding that the Surety perform its obligations under this Bond, and the Sponsor shall be



entitled to enforce any remedy available to the Sponsor. If the Surety proceeds as provided in Paragraph 5.4, and the Sponsor refuses the payment, or the Surety has denied liability, in whole or in part, without further notice, the Sponsor shall be entitled to enforce any remedy available to the Sponsor.

7. If the Surety elects to act under Paragraph 5.1, 5.2, or 5.3, then the responsibilities of the Surety to the Sponsor will not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Sponsor to the Surety will not be greater than those of the Sponsor under the Construction Contract. Subject to the commitment by the Sponsor to pay the Balance of the Contract Price, the Surety is obligated, without duplication for:
 - 7.1. the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;
 - 7.2. additional legal, design professional, and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Paragraph 5; and
 - 7.3. liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.
8. If the Surety elects to act under Paragraph 5.1, 5.3, or 5.4, the Surety's liability is limited to the amount of this Bond.
9. The Surety shall not be liable to the Sponsor or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price will not be reduced or set off on account of any such unrelated obligations. No right of action will accrue on this Bond to any person or entity other than the Sponsor or its heirs, executors, administrators, successors, and assigns.
10. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.
11. Any proceeding, legal or equitable, under this Bond must be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and must be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum periods of limitations available to sureties as a defense in the jurisdiction of the suit will be applicable.
12. Notice to the Surety, the Sponsor, or the Contractor must be mailed or delivered to the address shown on the page on which their signature appears.
13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement will be deemed deleted therefrom and provisions conforming to such statutory or other legal requirement will be deemed incorporated herein. When so furnished, the intent is that this Bond will be construed as a statutory bond and not as a common law bond.
14. Definitions
 - 14.1. *Balance of the Contract Price*—The total amount payable by the Sponsor to the Contractor under the Construction Contract after all proper adjustments have been made including allowance for the Contractor for any amounts received or to be received by the Sponsor in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.
 - 14.2. *Construction Contract*—The agreement between the Sponsor and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.
 - 14.3. *Contractor Default*—Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.



- 14.4. *Sponsor Default*—Failure of the Sponsor, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.
- 14.5. *Contract Documents*—All the documents that comprise the agreement between the Sponsor and Contractor.
15. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond will be deemed to be Subcontractor and the term Sponsor will be deemed to be Contractor.
16. Modifications to this Bond are as follows: **[Describe modification or enter “None”]**



Payment Bond Form

Contractor Name: [Full formal name of Contractor] Address (principal place of business): [Address of Contractor's principal place of business]	Surety Name: [Full formal name of Surety] Address (principal place of business): [Address of Surety's principal place of business]
Sponsor Name: [Full formal name of Sponsor] Mailing address (principal place of business): [Address of Sponsor's principal place of business]	Contract Description (name and location): [Sponsor's project/contract name, and location of the project] Contract Price: [Amount, from Contract] Effective Date of Contract: [Date, from Contract]
Bond Bond Amount: [Amount] Date of Bond: [Date] (Date of Bond cannot be earlier than Effective Date of Contract) Modifications to this Bond form: <input type="checkbox"/> None <input type="checkbox"/> See Paragraph 18	
Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth in this Payment Bond, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.	
Contractor as Principal	Surety
By: _____ (Full formal name of Contractor)	By: _____ (Full formal name of Surety) (corporate seal)
Name: _____ (Signature)	Name: _____ (Signature)(Attach Power of Attorney)
Title: _____ (Printed or typed)	Title: _____ (Printed or typed)
Attest: _____ (Signature)	Attest: _____ (Signature)
Name: _____ (Printed or typed)	Name: _____ (Printed or typed)
Title: _____	Title: _____
Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Sponsor, or other party is considered plural where applicable.	



1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Sponsor to pay for labor, materials, and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.
2. If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies, and holds harmless the Sponsor from claims, demands, liens, or suits by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.
3. If there is no Sponsor Default under the Construction Contract, the Surety's obligation to the Sponsor under this Bond will arise after the Sponsor has promptly notified the Contractor and the Surety (at the address described in Paragraph 13) of claims, demands, liens, or suits against the Sponsor or the Sponsor's property by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, and tendered defense of such claims, demands, liens, or suits to the Contractor and the Surety.
4. When the Sponsor has satisfied the conditions in Paragraph 3, the Surety shall promptly and at the Surety's expense defend, indemnify, and hold harmless the Sponsor against a duly tendered claim, demand, lien, or suit.
5. The Surety's obligations to a Claimant under this Bond will arise after the following:
 - 5.1. Claimants who do not have a direct contract with the Contractor
 - 5... have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
 - 5... have sent a Claim to the Surety (at the address described in Paragraph 13).
 - 5.2. Claimants who are employed by or have a direct contract with the Contractor have sent a Claim to the Surety (at the address described in Paragraph 13).
6. If a notice of non-payment required by Paragraph 5.1.1 is given by the Sponsor to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Paragraph 5.1.1.
7. When a Claimant has satisfied the conditions of Paragraph 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:
 - 7.1. Send an answer to the Claimant, with a copy to the Sponsor, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and
 - 7.2. Pay or arrange for payment of any undisputed amounts.
 - 7.3. The Surety's failure to discharge its obligations under Paragraph 7.1 or 7.2 will not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Paragraph 7.1 or 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.
8. The Surety's total obligation will not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Paragraph 7.3, and the amount of this Bond will be credited for any payments made in good faith by the Surety.



9. Amounts owed by the Sponsor to the Contractor under the Construction Contract will be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Sponsor accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfying obligations of the Contractor and Surety under this Bond, subject to the Sponsor's priority to use the funds for the completion of the work.
10. The Surety shall not be liable to the Sponsor, Claimants, or others for obligations of the Contractor that are unrelated to the Construction Contract. The Sponsor shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to or give notice on behalf of Claimants, or otherwise have any obligations to Claimants under this Bond.
11. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.
12. No suit or action will be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Paragraph 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit will be applicable.
13. Notice and Claims to the Surety, the Sponsor, or the Contractor must be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, will be sufficient compliance as of the date received.
14. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement will be deemed deleted here from and provisions conforming to such statutory or other legal requirement will be deemed incorporated herein. When so furnished, the intent is that this Bond will be construed as a statutory bond and not as a common law bond.
15. Upon requests by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Sponsor shall promptly furnish a copy of this Bond or shall permit a copy to be made.
16. Definitions
 - 16.1. *Claim*—A written statement by the Claimant including at a minimum:
 - 16... The name of the Claimant;
 - 16... The name of the person for whom the labor was done, or materials or equipment furnished;
 - 16... A copy of the agreement or purchase order pursuant to which labor, materials, or equipment was furnished for use in the performance of the Construction Contract;
 - 16... A brief description of the labor, materials, or equipment furnished;
 - 16... The date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
 - 16... The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;
 - 16... The total amount of previous payments received by the Claimant; and
 - 16... The total amount due and unpaid to the Claimant for labor, materials, or equipment furnished as of the date of the Claim.



- 16.2. *Claimant*—An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials, or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond is to include without limitation in the terms of "labor, materials, or equipment" that part of the water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.
- 16.3. *Construction Contract*—The agreement between the Sponsor and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.
- 16.4. *Sponsor Default*—Failure of the Sponsor, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.
- 16.5. *Contract Documents*—All the documents that comprise the agreement between the Sponsor and Contractor.
17. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond will be deemed to be Subcontractor and the term Sponsor will be deemed to be Contractor.
18. Modifications to this Bond are as follows: **[Describe modification or enter "None"]**



PART 4: FAA AC 150/5370-10H: GENERAL PROVISIONS



SECTION 10 – DEFINITION OF TERMS

When the following terms are used in these specifications, in the contract, or in any documents or other instruments pertaining to construction where these specifications govern, the intent and meaning shall be defined as follows:

Paragraph Number	Term	Definition
10-01	AASHTO	The American Association of State Highway and Transportation Officials.
10-02	Access Road	The right-of-way, the roadway and all improvements constructed thereon connecting the airport to a public roadway.
10-03	Advertisement	A public announcement, as required by local law, inviting bids for work to be performed and materials to be furnished.
10-04	Airport	Airport means an area of land or water which is used or intended to be used for the landing and takeoff of aircraft; an appurtenant area used or intended to be used for airport buildings or other airport facilities or rights of way; airport buildings and facilities located in any of these areas, and a heliport.
10-05	Airport Improvement Program (AIP)	A grant-in-aid program, administered by the Federal Aviation Administration (FAA).
10-06	Air Operations Area (AOA)	The term air operations area (AOA) shall mean any area of the airport used or intended to be used for the landing, takeoff, or surface maneuvering of aircraft. An air operation area shall include such paved or unpaved areas that are used or intended to be used for the unobstructed movement of aircraft in addition to its associated runway, taxiway, or apron.
10-07	Apron	Area where aircraft are parked, unloaded or loaded, fueled and/or serviced.
10-08	ASTM International (ASTM)	Formerly known as the American Society for Testing and Materials (ASTM).
10-09	Award	The Sponsor's notice to the successful bidder of the acceptance of the submitted bid.
10-10	Bidder	Any individual, partnership, firm, or corporation, acting directly or through a duly authorized representative, who submits a proposal for the work contemplated.
10-11	Building Area	An area on the airport to be used, considered, or intended to be used for airport buildings or other airport facilities or rights-of-way together with all airport buildings and facilities located thereon.
10-12	Calendar Day	Every day shown on the calendar.
10-13	Certificate of Analysis (COA)	The COA is the manufacturer's Certificate of Compliance (COC) including all applicable test results required by the specifications.
10-14	Certificate of Compliance (COC)	The manufacturer's certification stating that materials or assemblies furnished fully comply with the requirements of the contract. The certificate shall be signed by the manufacturer's authorized representative.
10-15	Change Order	A written order to the Contractor covering changes in the plans, specifications, or proposal quantities and establishing the basis of payment and contract time adjustment, if any, for work within the scope of the contract and necessary to complete the project.

Paragraph Number	Term	Definition
10-16	Contract	<p>A written agreement between the Sponsor and the Contractor that establishes the obligations of the parties including but not limited to performance of work, furnishing of labor, equipment and materials and the basis of payment.</p> <p>The awarded contract includes but may not be limited to: Advertisement, Contract form, Proposal, Performance bond, payment bond, General provisions, certifications and representations, Technical Specifications, Plans, Supplemental Provisions, standards incorporated by reference and issued addenda.</p>
10-17	Contract Item (Pay Item)	A specific unit of work for which a price is provided in the contract.
10-18	Contract Time	The number of calendar days or working days, stated in the proposal, allowed for completion of the contract, including authorized time extensions. If a calendar date of completion is stated in the proposal, in lieu of a number of calendar or working days, the contract shall be completed by that date.
10-19	Contractor	The individual, partnership, firm, or corporation primarily liable for the acceptable performance of the work contracted and for the payment of all legal debts pertaining to the work who acts directly or through lawful agents or employees to complete the contract work.
10-20	Contractors Quality Control (QC) Facilities	The Contractor's QC facilities in accordance with the Contractor Quality Control Program (CQCP).
10-21	Contractor Quality Control Program (CQCP)	Details the methods and procedures that will be taken to assure that all materials and completed construction required by the contract conform to contract plans, technical specifications and other requirements, whether manufactured by the Contractor, or procured from subcontractors or vendors.
10-22	Control Strip	A demonstration by the Contractor that the materials, equipment, and construction processes results in a product meeting the requirements of the specification.
10-23	Construction Safety and Phasing Plan (CSPP)	The overall plan for safety and phasing of a construction project developed by the airport operator, or developed by the airport operator's consultant and approved by the airport operator. It is included in the invitation for bids and becomes part of the project specifications.
10-24	Drainage System	The system of pipes, ditches, and structures by which surface or subsurface waters are collected and conducted from the airport area.
10-25	Engineer	The individual, partnership, firm, or corporation duly authorized by the Sponsor to be responsible for engineering, inspection, and/or observation of the contract work and acting directly or through an authorized representative.
10-26	Equipment	All machinery, together with the necessary supplies for upkeep and maintenance; and all tools and apparatus necessary for the proper construction and acceptable completion of the work.
10-27	Extra Work	An item of work not provided for in the awarded contract as previously modified by change order or supplemental agreement,



Paragraph Number	Term	Definition
		but which is found by the Sponsor's Engineer or Resident Project Representative (RPR) to be necessary to complete the work within the intended scope of the contract as previously modified.
10-28	FAA	The Federal Aviation Administration. When used to designate a person, FAA shall mean the Administrator or their duly authorized representative.
10-29	Federal Specifications	The federal specifications and standards, commercial item descriptions, and supplements, amendments, and indices prepared and issued by the General Services Administration.
10-30	Force Account	a. Contract Force Account - A method of payment that addresses extra work performed by the Contractor on a time and material basis. b. Sponsor Force Account - Work performed for the project by the Sponsor's employees.
10-31	Intention of Terms	Whenever, in these specifications or on the plans, the words "directed," "required," "permitted," "ordered," "designated," "prescribed," or words of like import are used, it shall be understood that the direction, requirement, permission, order, designation, or prescription of the Engineer and/or Resident Project Representative (RPR) is intended; and similarly, the words "approved," "acceptable," "satisfactory," or words of like import, shall mean approved by, or acceptable to, or satisfactory to the Engineer and/or RPR, subject in each case to the final determination of the Sponsor. Any reference to a specific requirement of a numbered paragraph of the contract specifications or a cited standard shall be interpreted to include all general requirements of the entire section, specification item, or cited standard that may be pertinent to such specific reference.
10-32	Lighting	A system of fixtures providing or controlling the light sources used on or near the airport or within the airport buildings. The field lighting includes all luminous signals, markers, floodlights, and illuminating devices used on or near the airport or to aid in the operation of aircraft landing at, taking off from, or taxiing on the airport surface.
10-33	Major and Minor Contract Items	A major contract item shall be any item that is listed in the proposal, the total cost of which is equal to or greater than 20% of the total amount of the award contract. All other items shall be considered minor contract items.
10-34	Materials	Any substance specified for use in the construction of the contract work.
10-35	Modification of Standards (MOS)	Any deviation from standard specifications applicable to material and construction methods in accordance with FAA Order 5300.1.
10-36	Notice to Proceed (NTP)	A written notice to the Contractor to begin the actual contract work on a previously agreed to date. If applicable, the Notice to Proceed shall state the date on which the contract time begins.
10-37	Sponsor	The term "Sponsor" shall mean the party of the first part or the contracting agency signatory to the contract. Where the term "Sponsor" is capitalized in this document, it shall mean airport



Paragraph Number	Term	Definition
		Sponsor only. The Sponsor for this project is Terre Haute Airport Authority .
10-38	Passenger Facility Charge (PFC)	Per 14 Code of Federal Regulations (CFR) Part 158 and 49 United States Code (USC) § 40117, a PFC is a charge imposed by a public agency on passengers enplaned at a commercial service airport it controls.
10-39	Pavement Structure	The combined surface course, base course(s), and subbase course(s), if any, considered as a single unit.
10-40	Payment bond	The approved form of security furnished by the Contractor and their own surety as a guaranty that the Contractor will pay in full all bills and accounts for materials and labor used in the construction of the work.
10-41	Performance bond	The approved form of security furnished by the Contractor and their own surety as a guaranty that the Contractor will complete the work in accordance with the terms of the contract.
10-42	Plans	The official drawings or exact reproductions which show the location, character, dimensions and details of the airport and the work to be done and which are to be considered as a part of the contract, supplementary to the specifications. Plans may also be referred to as 'contract drawings.'
10-43	Project	The agreed scope of work for accomplishing specific airport development with respect to a particular airport.
10-44	Proposal	The written offer of the bidder (when submitted on the approved proposal form) to perform the contemplated work and furnish the necessary materials in accordance with the provisions of the plans and specifications.
10-45	Proposal guaranty	The security furnished with a proposal to guarantee that the bidder will enter into a contract if their own proposal is accepted by the Sponsor.
10-46	Quality Assurance (QA)	Sponsor's responsibility to assure that construction work completed complies with specifications for payment.
10-47	Quality Control (QC)	Contractor's responsibility to control material(s) and construction processes to complete construction in accordance with project specifications.
10-48	Quality Assurance (QA) Inspector	An authorized representative of the Engineer and/or Resident Project Representative (RPR) assigned to make all necessary inspections, observations, tests, and/or observation of tests of the work performed or being performed, or of the materials furnished or being furnished by the Contractor.
10-49	Quality Assurance (QA) Laboratory	The official quality assurance testing laboratories of the Sponsor or such other laboratories as may be designated by the Engineer or RPR. May also be referred to as Engineer's, Sponsor's, or QA Laboratory.
10-50	Resident Project Representative (RPR)	The individual, partnership, firm, or corporation duly authorized by the Sponsor to be responsible for all necessary inspections, observations, tests, and/or observations of tests of the contract work performed or being performed, or of the materials furnished or being furnished by the Contractor, and acting directly or through an authorized representative.



Paragraph Number	Term	Definition
10-51	Runway	The area on the airport prepared for the landing and takeoff of aircraft.
10-52	Runway Safety Area (RSA)	A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to aircraft. See the construction safety and phasing plan (CSPP) for limits of the RSA.
10-53	Safety Plan Compliance Document (SPCD)	Details how the Contractor will comply with the CSPP.
10-54	Specifications	A part of the contract containing the written directions and requirements for completing the contract work. Standards for specifying materials or testing which are cited in the contract specifications by reference shall have the same force and effect as if included in the contract physically.
10-55	Sponsor	A Sponsor is defined in 49 USC § 47102(24) as a public agency that submits to the FAA for an AIP grant; or a private Sponsor of a public-use airport that submits to the FAA an application for an AIP grant for the airport.
10-56	Structures	Airport facilities such as bridges; culverts; catch basins, inlets, retaining walls, cribbing; storm and sanitary sewer lines; water lines; underdrains; electrical ducts, manholes, handholes, lighting fixtures and bases; transformers; navigational aids; buildings; vaults; and, other manmade features of the airport that may be encountered in the work and not otherwise classified herein.
10-57	Subgrade	The soil that forms the pavement foundation.
10-58	Superintendent	The Contractor's executive representative who is present on the work during progress, authorized to receive and fulfill instructions from the RPR, and who shall supervise and direct the construction.
10-59	Supplemental Agreement	A written agreement between the Contractor and the Sponsor that establishes the basis of payment and contract time adjustment, if any, for the work affected by the supplemental agreement. A supplemental agreement is required if: (1) in scope work would increase or decrease the total amount of the awarded contract by more than 25%; (2) in scope work would increase or decrease the total of any major contract item by more than 25%; (3) work that is not within the scope of the originally awarded contract; or (4) adding or deleting of a major contract item.
10-60	Surety	The corporation, partnership, or individual, other than the Contractor, executing payment or performance bonds that are furnished to the Sponsor by the Contractor.
10-61	Taxilane	A taxiway designed for low-speed movement of aircraft between aircraft parking areas and terminal areas.
10-62	Taxiway	The portion of the air operations area of an airport that has been designated by competent airport authority for movement of aircraft to and from the airport's runways, aircraft parking areas, and terminal areas.
10-63	Taxiway/Taxilane Safety Area (TSA)	A defined surface alongside the taxiway prepared or suitable for reducing the risk of damage to an aircraft. See the construction safety and phasing plan (CSPP) for limits of the TSA.



Paragraph Number	Term	Definition
10-64	Work	The furnishing of all labor, materials, tools, equipment, and incidentals necessary or convenient to the Contractor's performance of all duties and obligations imposed by the contract, plans, and specifications.
10-65	Working day	A working day shall be any day other than a legal holiday, Saturday, or Sunday on which the normal working forces of the Contractor may proceed with regular work for at least six (6) hours toward completion of the contract. When work is suspended for causes beyond the Contractor's control, it will not be counted as a working day. Saturdays, Sundays and holidays on which the Contractor's forces engage in regular work will be considered as working days.

END OF SECTION 10



SECTION 20 – PROPOSAL REQUIREMENTS AND CONDITIONS

20-01 Advertisement (Notice to Bidders). The advertisement can be found on page 14 of this Project Manual. This project has been advertised on the following dates:

Tribune Star: October 18th, 2024

Tribune Star: October 25th, 2024

20-02 Qualification of bidders. Each bidder shall submit evidence of competency and evidence of financial responsibility to perform the work to the Sponsor at the time of bid opening.

Evidence of competency, unless otherwise specified, shall consist of statements covering the bidder's past experience on similar work, and a list of equipment and a list of key personnel that would be available for the work.

Each bidder shall furnish the Sponsor satisfactory evidence of their financial responsibility. Evidence of financial responsibility, unless otherwise specified, shall consist of a confidential statement or report of the bidder's financial resources and liabilities as of the last calendar year or the bidder's last fiscal year. Such statements or reports shall be certified by a public accountant. At the time of submitting such financial statements or reports, the bidder shall further certify whether their financial responsibility is approximately the same as stated or reported by the public accountant. If the bidder's financial responsibility has changed, the bidder shall qualify the public accountant's statement or report to reflect the bidder's true financial condition at the time such qualified statement or report is submitted to the Sponsor.

Unless otherwise specified, a bidder may submit evidence that they are prequalified with the State Highway Division and are on the current "bidder's list" of the state in which the proposed work is located. Evidence of State Highway Division prequalification may be submitted as evidence of financial responsibility in lieu of the certified statements or reports specified above.

20-03 Contents of proposal forms. The Sponsor's proposal forms state the location and description of the proposed construction; the place, date, and time of opening of the proposals; and the estimated quantities of the various items of work to be performed and materials to be furnished for which unit bid prices are asked. The proposal form states the time in which the work must be completed, and the amount of the proposal guaranty that must accompany the proposal. The Sponsor will accept only those Proposals properly executed on physical forms or electronic forms provided by the Sponsor. Bidder actions that may cause the Sponsor to deem a proposal irregular are given in paragraph 20-09 *Irregular proposals*.

Mobilization is limited to [10] percent of the total project cost.

20-04 Issuance of proposal forms. The Sponsor reserves the right to refuse to issue a proposal form to a prospective bidder if the bidder is in default for any of the following reasons:

- a. Failure to comply with any prequalification regulations of the Sponsor, if such regulations are cited, or otherwise included, in the proposal as a requirement for bidding.
- b. Failure to pay, or satisfactorily settle, all bills due for labor and materials on former contracts in force with the Sponsor at the time the Sponsor issues the proposal to a prospective bidder.
- c. Documented record of Contractor default under previous contracts with the Sponsor.
- d. Documented record of unsatisfactory work on previous contracts with the Sponsor.

20-05 Interpretation of estimated proposal quantities. An estimate of quantities of work to be done and materials to be furnished under these specifications is given in the proposal. It is the result of careful calculations and is



believed to be correct. It is given only as a basis for comparison of proposals and the award of the contract. The Sponsor does not expressly, or by implication, agree that the actual quantities involved will correspond exactly therewith; nor shall the bidder plead misunderstanding or deception because of such estimates of quantities, or of the character, location, or other conditions pertaining to the work. Payment to the Contractor will be made only for the actual quantities of work performed or materials furnished in accordance with the plans and specifications. It is understood that the quantities may be increased or decreased as provided in the Section 40, paragraph 40-02, *Alteration of work and quantities*, without in any way invalidating the unit bid prices.

20-06 Examination of plans, specifications, and site. The bidder is expected to carefully examine the site of the proposed work, the proposal, plans, specifications, and contract forms. Bidders shall satisfy themselves to the character, quality, and quantities of work to be performed, materials to be furnished, and to the requirements of the proposed contract. The submission of a proposal shall be prima facie evidence that the bidder has made such examination and is satisfied to the conditions to be encountered in performing the work and the requirements of the proposed contract, plans, and specifications.

Boring logs and other records of subsurface investigations and tests are available for inspection of bidders. It is understood and agreed that such subsurface information, whether included in the plans, specifications, or otherwise made available to the bidder, was obtained and is intended for the Sponsor's design and estimating purposes only. Such information has been made available for the convenience of all bidders. It is further understood and agreed that each bidder is solely responsible for all assumptions, deductions, or conclusions which the bidder may make or obtain from their own examination of the boring logs and other records of subsurface investigations and tests that are furnished by the Sponsor.

20-07 Preparation of proposal. The bidder shall submit their proposal on the forms furnished by the Sponsor. All blank spaces in the proposal forms, unless explicitly stated otherwise, must be correctly filled in where indicated for each and every item for which a quantity is given. The bidder shall state the price (written in ink or typed) both in words and numerals which they propose for each pay item furnished in the proposal. In case of conflict between words and numerals, the words, unless obviously incorrect, shall govern.

The bidder shall correctly sign the proposal in ink. If the proposal is made by an individual, their name and post office address must be shown. If made by a partnership, the name and post office address of each member of the partnership must be shown. If made by a corporation, the person signing the proposal shall give the name of the state where the corporation was chartered and the name, titles, and business address of the president, secretary, and the treasurer. Anyone signing a proposal as an agent shall file evidence of their authority to do so and that the signature is binding upon the firm or corporation.

20-08 Responsive and responsible bidder. A responsive bid conforms to all significant terms and conditions contained in the Sponsor's invitation for bid. It is the Sponsor's responsibility to decide if the exceptions taken by a bidder to the solicitation are material or not and the extent of deviation it is willing to accept.

A responsible bidder has the ability to perform successfully under the terms and conditions of a proposed procurement, as defined in 2 CFR § 200.318(h). This includes such matters as Contractor integrity, compliance with public policy, record of past performance, and financial and technical resources.

20-09 Irregular proposals. Proposals shall be considered irregular for the following reasons:

- a. If the proposal is on a form other than that furnished by the Sponsor, or if the Sponsor's form is altered, or if any part of the proposal form is detached.
- b. If there are unauthorized additions, conditional or alternate pay items, or irregularities of any kind that make the proposal incomplete, indefinite, or otherwise ambiguous.
- c. If the proposal does not contain a unit price for each pay item listed in the proposal, except in the case of authorized alternate pay items, for which the bidder is not required to furnish a unit price.



- d. If the proposal contains unit prices that are obviously unbalanced.
- e. If the proposal is not accompanied by the proposal guaranty specified by the Sponsor.
- f. If the applicable Disadvantaged Business Enterprise information is incomplete.

The Sponsor reserves the right to reject any irregular proposal and the right to waive technicalities if such waiver is in the best interest of the Sponsor and conforms to local laws and ordinances pertaining to the letting of construction contracts.

20-10 Bid guarantee. Each separate proposal shall be accompanied by a bid bond, certified check, or other specified acceptable collateral, in the amount specified in the proposal form. Such bond, check, or collateral, shall be made payable to the Sponsor.

20-11 Delivery of proposal. Each proposal submitted shall be placed in a sealed envelope plainly marked with the project number, location of airport, and name and business address of the bidder on the outside. When sent by mail, preferably registered, the sealed proposal, marked as indicated above, should be enclosed in an additional envelope. No proposal will be considered unless received at the place specified in the advertisement or as modified by Addendum before the time specified for opening all bids. Proposals received after the bid opening time shall be returned to the bidder unopened.

20-12 Withdrawal or revision of proposals. A bidder may withdraw or revise (by withdrawal of one proposal and submission of another) a proposal provided that the bidder's request for withdrawal is received by the Sponsor **in writing** before the time specified for opening bids. Revised proposals must be received at the place specified in the advertisement before the time specified for opening all bids.

20-13 Public opening of proposals. Proposals shall be opened, and read, publicly at the time and place specified in the advertisement. Bidders, their authorized agents, and other interested persons are invited to attend. Proposals that have been withdrawn (by written or telegraphic request) or received after the time specified for opening bids shall be returned to the bidder unopened.

20-14 Disqualification of bidders. A bidder shall be considered disqualified for any of the following reasons:

- a. Submitting more than one proposal from the same partnership, firm, or corporation under the same or different name.
- b. Evidence of collusion among bidders. Bidders participating in such collusion shall be disqualified as bidders for any future work of the Sponsor until any such participating bidder has been reinstated by the Sponsor as a qualified bidder.
- c. If the bidder is considered to be in "default" for any reason specified in paragraph 20-04, *Issuance of Proposal Forms*, of this section.

20-15 Discrepancies and Omissions. A Bidder who discovers discrepancies or omissions with the project bid documents shall immediately notify the Sponsor's Engineer of the matter. A bidder that has doubt as to the true meaning of a project requirement may submit to the Sponsor's Engineer a written request for interpretation no later than 07 days prior to bid opening.

Any interpretation of the project bid documents by the Sponsor's Engineer will be by written addendum issued by the Sponsor. The Sponsor will not consider any instructions, clarifications or interpretations of the bidding documents in any manner other than written addendum.

END OF SECTION 20



SECTION 30 – AWARD AND EXECUTION OF CONTRACT

30-01 Consideration of proposals. After the proposals are publicly opened and read, they will be compared on the basis of the summation of the products obtained by multiplying the estimated quantities shown in the proposal by the unit bid prices. If a bidder's proposal contains a discrepancy between unit bid prices written in words and unit bid prices written in numbers, the unit bid price written in words shall govern.

Until the award of a contract is made, the Sponsor reserves the right to reject a bidder's proposal for any of the following reasons:

- a. If the proposal is irregular as specified in Section 20, paragraph 20-09, *Irregular proposals*.
- b. If the bidder is disqualified for any of the reasons specified Section 20, paragraph 20-14, *Disqualification of bidders*.

In addition, until the award of a contract is made, the Sponsor reserves the right to reject any or all proposals, waive technicalities, if such waiver is in the best interest of the Sponsor and is in conformance with applicable state and local laws or regulations pertaining to the letting of construction contracts; advertise for new proposals; or proceed with the work otherwise. All such actions shall promote the Sponsor's best interests.

30-02 Award of contract. The award of a contract, if it is to be awarded, shall be made within 30-120 calendar days of the date specified for publicly opening proposals, unless otherwise specified herein.

If the Sponsor elects to proceed with an award of contract, the Sponsor will make award to the responsible bidder whose bid, conforming with all the material terms and conditions of the bid documents, is the lowest in price. Should funding be available, the alternate bid would take precedence over the base bid and is at the sole discretion of the Sponsor.

30-03 Cancellation of award. The Sponsor reserves the right to cancel the award without liability to the bidder, except return of proposal guaranty, at any time before a contract has been fully executed by all parties and is approved by the Sponsor in accordance with paragraph 30-07 *Approval of contract*.

30-04 Return of proposal guaranty. All proposal guaranties, except those of the two lowest bidders, will be returned immediately after the Sponsor has made a comparison of bids as specified in the paragraph 30-01, *Consideration of proposals*. Proposal guaranties of the two lowest bidders will be retained by the Sponsor until such time as an award is made, at which time, the unsuccessful bidder's proposal guaranty will be returned. The successful bidder's proposal guaranty will be returned as soon as the Sponsor receives the contract bonds as specified in paragraph 30-05, *Requirements of Contract Bonds*.

30-05 Requirements of contract bonds. At the time of the execution of the contract, the successful bidder shall furnish the Sponsor a surety bond or bonds that have been fully executed by the bidder and the surety guaranteeing the performance of the work and the payment of all legal debts that may be incurred by reason of the Contractor's performance of the work. The surety and the form of the bond or bonds shall be acceptable to the Sponsor. Unless otherwise specified in this subsection, the surety bond or bonds shall be in a sum equal to the full amount of the contract.

30-06 Execution of contract. The successful bidder shall sign (execute) the necessary agreements for entering into the contract and return the signed contract to the Sponsor, along with the fully executed surety bond or bonds specified in paragraph 30-05, *Requirements of Contract Bonds*, of this section, within 15 calendar days from the date mailed or otherwise delivered to the successful bidder.



30-07 Approval of contract. Upon receipt of the contract and contract bond or bonds that have been executed by the successful bidder, the Sponsor shall complete the execution of the contract in accordance with local laws or ordinances, and return the fully executed contract to the Contractor. Delivery of the fully executed contract to the Contractor shall constitute the Sponsor's approval to be bound by the successful bidder's proposal and the terms of the contract.

30-08 Failure to execute contract. Failure of the successful bidder to execute the contract and furnish an acceptable surety bond or bonds within the period specified in paragraph 30-06, *Execution of Contract*, of this section shall be just cause for cancellation of the award and forfeiture of the proposal guaranty, not as a penalty, but as liquidated damages to the Sponsor.

END OF SECTION 30



SECTION 40 – SCOPE OF WORK

40-01 Intent of contract. The intent of the contract is to provide for construction and completion, in every detail, of the work described. It is further intended that the Contractor shall furnish all labor, materials, equipment, tools, transportation, and supplies required to complete the work in accordance with the plans, specifications, and terms of the contract.

40-02 Alteration of work and quantities. The Sponsor reserves the right to make such changes in quantities and work as may be necessary or desirable to complete, in a satisfactory manner, the original intended work. Unless otherwise specified in the Contract, the Sponsor's Engineer or RPR shall be and is hereby authorized to make, in writing, such in-scope alterations in the work and variation of quantities as may be necessary to complete the work, provided such action does not represent a significant change in the character of the work.

For purpose of this section, a significant change in character of work means: any change that is outside the current contract scope of work; any change (increase or decrease) in the total contract cost by more than 25%; or any change in the total cost of a major contract item by more than 25%.

Work alterations and quantity variances that do not meet the definition of significant change in character of work shall not invalidate the contract nor release the surety. Contractor agrees to accept payment for such work alterations and quantity variances in accordance with Section 90, paragraph 90-03, *Compensation for Altered Quantities*.

Should the value of altered work or quantity variance meet the criteria for significant change in character of work, such altered work and quantity variance shall be covered by a supplemental agreement. Supplemental agreements shall also require consent of the Contractor's surety and separate performance and payment bonds. If the Sponsor and the Contractor are unable to agree on a unit adjustment for any contract item that requires a supplemental agreement, the Sponsor reserves the right to terminate the contract with respect to the item and make other arrangements for its completion.

40-03 Omitted items. The Sponsor, the Sponsor's Engineer or the RPR may provide written notice to the Contractor to omit from the work any contract item that does not meet the definition of major contract item. Major contract items may be omitted by a supplemental agreement. Such omission of contract items shall not invalidate any other contract provision or requirement.

Should a contract item be omitted or otherwise ordered to be non-performed, the Contractor shall be paid for all work performed toward completion of such item prior to the date of the order to omit such item. Payment for work performed shall be in accordance with Section 90, paragraph 90-04, *Payment for Omitted Items*.

40-04 Extra work. Should acceptable completion of the contract require the Contractor to perform an item of work not provided for in the awarded contract as previously modified by change order or supplemental agreement, Sponsor may issue a Change Order to cover the necessary extra work. Change orders for extra work shall contain agreed unit prices for performing the change order work in accordance with the requirements specified in the order and shall contain any adjustment to the contract time that, in the RPR's opinion, is necessary for completion of the extra work.

When determined by the RPR to be in the Sponsor's best interest, the RPR may order the Contractor to proceed with extra work as provided in Section 90, paragraph 90-05, *Payment for Extra Work*. Extra work that is necessary for acceptable completion of the project, but is not within the general scope of the work covered by the original contract, shall be covered by a supplemental agreement as defined in Section 10, paragraph 10-59, *Supplemental Agreement*.



If extra work is essential to maintaining the project critical path, RPR may order the Contractor to commence the extra work under a Time and Material contract method. Once sufficient detail is available to establish the level of effort necessary for the extra work, the Sponsor shall initiate a change order or supplemental agreement to cover the extra work.

Any claim for payment of extra work that is not covered by written agreement (change order or supplemental agreement) shall be rejected by the Sponsor.

40-05 Maintenance of traffic. It is the explicit intention of the contract that the safety of aircraft, as well as the Contractor's equipment and personnel, is the most important consideration. The Contractor shall maintain traffic in the manner detailed in the Construction Safety and Phasing Plan (CSPP).

- a. It is understood and agreed that the Contractor shall provide for the free and unobstructed movement of aircraft in the air operations areas (AOAs) of the airport with respect to their own operations and the operations of all subcontractors as specified in Section 80, paragraph 80-04, *Limitation of Operations*. It is further understood and agreed that the Contractor shall provide for the uninterrupted operation of visual and electronic signals (including power supplies thereto) used in the guidance of aircraft while operating to, from, and upon the airport as specified in Section 70, paragraph 70-15, *Contractor's Responsibility for Utility Service and Facilities of Others*.
- b. With respect to their own operations and the operations of all subcontractors, the Contractor shall provide marking, lighting, and other acceptable means of identifying personnel, equipment, vehicles, storage areas, and any work area or condition that may be hazardous to the operation of aircraft, fire-rescue equipment, or maintenance vehicles at the airport in accordance with the construction safety and phasing plan (CSPP) and the safety plan compliance document (SPCD).
- c. When the contract requires the maintenance of an existing road, street, or highway during the Contractor's performance of work that is otherwise provided for in the contract, plans, and specifications, the Contractor shall keep the road, street, or highway open to all traffic and shall provide maintenance as may be required to accommodate traffic. The Contractor, at their expense, shall be responsible for the repair to equal or better than preconstruction conditions of any damage caused by the Contractor's equipment and personnel. The Contractor shall furnish, erect, and maintain barricades, warning signs, flag person, and other traffic control devices in reasonable conformity with the Manual on Uniform Traffic Control Devices (MUTCD) (<http://mutcd.fhwa.dot.gov/>), unless otherwise specified. The Contractor shall also construct and maintain in a safe condition any temporary connections necessary for ingress to and egress from abutting property or intersecting roads, streets or highways. Unless otherwise specified herein, the Contractor will not be required to furnish snow removal for such existing road, street, or highway.

40-06 Removal of existing structures. All existing structures encountered within the established lines, grades, or grading sections shall be removed by the Contractor, unless such existing structures are otherwise specified to be relocated, adjusted up or down, salvaged, abandoned in place, reused in the work or to remain in place. The cost of removing such existing structures shall not be measured or paid for directly but shall be included in the various contract items.

Should the Contractor encounter an existing structure (above or below ground) in the work for which the disposition is not indicated on the plans, the Resident Project Representative (RPR) shall be notified prior to disturbing such structure. The disposition of existing structures so encountered shall be immediately determined by the RPR in accordance with the provisions of the contract.

Except as provided in Section 40, paragraph 40-07, *Rights in and use of materials found in the work*, it is intended that all existing materials or structures that may be encountered (within the lines, grades, or grading sections established for completion of the work) shall be used in the work as otherwise provided for in the contract and shall remain the property of the Sponsor when so used in the work.



40-07 Rights in and use of materials found in the work. Should the Contractor encounter any material such as (but not restricted to) sand, stone, gravel, slag, or concrete slabs within the established lines, grades, or grading sections, the use of which is intended by the terms of the contract to be embankment, the Contractor may at their own option either:

- a. Use such material in another contract item, providing such use is approved by the RPR and is in conformance with the contract specifications applicable to such use; or,
- b. Remove such material from the site, upon written approval of the RPR; or
- c. Use such material for the Contractor's own temporary construction on site; or,
- d. Use such material as intended by the terms of the contract.

Should the Contractor wish to exercise option a., b., or c., the Contractor shall request the RPR's approval in advance of such use.

Should the RPR approve the Contractor's request to exercise option a., b., or c., the Contractor shall be paid for the excavation or removal of such material at the applicable contract price. The Contractor shall replace, at their expense, such removed or excavated material with an agreed equal volume of material that is acceptable for use in constructing embankment, backfills, or otherwise to the extent that such replacement material is needed to complete the contract work. The Contractor shall not be charged for use of such material used in the work or removed from the site.

Should the RPR approve the Contractor's exercise of option a., the Contractor shall be paid, at the applicable contract price, for furnishing and installing such material in accordance with requirements of the contract item in which the material is used.

It is understood and agreed that the Contractor shall make no claim for delays by reason of their own exercise of option a., b., or c.

The Contractor shall not excavate, remove, or otherwise disturb any material, structure, or part of a structure which is located outside the lines, grades, or grading sections established for the work, except where such excavation or removal is provided for in the contract, plans, or specifications.

40-08 Final cleanup. Upon completion of the work and before acceptance and final payment will be made, the Contractor shall remove from the site all machinery, equipment, surplus and discarded materials, rubbish, temporary structures, and stumps or portions of trees. The Contractor shall cut all brush and woods within the limits indicated and shall leave the site in a neat and presentable condition. Material cleared from the site and deposited on adjacent property will not be considered as having been disposed of satisfactorily, unless the Contractor has obtained the written permission of the property Sponsor.

END OF SECTION 40



SECTION 50 – CONTROL OF WORK

50-01 Authority of the Resident Project Representative (RPR). The RPR has final authority regarding the interpretation of project specification requirements. The RPR shall determine acceptability of the quality of materials furnished, method of performance of work performed, and the manner and rate of performance of the work. The RPR does not have the authority to accept work that does not conform to specification requirements.

50-02 Conformity with plans and specifications. All work and all materials furnished shall be in reasonably close conformity with the lines, grades, grading sections, cross-sections, dimensions, material requirements, and testing requirements that are specified (including specified tolerances) in the contract, plans, or specifications.

If the RPR finds the materials furnished, work performed, or the finished product not within reasonably close conformity with the plans and specifications, but that the portion of the work affected will, in their opinion, result in a finished product having a level of safety, economy, durability, and workmanship acceptable to the Sponsor, the RPR will advise the Sponsor of their determination that the affected work be accepted and remain in place. The RPR will document the determination and recommend to the Sponsor a basis of acceptance that will provide for an adjustment in the contract price for the affected portion of the work. Changes in the contract price must be covered by contract change order or supplemental agreement as applicable.

If the RPR finds the materials furnished, work performed, or the finished product are not in reasonably close conformity with the plans and specifications and have resulted in an unacceptable finished product, the affected work or materials shall be removed and replaced or otherwise corrected by and at the expense of the Contractor in accordance with the RPR's written orders.

The term "reasonably close conformity" shall not be construed as waiving the Contractor's responsibility to complete the work in accordance with the contract, plans, and specifications. The term shall not be construed as waiving the RPR's responsibility to insist on strict compliance with the requirements of the contract, plans, and specifications during the Contractor's execution of the work, when, in the RPR's opinion, such compliance is essential to provide an acceptable finished portion of the work.

The term "reasonably close conformity" is also intended to provide the RPR with the authority, after consultation with the Sponsor and FAA, to use sound engineering judgment in their determinations to accept work that is not in strict conformity, but will provide a finished product equal to or better than that required by the requirements of the contract, plans and specifications.

The RPR will not be responsible for the Contractor's means, methods, techniques, sequences, or procedures of construction or the safety precautions incident thereto.

50-03 Coordination of contract, plans, and specifications. The contract, plans, specifications, and all referenced standards cited are essential parts of the contract requirements. If electronic files are provided and used on the project and there is a conflict between the electronic files and hard copy plans, the hard copy plans shall govern. A requirement occurring in one is as binding as though occurring in all. They are intended to be complementary and to describe and provide for a complete work. In case of discrepancy, calculated dimensions will govern over scaled dimensions; contract technical specifications shall govern over contract general provisions, plans, cited standards for materials or testing, and cited advisory circulars (ACs); contract general provisions shall govern over plans, cited standards for materials or testing, and cited ACs; plans shall govern over cited standards for materials or testing and cited ACs. If any paragraphs contained in the Special Provisions conflict with General Provisions or Technical Specifications, the Special Provisions shall govern.



From time to time, discrepancies within cited testing standards occur due to the timing of the change, edits, and/or replacement of the standards. If the Contractor discovers any apparent discrepancy within standard test methods, the Contractor shall immediately ask the RPR for an interpretation and decision, and such decision shall be final.

The Contractor shall not take advantage of any apparent error or omission on the plans or specifications. In the event the Contractor discovers any apparent error or discrepancy, Contractor shall immediately notify the Sponsor or the designated representative in writing requesting their written interpretation and decision.

50-04 List of Special Provisions.

Special Provisions are located in Part 5 of this manual and listed in order of precedence.

50-05 Cooperation of Contractor. The Contractor shall be supplied with zero hard copies or one electronic PDF of the plans and specifications. The Contractor shall have available on the construction site at all times one hardcopy each of the plans and specifications. Additional hard copies of plans and specifications may be obtained by the Contractor for the cost of reproduction.

The Contractor shall give constant attention to the work to facilitate the progress thereof, and shall cooperate with the RPR and their inspectors and with other Contractors in every way possible. The Contractor shall have a competent superintendent on the work at all times who is fully authorized as their agent on the work. The superintendent shall be capable of reading and thoroughly understanding the plans and specifications and shall receive and fulfill instructions from the RPR or their authorized representative.

50-06 Cooperation between Contractors. The Sponsor reserves the right to contract for and perform other or additional work on or near the work covered by this contract.

When separate contracts are let within the limits of any one project, each Contractor shall conduct the work not to interfere with or hinder the progress of completion of the work being performed by other Contractors. Contractors working on the same project shall cooperate with each other as directed.

Each Contractor involved shall assume all liability, financial or otherwise, in connection with their own contract and shall protect and hold harmless the Sponsor from any and all damages or claims that may arise because of inconvenience, delays, or loss experienced because of the presence and operations of other Contractors working within the limits of the same project.

The Contractor shall arrange their work and shall place and dispose of the materials being used to not interfere with the operations of the other Contractors within the limits of the same project. The Contractor shall join their work with that of the others in an acceptable manner and shall perform it in proper sequence to that of the others.

50-07 Construction layout and stakes. The Engineer/RPR shall establish necessary horizontal and vertical control. The establishment of Survey Control and/or reestablishment of survey control shall be by a State Licensed Land Surveyor. Contractor is responsible for preserving integrity of horizontal and vertical controls established by Engineer/RPR. In case of negligence on the part of the Contractor or their employees, resulting in the destruction of any horizontal and vertical control, the resulting costs will be deducted as a liquidated damage against the Contractor.

Prior to the start of construction, the Contractor will check all control points for horizontal and vertical accuracy and certify in writing to the RPR that the Contractor concurs with survey control established for the project. All lines, grades and measurements from control points necessary for the proper execution and control of the work on this project will be provided to the RPR. The Contractor is responsible to establish all layout required for the construction of the project.

Copies of survey notes will be provided to the RPR for each area of construction and for each placement of material as specified to allow the RPR to make periodic checks for conformance with plan grades, alignments and grade



tolerances required by the applicable material specifications. Surveys will be provided to the RPR prior to commencing work items that cover or disturb the survey staking. Survey(s) and notes shall be provided in the following format(s): electronic format approved by the RPR .

Laser, GPS, String line, or other automatic control shall be checked with temporary control as necessary. In the case of error, on the part of the Contractor, their surveyor, employees or subcontractors, resulting in established grades, alignment or grade tolerances that do not concur with those specified or shown on the plans, the Contractor is solely responsible for correction, removal, replacement and all associated costs at no additional cost to the Sponsor.

No direct payment will be made, unless otherwise specified in contract documents, for this labor, materials, or other expenses. The cost shall be included in the price of the bid for the various items of the Contract.

50-08 Authority and duties of Quality Assurance (QA) inspectors. QA inspectors shall be authorized to inspect all work done and all material furnished. Such QA inspection may extend to all or any part of the work and to the preparation, fabrication, or manufacture of the materials to be used. QA inspectors are not authorized to revoke, alter, or waive any provision of the contract. QA inspectors are not authorized to issue instructions contrary to the plans and specifications or to act as foreman for the Contractor.

QA Inspectors are authorized to notify the Contractor or their representatives of any failure of the work or materials to conform to the requirements of the contract, plans, or specifications and to reject such nonconforming materials in question until such issues can be referred to the RPR for a decision.

50-09 Inspection of the work. All materials and each part or detail of the work shall be subject to inspection. The RPR shall be allowed access to all parts of the work and shall be furnished with such information and assistance by the Contractor as is required to make a complete and detailed inspection.

If the RPR requests it, the Contractor, at any time before acceptance of the work, shall remove or uncover such portions of the finished work as may be directed. After examination, the Contractor shall restore said portions of the work to the standard required by the specifications. Should the work thus exposed or examined prove acceptable, the uncovering, or removing, and the replacing of the covering or making good of the parts removed will be paid for as extra work; but should the work so exposed or examined prove unacceptable, the uncovering, or removing, and the replacing of the covering or making good of the parts removed will be at the Contractor's expense.

Provide advance written notice to the RPR of work the Contractor plans to perform each week and each day. Any work done or materials used without written notice and allowing opportunity for inspection by the RPR may be ordered removed and replaced at the Contractor's expense.

Should the contract work include relocation, adjustment, or any other modification to existing facilities, not the property of the (contract) Sponsor, authorized representatives of the Owners of such facilities shall have the right to inspect such work. Such inspection shall in no sense make any facility Sponsor a party to the contract, and shall in no way interfere with the rights of the parties to this contract.

50-10 Removal of unacceptable and unauthorized work. All work that does not conform to the requirements of the contract, plans, and specifications will be considered unacceptable, unless otherwise determined acceptable by the RPR as provided in paragraph 50-02, *Conformity with plans and specifications*.

Unacceptable work, whether the result of poor workmanship, use of defective materials, damage through carelessness, or any other cause found to exist prior to the final acceptance of the work, shall be removed immediately and replaced in an acceptable manner in accordance with the provisions of Section 70, paragraph 70-14, *Contractor's responsibility for work*.

No removal work made under provision of this paragraph shall be done without lines and grades having been established by the RPR. Work done contrary to the instructions of the RPR, work done beyond the lines shown on the plans or as established by the RPR, except as herein specified, or any extra work done without authority, will be



considered as unauthorized and will not be paid for under the provisions of the contract. Work so done may be ordered removed or replaced at the Contractor's expense.

Upon failure on the part of the Contractor to comply with any order of the RPR made under the provisions of this subsection, the RPR will have authority to cause unacceptable work to be remedied or removed and replaced; and unauthorized work to be removed and recover the resulting costs as a liquidated damage against the Contractor.

50-11 Load restrictions. The Contractor shall comply with all legal load restrictions in the hauling of materials on public roads beyond the limits of the work. A special permit will not relieve the Contractor of liability for damage that may result from the moving of material or equipment.

The operation of equipment of such weight or so loaded as to cause damage to structures or to any other type of construction will not be permitted. Hauling of materials over the base course or surface course under construction shall be limited as directed. No loads will be permitted on a concrete pavement, base, or structure before the expiration of the curing period. The Contractor, at their own expense, shall be responsible for the repair to equal or better than preconstruction conditions of any damage caused by the Contractor's equipment and personnel.

50-12 Maintenance during construction. The Contractor shall maintain the work during construction and until the work is accepted. Maintenance shall constitute continuous and effective work prosecuted day by day, with adequate equipment and forces so that the work is maintained in satisfactory condition at all times.

In the case of a contract for the placing of a course upon a course or subgrade previously constructed, the Contractor shall maintain the previous course or subgrade during all construction operations.

All costs of maintenance work during construction and before the project is accepted shall be included in the unit prices bid on the various contract items, and the Contractor will not be paid an additional amount for such work.

50-13 Failure to maintain the work. Should the Contractor at any time fail to maintain the work as provided in paragraph 50-12, *Maintenance during construction*, the RPR shall immediately notify the Contractor of such noncompliance. Such notification shall specify a reasonable time within which the Contractor shall be required to remedy such unsatisfactory maintenance condition. The time specified will give due consideration to the exigency that exists.

Should the Contractor fail to respond to the RPR's notification, the Sponsor may suspend any work necessary for the Sponsor to correct such unsatisfactory maintenance condition, depending on the exigency that exists. Any maintenance cost incurred by the Sponsor, shall be recovered as a liquidated damage against the Contractor.

50-14 Partial acceptance. If at any time during the execution of the project the Contractor substantially completes a usable unit or portion of the work, the occupancy of which will benefit the Sponsor, the Contractor may request the RPR to make final inspection of that unit. If the RPR finds upon inspection that the unit has been satisfactorily completed in compliance with the contract, the RPR may accept it as being complete, and the Contractor may be relieved of further responsibility for that unit. Such partial acceptance and beneficial occupancy by the Sponsor shall not void or alter any provision of the contract.

50-15 Final acceptance. Upon due notice from the Contractor of presumptive completion of the entire project, the RPR and Sponsor will make an inspection. If all construction provided for and contemplated by the contract is found to be complete in accordance with the contract, plans, and specifications, such inspection shall constitute the final inspection. The RPR shall notify the Contractor in writing of final acceptance as of the date of the final inspection.

If, however, the inspection discloses any work, in whole or in part, as being unsatisfactory, the RPR will notify the Contractor and the Contractor shall correct the unsatisfactory work. Upon correction of the work, another inspection will be made which shall constitute the final inspection, provided the work has been satisfactorily completed. In such



event, the RPR will make the final acceptance and notify the Contractor in writing of this acceptance as of the date of final inspection.

50-16 Claims for adjustment and disputes. If for any reason the Contractor deems that additional compensation is due for work or materials not clearly provided for in the contract, plans, or specifications or previously authorized as extra work, the Contractor shall notify the RPR in writing of their intention to claim such additional compensation before the Contractor begins the work on which the Contractor bases the claim. If such notification is not given or the RPR is not afforded proper opportunity by the Contractor for keeping strict account of actual cost as required, then the Contractor hereby agrees to waive any claim for such additional compensation. Such notice by the Contractor and the fact that the RPR has kept account of the cost of the work shall not in any way be construed as proving or substantiating the validity of the claim. When the work on which the claim for additional compensation is based has been completed, the Contractor shall, within 10 calendar days, submit a written claim to the RPR who will present it to the Sponsor for consideration in accordance with local laws or ordinances.

Nothing in this subsection shall be construed as a waiver of the Contractor's right to dispute final payment based on differences in measurements or computations.

50-17 Value Engineering Cost Proposal.

The provisions of this paragraph will apply only to contracts awarded to the lowest bidder pursuant to competitive bidding.

On projects with original contract amounts in excess of \$100,000, the Contractor may submit to the RPR, in writing, proposals for modifying the plans, specifications or other requirements of the contract for the sole purpose of reducing the cost of construction. The value engineering cost proposal shall not impair, in any manner, the essential functions or characteristics of the project, including but not limited to service life, economy of operation, ease of maintenance, desired appearance, design and safety standards. This provision shall not apply unless the proposal submitted is specifically identified by the Contractor as being presented for consideration as a value engineering proposal.

Not eligible for value engineering cost proposals are changes in the basic design of a pavement type, runway and taxiway lighting, visual aids, hydraulic capacity of drainage facilities, or changes in grade or alignment that reduce the geometric standards of the project.

As a minimum, the following information shall be submitted by the Contractor with each proposal:

- a. A description of both existing contract requirements for performing the work and the proposed changes, with a discussion of the comparative advantages and disadvantages of each.
- b. An itemization of the contract requirements that must be changed if the proposal is adopted.
- c. A detailed estimate of the cost of performing the work under the existing contract and under the proposed changes.
- d. A statement of the time by which a change order adopting the proposal must be issued.
- e. A statement of the effect adoption of the proposal will have on the time for completion of the contract.
- f. The contract items of work affected by the proposed changes, including any quantity variation attributable to them.

The Contractor may withdraw, in whole or in part, any value engineering cost proposal not accepted by the RPR, within the period specified in the proposal. The provisions of this subsection shall not be construed to require the RPR to consider any value engineering cost proposal that may be submitted.



The Contractor shall continue to perform the work in accordance with the requirements of the contract until a change order incorporating the value engineering cost proposal has been issued. If a change order has not been issued by the date upon which the Contractor's value engineering cost proposal specifies that a decision should be made, or such other date as the Contractor may subsequently have requested in writing, such value engineering cost proposal shall be deemed rejected.

The RPR shall be the sole judge of the acceptability of a value engineering cost proposal and of the estimated net savings from the adoption of all or any part of such proposal. In determining the estimated net savings, the RPR may disregard the contract bid prices if, in the RPR's judgment such prices do not represent a fair measure of the value of the work to be performed or deleted.

The Sponsor may require the Contractor to share in the Sponsor's costs of investigating a value engineering cost proposal submitted by the Contractor as a condition of considering such proposal. Where such a condition is imposed, the Contractor shall acknowledge acceptance of it in writing. Such acceptance shall constitute full authority for the Sponsor to deduct the cost of investigating a value engineering cost proposal from amounts payable to the Contractor under the contract.

If the Contractor's value engineering cost proposal is accepted in whole or in part, such acceptance will be by a contract change order that shall specifically state that it is executed pursuant to this paragraph. Such change order shall incorporate the changes in the plans and specifications which are necessary to permit the value engineering cost proposal or such part of it as has been accepted and shall include any conditions upon which the RPR's approval is based. The change order shall also set forth the estimated net savings attributable to the value engineering cost proposal. The net savings shall be determined as the difference in costs between the original contract costs for the involved work items and the costs occurring as a result of the proposed change. The change order shall also establish the net savings agreed upon and shall provide for adjustment in the contract price that will divide the net savings equally between the Contractor and the Sponsor.

The Contractor's 50% share of the net savings shall constitute full compensation to the Contractor for the value engineering cost proposal and the performance of the work.

Acceptance of the value engineering cost proposal and performance of the work shall not extend the time of completion of the contract unless specifically provided for in the contract change order.]

END OF SECTION 50



SECTION 60 – CONTROL OF MATERIALS

60-01 Source of supply and quality requirements. The materials used in the work shall conform to the requirements of the contract, plans, and specifications. Unless otherwise specified, such materials that are manufactured or processed shall be new (as compared to used or reprocessed).

In order to expedite the inspection and testing of materials, the Contractor shall furnish documentation to the RPR as to the origin, composition, and manufacture of all materials to be used in the work. Documentation shall be furnished promptly after execution of the contract but, in all cases, prior to delivery of such materials.

At the RPR's option, materials may be approved at the source of supply before delivery. If it is found after trial that sources of supply for previously approved materials do not produce specified products, the Contractor shall furnish materials from other sources.

The Contractor shall furnish airport lighting equipment that meets the requirements of the specifications; and is listed in AC 150/5345-53, *Airport Lighting Equipment Certification Program and Addendum*, that is in effect on the date of advertisement.

60-02 Samples, tests, and cited specifications. All materials used in the work shall be inspected, tested, and approved by the RPR before incorporation in the work unless otherwise designated. Any work in which untested materials are used without approval or written permission of the RPR shall be performed at the Contractor's risk. Materials found to be unacceptable and unauthorized will not be paid for and, if directed by the RPR, shall be removed at the Contractor's expense.

Unless otherwise designated, quality assurance tests will be made by and at the expense of the Sponsor in accordance with the cited standard methods of ASTM, American Association of State Highway and Transportation Officials (AASHTO), federal specifications, Commercial Item Descriptions, and all other cited methods, which are current on the date of advertisement for bids.

The testing organizations performing on-site quality assurance field tests shall have copies of all referenced standards on the construction site for use by all technicians and other personnel. Unless otherwise designated, samples for quality assurance will be taken by a qualified representative of the RPR. All materials being used are subject to inspection, test, or rejection at any time prior to or during incorporation into the work. Copies of all tests will be furnished to the Contractor's representative at their request after review and approval of the RPR.

A copy of all Contractor QC test data shall be provided to the RPR daily, along with printed reports, in an approved format, on a weekly basis. After completion of the project, and prior to final payment, the Contractor shall submit a final report to the RPR showing all test data reports, plus an analysis of all results showing ranges, averages, and corrective action taken on all failing tests.

60-03 Certification of compliance/analysis (COC/COA). The RPR may permit the use, prior to sampling and testing, of certain materials or assemblies when accompanied by manufacturer's COC stating that such materials or assemblies fully comply with the requirements of the contract. The certificate shall be signed by the manufacturer. Each lot of such materials or assemblies delivered to the work must be accompanied by a certificate of compliance in which the lot is clearly identified. The COA is the manufacturer's COC and includes all applicable test results.

Materials or assemblies used on the basis of certificates of compliance may be sampled and tested at any time and if found not to be in conformity with contract requirements will be subject to rejection whether in place or not. The form and distribution of certificates of compliance shall be as approved by the RPR.



When a material or assembly is specified by “brand name or equal” and the Contractor elects to furnish the specified “or equal,” the Contractor shall be required to furnish the manufacturer’s certificate of compliance for each lot of such material or assembly delivered to the work. Such certificate of compliance shall clearly identify each lot delivered and shall certify as to:

- a. Conformance to the specified performance, testing, quality or dimensional requirements; and,
- b. Suitability of the material or assembly for the use intended in the contract work.

The RPR shall be the sole judge as to whether the proposed “or equal” is suitable for use in the work.

The RPR reserves the right to refuse permission for use of materials or assemblies on the basis of certificates of compliance.

60-04 Plant inspection. The RPR or their authorized representative may inspect, at its source, any specified material or assembly to be used in the work. Manufacturing plants may be inspected from time to time for the purpose of determining compliance with specified manufacturing methods or materials to be used in the work and to obtain samples required for acceptance of the material or assembly.

Should the RPR conduct plant inspections, the following conditions shall exist:

- a. The RPR shall have the cooperation and assistance of the Contractor and the producer with whom the Contractor has contracted for materials.
- b. The RPR shall have full entry at all reasonable times to such parts of the plant that concern the manufacture or production of the materials being furnished.
- c. If required by the RPR, the Contractor shall arrange for adequate office or working space that may be reasonably needed for conducting plant inspections. Place office or working space in a convenient location with respect to the plant.

It is understood and agreed that the Sponsor shall have the right to retest any material that has been tested and approved at the source of supply after it has been delivered to the site. The RPR shall have the right to reject only material which, when retested, does not meet the requirements of the contract, plans, or specifications.

60-05 Engineer/ Resident Project Representative (RPR) An Engineer/RPR field office is not required.

60-06 Storage of materials. Materials shall be stored to assure the preservation of their quality and fitness for the work. Stored materials, even though approved before storage, may again be inspected prior to their use in the work. Stored materials shall be located to facilitate their prompt inspection. The Contractor shall coordinate the storage of all materials with the RPR. Materials to be stored on airport property shall not create an obstruction to air navigation nor shall they interfere with the free and unobstructed movement of aircraft. Unless otherwise shown on the plans and/or CSPP, the storage of materials and the location of the Contractor’s plant and parked equipment or vehicles shall be as directed by the RPR. Private property shall not be used for storage purposes without written permission of the Sponsor or lessee of such property. The Contractor shall make all arrangements and bear all expenses for the storage of materials on private property. Upon request, the Contractor shall furnish the RPR a copy of the property Sponsor’s permission.

All storage sites on private or airport property shall be restored to their original condition by the Contractor at their expense, except as otherwise agreed to (in writing) by the Sponsor or lessee of the property.



60-07 Unacceptable materials. Any material or assembly that does not conform to the requirements of the contract, plans, or specifications shall be considered unacceptable and shall be rejected. The Contractor shall remove any rejected material or assembly from the site of the work, unless otherwise instructed by the RPR.

Rejected material or assembly, the defects of which have been corrected by the Contractor, shall not be returned to the site of the work until such time as the RPR has approved its use in the work.

60-08 Sponsor furnished materials. The Contractor shall furnish all materials required to complete the work, except those specified, if any, to be furnished by the Sponsor. Sponsor-furnished materials shall be made available to the Contractor at the location specified.

All costs of handling, transportation from the specified location to the site of work, storage, and installing Sponsor-furnished materials shall be included in the unit price bid for the contract item in which such Sponsor-furnished material is used.

After any Sponsor-furnished material has been delivered to the location specified, the Contractor shall be responsible for any demurrage, damage, loss, or other deficiencies that may occur during the Contractor's handling, storage, or use of such Sponsor-furnished material. The Sponsor will deduct from any monies due or to become due the Contractor any cost incurred by the Sponsor in making good such loss due to the Contractor's handling, storage, or use of Sponsor-furnished materials.

END OF SECTION 60



SECTION 70 – LEGAL REGULATIONS AND RESPONSIBILITY TO PUBLIC

70-01 Laws to be observed. The Contractor shall keep fully informed of all federal and state laws, all local laws, ordinances, and regulations and all orders and decrees of bodies or tribunals having any jurisdiction or authority, which in any manner affect those engaged or employed on the work, or which in any way affect the conduct of the work. The Contractor shall at all times observe and comply with all such laws, ordinances, regulations, orders, and decrees; and shall protect and indemnify the Sponsor and all their officers, agents, or servants against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order, or decree, whether by the Contractor or the Contractor's employees.

70-02 Permits, licenses, and taxes. The Contractor shall procure all permits and licenses, pay all charges, fees, and taxes, and give all notices necessary and incidental to the due and lawful execution of the work.

70-03 Patented devices, materials, and processes. If the Contractor is required or desires to use any design, device, material, or process covered by letters of patent or copyright, the Contractor shall provide for such use by suitable legal agreement with the Patentee or Sponsor. The Contractor and the surety shall indemnify and hold harmless the Sponsor, any third party, or political subdivision from any and all claims for infringement by reason of the use of any such patented design, device, material or process, or any trademark or copyright, and shall indemnify the Sponsor for any costs, expenses, and damages which it may be obliged to pay by reason of an infringement, at any time during the execution or after the completion of the work.

70-04 Restoration of surfaces disturbed by others. The Sponsor reserves the right to authorize the construction, reconstruction, or maintenance of any public or private utility service, FAA or National Oceanic and Atmospheric Administration (NOAA) facility, or a utility service of another government agency at any time during the progress of the work. To the extent that such construction, reconstruction, or maintenance has been coordinated with the Sponsor, such authorized work (by others) must be shown on the plans and is indicated as follows:

Owner (Utility or Other Facility)	Location (See Plan Sheet No.)	Person to Contact (Name, Title, Address and Phone)
Any Utilities	C-014	Refer to C-003 for Contacts

Except as listed above, the Contractor shall not permit any individual, firm, or corporation to excavate or otherwise disturb such utility services or facilities located within the limits of the work without the written permission of the RPR.

Should the Sponsor of public or private utility service, FAA, or NOAA facility, or a utility service of another government agency be authorized to construct, reconstruct, or maintain such utility service or facility during the progress of the work, the Contractor shall cooperate with such Owners by arranging and performing the work in this contract to facilitate such construction, reconstruction or maintenance by others whether or not such work by others is listed above. When ordered as extra work by the RPR, the Contractor shall make all necessary repairs to the work which are due to such authorized work by others, unless otherwise provided for in the contract, plans, or specifications. It is understood and agreed that the Contractor shall not be entitled to make any claim for damages due to such authorized work by others or for any delay to the work resulting from such authorized work.

70-05 Federal Participation. The United States Government has agreed to reimburse the Sponsor for some portion of the contract costs. The contract work is subject to the inspection and approval of duly authorized representatives of the FAA Administrator. No requirement of this contract shall be construed as making the United States a party to the contract nor will any such requirement interfere, in any way, with the rights of either party to the contract.



70-06 Sanitary, health, and safety provisions. The Contractor's worksite and facilities shall comply with applicable federal, state, and local requirements for health, safety and sanitary provisions.

70-07 Public convenience and safety. The Contractor shall control their operations and those of their subcontractors and all suppliers, to assure the least inconvenience to the traveling public. Under all circumstances, safety shall be the most important consideration.

The Contractor shall maintain the free and unobstructed movement of aircraft and vehicular traffic with respect to their own operations and those of their own subcontractors and all suppliers in accordance with Section 40, paragraph 40-05, *Maintenance of traffic*, and shall limit such operations for the convenience and safety of the traveling public as specified in Section 80, paragraph 80-04, *Limitation of operations*.

The Contractor shall remove or control debris and rubbish resulting from its work operations at frequent intervals, and upon the order of the RPR. If the RPR determines the existence of Contractor debris in the work site represents a hazard to airport operations and the Contractor is unable to respond in a prompt and reasonable manner, the RPR reserves the right to assign the task of debris removal to a third party and recover the resulting costs as a liquidated damage against the Contractor.

70-08 Construction Safety and Phasing Plan (CSPP). The Contractor shall complete the work in accordance with the approved Construction Safety and Phasing Plan (CSPP) developed in accordance with AC 150/5370-2, Operational Safety on Airports During Construction. The CSPP is on sheet(s) C-006 through C-010 of the project plans.

70-09 Use of explosives. The use of explosives is not permitted on this project.

70-10 Protection and restoration of property and landscape. The Contractor shall be responsible for the preservation of all public and private property, and shall protect carefully from disturbance or damage all land monuments and property markers until the Engineer/RPR has witnessed or otherwise referenced their location and shall not move them until directed.

The Contractor shall be responsible for all damage or injury to property of any character, during the execution of the work, resulting from any act, omission, neglect, or misconduct in manner or method of executing the work, or at any time due to defective work or materials, and said responsibility shall not be released until the project has been completed and accepted.

When or where any direct or indirect damage or injury is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work, or in consequence of the non-execution thereof by the Contractor, the Contractor shall restore, at their expense, such property to a condition similar or equal to that existing before such damage or injury was done, by repairing, or otherwise restoring as may be directed, or the Contractor shall make good such damage or injury in an acceptable manner.

70-11 Responsibility for damage claims. The Contractor shall indemnify and hold harmless the Engineer/RPR and the Sponsor and their officers, agents, and employees from all suits, actions, or claims, of any character, brought because of any injuries or damage received or sustained by any person, persons, or property on account of the operations of the Contractor; or on account of or in consequence of any neglect in safeguarding the work; or through use of unacceptable materials in constructing the work; or because of any act or omission, neglect, or misconduct of said Contractor; or because of any claims or amounts recovered from any infringements of patent, trademark, or copyright; or from any claims or amounts arising or recovered under the "Workmen's Compensation Act," or any other law, ordinance, order, or decree. Money due the Contractor under and by virtue of their own contract considered necessary by the Sponsor for such purpose may be retained for the use of the Sponsor or, in case no money is due, their own surety may be held until such suits, actions, or claims for injuries or damages shall have been settled and suitable evidence to that effect furnished to the Sponsor, except that money due the Contractor will not be withheld when the Contractor produces satisfactory evidence that he or she is adequately protected by public liability and property damage insurance.



70-12 Third party beneficiary clause. It is specifically agreed between the parties executing the contract that it is not intended by any of the provisions of any part of the contract to create for the public or any member thereof, a third-party beneficiary or to authorize anyone not a party to the contract to maintain a suit for personal injuries or property damage pursuant to the terms or provisions of the contract.

70-13 Opening sections of the work to traffic. If it is necessary for the Contractor to complete portions of the contract work for the beneficial occupancy of the Sponsor prior to completion of the entire contract, such “phasing” of the work must be specified below and indicated on the approved Construction Safety and Phasing Plan (CSPP) and the project plans. When so specified, the Contractor shall complete such portions of the work on or before the date specified or as otherwise specified.

Phase or Description	Required Date or Sequence of Owner's Beneficial Occupancy	Work Shown on Plan Sheet
Refer to the Construction Safety Phasing Plans, Sheets C-006 through C-010		

Upon completion of any portion of work listed above, such portion shall be accepted by the Sponsor in accordance with Section 50, paragraph 50-14, *Partial acceptance*.

No portion of the work may be opened by the Contractor until directed by the Sponsor in writing. Should it become necessary to open a portion of the work to traffic on a temporary or intermittent basis, such openings shall be made when, in the opinion of the RPR, such portion of the work is in an acceptable condition to support the intended traffic. Temporary or intermittent openings are considered to be inherent in the work and shall not constitute either acceptance of the portion of the work so opened or a waiver of any provision of the contract. Any damage to the portion of the work so opened that is not attributable to traffic which is permitted by the Sponsor shall be repaired by the Contractor at their expense.

The Contractor shall make their own estimate of the inherent difficulties involved in completing the work under the conditions herein described and shall not claim any added compensation by reason of delay or increased cost due to opening a portion of the contract work.

The Contractor must conform to safety standards contained AC 150/5370-2 and the approved CSPP.

Contractor shall refer to the plans, specifications, and the approved CSPP to identify barricade requirements, temporary and/or permanent markings, airfield lighting, guidance signs and other safety requirements prior to opening up sections of work to traffic.

70-14 Contractor's responsibility for work. Until the RPR's final written acceptance of the entire completed work, excepting only those portions of the work accepted in accordance with Section 50, paragraph 50-14, *Partial acceptance*, the Contractor shall have the charge and care thereof and shall take every precaution against injury or damage to any part due to the action of the elements or from any other cause, whether arising from the execution or from the non-execution of the work. The Contractor shall rebuild, repair, restore, and make good all injuries or damages to any portion of the work occasioned by any of the above causes before final acceptance and shall bear the expense thereof except damage to the work due to unforeseeable causes beyond the control of and without the fault or negligence of the Contractor, including but not restricted to acts of God such as earthquake, tidal wave, tornado, hurricane or other cataclysmic phenomenon of nature, or acts of the public enemy or of government authorities.

If the work is suspended for any cause whatever, the Contractor shall be responsible for the work and shall take such precautions necessary to prevent damage to the work. The Contractor shall provide for normal drainage and shall erect necessary temporary structures, signs, or other facilities at their own expense. During such period of suspension of work, the Contractor shall properly and continuously maintain in an acceptable growing condition all



living material in newly established planting, seeding, and sodding furnished under the contract, and shall take adequate precautions to protect new tree growth and other important vegetative growth against injury.

70-15 Contractor's responsibility for utility service and facilities of others. As provided in paragraph 70-04, *Restoration of surfaces disturbed by others*, the Contractor shall cooperate with the Sponsor of any public or private utility service, FAA or NOAA, or a utility service of another government agency that may be authorized by the Sponsor to construct, reconstruct or maintain such utility services or facilities during the progress of the work. In addition, the Contractor shall control their operations to prevent the unscheduled interruption of such utility services and facilities.

To the extent that such public or private utility services, FAA, or NOAA facilities, or utility services of another governmental agency are known to exist within the limits of the contract work, the approximate locations have been indicated on the plans and/or in the contract documents.

Utility Service or Facility	Person to Contact (Name, Title, Address, & Phone)	Owner's Emergency Contact (Phone)
Duke Energy	William Swift	765-820-8265
Centerpoint Energy	Matt Lemay	812-231-6311
Sewer/Storm City of Terre Haute	Marc Maurer	812-232-4028
Frontier Communications	Andrew Boyle	812-462-9368
American Water	David Baker	812-232-1400 ext. 4217
Joink Communications	Bryce Brown	812-234-5100
FAA Technical Operations	Bryan Stevens	217-521-8538

It is understood and agreed that the Sponsor does not guarantee the accuracy or the completeness of the location information relating to existing utility services, facilities, or structures that may be shown on the plans or encountered in the work. Any inaccuracy or omission in such information shall not relieve the Contractor of the responsibility to protect such existing features from damage or unscheduled interruption of service.

It is further understood and agreed that the Contractor shall, upon execution of the contract, notify the Owners of all utility services or other facilities of their plan of operations. Such notification shall be in writing addressed to "The Person to Contact" as provided in this paragraph and paragraph 70-04, *Restoration of surfaces disturbed by others*. A copy of each notification shall be given to the RPR.

In addition to the general written notification provided, it shall be the responsibility of the Contractor to keep such individual Owners advised of changes in their plan of operations that would affect such Owners.

Prior to beginning the work in the general vicinity of an existing utility service or facility, the Contractor shall again notify each such Sponsor of their plan of operation. If, in the Contractor's opinion, the Sponsor's assistance is needed to locate the utility service or facility or the presence of a representative of the Sponsor is desirable to observe the work, such advice should be included in the notification. Such notification shall be given by the most expeditious means to reach the utility Sponsor's "Person to Contact" no later than two normal business days prior to the Contractor's commencement of operations in such general vicinity. The Contractor shall furnish a written summary of the notification to the RPR.

The Contractor's failure to give the two days' notice shall be cause for the Sponsor to suspend the Contractor's operations in the general vicinity of a utility service or facility.

Where the outside limits of an underground utility service have been located and staked on the ground, the Contractor shall be required to use hand excavation methods within 3 feet (1 m) of such outside limits at such points as may be required to ensure protection from damage due to the Contractor's operations.



Should the Contractor damage or interrupt the operation of a utility service or facility by accident or otherwise, the Contractor shall immediately notify the proper authority and the RPR and shall take all reasonable measures to prevent further damage or interruption of service. The Contractor, in such events, shall cooperate with the utility service or facility Sponsor and the RPR continuously until such damage has been repaired and service restored to the satisfaction of the utility or facility Sponsor.

The Contractor shall bear all costs of damage and restoration of service to any utility service or facility due to their operations whether due to negligence or accident. The Sponsor reserves the right to deduct such costs from any monies due or which may become due the Contractor, or their own surety.

70-15.1 FAA facilities and cable runs. The Contractor is hereby advised that the construction limits of the project include existing facilities and buried cable runs that are owned, operated and maintained by the FAA. The Contractor, during the execution of the project work, shall comply with the following:

a. The Contractor shall permit FAA maintenance personnel the right of access to the project work site for purposes of inspecting and maintaining all existing FAA owned facilities.

b. The Contractor shall provide notice to the FAA Air Traffic Organization (ATO)/Technical Operations/System Support Center (SSC) Point-of-Contact through the airport Director of Operations a minimum of seven (7) calendar days prior to commencement of construction activities in order to permit sufficient time to locate and mark existing buried cables and to schedule any required facility outages.

Note: *FAA Airports (ARP) will inform the Airport Sponsor of their requirement to notify the FAA preferably a minimum of 45 days prior to scheduled interruptions and airport projects with the potential to cause significant impacts to the National Airspace System (NAS). This is handled through the Internet Obstruction Evaluation/Airport Airspace Analysis (iOE/AAA) process and the airspace determination letter.

c. If execution of the project work requires a facility outage, the Contractor shall contact the FAA Point-of-Contact a minimum of 72 hours prior to the time of the required outage.

d. Any damage to FAA cables, access roads, or FAA facilities during construction caused by the Contractor's equipment or personnel whether by negligence or accident will require the Contractor to repair or replace the damaged cables, access road, or FAA facilities to FAA requirements. The Contractor shall not bear the cost to repair damage to underground facilities or utilities improperly located by the FAA.

Note: *Any displaced or relocated FAA facility or cables due to construction will require a signed and executed reimbursable agreement between the Sponsor and the FAA Tech Ops Division.

The splicing of cables may not be an acceptable form of repair for certain projects. If any FAA cables are damaged, the Sponsor shall replace the cables in their entirety.

e. If the project work requires the cutting or splicing of FAA owned cables, the FAA Point-of-Contact shall be contacted a minimum of 72 hours prior to the time the cable work commences. The FAA reserves the right to have a FAA representative on site to observe the splicing of the cables as a condition of acceptance. All cable splices are to be accomplished in accordance with FAA specifications and require approval by the FAA Point-of-Contact as a condition of acceptance by the Sponsor. The Contractor is hereby advised that FAA restricts the location of where splices may be installed. If a cable splice is required in a location that is not permitted by FAA, the Contractor shall furnish and install a sufficient length of new cable that eliminates the need for any splice.

70-16 Furnishing rights-of-way. The Sponsor will be responsible for furnishing all rights-of-way upon which the work is to be constructed in advance of the Contractor's operations.



70-17 Personal liability of public officials. In carrying out any of the contract provisions or in exercising any power or authority granted by this contract, there shall be no liability upon the Engineer, RPR, their authorized representatives, or any officials of the Sponsor either personally or as an official of the Sponsor. It is understood that in such matters they act solely as agents and representatives of the Sponsor.

70-18 No waiver of legal rights. Upon completion of the work, the Sponsor will expeditiously make final inspection and notify the Contractor of final acceptance. Such final acceptance, however, shall not preclude or stop the Sponsor from correcting any measurement, estimate, or certificate made before or after completion of the work, nor shall the Sponsor be precluded or stopped from recovering from the Contractor or their surety, or both, such overpayment as may be sustained, or by failure on the part of the Contractor to fulfill their obligations under the contract. A waiver on the part of the Sponsor of any breach of any part of the contract shall not be held to be a waiver of any other or subsequent breach.

The Contractor, without prejudice to the terms of the contract, shall be liable to the Sponsor for latent defects, fraud, or such gross mistakes as may amount to fraud, or as regards the Sponsor's rights under any warranty or guaranty.

70-19 Environmental protection. The Contractor shall comply with all federal, state, and local laws and regulations controlling pollution of the environment. The Contractor shall take necessary precautions to prevent pollution of streams, lakes, ponds, and reservoirs with fuels, oils, asphalts, chemicals, or other harmful materials and to prevent pollution of the atmosphere from particulate and gaseous matter.

70-20 Archaeological and historical findings. Unless otherwise specified in this subsection, the Contractor is advised that the site of the work is not within any property, district, or site, and does not contain any building, structure, or object listed in the current National Register of Historic Places published by the United States Department of Interior.

Should the Contractor encounter, during their operations, any building, part of a building, structure, or object that is incongruous with its surroundings, the Contractor shall immediately cease operations in that location and notify the RPR. The RPR will immediately investigate the Contractor's finding and the Sponsor will direct the Contractor to either resume operations or to suspend operations as directed.

Should the Sponsor order suspension of the Contractor's operations in order to protect an archaeological or historical finding, or order the Contractor to perform extra work, such shall be covered by an appropriate contract change order or supplemental agreement as provided in Section 40, paragraph 40-04, *Extra work*, and Section 90, paragraph 90-05, *Payment for extra work*. If appropriate, the contract change order or supplemental agreement shall include an extension of contract time in accordance with Section 80, paragraph 80-07, *Determination and extension of contract time*.

70-21 Insurance requirements. Insurance requirements are included in these project Contract Documents as Local Provisions within Part 5: Special Provisions.

END OF SECTION 70



SECTION 80 – EXECUTION AND PROGRESS

80-01 Subletting of contract. The Sponsor will not recognize any subcontractor on the work. The Contractor shall at all times when work is in progress be represented either in person, by a qualified superintendent, or by other designated, qualified representative who is duly authorized to receive and execute orders of the Resident Project Representative (RPR).

The Contractor shall perform, with his organization, an amount of work equal to at least 50% of the total contract cost.

Should the Contractor elect to assign their contract, said assignment shall be concurred in by the surety, shall be presented for the consideration and approval of the Sponsor, and shall be consummated only on the written approval of the Sponsor.

The Contractor shall provide copies of all subcontracts to the RPR **14 days** prior to being utilized on the project. As a minimum, the information shall include the following:

- Subcontractor's legal company name.
- Subcontractor's legal company address, including County name.
- Principal contact person's name, telephone and fax number.
- Complete narrative description, and dollar value of the work to be performed by the subcontractor.
- Copies of required insurance certificates in accordance with the specifications.
- Minority/ non-minority status.

80-02 Notice to Proceed (NTP). The Owners notice to proceed will state the date on which contract time commences. The Contractor is expected to commence project operations within **14 days** of the NTP date. The Contractor shall notify the RPR at least **24 hours** in advance of the time contract operations begins. The Contractor shall not commence any actual operations prior to the date on which the notice to proceed is issued by the Sponsor.

80-03 Execution and progress. Unless otherwise specified, the Contractor shall submit their coordinated construction schedule showing all work activities for the RPR's review and acceptance at least **10 days** prior to the start of work. The Contractor's progress schedule, once accepted by the RPR, will represent the Contractor's baseline plan to accomplish the project in accordance with the terms and conditions of the Contract. The RPR will compare actual Contractor progress against the baseline schedule to determine that status of the Contractor's performance. The Contractor shall provide sufficient materials, equipment, and labor to guarantee the completion of the project in accordance with the plans and specifications within the time set forth in the proposal.

If the Contractor falls significantly behind the submitted schedule, the Contractor shall, upon the RPR's request, submit a revised schedule for completion of the work within the contract time and modify their operations to provide such additional materials, equipment, and labor necessary to meet the revised schedule. Should the execution of the work be discontinued for any reason, the Contractor shall notify the RPR at least 24 hours in advance of resuming operations.

The Contractor shall not commence any actual construction prior to the date on which the NTP is issued by the Sponsor.

The project schedule shall be prepared as a network diagram in Critical Path Method (CPM), Program Evaluation and Review Technique (PERT), or other format, or as otherwise specified. It shall include information on the sequence of work activities, milestone dates, and activity duration. The schedule shall show all work items identified in the project proposal for each work area and shall include the project start date and end date.



The Contractor shall maintain the work schedule and provide an update and analysis of the progress schedule on a twice monthly basis, or as otherwise specified in the contract. Submission of the work schedule shall not relieve the Contractor of overall responsibility for scheduling, sequencing, and coordinating all work to comply with the requirements of the contract.

80-04 Limitation of operations. The Contractor shall control their operations and the operations of their subcontractors and all suppliers to provide for the free and unobstructed movement of aircraft in the air operations areas (AOA) of the airport.

When the work requires the Contractor to conduct their operations within an AOA of the airport, the work shall be coordinated with airport operations (through the RPR) at least **72 hours** prior to commencement of such work. The Contractor shall not close an AOA until so authorized by the RPR and until the necessary temporary marking, signage and associated lighting is in place as provided in Section 70, paragraph 70-08, *Construction Safety and Phasing Plan (CSPP)*.

When the contract work requires the Contractor to work within an AOA of the airport on an intermittent basis (intermittent opening and closing of the AOA), the Contractor shall maintain constant communications as specified; immediately obey all instructions to vacate the AOA; and immediately obey all instructions to resume work in such AOA. Failure to maintain the specified communications or to obey instructions shall be cause for suspension of the Contractor's operations in the AOA until satisfactory conditions are provided. The areas of the AOA identified in the Construction Safety and Phasing Plan (CSPP) and as listed below, cannot be closed to operating aircraft to permit the Contractor's operations on a continuous basis and will therefore be closed to aircraft operations intermittently as follows:

AOA	Time Periods for Closure	Type of Communications Required	Control Authority
Refer to the Safety Plan of the Construction Drawings			Director of Operations

The Contractor shall be required to conform to safety standards contained in AC 150/5370-2, *Operational Safety on Airports During Construction* and the approved CSPP.

80-04.1 Operational safety on airport during construction. All Contractors' operations shall be conducted in accordance with the approved project Construction Safety and Phasing Plan (CSPP) and the Safety Plan Compliance Document (SPCD) and the provisions set forth within the current version of AC 150/5370-2, *Operational Safety on Airports During Construction*. The CSPP included within the contract documents conveys minimum requirements for operational safety on the airport during construction activities. The Contractor shall prepare and submit a SPCD that details how it proposes to comply with the requirements presented within the CSPP.

The Contractor shall implement all necessary safety plan measures prior to commencement of any work activity. The Contractor shall conduct routine checks to assure compliance with the safety plan measures.

The Contractor is responsible to the Sponsor for the conduct of all subcontractors it employs on the project. The Contractor shall assure that all subcontractors are made aware of the requirements of the CSPP and SPCD and that they implement and maintain all necessary measures.

No deviation or modifications may be made to the approved CSPP and SPCD unless approved in writing by the Sponsor. The necessary coordination actions to review Contractor proposed modifications to an approved CSPP or approved SPCD can require a significant amount of time.

The Sponsor must coordinate any changes to the CSPP with the FAA.



80-05 Character of workers, methods, and equipment. The Contractor shall, at all times, employ sufficient labor and equipment for prosecuting the work to full completion in the manner and time required by the contract, plans, and specifications.

All workers shall have sufficient skill and experience to perform properly the work assigned to them. Workers engaged in special work or skilled work shall have sufficient experience in such work and in the operation of the equipment required to perform the work satisfactorily.

Any person employed by the Contractor or by any subcontractor who violates any operational regulations or operational safety requirements and, in the opinion of the RPR, does not perform his work in a proper and skillful manner or is intemperate or disorderly shall, at the written request of the RPR, be removed immediately by the Contractor or subcontractor employing such person, and shall not be employed again in any portion of the work without approval of the RPR.

Should the Contractor fail to remove such person or persons, or fail to furnish suitable and sufficient personnel for the proper execution of the work, the RPR may suspend the work by written notice until compliance with such orders.

All equipment that is proposed to be used on the work shall be of sufficient size and in such mechanical condition as to meet requirements of the work and to produce a satisfactory quality of work. Equipment used on any portion of the work shall not cause injury to previously completed work, adjacent property, or existing airport facilities due to its use.

When the methods and equipment to be used by the Contractor in accomplishing the work are not prescribed in the contract, the Contractor is free to use any methods or equipment that will accomplish the work in conformity with the requirements of the contract, plans, and specifications.

When the contract specifies the use of certain methods and equipment, such methods and equipment shall be used unless otherwise authorized by the RPR. If the Contractor desires to use a method or type of equipment other than specified in the contract, the Contractor may request authority from the RPR to do so. The request shall be in writing and shall include a full description of the methods and equipment proposed and of the reasons for desiring to make the change. If approval is given, it will be on the condition that the Contractor will be fully responsible for producing work in conformity with contract requirements. If, after trial use of the substituted methods or equipment, the RPR determines that the work produced does not meet contract requirements, the Contractor shall discontinue the use of the substitute method or equipment and shall complete the remaining work with the specified methods and equipment. The Contractor shall remove any deficient work and replace it with work of specified quality or take such other corrective action as the RPR may direct. No change will be made in basis of payment for the contract items involved nor in contract time as a result of authorizing a change in methods or equipment under this paragraph.

80-06 Temporary suspension of the work. The Sponsor shall have the authority to suspend the work wholly, or in part, for such period or periods the Sponsor may deem necessary, due to unsuitable weather, or other conditions considered unfavorable for the execution of the work, or for such time necessary due to the failure on the part of the Contractor to carry out orders given or perform any or all provisions of the contract.

In the event that the Contractor is ordered by the Sponsor, in writing, to suspend work for some unforeseen cause not otherwise provided for in the contract and over which the Contractor has no control, the Contractor may be reimbursed for actual money expended on the work during the period of shutdown. No allowance will be made for anticipated profits. The period of shutdown shall be computed from the effective date of the written order to suspend work to the effective date of the written order to resume the work. Claims for such compensation shall be filed with the RPR within the time period stated in the RPR's order to resume work. The Contractor shall submit with their own claim information substantiating the amount shown on the claim. The RPR will forward the Contractor's claim to the Sponsor for consideration in accordance with local laws or ordinances. No provision of this article shall



be construed as entitling the Contractor to compensation for delays due to inclement weather or for any other delay provided for in the contract, plans, or specifications.

If it becomes necessary to suspend work for an indefinite period, the Contractor shall store all materials in such manner that they will not become an obstruction nor become damaged in any way. The Contractor shall take every precaution to prevent damage or deterioration of the work performed and provide for normal drainage of the work. The Contractor shall erect temporary structures where necessary to provide for traffic on, to, or from the airport.

80-07.1 Contract Time

Contract time based on calendar days. Contract Time based on calendar days shall consist of the number of calendar days stated in the contract counting from the effective date of the Notice to Proceed and including all Saturdays, Sundays, holidays, and non-work days. All calendar days elapsing between the effective dates of the Sponsor's orders to suspend and resume all work, due to causes not the fault of the Contractor, shall be excluded.

At the time of final payment, the contract time shall be increased in the same proportion as the cost of the actually completed quantities bears to the cost of the originally estimated quantities in the proposal. Such increase in the contract time shall not consider either cost of work or the extension of contract time that has been covered by a change order or supplemental agreement. Charges against the contract time will cease as of the date of final acceptance.

Contract time based on specific completion date. When the contract time is a specified completion date, it shall be the date on which all contract work shall be substantially complete.

If the Contractor finds it impossible for reasons beyond their own control to complete the work within the contract time as specified, or as extended in accordance with the provisions of this paragraph, the Contractor may, at any time prior to the expiration of the contract time as extended, make a written request to the Sponsor for an extension of time setting forth the reasons which the Contractor believes will justify the granting of their own request. Requests for extension of time, caused by inclement weather, shall be supported with National Weather Bureau data showing the actual amount of inclement weather exceeded what could normally be expected during the contract period. The Contractor's plea that insufficient time was specified is not a valid reason for extension of time. If the supporting documentation justify the work was delayed because of conditions beyond the control and without the fault of the Contractor, the Sponsor may extend the time for completion by a change order that adjusts the contract time or completion date. The extended time for completion shall then be in full force and effect, the same as though it were the original time for completion.

80-08 Failure to complete on time. For each calendar day or working day, as specified in the contract, that any work remains uncompleted after the contract time (including all extensions and adjustments as provided in paragraph 80-07, *Determination and extension of contract time*) the sum specified in the contract and proposal as liquidated damages (LD) will be deducted from any money due or to become due the Contractor or their own surety. Such deducted sums shall not be deducted as a penalty but shall be considered as liquidation of a reasonable portion of damages including but not limited to additional engineering services that will be incurred by the Sponsor should the Contractor fail to complete the work in the time provided in their contract.



Bid	Liquidated Damages Cost	Allowed Construction Time
Base	As Noted on Sheet C-006 of the Construction Plans	As Noted on Sheet C-006 of the Construction Plans
Alternative	As Noted on Sheet C-006 of the Construction Plans	As Noted on Sheet C-006 of the Construction Plans

80-09 Default and termination of contract. The Contractor shall be considered in default of their contract and such default will be considered as cause for the Sponsor to terminate the contract for any of the following reasons, if the Contractor:

- a. Fails to begin the work under the contract within the time specified in the Notice to Proceed, or
- b. Fails to perform the work or fails to provide sufficient workers, equipment and/or materials to assure completion of work in accordance with the terms of the contract, or
- c. Performs the work unsuitably or neglects or refuses to remove materials or to perform anew such work as may be rejected as unacceptable and unsuitable, or
- d. Discontinues the execution of the work, or
- e. Fails to resume work which has been discontinued within a reasonable time after notice to do so, or
- f. Becomes insolvent or is declared bankrupt, or commits any act of bankruptcy or insolvency, or
- g. Allows any final judgment to stand against the Contractor unsatisfied for a period of 10 days, or
- h. Makes an assignment for the benefit of creditors, or
- i. For any other cause whatsoever, fails to carry on the work in an acceptable manner.

Should the Sponsor consider the Contractor in default of the contract for any reason above, the Sponsor shall immediately give written notice to the Contractor and the Contractor's surety as to the reasons for considering the Contractor in default and the Sponsor's intentions to terminate the contract.

If the Contractor or surety, within a period of 10 days after such notice, does not proceed in accordance therewith, then the Sponsor will, upon written notification from the RPR of the facts of such delay, neglect, or default and the



Contractor's failure to comply with such notice, have full power and authority without violating the contract, to take the execution of the work out of the hands of the Contractor. The Sponsor may appropriate or use any or all materials and equipment that have been mobilized for use in the work and are acceptable and may enter into an agreement for the completion of said contract according to the terms and provisions thereof, or use such other methods as in the opinion of the RPR will be required for the completion of said contract in an acceptable manner.

All costs and charges incurred by the Sponsor, together with the cost of completing the work under contract, will be deducted from any monies due or which may become due the Contractor. If such expense exceeds the sum which would have been payable under the contract, then the Contractor and the surety shall be liable and shall pay to the Sponsor the amount of such excess.

80-10 Termination for national emergencies. The Sponsor shall terminate the contract or portion thereof by written notice when the Contractor is prevented from proceeding with the construction contract as a direct result of an Executive Order of the President with respect to the execution of war or in the interest of national defense.

When the contract, or any portion thereof, is terminated before completion of all items of work in the contract, payment will be made for the actual number of units or items of work completed at the contract price or as mutually agreed for items of work partially completed or not started. No claims or loss of anticipated profits shall be considered.

Reimbursement for organization of the work, and other overhead expenses, (when not otherwise included in the contract) and moving equipment and materials to and from the job will be considered, the intent being that an equitable settlement will be made with the Contractor.

Acceptable materials, obtained or ordered by the Contractor for the work and that are not incorporated in the work shall, at the option of the Contractor, be purchased from the Contractor at actual cost as shown by receipted bills and actual cost records at such points of delivery as may be designated by the RPR.

Termination of the contract or a portion thereof shall neither relieve the Contractor of their responsibilities for the completed work nor shall it relieve their surety of its obligation for and concerning any just claim arising out of the work performed.

80-11 Work area, storage area and sequence of operations. The Contractor shall obtain approval from the RPR prior to beginning any work in all areas of the airport. No operating runway, taxiway, or air operations area (AOA) shall be crossed, entered, or obstructed while it is operational. The Contractor shall plan and coordinate work in accordance with the approved CSPP and SPCD.

END OF SECTION 80



SECTION 90 – MEASUREMENT AND PAYMENT

90-01 Measurement of quantities. All work completed under the contract will be measured by the RPR, or their authorized representatives, using United States Customary Units of Measurement

The method of measurement and computations to be used in determination of quantities of material furnished and of work performed under the contract will be those methods generally recognized as conforming to good engineering practice.

Unless otherwise specified, longitudinal measurements for area computations will be made horizontally, and no deductions will be made for individual fixtures (or leave-outs) having an area of 9 square feet (0.8 square meters) or less. Unless otherwise specified, transverse measurements for area computations will be the neat dimensions shown on the plans or ordered in writing by the RPR.

Unless otherwise specified, all contract items which are measured by the linear foot such as electrical ducts, conduits, pipe culverts, underdrains, and similar items shall be measured parallel to the base or foundation upon which such items are placed.

The term “lump sum” when used as an item of payment will mean complete payment for the work described in the contract. When a complete structure or structural unit (in effect, “lump sum” work) is specified as the unit of measurement, the unit will be construed to include all necessary fittings and accessories.

When requested by the Contractor and approved by the RPR in writing, material specified to be measured by the cubic yard (cubic meter) may be weighed, and such weights will be converted to cubic yards (cubic meters) for payment purposes. Factors for conversion from weight measurement to volume measurement will be determined by the RPR and shall be agreed to by the Contractor before such method of measurement of pay quantities is used.

MEASUREMENT AND PAYMENT TERMS

Term	Description
Excavation and Embankment Volume	In computing volumes of excavation, the average end area method will be used unless otherwise specified.
Measurement and Proportion by Weight	The term “ton” will mean the short ton consisting of 2,000 pounds (907 kg) avoirdupois. All materials that are measured or proportioned by weights shall be weighed on accurate, independently certified scales by competent, qualified personnel at locations designated by the RPR. If material is shipped by rail, the car weight may be accepted provided that only the actual weight of material is paid for. However, car weights will not be acceptable for material to be passed through mixing plants. Trucks used to haul material being paid for by weight shall be weighed empty daily at such times as the RPR directs, and each truck shall bear a plainly legible identification mark.
Measurement by Volume	Materials to be measured by volume in the hauling vehicle shall be hauled in approved vehicles and measured therein at the point of delivery. Vehicles for this purpose may be of any size or type acceptable for the materials hauled, provided that the body is of such shape that the actual contents may be readily and accurately determined. All vehicles shall be loaded to at least their water level capacity, and all loads shall be leveled when the vehicles arrive at the point of delivery.
Asphalt Material	Asphalt materials will be measured by the gallon (liter) or ton (kg). When measured by volume, such volumes will be measured at 60°F (16°C) or will be corrected to the volume at 60°F (16°C) using ASTM D1250 for asphalts. Net certified scale weights or weights



Term	Description
	based on certified volumes in the case of rail shipments will be used as a basis of measurement, subject to correction when asphalt material has been lost from the car or the distributor, wasted, or otherwise not incorporated in the work. When asphalt materials are shipped by truck or transport, net certified weights by volume, subject to correction for loss or foaming, will be used for computing quantities.
Cement	Cement will be measured by the ton (kg) or hundredweight (km).
Structure	Structures will be measured according to neat lines shown on the plans or as altered to fit field conditions.
Timber	Timber will be measured by the thousand feet board measure (MFBM) actually incorporated in the structure. Measurement will be based on nominal widths and thicknesses and the extreme length of each piece.
Plates and Sheets	The thickness of plates and galvanized sheet used in the manufacture of corrugated metal pipe, metal plate pipe culverts and arches, and metal cribbing will be specified and measured in decimal fraction of inch.
Miscellaneous Items	When standard manufactured items are specified such as fence, wire, plates, rolled shapes, pipe conduit, etc., and these items are identified by gauge, unit weight, section dimensions, etc., such identification will be considered to be nominal weights or dimensions. Unless more stringently controlled by tolerances in cited specifications, manufacturing tolerances established by the industries involved will be accepted.
Scales	<p>Scales must be tested for accuracy and serviced before use. Scales for weighing materials which are required to be proportioned or measured and paid for by weight shall be furnished, erected, and maintained by the Contractor, or be certified permanently installed commercial scales. Platform scales shall be installed and maintained with the platform level and rigid bulkheads at each end.</p> <p>Scales shall be accurate within 0.5% of the correct weight throughout the range of use. The Contractor shall have the scales checked under the observation of the RPR before beginning work and at such other times as requested. The intervals shall be uniform in spacing throughout the graduated or marked length of the beam or dial and shall not exceed 0.1% of the nominal rated capacity of the scale, but not less than one pound (454 grams). The use of spring balances will not be permitted.</p> <p>In the event inspection reveals the scales have been “overweighing” (indicating more than correct weight) they will be immediately adjusted. All materials received subsequent to the last previous correct weighting-accuracy test will be reduced by the percentage of error in excess of 0.5%.</p> <p>In the event inspection reveals the scales have been under-weighing (indicating less than correct weight), they shall be immediately adjusted. No additional payment to the Contractor will be allowed for materials previously weighed and recorded.</p> <p>Beams, dials, platforms, and other scale equipment shall be so arranged that the operator and the RPR can safely and conveniently view them.</p> <p>Scale installations shall have available ten standard 50-pound (2.3 km) weights for testing the weighing equipment or suitable weights and devices for other approved equipment.</p> <p>All costs in connection with furnishing, installing, certifying, testing, and maintaining scales; for furnishing check weights and scale house; and for all other items specified in this subsection, for the weighing of materials for proportioning or payment, shall be included in the unit contract prices for the various items of the project.</p>



Term	Description
Rental Equipment	Rental of equipment will be measured by time in hours of actual working time and necessary traveling time of the equipment within the limits of the work. Special equipment ordered in connection with extra work will be measured as agreed in the change order or supplemental agreement authorizing such work as provided in paragraph 90-05 <i>Payment for extra work</i> .
Pay Quantities	When the estimated quantities for a specific portion of the work are designated as the pay quantities in the contract, they shall be the final quantities for which payment for such specific portion of the work will be made, unless the dimensions of said portions of the work shown on the plans are revised by the RPR. If revised dimensions result in an increase or decrease in the quantities of such work, the final quantities for payment will be revised in the amount represented by the authorized changes in the dimensions.

90-02 Scope of payment. The Contractor shall receive and accept compensation provided for in the contract as full payment for furnishing all materials, for performing all work under the contract in a complete and acceptable manner, and for all risk, loss, damage, or expense of whatever character arising out of the nature of the work or the execution thereof, subject to the provisions of Section 70, paragraph 70-18, *No waiver of legal rights*.

When the “basis of payment” subsection of a technical specification requires that the contract price (price bid) include compensation for certain work or material essential to the item, this same work or material will not also be measured for payment under any other contract item which may appear elsewhere in the contract, plans, or specifications.

90-03 Compensation for altered quantities. When the accepted quantities of work vary from the quantities in the proposal, the Contractor shall accept as payment in full, so far as contract items are concerned, payment at the original contract price for the accepted quantities of work actually completed and accepted. No allowance, except as provided for in Section 40, paragraph 40-02, *Alteration of work and quantities*, will be made for any increased expense, loss of expected reimbursement, or loss of anticipated profits suffered or claimed by the Contractor which results directly from such alterations or indirectly from their own unbalanced allocation of overhead and profit among the contract items, or from any other cause.

90-04 Payment for omitted items. As specified in Section 40, paragraph 40-03, *Omitted items*, the RPR shall have the right to omit from the work (order nonperformance) any contract item, except major contract items, in the best interest of the Sponsor.

Should the RPR omit or order nonperformance of a contract item or portion of such item from the work, the Contractor shall accept payment in full at the contract prices for any work actually completed and acceptable prior to the RPR’s order to omit or non-perform such contract item.

Acceptable materials ordered by the Contractor or delivered on the work prior to the date of the RPR’s order will be paid for at the actual cost to the Contractor and shall thereupon become the property of the Sponsor.

In addition to the reimbursement hereinbefore provided, the Contractor shall be reimbursed for all actual costs incurred for the purpose of performing the omitted contract item prior to the date of the RPR’s order. Such additional costs incurred by the Contractor must be directly related to the deleted contract item and shall be supported by certified statements by the Contractor as to the nature the amount of such costs.

90-05 Payment for extra work. Extra work, performed in accordance with Section 40, paragraph 40-04, *Extra work*, will be paid for at the contract prices or agreed prices specified in the change order or supplemental agreement authorizing the extra work.

90-06 Partial payments. Partial payments will be made to the Contractor at least once each month as the work progresses. Said payments will be based upon estimates, prepared by the RPR, of the value of the work performed



and materials complete and in place, in accordance with the contract, plans, and specifications. Such partial payments may also include the delivered actual cost of those materials stockpiled and stored in accordance with paragraph 90-07, *Payment for materials on hand*. No partial payment will be made when the amount due to the Contractor since the last estimate amounts to less than five hundred dollars.

a. From the total of the amount determined to be payable on a partial payment, [insert amount of retainage, not to exceed 10%] percent of such total amount will be deducted and retained by the Sponsor for protection of the Sponsor's interests. Unless otherwise instructed by the Sponsor, the amount retained by the Sponsor will be in effect until the final payment is made except as follows:

(1) Contractor may request release of retainage on work that has been partially accepted by the Sponsor in accordance with Section 50-14. Contractor must provide a certified invoice to the RPR that supports the value of retainage held by the Sponsor for partially accepted work.

(2) In lieu of retainage, the Contractor may exercise at its option the establishment of an escrow account per paragraph 90-08.

b. The Contractor is required to pay all subcontractors for satisfactory performance of their contracts no later than 30 days after the Contractor has received a partial payment. Contractor must provide the Sponsor evidence of prompt and full payment of retainage held by the prime Contractor to the subcontractor within 30 days after the subcontractor's work is satisfactorily completed. A subcontractor's work is satisfactorily completed when all the tasks called for in the subcontract have been accomplished and documented as required by the Sponsor. When the Sponsor has made an incremental acceptance of a portion of a prime contract, the work of a subcontractor covered by that acceptance is deemed to be satisfactorily completed.

c. When at least 95% of the work has been completed to the satisfaction of the RPR, the RPR shall, at the Sponsor's discretion and with the consent of the surety, prepare estimates of both the contract value and the cost of the remaining work to be done. The Sponsor may retain an amount not less than twice the contract value or estimated cost, whichever is greater, of the work remaining to be done. The remainder, less all previous payments and deductions, will then be certified for payment to the Contractor.

It is understood and agreed that the Contractor shall not be entitled to demand or receive partial payment based on quantities of work in excess of those provided in the proposal or covered by approved change orders or supplemental agreements, except when such excess quantities have been determined by the RPR to be a part of the final quantity for the item of work in question.

No partial payment shall bind the Sponsor to the acceptance of any materials or work in place as to quality or quantity. All partial payments are subject to correction at the time of final payment as provided in paragraph 90-09, *Acceptance and final payment*.

The Contractor shall deliver to the Sponsor a complete release of all claims for labor and material arising out of this contract before the final payment is made. If any subcontractor or supplier fails to furnish such a release in full, the Contractor may furnish a bond or other collateral satisfactory to the Sponsor to indemnify the Sponsor against any potential lien or other such claim. The bond or collateral shall include all costs, expenses, and attorney fees the Sponsor may be compelled to pay in discharging any such lien or claim.

90-07 Payment for materials on hand. Partial payments may be made to the extent of the delivered cost of materials to be incorporated in the work, provided that such materials meet the requirements of the contract, plans, and specifications and are delivered to acceptable sites on the airport property or at other sites in the vicinity that are acceptable to the Sponsor. Such delivered costs of stored or stockpiled materials may be included in the next partial payment after the following conditions are met:



- a. The material has been stored or stockpiled in a manner acceptable to the RPR at or on an approved site.
- b. The Contractor has furnished the RPR with acceptable evidence of the quantity and quality of such stored or stockpiled materials.
- c. The Contractor has furnished the RPR with satisfactory evidence that the material and transportation costs have been paid.
- d. The Contractor has furnished the Sponsor legal title (free of liens or encumbrances of any kind) to the material stored or stockpiled.
- e. The Contractor has furnished the Sponsor evidence that the material stored or stockpiled is insured against loss by damage to or disappearance of such materials at any time prior to use in the work.

It is understood and agreed that the transfer of title and the Sponsor's payment for such stored or stockpiled materials shall in no way relieve the Contractor of their responsibility for furnishing and placing such materials in accordance with the requirements of the contract, plans, and specifications.

In no case will the amount of partial payments for materials on hand exceed the contract price for such materials or the contract price for the contract item in which the material is intended to be used.

No partial payment will be made for stored or stockpiled living or perishable plant materials.

The Contractor shall bear all costs associated with the partial payment of stored or stockpiled materials in accordance with the provisions of this paragraph.

90-08 Payment of withheld funds. At the Contractor's option, if an Sponsor withholds retainage in accordance with the methods described in paragraph 90-06 *Partial payments*, the Contractor may request that the Sponsor deposit the retainage into an escrow account. The Sponsor's deposit of retainage into an escrow account is subject to the following conditions:

- a. The Contractor shall bear all expenses of establishing and maintaining an escrow account and escrow agreement acceptable to the Sponsor.
- b. The Contractor shall deposit to and maintain in such escrow only those securities or bank certificates of deposit as are acceptable to the Sponsor and having a value not less than the retainage that would otherwise be withheld from partial payment.
- c. The Contractor shall enter into an escrow agreement satisfactory to the Sponsor.
- d. The Contractor shall obtain the written consent of the surety to such agreement.

90-09 Acceptance and final payment. When the contract work has been accepted in accordance with the requirements of Section 50, paragraph 50-15, *Final acceptance*, the RPR will prepare the final estimate of the items of work actually performed. The Contractor shall approve the RPR's final estimate or advise the RPR of the Contractor's objections to the final estimate which are based on disputes in measurements or computations of the final quantities to be paid under the contract as amended by change order or supplemental agreement. The Contractor and the RPR shall resolve all disputes (if any) in the measurement and computation of final quantities to be paid within 30 calendar days of the Contractor's receipt of the RPR's final estimate. If, after such 30-day period, a dispute still exists, the Contractor may approve the RPR's estimate under protest of the quantities in dispute, and such disputed quantities shall be considered by the Sponsor as a claim in accordance with Section 50, paragraph 50-16, *Claims for adjustment and disputes*.



After the Contractor has approved, or approved under protest, the RPR's final estimate, and after the RPR's receipt of the project closeout documentation required in paragraph 90-11, *Contractor final project documentation*, final payment will be processed based on the entire sum, or the undisputed sum in case of approval under protest, determined to be due the Contractor less all previous payments and all amounts to be deducted under the provisions of the contract. All prior partial estimates and payments shall be subject to correction in the final estimate and payment.

If the Contractor has filed a claim for additional compensation under the provisions of Section 50, paragraph 50-16, *Claims for adjustments and disputes*, or under the provisions of this paragraph, such claims will be considered by the Sponsor in accordance with local laws or ordinances. Upon final adjudication of such claims, any additional payment determined to be due the Contractor will be paid pursuant to a supplemental final estimate.

90-10 Construction warranty.

- a. In addition to any other warranties in this contract, the Contractor warrants that work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material, workmanship, or design furnished, or performed by the Contractor or any subcontractor or supplier at any tier.
- b. This warranty shall continue for a period of one year from the date of final acceptance of the work, except as noted. If the Sponsor takes possession of any part of the work before final acceptance, this warranty shall continue for a period of one year from the date the Sponsor takes possession. However, this will not relieve the Contractor from corrective items required by the final acceptance of the project work. Light Emitting Diode emitting diode (LED) light fixtures with the exception of obstruction lighting, must be warranted by the manufacturer for a minimum of four (4) years after date of installation inclusive of all electronics.
- c. The Contractor shall remedy at the Contractor's expense any failure to conform, or any defect. In addition, the Contractor shall remedy at the Contractor's expense any damage to Sponsor real or personal property, when that damage is the result of the Contractor's failure to conform to contract requirements; or any defect of equipment, material, workmanship, or design furnished by the Contractor.
- d. The Contractor shall restore any work damaged in fulfilling the terms and conditions of this clause. The Contractor's warranty with respect to work repaired or replaced will run for one year from the date of repair or replacement.
- e. The Sponsor will notify the Contractor, in writing, within **fourteen (14) days** after the discovery of any failure, defect, or damage.
- f. If the Contractor fails to remedy any failure, defect, or damage within [14] days after receipt of notice, the Sponsor shall have the right to replace, repair, or otherwise remedy the failure, defect, or damage at the Contractor's expense.
- g. With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this contract, the Contractor shall:
 - (1) Obtain all warranties that would be given in normal commercial practice;
 - (2) Require all warranties to be executed, in writing, for the benefit of the Sponsor, as directed by the Sponsor, and
 - (3) Enforce all warranties for the benefit of the Sponsor.



- h. This warranty shall not limit the Sponsor's rights with respect to latent defects, gross mistakes, or fraud.

90-11 Contractor Final Project Documentation. Approval of final payment to the Contractor is contingent upon completion and submittal of the items listed below. The final payment will not be approved until the RPR approves the Contractor's final submittal. The Contractor shall:

- a. Provide two (2) copies of all manufacturer's warranties specified for materials, equipment, and installations.
- b. Provide weekly payroll records (not previously received) from the general Contractor and all subcontractors.
- c. Complete final cleanup in accordance with Section 40, paragraph 40-08, *Final cleanup*.
- d. Complete all punch list items identified during the Final Inspection.
- e. Provide complete release of all claims for labor and material arising out of the Contract.
- f. Provide a certified statement signed by the subcontractors, indicating actual amounts paid to the Disadvantaged Business Enterprise (DBE) subcontractors and/or suppliers associated with the project.
- g. When applicable per state requirements, return copies of sales tax completion forms.
- h. Manufacturer's certifications for all items incorporated in the work.
- i. All required record drawings, as-built drawings or as-constructed drawings.
- j. Project Operation and Maintenance (O&M) Manual(s).
- k. Security for Construction Warranty.
- l. Equipment commissioning documentation submitted, if required.

END OF SECTION 90



PART 5: SPECIAL PROVISIONS



FEDERAL PROVISIONS

ACCESS TO RECORDS AND REPORTS

The Contractor must maintain an acceptable cost accounting system. The Contractor agrees to provide the Sponsor, the Federal Aviation Administration and the Comptroller General of the United States or any of their duly authorized representatives access to any books, documents, papers and records of the Contractor which are directly pertinent to the specific contract for the purpose of making audit, examination, excerpts and transcriptions. The Contractor agrees to maintain all books, records and reports required under this contract for a period of not less than three years after final payment is made and all pending matters are closed.

BREACH OF CONTRACT TERMS

Any violation or breach of terms of this contract on the part of the Contractor or its subcontractors may result in the suspension or termination of this contract or such other action that may be necessary to enforce the rights of the parties of this agreement.

Sponsor will provide Contractor written notice that describes the nature of the breach and corrective actions the Contractor must undertake in order to avoid termination of the contract. Sponsor reserves the right to withhold payments to Contractor until such time the Contractor corrects the breach or the Sponsor elects to terminate the contract. The Sponsor's notice will identify a specific date by which the Contractor must correct the breach. Sponsor may proceed with termination of the contract if the Contractor fails to correct the breach by the deadline indicated in the Sponsor's notice.

The duties and obligations imposed by the Contract Documents and the rights and remedies available thereunder are in addition to, and not a limitation of, any duties, obligations, rights and remedies otherwise imposed or available by law.

GENERAL CIVIL RIGHTS PROVISIONS

In all its activities within the scope of its airport program, the Contractor agrees to comply with pertinent statutes, Executive Orders, and such rules as identified in Title VI List of Pertinent Nondiscrimination Acts and Authorities to ensure that no person shall, on the grounds of race, color, national origin (including limited English proficiency), creed, sex (including sexual orientation and gender identity), age, or disability be excluded from participating in any activity conducted with or benefiting from Federal assistance.

This provision is in addition to that required by Title VI of the Civil Rights Act of 1964.

The above provision binds the Contractor and subcontractors from the bid solicitation period through the completion of the contract.

CIVIL RIGHTS – TITLE VI ASSURANCES

() Compliance with Nondiscrimination Requirements:

During the performance of this contract, the Contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "Contractor"), agrees as follows:



1. **Compliance with Regulations:** The Contractor (hereinafter includes consultants) will comply with the Title VI List of Pertinent Nondiscrimination Acts and Authorities, as they may be amended from time to time, which are herein incorporated by reference and made a part of this contract.
2. **Nondiscrimination:** The Contractor, with regard to the work performed by it during the contract, will not discriminate on the grounds of race, color, national origin (including limited English proficiency), creed, sex (including sexual orientation and gender identity), age, or disability in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The Contractor will not participate directly or indirectly in the discrimination prohibited by the Nondiscrimination Acts and Authorities, including employment practices when the contract covers any activity, project, or program set forth in Appendix B of 49 CFR part 21.
3. **Solicitations for Subcontracts, including Procurements of Materials and Equipment:** In all solicitations, either by competitive bidding or negotiation made by the Contractor for work to be performed under a subcontract, including procurements of materials, or leases of equipment, each potential subcontractor or supplier will be notified by the Contractor of the contractor's obligations under this contract and the Nondiscrimination Acts and Authorities on the grounds of race, color, or national origin.
4. **Information and Reports:** The Contractor will provide all information and reports required by the Acts, the Regulations, and directives issued pursuant thereto and will permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the Sponsor or the Federal Aviation Administration to be pertinent to ascertain compliance with such Nondiscrimination Acts and Authorities and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish the information, the Contractor will so certify to the Sponsor or the Federal Aviation Administration, as appropriate, and will set forth what efforts it has made to obtain the information.
5. **Sanctions for Noncompliance:** In the event of a Contractor's noncompliance with the non-discrimination provisions of this contract, the Sponsor will impose such contract sanctions as it or the Federal Aviation Administration may determine to be appropriate, including, but not limited to:
 - . Withholding payments to the Contractor under the contract until the Contractor complies; and/or
 - . Cancelling, terminating, or suspending a contract, in whole or in part.
6. **Incorporation of Provisions:** The Contractor will include the provisions of paragraphs one through six in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Acts, the Regulations, and directives issued pursuant thereto. The Contractor will take action with respect to any subcontract or procurement as the Sponsor or the Federal Aviation Administration may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, that if the Contractor becomes involved in, or is threatened with litigation by a subcontractor, or supplier because of such direction, the Contractor may request the Sponsor to enter into any litigation to protect the interests of the Sponsor. In addition, the Contractor may request the United States to enter into the litigation to protect the interests of the United States.

Clauses for Construction/Use/Access to Real Property Acquired Under the Activity, Facility or Program

The (grantee, licensee, permittee, etc., as appropriate) for himself/herself, his/her heirs, personal representatives, successors in interest, and assigns, as a part of the consideration hereof, does hereby covenant and agree (in the case of deeds and leases add, "as a covenant running with the land") that (1) no person on the ground of race, color, or national origin, will be excluded from participation in, denied the benefits of, or be otherwise subjected to discrimination in the use of said facilities, (2) that in the construction of any improvements on, over, or under such land, and the furnishing of services thereon, no person on the ground of race, color, or national origin, will be



excluded from participation in, denied the benefits of, or otherwise be subjected to discrimination, (3) that the (grantee, licensee, lessee, permittee, etc.) will use the premises in compliance with all other requirements imposed by or pursuant to the List of discrimination Acts And Authorities.

With respect to (licenses, leases, permits, etc.), in the event of breach of any of the above Non-discrimination covenants, (Title of Sponsor) will have the right to terminate the (license, permit, etc., as appropriate) and to enter or re-enter and repossess said land and the facilities thereon, and hold the same as if said (license, permit, etc., as appropriate) had never been made or issued.*

With respect to deeds, in the event of breach of any of the above Non-discrimination covenants, (Title of Sponsor) will there upon revert to and vest in and become the absolute property of (Title of Sponsor) and its assigns.*

(*Reverter clause and related language to be used only when it is determined that such a clause is necessary to make clear the purpose of Title VI.)

() Title VI List of Pertinent Nondiscrimination Acts and Authorities

During the performance of this contract, the Contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "Contractor") agrees to comply with the following non-discrimination statutes and authorities; including but not limited to:

- Title VI of the Civil Rights Act of 1964 (42 USC § 2000d et seq., 78 stat. 252) (prohibits discrimination on the basis of race, color, national origin);
- 49 CFR part 21 (Non-discrimination in Federally-Assisted programs of the Department of Transportation—Effectuation of Title VI of the Civil Rights Act of 1964);
- The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, (42 USC § 4601) (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-aid programs and projects);
- Section 504 of the Rehabilitation Act of 1973 (29 USC § 794 et seq.), as amended (prohibits discrimination on the basis of disability); and 49 CFR part 27 (Nondiscrimination on the Basis of Disability in Programs or Activities Receiving Federal Financial Assistance);
- The Age Discrimination Act of 1975, as amended (42 USC § 6101 et seq.) (prohibits discrimination on the basis of age);
- Airport and Airway Improvement Act of 1982 (49 USC § 47123), as amended (prohibits discrimination based on race, creed, color, national origin, or sex);
- The Civil Rights Restoration Act of 1987 (PL 100-259) (broadened the scope, coverage and applicability of Title VI of the Civil Rights Act of 1964, the Age Discrimination Act of 1975 and Section 504 of the Rehabilitation Act of 1973, by expanding the definition of the terms "programs or activities" to include all of the programs or activities of the Federal-aid recipients, sub-recipients and contractors, whether such programs or activities are Federally funded or not);
- Titles II and III of the Americans with Disabilities Act of 1990 (42 USC § 12101, et seq) (prohibit discrimination on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities) as implemented by U.S. Department of Transportation regulations at 49 CFR parts 37 and 38;
- The Federal Aviation Administration's Nondiscrimination statute (49 USC § 47123) (prohibits discrimination on the basis of race, color, national origin, and sex);
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (ensures nondiscrimination against minority populations by discouraging programs, policies, and activities with disproportionately high and adverse human health or environmental effects on minority and low-income populations);
- Executive Order 13166, Improving Access to Services for Persons with Limited English Proficiency, and resulting agency guidance, national origin discrimination includes discrimination because of limited English



proficiency (LEP). To ensure compliance with Title VI, you must take reasonable steps to ensure that LEP persons have meaningful access to your programs [70 Fed. Reg. 74087 (2005)];

- Title IX of the Education Amendments of 1972, as amended, which prohibits you from discriminating because of sex in education programs or activities (20 USC § 1681, et seq).

CLEAN AIR AND WATER POLLUTION CONTROL

Contractor agrees to comply with all applicable standards, orders, and regulations issued pursuant to the Clean Air Act (42 USC §§ 7401-7671q) and the Federal Water Pollution Control Act as amended (33 USC §§ 1251-1387). The Contractor agrees to report any violation to the Sponsor immediately upon discovery. The Sponsor assumes responsibility for notifying the Environmental Protection Agency (EPA) and the Federal Aviation Administration.

Contractor must include this requirement in all subcontracts that exceeds \$150,000.

CONTRACT WORKHOURS AND SAFETY STANDARDS ACT REQUIREMENTS

1. **Overtime Requirements.** No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic, including watchmen and guards, in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.
2. **Violation; Liability for Unpaid Wages; Liquidated Damages.** In the event of any violation of the clause set forth in paragraph (1) of this clause, the Contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1) of this clause, in the sum of \$29 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1) of this clause.
3. **Withholding for Unpaid Wages and Liquidated Damages.** The Federal Aviation Administration (FAA) or the Sponsor shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2) of this clause.
4. **Subcontractors.** The Contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraphs (1) through (4) and also a clause requiring the subcontractor to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1) through (4) of this clause.

COPELAND "ANTI-KICKBACK" ACT

Contractor must comply with the requirements of the Copeland "Anti-Kickback" Act (18 USC 874 and 40 USC 3145), as supplemented by Department of Labor regulation 29 CFR part 3. Contractor and subcontractors are prohibited



from inducing, by any means, any person employed on the project to give up any part of the compensation to which the employee is entitled. The Contractor and each Subcontractor must submit to the Sponsor, a weekly statement on the wages paid to each employee performing on covered work during the prior week. Sponsor must report any violations of the Act to the Federal Aviation Administration.

DAVIS-BACON REQUIREMENTS

1. Minimum Wages.

- . All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by the Secretary of Labor under the Copeland Act (29 CFR Part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalent thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the Contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR § 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under (1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the Contractor and its subcontractors at the site of the work in a prominent and accessible place where it can easily be seen by the workers.

- . The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:
 - () The work to be performed by the classification requested is not performed by a classification in the wage determination;
 - () The classification is utilized in the area by the construction industry; and
 - () The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.
- . If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30



days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

- . In the event the Contractor, the laborers, or mechanics to be employed in the classification, or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.
 - . The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs (1)(ii) (B) or (C) of this paragraph, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.
 - . Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.
 - . If the Contractor does not make payments to a trustee or other third person, the Contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, that the Secretary of Labor has found, upon the written request of the Contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.
2. **Withholding.** The Federal Aviation Administration or the Sponsor shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the Contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the Contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the Federal Aviation Administration may, after written notice to the Contractor, Sponsor, Applicant, or Sponsor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.
3. **Payrolls and Basic Records.**
- . Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker; his or her correct classification; hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in 1(b)(2)(B) of the Davis-Bacon Act); daily and weekly number of hours worked; deductions made; and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the



Contractor shall maintain records that show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual costs incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

- . The Contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the Federal Aviation Administration if the agency is a party to the contract, but if the agency is not such a party, the Contractor will submit the payrolls to the applicant, Sponsor, or Sponsor, as the case may be, for transmission to the Federal Aviation Administration. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR § 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <https://www.dol.gov/agencies/whd/government-contracts/construction/payroll-certification> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker and shall provide them upon request to the Federal Aviation Administration if the agency is a party to the contract, but if the agency is not such a party, the Contractor will submit them to the applicant, Sponsor, or Sponsor, as the case may be, for transmission to the Federal Aviation Administration, the Contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the sponsoring government agency (or the applicant, Sponsor, or Sponsor).
- . Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the Contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:
 - (i) That the payroll for the payroll period contains the information required to be provided under 29 CFR § 5.5(a)(3)(ii), the appropriate information is being maintained under 29 CFR § 5.5(a)(3)(i), and that such information is correct and complete;
 - (i) That each laborer and mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR Part 3;
 - (i) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.
- . The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (3)(ii)(B) of this section.



- . The falsification of any of the above certifications may subject the Contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 231 of Title 31 of the United States Code.
- . The Contractor or subcontractor shall make the records required under paragraph (3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the Sponsor, the Federal Aviation Administration, or the Department of Labor and shall permit such representatives to interview employees during working hours on the job. If the Contractor or subcontractor fails to submit the required records or to make them available, the Federal agency may, after written notice to the Contractor, Sponsor, applicant, or Sponsor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR § 5.12.

4. Apprentices and Trainees.

- . Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the Contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the Contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.
- . Trainees. Except as provided in 29 CFR § 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate



- specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination that provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate that is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the Contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.
- . Equal Employment Opportunity. The utilization of apprentices, trainees, and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.
5. **Compliance with Copeland Act Requirements.** The Contractor shall comply with the requirements of 29 CFR Part 3, which are incorporated by reference in this contract.
 6. **Subcontracts.** The Contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR §§ 5.5(a)(1) through (10) and such other clauses as the Federal Aviation Administration may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR § 5.5.
 7. **Contract Termination: Debarment.** A breach of the contract clauses in paragraph 1 through 10 of this section may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR § 5.12.
 8. **Compliance with Davis-Bacon and Related Act Requirements.** All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract.
 9. **Disputes Concerning Labor Standards.** Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the Contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.
 10. **Certification of Eligibility.**
 - . By entering into this contract, the Contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the Contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR § 5.12(a)(1).
 - . No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR § 5.12(a)(1).
 - . The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 USC § 1001.



DISADVANTAGED BUSINESS ENTERPRISES

Contract Assurance (49 CFR § 26.13) – The Contractor, subrecipient or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The Contractor shall carry out applicable requirements of 49 CFR part 26 in the award and administration of Department of Transportation-assisted contracts. Failure by the Contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the Sponsor deems appropriate, which may include, but is not limited to:

1. Withholding monthly progress payments;
2. Assessing sanctions;
3. Liquidated damages; and/or
4. Disqualifying the Contractor from future bidding as non-responsible.

Prompt Payment (49 CFR § 26.29) – The prime contractor agrees to pay each subcontractor under this prime contract for satisfactory performance of its contract no later than 14 days from the receipt of each payment the prime contractor receives from the Sponsor. The prime contractor agrees further to return retainage payments to each subcontractor within 14 days after the subcontractor's work is satisfactorily completed. Any delay or postponement of payment from the above referenced time frame may occur only for good cause following written approval of the Sponsor. This clause applies to both DBE and non-DBE subcontractors.

Termination of DBE Subcontracts (49 CFR § 26.53(f)) - The prime contractor must not terminate a DBE subcontractor listed in response to the DBE requirements listed in the Notice to Bidders (or an approved substitute DBE firm) without prior written consent of the Sponsor. This includes, but is not limited to, instances in which the prime contractor seeks to perform work originally designated for a DBE subcontractor with its own forces or those of an affiliate, a non-DBE firm, or with another DBE firm.

The prime contractor shall utilize the specific DBEs listed to perform the work and supply the materials for which each is listed unless the contractor obtains written consent the Sponsor. Unless the Sponsor consent is provided, the prime contractor shall not be entitled to any payment for work or material unless it is performed or supplied by the listed DBE.

Sponsor may provide such written consent only if the Sponsor agrees, for reasons stated in the concurrence document, that the prime contractor has good cause to terminate the DBE firm. For purposes of this paragraph, good cause includes the circumstances listed in 49 CFR §26.53.

Before transmitting to the Sponsor its request to terminate and/or substitute a DBE subcontractor, the prime contractor must give notice in writing to the DBE subcontractor, with a copy to the Sponsor, of its intent to request to terminate and/or substitute, and the reason for the request.

The prime contractor must give the DBE five days to respond to the prime contractor's notice and advise the Sponsor and the contractor of the reasons, if any, why it objects to the proposed termination of its subcontract and why the Sponsor should not approve the prime contractor's action. If required in a particular case as a matter of public necessity (e.g., safety), Sponsor may provide a response period shorter than five days.

In addition to post-award terminations, the provisions of this section apply to pre-award deletions of or substitutions for DBE firms put forward by offerors in negotiated procurements.

TEXTING WHEN DRIVING

In accordance with Executive Order 13513, "Federal Leadership on Reducing Text Messaging While Driving", (10/1/2009) and DOT Order 3902.10, "Text Messaging While Driving", (12/30/2009), the Federal Aviation Administration encourages recipients of Federal grant funds to adopt and enforce safety policies that decrease



crashes by distracted drivers, including policies to ban text messaging while driving when performing work related to a grant or subgrant.

In support of this initiative, the Sponsor encourages the Contractor to promote policies and initiatives for its employees and other work personnel that decrease crashes by distracted drivers, including policies that ban text messaging while driving motor vehicles while performing work activities associated with the project. The Contractor must include the substance of this clause in all sub-tier contracts exceeding \$10,000 that involve driving a motor vehicle in performance of work activities associated with the project.

PROHIBITION ON CERTAIN TELECOMMUNICATIONS AND VIDEO SURVEILLANCE SERVICES OR EQUIPMENT

Contractor and Subcontractor agree to comply with mandatory standards and policies relating to use and procurement of certain telecommunications and video surveillance services or equipment in compliance with the National Defense Authorization Act [Public Law 115-232 § 889(f)(1)].

ENERGY CONSERVATION REQUIREMENTS

Contractor and Subcontractor agree to comply with mandatory standards and policies relating to energy efficiency as contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act (42 USC 6201et seq).

EQUAL OPPORTUNITY CLAUSE

During the performance of this contract, the Contractor agrees as follows:

1. The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff, or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.
2. The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin.
3. The contractor will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the contractor's legal duty to furnish information.
4. The Contractor will send to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, a notice to be provided by the agency contracting officer, advising the labor union or workers' representative of the Contractor's commitments under this



section 202 of Executive Order 11246 of September 24, 1965, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

5. The Contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.
6. The Contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the contracting agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.
7. In the event of the Contractor's noncompliance with the nondiscrimination clauses of this contract or with any such rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.
8. The Contractor will include the provisions of paragraphs (1) through (8) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as may be directed by the Secretary of Labor as a means of enforcing such provisions, including sanctions for noncompliance: Provided, however, that in the event the contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction, the Contractor may request the United States to enter into such litigation to protect the interests of the United States.

PROHIBITION OF SEGREGATED FACILITIES

1. The Contractor agrees that it does not and will not maintain or provide for its employees any segregated facilities at any of its establishments, and that it does not and will not permit its employees to perform their services at any location under its control where segregated facilities are maintained. The Contractor agrees that a breach of this clause is a violation of the Equal Employment Opportunity clause in this contract.
2. "Segregated facilities," as used in this clause, means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees that are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, sex, or national origin because of written or oral policies or employee custom. The term does not include separate or single-user rest rooms or necessary dressing or sleeping areas provided to assure privacy between the sexes.
3. The Contractor shall include this clause in every subcontract and purchase order that is subject to the Equal Employment Opportunity clause of this contract.

OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970

All contracts and subcontracts that result from this solicitation incorporate by reference the requirements of 29 CFR Part 1910 with the same force and effect as if given in full text. The employer must provide a work environment that is free from recognized hazards that may cause death or serious physical harm to the employee. The employer retains full responsibility to monitor its compliance and their subcontractor's compliance with the applicable requirements of the Occupational Safety and Health Act of 1970 (29 CFR Part 1910). The employer must address any claims or disputes that pertain to a referenced requirement directly with the U.S. Department of Labor – Occupational Safety and Health Administration.



PROCUREMENT OF RECOVERED MATERIALS

Contractor and subcontractor agree to comply with Section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act, and the regulatory provisions of 40 CFR Part 247. In the performance of this contract and to the extent practicable, the Contractor and subcontractors are to use products containing the highest percentage of recovered materials for items designated by the Environmental Protection Agency (EPA) under 40 CFR Part 247 whenever:

1. The contract requires procurement of \$10,000 or more of a designated item during the fiscal year; or
2. The contractor has procured \$10,000 or more of a designated item using Federal funding during the previous fiscal year.

The list of EPA-designated items is available at www.epa.gov/smm/comprehensive-procurement-guidelines-construction-products.

Section 6002(c) establishes exceptions to the preference for recovery of EPA-designated products if the contractor can demonstrate the item is:

1. Not reasonably available within a timeframe providing for compliance with the contract performance schedule;
2. Fails to meet reasonable contract performance requirements; or
3. Is only available at an unreasonable price.

RIGHTS TO INVENTIONS

Contracts or agreements that include the performance of experimental, developmental, or research work must provide for the rights of the Federal Government and the Sponsor in any resulting invention as established by 37 CFR part 401, Rights to Inventions Made by Non-profit Organizations and Small Business Firms under Government Grants, Contracts, and Cooperative Agreements. This contract incorporates by reference the patent and inventions rights as specified within 37 CFR § 401.14. Contractor must include this requirement in all sub-tier contracts involving experimental, developmental, or research work.

SEISMIC SAFETY

SEISMIC SAFETY – PROFESSIONAL SERVICES

In the performance of design services, the Consultant agrees to furnish a building design and associated construction specification that conform to a building code standard that provides a level of seismic safety substantially equivalent to standards as established by the National Earthquake Hazards Reduction Program (NEHRP). Local building codes that model their building code after the current version of the International Building Code (IBC) meet the NEHRP equivalency level for seismic safety. At the conclusion of the design services, the Consultant agrees to furnish the Sponsor a “certification of compliance” that attests conformance of the building design and the construction specifications with the seismic standards of NEHRP or an equivalent building code.

SEISMIC SAFETY – CONSTRUCTION / EQUIPMENT

The Contractor agrees to ensure that all work performed under this contract, including work performed by subcontractors, conforms to a building code standard that provides a level of seismic safety substantially equivalent to standards established by the National Earthquake Hazards Reduction Program (NEHRP). Local building codes that



model their code after the current version of the International Building Code (IBC) meet the NEHRP equivalency level for seismic safety.

TERMINATION FOR CONVENIENCE (CONSTRUCTION & EQUIPMENT CONTRACTS)

The Sponsor may terminate this contract in whole or in part at any time by providing written notice to the Contractor. Such action may be without cause and without prejudice to any other right or remedy of Sponsor. Upon receipt of a written notice of termination, except as explicitly directed by the Sponsor, the Contractor shall immediately proceed with the following obligations regardless of any delay in determining or adjusting amounts due under this clause:

1. Contractor must immediately discontinue work as specified in the written notice.
2. Terminate all subcontracts to the extent they relate to the work terminated under the notice.
3. Discontinue orders for materials and services except as directed by the written notice.
4. Deliver to the Sponsor all fabricated and partially fabricated parts, completed and partially completed work, supplies, equipment and materials acquired prior to termination of the work, and as directed in the written notice.
5. Complete performance of the work not terminated by the notice.
6. Take action as directed by the Sponsor to protect and preserve property and work related to this contract that Sponsor will take possession.

Sponsor agrees to pay Contractor for:

1. completed and acceptable work executed in accordance with the contract documents prior to the effective date of termination;
2. documented expenses sustained prior to the effective date of termination in performing work and furnishing labor, materials, or equipment as required by the contract documents in connection with uncompleted work;
3. reasonable and substantiated claims, costs, and damages incurred in settlement of terminated contracts with Subcontractors and Suppliers; and
4. reasonable and substantiated expenses to the Contractor directly attributable to Sponsor's termination action.

Sponsor will not pay Contractor for loss of anticipated profits or revenue or other economic loss arising out of or resulting from the Sponsor's termination action.

The rights and remedies this clause provides are in addition to any other rights and remedies provided by law or under this contract.

TERMINATION FOR CAUSE (CONSTRUCTION)

Section 80-09 of FAA Advisory Circular 150/5370-10 (current version) establishes conditions, rights, and remedies associated with Sponsor termination of this contract due to default of the Contractor.

The Sponsor may, by written notice of default to the Contractor, terminate all or part of this Contract if the Contractor:

1. Fails to commence the Work under the Contract within the time specified in the Notice-to-Proceed;
2. Fails to make adequate progress as to endanger performance of this Contract in accordance with its terms;
3. Fails to make delivery of the equipment within the time specified in the Contract, including any Sponsor approved extensions;
4. Fails to comply with material provisions of the Contract;



5. Submits certifications made under the Contract and as part of their proposal that include false or fraudulent statements; or
6. Becomes insolvent or declares bankruptcy.

If one or more of the stated events occur, the Sponsor will give notice in writing to the Contractor and Surety of its intent to terminate the contract for cause. At the Sponsor's discretion, the notice may allow the Contractor and Surety an opportunity to cure the breach or default.

If within [10] days of the receipt of notice, the Contractor or Surety fails to remedy the breach or default to the satisfaction of the Sponsor, the Sponsor has authority to acquire equipment by other procurement action. The Contractor will be liable to the Sponsor for any excess costs the Sponsor incurs for acquiring such similar equipment.

Payment for completed equipment delivered to and accepted by the Sponsor shall be at the Contract price. The Sponsor may withhold from amounts otherwise due the Contractor for such completed equipment, such sum as the Sponsor determines to be necessary to protect the Sponsor against loss because of Contractor default.

Sponsor will not terminate the Contractor's right to proceed with the Work under this clause if the delay in completing the work arises from unforeseeable causes beyond the control and without the fault or negligence of the Contractor. Examples of such acceptable causes include: acts of God, acts of the Sponsor, acts of another Contractor in the performance of a contract with the Sponsor, and severe weather events that substantially exceed normal conditions for the location.

If, after termination of the Contractor's right to proceed, the Sponsor determines that the Contractor was not in default, or that the delay was excusable, the rights and obligations of the parties will be the same as if the Sponsor issued the termination for the convenience the Sponsor.

The rights and remedies of the Sponsor in this clause are in addition to any other rights and remedies provided by law or under this contract.

VETERAN'S PREFERENCE

In the employment of labor (excluding executive, administrative, and supervisory positions), the Contractor and all sub-tier contractors must give preference to covered veterans as defined within Title 49 United States Code Section 47112. Covered veterans include Vietnam-era veterans, Persian Gulf veterans, Afghanistan-Iraq war veterans, disabled veterans, and small business concerns (as defined by 15 USC 632) owned and controlled by disabled veterans. This preference only applies when there are covered veterans readily available and qualified to perform the work to which the employment relates.

FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CONSTRUCTION CONTRACT SPECIFICATION

EEO Specification:

1. As used in these specifications:
 - a.) "Covered area" means the geographical area described in the solicitation from which this contract resulted;
 - b.) "Director" means Director, Office of Federal Contract Compliance Programs (OFCCP), U.S. Department of Labor, or any person to whom the Director delegates authority;
 - c.) "Employer identification number" means the Federal social security number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941;



- d.) “Minority” includes:
 - i.) Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);
 - ii.) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race);
 - iii.) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and
 - iv.) American Indian or Alaskan native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).
- 2. Whenever the Contractor, or any subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of \$10,000 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.
- 3. If the Contractor is participating (pursuant to 41 CFR part 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each contractor or subcontractor participating in an approved plan is individually required to comply with its obligations under the EEO clause and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other contractors or subcontractors toward a goal in an approved Plan does not excuse any covered contractor’s or subcontractor’s failure to take good faith efforts to achieve the Plan goals and timetables.
- 4. The Contractor shall implement the specific affirmative action standards provided in paragraphs 7a through 7p of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. Covered construction contractors performing construction work in a geographical area where they do not have a Federal or federally assisted construction contract shall apply the minority and female goals established for the geographical area where the work is being performed. Goals are published periodically in the Federal Register in notice form, and such notices may be obtained from any Office of Federal Contract Compliance Programs office or from Federal procurement contracting officers. The Contractor is expected to make substantially uniform progress in meeting its goals in each craft during the period specified.
- 5. Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the Contractor has a collective bargaining agreement, to refer either minorities or women shall excuse the Contractor’s obligations under these specifications, Executive Order 11246, or the regulations promulgated pursuant thereto.
- 6. In order for the nonworking training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the Contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.
- 7. The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the Contractor’s compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully, and shall implement affirmative action steps at least as extensive as the following:



-) Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the Contractor's employees are assigned to work. The Contractor, where possible, will assign two or more women to each construction project. The Contractor shall specifically ensure that all foremen, superintendents, and other onsite supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.
-) Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.
-) Maintain a current file of the names, addresses, and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source, or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be documented in the file with the reason therefor, along with whatever additional actions the Contractor may have taken.
-) Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.
-) Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under 7b above.
-) Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.
-) Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination, or other employment decisions including specific review of these items with onsite supervisory personnel such superintendents, general foremen, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.
-) Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the Contractor's EEO policy with other contractors and subcontractors with whom the Contractor does or anticipates doing business.
-) Direct its recruitment efforts, both oral and written, to minority, female, and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the Contractor shall send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.



-) Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer, and vacation employment to minority and female youth both on the site and in other areas of a contractor's work force.
 -) Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR part 60-3.
 -) Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel, for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.
 -) Ensure that seniority practices, job classifications, work assignments, and other personnel practices do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the Contractor's obligations under these specifications are being carried out.
 -) Ensure that all facilities and company activities are nonsegregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.
 -) Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.
 -) Conduct a review, at least annually, of all supervisor's adherence to and performance under the Contractor's EEO policies and affirmative action obligations.
8. Contractors are encouraged to participate in voluntary associations, which assist in fulfilling one or more of their affirmative action obligations (7a through 7p). The efforts of a contractor association, joint contractor-union, contractor-community, or other similar group of which the Contractor is a member and participant may be asserted as fulfilling any one or more of its obligations under 7a through 7p of these specifications provided that the Contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Contractor's minority and female workforce participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation to comply, however, is the Contractor's and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.
9. A single goal for minorities and a separate single goal for women have been established. The Contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the Contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example, even though the Contractor has achieved its goals for women generally, the Contractor may be in violation of the Executive Order if a specific minority group of women is underutilized).
10. The Contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex, sexual orientation, gender identity, or national origin.
11. The Contractor shall not enter into any subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.
12. The Contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination, and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.



13. The Contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 7 of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR part 60-4.8.
14. The Contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government, and to keep records. Records shall at least include for each employee, the name, address, telephone numbers, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.
15. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g. those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).



STATE PROVISIONS

SALES AND USE TAXES

GENERAL

Construction and building materials sold to the contractors and subcontractors for use on public works owned by the Sponsor, are exempt from State Sales and Use Taxes. However, such materials will be subject to any Sales and Use Taxes imposed by local cities and counties. This change in the State Tax Law has no effect of Sales and Use Taxes imposed by other local taxing authorities. Contractor shall provide proof of exemption prior to commencing work.

AUDITS

The Contractor acknowledges that it may be required to submit to an audit of funds paid through this Contract. Any such audit shall be conducted in accordance with IC §5-11-1, et seq., and audit guidelines specified by the State.

The State considers the Contractor to be a “vendor” for purposes of this Contract. However, if required by applicable provisions of the Office of Management and Budget Circular A-133 (Audits of States, Local Governments, and Non-Profit Organizations), following the expiration of this Contract the Contractor shall arrange for a financial and compliance audit of funds provided by the State pursuant to this Contract. Such audit is to be conducted by an independent public or certified public accountant (or as applicable, the Indiana State Board of Accounts), and performed in accordance with Indiana State Board of Accounts publication entitled “Uniform Compliance Guidelines for Examination of Entities Receiving Financial Assistance from Governmental Sources,” and applicable provisions of the Office of Management and Budget Circulars A-133 (Audits of States, Local Governments, and Non-Profit Organizations). The Contractor is responsible for ensuring that the audit and any management letters are completed and forwarded to the State in accordance with the terms of this Contract. Audits conducted pursuant to this paragraph must be submitted no later than nine (9) months following the close of the Contractor’s fiscal year. The Contractor agrees to provide the Indiana State Board of Accounts and the State an original of all financial and compliance audits. The audit shall be an audit of the actual entity, or distinct portion thereof that is the Contractor, and not of a parent, member, or subsidiary corporation of the Contractor, except to the extent such an expanded audit may be determined by the Indiana State Board of Accounts or the State to be in the best interests of the State. The audit shall include a statement from the Auditor that the Auditor has reviewed this Contract and that the Contractor is not out of compliance with the financial aspects of this Contract. The Contractor must maintain an acceptable cost accounting system. The Contractor agrees to provide the Sponsor, the Federal Aviation Administration, and the Comptroller General of the United States or any of their duly authorized representatives access to any books, documents, papers, and records of the contractor which are directly pertinent to the specific contract for the purpose of making audit, examination, excerpts and transcriptions. The Contractor agrees to maintain all books, records and reports required under this contract for a period of not less than three years after final payment is made and all pending matters are closed.

COMPLIANCE WITH LAWS

A. The Contractor shall comply with all applicable federal, state, and local laws, rules, regulations, and ordinances, and all provisions required thereby to be included herein are hereby incorporated by reference. The enactment or modification of any applicable state or federal statute or the promulgation of rules or regulations thereunder after execution of this Contract shall be reviewed by the State and the Contractor to determine whether the provisions of this Contract require formal modification.

B. The Contractor and its agents shall abide by all ethical requirements that apply to persons who have a business relationship with the State as set forth in IC §4-2-6, et seq., IC §4-2-7, et seq., the regulations promulgated thereunder, and Executive Order 04-08, dated April 27, 2004. If the Contractor is not familiar with these ethical requirements, the Contractor should refer any questions to the Indiana State Ethics Commission, or visit the Inspector General’s website at <http://www.in.gov/ig/>. If the Contractor or its agents violate any applicable ethical



standards, the State may, in its sole discretion, terminate this Contract immediately upon notice to the Contractor. In addition, the Contractor may be subject to penalties under IC §§4-2-6, 4-2-7, 35-44.1-1-4, and under any other applicable laws.

C. The Contractor certifies by entering into this Contract that neither it nor its principal(s) is presently in arrears in payment of taxes, permit fees or other statutory, regulatory or judicially required payments to the State of Indiana. The Contractor agrees that any payments currently due to the State of Indiana may be withheld from payments due to the Contractor. Additionally, further work or payments may be withheld, delayed, or denied and/or this Contract suspended until the Contractor is current in its payments and has submitted proof of such payment to the State.

D. The Contractor warrants that it has no current, pending or outstanding criminal, civil, or enforcement actions initiated by the State, and agrees that it will immediately notify the State of any such actions. During the term of such actions, the Contractor agrees that the State may delay, withhold, or deny work under any supplement, amendment, change order or other contractual device issued pursuant to this Contract.

E. If a valid dispute exists as to the Contractor's liability or guilt in any action initiated by the State or its agencies, and the State decides to delay, withhold, or deny work to the Contractor, the Contractor may request that it be allowed to continue, or receive work, without delay. The Contractor must submit, in writing, a request for review to the Indiana Department of Administration (IDOA) following the procedures for disputes outlined herein. A determination by IDOA shall be binding on the parties. Any payments that the State may delay, withhold, deny, or apply under this section shall not be subject to penalty or interest, except as permitted by IC §5-17-5.

F. The Contractor warrants that the Contractor and its subcontractors, if any, shall obtain and maintain all required permits, licenses, registrations, and approvals, and shall comply with all health, safety, and environmental statutes, rules, or regulations in the performance of work activities for the State. Failure to do so may be deemed a material breach of this Contract and grounds for immediate termination and denial of further work with the State.

G. The Contractor affirms that, if it is an entity described in IC Title 23, it is properly registered and owes no outstanding reports to the Indiana Secretary of State.

H. As required by IC §5-22-3-7:

- (1) The Contractor and any principals of the Contractor certify that:
 - (A) the Contractor, except for de minimis and nonsystematic violations, has not violated the terms of:
 - (i) IC §24-4.7 [Telephone Solicitation Of Consumers];
 - (ii) IC §24-5-12 [Telephone Solicitations]; or
 - (iii) IC §24-5-14 [Regulation of Automatic Dialing Machines];in the previous three hundred sixty-five (365) days, even if IC §24-4.7 is preempted by federal law; and
 - (B) the Contractor will not violate the terms of IC §24-4.7 for the duration of the Contract, even if IC §24-4.7 is preempted by federal law.
- (2) The Contractor and any principals of the Contractor certify that an affiliate or principal of the Contractor and any agent acting on behalf of the Contractor or on behalf of an affiliate or principal of the Contractor, except for de minimis and nonsystematic violations,
 - (A) has not violated the terms of IC §24-4.7 in the previous three hundred sixty-five (365) days, even if IC §24-4.7 is preempted by federal law; and
 - (B) will not violate the terms of IC §24-4.7 for the duration of the Contract, even if IC §24-4.7 is preempted by federal law.

I. As required by IC §5-22-16.5, the Contractor certifies that the Contractor is not engaged in investment activities in Iran. Providing false certification may result in the consequences listed in IC §5-22-16.5-14



including termination of this Contract, denial of future state contracts, as well as an imposition of a civil penalty.

SALES TAX EXEMPTION FORM

The scope of work as provided in the project contract documents, including all labor, materials, and equipment, is purchased directly by an Indiana state or local government entity and is exempt from Indiana sales tax per the attached State of Indiana Department of Revenue Information Bulletin #4 Sales Tax (dated June 2016). In addition, attached is a copy of the Indiana Department of Revenue General Sales Tax Exemption Certificate to be filed by the Contractor for work associated with the proposed project.

<https://www.in.gov/dor/tax-forms/sales-tax-forms/>
Form ST-105

Sale Tax Form, attached.

Indiana Department of Revenue
General Sales Tax Exemption Certificate

Indiana registered retail merchants and businesses located outside Indiana may use this certificate. The claimed exemption must be allowed by Indiana code. Exemption statutes of other states are not valid for purchases from Indiana vendors. **This exemption certificate can not be issued for the purchase of Utilities, Vehicles, Watercraft, or Aircraft.** Purchaser must be registered with the Department of Revenue or the appropriate taxing authority of the purchaser's state of residence.

Sales tax must be charged unless all information in each section is fully completed by the purchaser. Purchasers not able to provide all required information must pay the tax and may file a claim for refund (Form GA-110L) directly with the Department of Revenue.

Section 1 (print only)

Name of Purchaser Terre Haute Regional Airport

Business Address 581 S Airport St City Terre Haute State IN Zip 47803

Purchaser must provide minimum of one ID number below *

Provide your Indiana Registered Retail Merchant's Certificate
TID and LOC Number as shown on your Certificate..... 0022015690 - 014
TID# (10 digits) LOC# (3 digits)

If not registered with the Indiana DOR, provide your State Tax
ID Number from another State.....
*See instructions on the reverse side if you do not have either number. State ID# State of Issue

Section 2

Is this a ☒ blanket purchase exemption request or a ☐ single purchase exemption request? (check one)

Description of items to be purchased. _____

Section 3

Purchaser must indicate the type of exemption being claimed for this purchase. (check one or explain)

☐ Sales to a retailer, wholesaler, or manufacturer for **resale** only.

☐ Sale of manufacturing machinery, tools, and equipment to be used directly in direct **production**.

☐ Sales to **nonprofit organizations** claiming exemption pursuant to Sales Tax Information Bulletin #10.
(May not be used for personal hotel rooms and meals.)

☐ Sales of tangible personal property predominately used (greater than 50 percent) in providing **public transportation** - provide USDOT#.
A person or corporation who is hauling under someone else's motor carrier authority, or has a contract as a **school bus operator**, must provide their SS# or FID# in lieu of a State ID# in Section #1. USDOT# _____

☐ Sales to persons, occupationally engaged as farmers, to be used directly in production of **agricultural** products for sale.
Note: A farmer not possessing a State Business License# may enter a FID# or a SS# in lieu of a State ID# in Section #1.

☐ Sales to a **contractor** for exempt projects (such as public schools, government, or nonprofits).

☒ Sales to **Indiana Governmental Units** (agencies, cities, towns, municipalities, public schools, and state universities).

☐ Sales to the **United States Federal Government** - show agency name. _____
Note: A U.S. Government agency should enter its Federal Identification Number (FID#) in Section #1 in lieu of a State ID#.

☐ Other - explain. _____

Section 4

I hereby certify under the penalties of perjury that the property purchased by the use of this exemption certificate is to be used for an exempt purpose pursuant to the State Gross Retail Sales Tax Act, Indiana Code 6-2.5, and the item purchased is not a utility, vehicle, watercraft, or aircraft.

I confirm my understanding that misuse, (either *negligent* or *intentional*), and/or fraudulent use of this certificate may subject both me personally and/or the business entity I represent to the imposition of tax, interest, and civil and/or criminal penalties.

Signature of Purchaser Kelsey Deatch Date 10/1/2024

Printed Name Kelsey Deatch Title Finance Manager

The Indiana Department of Revenue may request verification of registration in another state if you are an out-of-state purchaser.

Seller must keep this certificate on file to support exempt sales.



LOCAL PROVISIONS

CONTRACTOR PAYMENTS PROCESS AND TIMELINE

The Contractor invoices shall be due to the RPR no later than ten working days prior to the scheduled Airport Board Meeting, but in no case any later than the last day of the month, unless otherwise approved in writing. This will allow time for the RPR to process the invoice, review the accuracy of the statement along with its supporting documentation, and present the invoice within the sponsors meeting/processing schedule.

Should the invoice not be remitted for payment to the Sponsor by the next month due to error on the part of the RPR, the RPR shall immediately correct the issue with the Sponsor and submit payment to the Subcontractor within 30 days of the error being identified.

RPR will advise the Contractor as to the Sponsor's schedule and policies. If there are significant changes or delays to the Owner's meetings, payment requirements, or schedule that would not allow the Contractors payment to be released to the Sponsor, RPR will advise the Contractor of such conditions. Neither the Sponsor nor their representatives or agents shall be responsible for changes to the Owners meeting, payment processing requirements, or schedule that would delay the Contractors payment.

Contractor shall electronically submit invoices (with a monthly progress report, supporting quantities, and updated construction schedule, as required by these specifications) via email strictly in accordance with this Agreement. Invoices shall be emailed to Payrolls@Woolpert.com, with copy to the Woolpert Project Manager and others as identified at the preconstruction meeting requesting payment for services accomplished during the stated work period. Failure to send to both Payrolls@Woolpert.com and the Project Manager may result in delay of payment.

Invoices shall be submitted on the Pay Request form included in these specifications or on an AIA invoice format with an attachment showing DBE utilization and reporting. Contractor shall submit all certified payrolls and schedule update as part of the pay application for the pay application to be considered complete and eligible for review.

Any work performed on any pay item in excess of the original contract amount for that pay item is at the risk of the Contractor unless otherwise agreed to in writing with Sponsor.

Once the contract reaches 90% of the ORIGINAL amount, regardless of approved change orders or other authorized work, the Contractor shall hold all costs in excess of 90% of the original contract as retainage in a final invoice, even if the retainage results in being greater than 10%. Once all work, including punch list and administrative documentation/reporting is completed, the Contractor can invoice for the remaining 10% of the Original contract amount. Should costs exceed the Original contract, a second invoice shall be prepared for the balance of the work.

In cases where multiple contractors or contracts are on the same grant, the processing of the retainage and/or extra work for one contractor may be delayed due to work by others continuing at a different schedule. Full or Partial payment for retainage for contractors is not guaranteed to be processed until all work by all contractors is completed.

In some cases, the FAA will allow and process partial payments of the retainage amount, if supported by just cause and adequate documentation. Should a partial retainage payment be approved, the Sponsor, or their authorized representative, shall coordinate with the Contractor for the preparation and submission of a partial retainage payment. Contractor acknowledges that partial retainage payments are performed manually by the FAA and payments are often significantly delayed by the manual process.



Grant Amendments to cover costs in excess of the Original contract can take a significant amount of time and documentation to process. In many cases, the funds needed for an Amendment are not available until the following Federal Fiscal Year. Depending on the time of year when the Amendment request, based on overall project costs, is presented to the FAA, it can take a calendar year or more to identify and program funds for the Amendment.

Contractor acknowledges that Sponsor acceptance of the deliverables and receipt of federal/state funds is a condition of payment to the Contractor. Finance charges or other damages due to delays in partial retainage payments or payment for costs in excess of the Original contract are not eligible for payment by the FAA, State, or Sponsor. The possibility of delay and the Grant Amendment process is documented in these Specifications and by execution of the Contract, is understood to be a condition of the Agreement.

INSURANCE

The Contractor and their subcontractors (if any) shall secure and keep in force during the term of this Contract the following insurance coverages (if applicable) covering the Contractor for any and all claims of any nature which may in any manner arise out of or result from Contractor's performance under this Contract.

The Contractor shall provide proof of such insurance coverage by tendering a certificate of insurance prior to the commencement of this Contract and proof of workers' compensation coverage meeting all statutory requirements of IC § 22-3-2. In addition, proof of an "all states endorsement" covering claims occurring outside the State is required if any of the services provided under this Contract involve work outside of Indiana.

The Sponsor and Engineer (Woolpert, Inc.) are to be named as an additional insured on a primary, non-contributory basis for any liability arising directly or indirectly under or in connection with this Contract.

COMMERCIAL GENERAL:

Contractor shall maintain commercial general liability insurance (CGL) and, if necessary, commercial umbrella insurance, with a limit of not less than \$1,000,000 per occurrence and \$2,000,000 aggregate. If such GCL insurance contains a general aggregate limit, it shall apply separately to the project.

CGL Insurance shall be written on ISO occurrence form CG 20 10 (11-85) (or a substitute combination of forms CG 20 10 (10-01) and CG 20 37 (10-01) providing equivalent coverage) and shall cover liability arising from premises, operations, independent contractors, products-completed operations, personal injury and advertising injury, and liability assumed under an insured contract

There shall be no endorsement or modification of the CGL limiting the scope of coverage for liability arising from pollution, explosion, collapse, underground property damage, or amending the contractual coverage in the ISO occurrence form.

CONTINUING CGL COVERAGE:

Contractor shall maintain commercial general liability (CGL) and, if necessary, commercial umbrella insurance, with a limit of not less than \$1,000,000 per occurrence and \$2,000,000 aggregate for at least three (3) years following substantial completion of the work.

Continuing commercial umbrella coverage, if any, shall include liability coverage for damage to the insured's completed work equivalent to that provided under ISO form CG 00 01.

COMMERCIAL AUTO:

Contractor shall maintain business auto liability and, if necessary, commercial umbrella liability insurance with a limit of not less than \$2,000,000 combined single limit for BI and PD. Such insurance shall cover liability arising out of any auto, including owned, hired, and non-owned automobiles.



The Sponsor and Engineer (Woolpert, Inc.) is to be named as an additional insured on a primary, non-contributory basis.

Commercial auto coverage shall be written on ISO form CA 00 01, CA 00 05, CA 00 12, or a substitute form providing equivalent liability coverage. If necessary, the policy shall be endorsed to provide contractual liability coverage equivalent to that provided in the 1990 and later editions of CA 00 01.

If the Contract Documents require Contractor to remove and haul hazardous waste from the Project, or if the Project involves such similar environmental exposure, pollution liability coverage equivalent to that provided under ISO Pollution Liability-Broadened Coverage for Covered Autos Endorsement (CA 99 43) shall be provided, and the Motor Carrier Act Endorsement (MCS 90) shall be attached.

UMBRELLA LIABILITY INSURANCE:

Contractor shall maintain commercial umbrella liability insurance with a limit of not less than \$2,000,000 combined single limit naming the Sponsor as additionally insured.

BUILDERS RISK INSURANCE:

The contractor shall provide property insurance for the building work under construction, a.k.a. Builders Risk Insurance, for the duration of the contract. This shall equal an amount sufficient to cover the replacement cost of the property during the course of construction at the estimated value of the total project. This policy shall remain in place until the date indicated for the owner's occupancy on the certificate of substantial completion.

WORKERS' COMPENSATION INSURANCE:

All Indiana employers must provide Workers Compensation coverage to all employees subject to Indiana Code 22-3-2-2. IC 22-3-2-2 Mandatory compliance; burden of proof; exemptions Sec. 2. (a) Every employer and every employee, except as stated in IC 22-3-2 through IC 22-3-6, shall comply with the provisions of IC 22-3-2 through IC 22-3-6 respectively to pay and accept compensation for personal injury or death by accident arising out of and in the course of the employment, and shall be bound thereby.

Contractor shall maintain workers' compensation and employer's liability insurance. The employer's liability and, if necessary commercial umbrella, limits shall not be less than \$1,000,000 each accident for bodily injury by accident or \$1,000,000 each employee for bodily injury by disease.

If Contractor leases its employees, the alternate employer endorsement (WC 00 03 01 A) shall be attached showing the Contractor in the schedule as the alternate employer.

Where applicable, Outer Continental Shelf Lands Act Endorsement, Maritime Coverage Endorsement, and/or US Longshore and Harborworkers Compensation Act Endorsement shall be attached to the policy.

Where applicable, Non-appropriated Fund Instrumentalities Act (NFIA) shall be attached to the policy. NFIA extends the coverage of the Longshore and Harbor Workers' Compensation Act to civilian employees working on United States Military Bases throughout the world who are not paid with funds appropriated by Congress. These employees, working in facilities operated for the comfort, contentment, and improvement of armed forces personnel, are instead compensated with funds generated from earnings of their facility.

If project is located in a state where workers compensation is secured via monopolistic state funds, include evidence of the "Stop Gap" endorsement to the general liability policy.

PROFESSIONAL LIABILITY INSURANCE:

Contractor, and/or their subcontractor(s), if providing professional services such as surveying, engineering, materials testing, geotechnical investigations, or other professional service shall carry a minimum level of professional liability coverage not less than \$2,000,000 per occurrence. Coverage for the benefit of the Sponsor and Engineer (Woolpert, Inc.) shall continue for a period of two (2) years after the date of service provided under this Contract.

**PROPERTY AND INLAND MARINE INSURANCE:**

Contractor shall purchase and maintain property and inland marine insurance for the Work sufficient to cover equipment on site, stored on site, stored at an off-site location, and/or during transit. Such insurance shall be written in an amount at least equal to the replacement value of the equipment and structures to be installed or modified as part of the contract. If the insurance obtained in compliance with this paragraph is builders risk insurance, coverage shall be written on a completed value form. The property insurance as required shall name as insureds the Sponsor, Contractor, and all subcontractors on the Project.

PRIMARY AND NON-CONTRIBUTORY:

The Contractor agrees that the insurance listed above, including insurance provided under the commercial umbrella, if any, shall apply as primary and non-contributory insurance with respect to any other insurance or self-insurance programs afforded to, or maintained by, the Sponsor.

WAIVER OF SUBROGATION:

The Contractor waives all rights against the Sponsor and Engineer and their representatives, agents, officers, directors, and employees for recovery of damages to the extent these damages are covered by the commercial general liability, commercial umbrella liability, automobile liability, and workers compensation insurances maintained pursuant to this agreement.

NO IMPLIED WAIVER:

Contractor shall furnish certifications matching the coverage requirements. Failure of Sponsor or Engineer to demand such certificate or other evidence of full compliance with these insurance requirements or failure of the Sponsor or Engineer to identify a deficiency from evidence that is provided shall not be construed as a waiver of the contractor's obligations to furnish and maintain such insurance, or as a waiver to the enforcement of any of the provisions at a later date. Any waiver of the contractor's obligation to furnish such certificate or maintain such evidence must be by written change order.

CANCELLATION, NON-RENEWAL, AND/OR IMPAIRMENT NOTIFICATION:

The Contractor shall not cause any insurance policy to be cancelled or permit it to lapse and all insurance policies shall include an endorsement to the effect that the insurance policy or certificate shall not be subject to cancellation or to a reduction in the required limits of liability or amounts of insurance until notice has been mailed to the Sponsor and Engineer, stating the date when such cancellation or reduction shall be effective, which shall not be less than sixty (60) days after such notice.

Contractor's insurance shall not be paid for separately but shall be considered subsidiary to Mobilization.

INDEMNIFICATION

The Contractor agrees to indemnify and save harmless Terre Haute Airport Authority/City of Terre Haute, its officers, agents, and employees, against any and all damages to property or injuries to or death of any person or persons, including property and employees or agents of Terre Haute Airport Authority/City of Terre Haute, and further agrees to defend, indemnify and save harmless, Terre Haute Airport Authority/City of Terre Haute, its officers, agents, and employees from any claims, demands, suits, actions, proceedings of any kind or nature resulting from or arising out of operations in connection herewith, including operations of subcontractors and acts of omissions of employees or agents of the Contractor or his subcontractors.

PERMITS AND COMPLIANCE WITH LAWS

The Contractor shall procure and pay for all permits, licenses, and bonds necessary for the prosecution of his work, and/or required by Local, State, and Federal regulations and laws, as pertains particularly to permits and transportation of materials and equipment, or other operations which are not a specific requirement of these



specifications. The Contractor shall give all notices, pay all fees and taxes, and comply with all Federal, State, and Local laws, ordinances, rules, and regulations, and building and construction codes bearing on the conduct of the work.

LIQUIDATED DAMAGES

Subject to the provisions of the Contract Documents, the Sponsor shall be entitled to liquidated damages as anticipated damages to the Sponsor for failure of the Contractor to complete the work within the specified contract time. Liquidated damages are to serve as compensation for the Sponsor's non-use and incurred costs related to work extending beyond the contract time. The Contractor shall be assessed a liquidated damage for each day that the work remains uncompleted beyond the contract period. Further, each phase of work under the project may have different liquidated damage amounts, as outlined in General Provisions Section 80-08 FAILURE TO COMPLETE ON TIME.

As part of liquidated damages, the Contractor further agrees to pay the Sponsor for the costs associated for the construction manager/Engineer in connection with the failure of the Contractor to complete the work within the specified contract time plus any incurred expenses (per diem, lodging, etc.). The Contractor also agrees to pay for any services of the Engineer and its subcontractors arising from the failure of the Contractor to furnish materials or equipment in conformance with the Contract Documents necessitating redesign, retesting, or additional review time by the Engineer and their subcontractors or the failure of the Contractor to complete the work within the specified contract time. Such services shall be paid at the standard hourly rates of Engineer and its Subcontractors.

AIRPORT IMPROVEMENT PROGRAM

The work in this contract is included in Airport Improvement Program (AIP) Project Number 3-18-0082-057-2024 which is being undertaken and accomplished by the Sponsor in accordance with the terms and conditions of a grant agreement between the Sponsor and the United States, under the Airport Improvement Act per Chapter 471 of Title 49 of the United States Code (U.S.C.), as amended by the airport, and the Airway Safety and Capacity Expansion Act of 1987, pursuant to which the United States has agreed to pay a certain percentage of the associated project costs that are determined to be allowable under said Act. The Contractor shall note that the United States is not a party to this contract and no reference in this contract to the FAA or any representative thereof, or to any rights granted to the FAA or any representative thereof, or the United States, by the contract, make the United States a party to this contract.

DBE ADMINISTRATION

1. Eligibility of DBE's:

Those firms currently certified as DBE's by the State Department of Transportation are eligible to participate as DBE's on this contract. A list of these firms can be obtained from the State, the consulting engineer, or the Sponsor. Previous acceptance of a DBE by the FAA, State or Sponsor does not ensure acceptance on this project.

2. Counting DBE Participation Towards DBE Goals:

DBE participation toward attainment of the goal will be computed based on the subcontract prices agreed to between the contractor and subcontractors for the contract items or portions of items being sublet, as shown on the DBE Participation Form and attachments. Credit will only be given for use of DBE's that are



certified or accepted according to this specification. DBE participation shall be counted toward meeting the DBE goal in accordance with the following:

. **Commercially Useful Function:**

The Sponsor shall count toward the DBE goal only those expenditures to DBE's that perform a commercially useful function in the work of the contract. A DBE performs a commercially useful function when it is responsible for execution of a distinct element of work by performing, managing, and supervising that work. To determine if a DBE is performing a commercially useful function, the amount of work subcontracted, industry practices, and other relevant factors will be evaluated. If consistent with industry practices, a DBE shall enter into a subcontract or other contractual written agreement. A DBE Contractor may subcontract a portion of the work up to the amount allowed under standard subcontracting contract provisions of normal industry practices. A DBE is presumed not to be performing a commercially useful function if the DBE is performing outside these guidelines.

. **Materials and Supplies:**

The Sponsor shall count toward the DBE goal the expenditures for materials and supplies obtained from DBE suppliers and manufacturers as described below. The DBE's must assume the actual and contractual responsibility for the provision of the materials and supplies:

- (i) The entire expenditure to a DBE manufacturer will be counted toward the DBE goal. A manufacturer must operate or maintain a factory or establishment that produces on the premises the materials or supplies that are obtained by the contractor.
- (i) Sixty percent of expenditures to a DBE regular dealer will be counted toward the DBE goal. A regular dealer must perform a commercially useful function in the supply process including buying the materials or supplies, maintaining an inventory, and regularly selling materials to the public. Bulk items such as steel, cement, gravel, stone, and petroleum products need not be kept in stock, but the dealer must own or operate distribution equipment.
- (i) No credit will be given toward the DBE goal, if the prime contractor makes a direct payment to a non-DBE material supplier. However, it will be permissible for a material supplier to invoice the prime contractor and the DBE jointly and be paid by the prime contractor making remittance to the DBE firm and material supplier jointly.
- (i) No credit, toward the DBE goal, will be given for the cost of materials or equipment used in a DBE firm's work when those costs are paid by a deduction from the prime contractor's payment(s) to the DBE firm.

Sponsor-Operator Trucking:

The Sponsor shall count toward the DBE goal, the entire delivery fee paid to DBE Sponsor-operators performing trucking for the contractor, if they appear on the contractor's payroll and separate records are furnished to the Sponsor documenting the expenditures. The records shall include for each Sponsor-operator; their social security number; driver's license number; vehicle registration number; current vehicle license number; truck number; and a complete record of the contract fees paid to them.

. **Joint Venture:**



When a joint venture contract is involved, the Sponsor shall count towards the DBE goal that portion of the contract total dollar value equal to the percentage of ownership and control of each DBE firm within the joint venture. Such crediting is subject to the sponsor's acceptance of the joint venture agreement. The Bidder must furnish the joint venture agreement with the DBE Participation Form. The joint venture agreement must include a detailed breakdown of the following:

- () Contract responsibility of the DBE for specific contract items of work,
- () Capital participation by the DBE,
- () Specific equipment to be provided by the DBE,
- () Specific responsibilities of the DBE regarding control of the joint venture,
- () Specific workers and skills to be provided by the DBE, and
- () Percentage distribution to the DBE of the projected profit or loss incurred by the joint venture.

The joint venture must be certified by the sponsor prior to the sponsor submitting the proposal to the FAA. A copy of the sponsor's certification letter must be submitted to FAA along with the DBE Participation Form.

DBE AWARD DOCUMENTATION AND PROCEDURE

All bidders shall certify in the bid proposal their intent to meet or exceed the established goal or to demonstrate good faith efforts to meet the goal. Failure to make such certification or failure to demonstrate good faith efforts will render a bid non-responsive.

1. DBE Participation Form:

The apparent successful bidder must submit with the bid the following information on the proposed DBE Participation Form attached to the Proposal. The information shall demonstrate the contractor's intended participation by certified DBE's. When the required information is not provided by the apparent low bidder the bid will be ruled non-responsive and will not be considered. The information furnished shall consist of:

- . The names, addresses, contact persons, phone numbers, and category of DBE firms to be used on the contract;
- . A list of the bid items of work to be performed by the DBE and the percent to be credited toward the DBE goal;
- . The dollar value of each of the DBE work items; and
- . If the DBE goal is not met, a statement of why the goal and a demonstration of the good faith efforts taken to meet the DBE goal.

2. Sponsor Evaluation:

In selecting the lowest responsible bidder, the Sponsor will evaluate the DBE information provided with the bid. The Sponsor may request additional DBE information and may allow the bidders, up to 7 calendar days after bid submittal to supplement or resubmit information concerning their proposed DBE participation. Prior to awarding the contract the Sponsor will verify verbally and/or in writing that the information submitted by the apparent successful bidder is accurate and complete.



3. Good Faith Efforts:

If the bidder is unable to meet the DBE goal, the bidder must submit evidence of good faith efforts taken to meet the goal. Good faith efforts conducted after the bid opening will not be considered adequate to fulfill these bid requirements. Good faith efforts may include but are not limited to:

- . Efforts to select portions of the work for performance by DBE's, to increase the likelihood of achieving the DBE goal. This can include, but is not limited to, breaking down contracts into economically feasible units to facilitate DBE participation. Selection of portions of work shall be at least equal to the DBE goal.
- . Written notification to individual DBE's likely to participate in the contract sent at least 7 calendar days prior to the bid opening. The notification shall list specific items or types of work and shall be sent to a reasonable number of DBE's qualified to participate in the contract.
- . Efforts to negotiate with DBE's for specific items of work including:
 - () Names, addresses, and telephone numbers of DBE's who were contacted, the dates of initial contact and information on further contacts made to determine with certainty if the DBE's were interested. Personal or phone contacts are expected;
 - () Description of the information provided to the DBE's regarding the plans, specifications and estimated quantities for portions of the work to be performed;
 - () Individual statements as to why agreements with DBE's were not reached; and
 - () Information on each DBE contacted but rejected and the reasons for the rejection.
- . Efforts to assist the DBE's that need assistance in obtaining bonding, insurance, or lines of credit required by the contractor.
- . Documentation that qualified DBE's are not available or not interested.
- . Advertisements in general circulation media, trade association publications and disadvantaged-focus media concerning subcontracting opportunities.
- . Efforts to use the services of available disadvantaged community organizations; disadvantaged contractor's groups; local, state, and federal disadvantaged business assistance offices; and other organizations that provide assistance in recruitment and placement of DBE's.

The demonstration of good faith efforts by the contractor must prove the contractor actively and aggressively sought out DBE's to participate in the project. The following actions would not be considered acceptable reasons for failure to meet the DBE goal and would not constitute a good faith effort:

- a. The DBE was unable to provide adequate performance and/or payment bonds.
- b. A reasonable DBE bid was rejected based on price.
- c. The DBE would not agree to perform the subcontract work at the prime contractors unit bid price.



- d. Union versus non-union status of the DBE firm.
- e. The prime contractor would normally perform all work included in this contract.
- f. The prime contractor solicited DBE participation by mail only.

4. Post Award Compliance:

If the contract is awarded on less than full DBE goal participation, the contractor is not relieved of the responsibility to make a determined effort to meet the full goal amount during the life of the contract. In such a case, the contractor shall continue good faith efforts throughout the life of the contract to increase the DBE participation to meet the contract goal.

If a DBE is unwilling or unable to perform the work specified, the contractor shall request from the Sponsor and FAA, relief from the obligation to use that DBE. Efforts will be made by the contractor to acquire from the DBE a letter which states the reason the DBE is unwilling or unable to complete its obligations under the project. If this results in a DBE contract shortfall, the contractor shall immediately take steps to obtain another certified DBE to perform an equal dollar value of allowable credit. If a new DBE cannot be found, the contractor shall submit evidence of good faith efforts within 15 calendar days of the request for relief. The contractor shall submit the new DBE's name, address, work items and the dollar amount of each item. The sponsor and the FAA shall approve the new DBE before the DBE starts work.

If the contractor fails to conform to the approved DBE participation or if it becomes evident that the remaining work will not meet the approved participation, then the contractor shall submit evidence showing either how the contractor intends to meet the DBE participation, or what circumstances have changed affecting the DBE participation. If the sponsor is not satisfied with the evidence, then liquidated damages may be assessed for the difference between the approved and actual DBE participation.

5. Records and Reports:

The contractor shall keep records as necessary to determine compliance with the DBE obligations. The records shall include but are not limited to:

- . Record of DBE Participation: The names of disadvantaged and non-disadvantaged subcontractors, regular dealers, manufacturers, consultant and service agencies; the type of work or materials or services performed on or incorporated in the project; and the actual value of such work.
- . Efforts to Utilize DBE Firms: Documentation of all efforts made to seek out disadvantaged contractor organizations and individual disadvantaged contractors for work on this project. All correspondence, personal contacts, telephone calls, etc., to obtain the services of DBE's should be documented.
- . Final DBE Certification: Upon completion of the individual DBE firm's work, the prime contractor shall submit a certification attesting to the actual work performed by the DBE firm and the amount paid the DBE firm. This certification shall be signed by both the prime contractor and the DBE firm.

QUALIFICATION OF DISADVANTAGED BUSINESS ENTERPRISES:

A Contractor, or subcontractor, will be considered as certified if that company has received a letter of certification from an organization, whose procedures for certifying business, is acceptable to the FAA.



A Contractor is permitted to use 100% of the Contract amount for the unit of work if the Contractor, or subcontractor, performs the construction, installation, rehabilitation, etc. of that work item(s).

A Contractor is permitted to use only 60% of the Contract amount for the purchase of material from a certified DBE supplier.

The Contractor is required to submit, to the Engineer, the names, work terms and contract value of all subcontractors, prior to commencing work. The Contractor is required to submit the names, work items and final contract amounts of all subcontractors after the substantial completion of the project.

FAA INSPECTION

The Contractor shall allow any authorized representative of the FAA to inspect and review any work or materials used in the performance of this contract.

FAA FACILITIES

The Contractor shall permit FAA personnel the right to enter the work site during the term of the contract for maintenance of existing navigation and communication facilities.

In the event that the proposed AIP work will impact existing FAA navigation and communication facilities, the Engineer will notify FAA one week in advance of construction activity in order to allow the FAA sufficient time to locate and mark existing field cables and to avoid an unscheduled facility outage. The Engineer shall coordinate with FAA concerning all operation and shutdown of all FAA navigational facilities during this construction project.

Any FAA equipment/cable that is damaged by the contractor shall be repaired as approved by FAA personnel. If FAA cables are anticipated to facilitate construction, the Contractor shall provide advance notice to FAA in order to mobilize an FAA technician to the site for observation of the splicing. Splicing and cable repair shall meet the FAA specifications and shall be accomplished to the satisfaction of FAA. All such work shall be performed by qualified workmen regularly engaged in cable repair & splicing. In the event the existing cable cannot be repaired to the satisfaction of FAA personnel, new cable of like kind shall be procured and installed by the Contractor.

ACCIDENT PREVENTION

Precautions shall be exercised at all times for the protection of persons (including employees) and property, and that the safety provisions of applicable laws and of applicable building construction codes shall be observed, and that machinery, equipment, and explosives shall be guarded and all hazards shall be eliminated in accordance with the safety provisions of the Manual of Accident Prevention in Construction, published by the Associated General Contractors of America, to the extent that such provisions are not in contravention of applicable law.

CONSTRUCTION MANAGEMENT PLAN

The Contractor and testing firm are required to prepare a Quality Control Program as required under SECTION C100, CONTRACTOR QUALITY CONTROL PROGRAM, of the Technical Specifications. The Contractor shall obtain from the testing laboratory a proposed schedule of material testing submitted on forms provided by the Engineer, an example of which, is included following this specification. The requirements for the quality control program specified under Section 100 shall formulate a portion of the CONSTRUCTION MANAGEMENT PLAN (CMP) required under this item.

The Engineer will assemble and submit the CMP. The Contractor must complete sections of the CMP as indicated on the following pages. All sections indicated to be completed by the Contractor must be titled as shown. Other sections will be completed by the Engineer as indicated. The plan will be submitted to the Sponsor and FAA for approval a minimum of 10 days prior to construction. Approval of the CMP must be obtained prior to commencing any paving



operations. Changes in the Contractor's personnel, sub-contractor's personnel, testing laboratory's personnel or testing procedures will require revision to the plan. The Contractor is required to submit any changes immediately to the Engineer.

The following outline shall be utilized as a guide for preparation of the CMP. Modifications may be incorporated as approved by the Engineer.

1. Introduction/Summary (by Engineer)
2. Personnel
 - . Name of Sponsor representatives who have responsibility and authority for contract administration. (by Engineer)
 - . Consulting Engineer and staff showing qualifications, experience, and project responsibilities. (by Engineer)
 - . Contractor project personnel and responsibilities. (by Contractor)
 - . Quality Control Testing Laboratory project personnel and responsibilities. (by Contractor)
 - . Acceptance Testing Laboratory project personnel and responsibilities (by Certified Testing Firm)
3. Inspection Procedures and Frequencies (by Contractor, refer to Section 100)
4. Submittal Process (by Contractor, refer to Section 100)
5. Quality Control Testing (by Contractor, refer to Section 100)
6. Acceptance Testing (by Certified Testing Firm)
7. Test Results
 - . Quality Control Testing (by Contractor, refer to Section 100)
 - . Acceptance Testing (by Certified Testing Laboratory)
8. Final Test and Quality Control Report (by Contractor)

At the end of the project and prior to final inspection and reduction of contract retainage, the prime contractor shall prepare and submit to the engineer for review and for FAA concurrence a final project summary report. Two bound copies and one loose leaf copy shall be submitted. The report shall include a summary of all tests taken with results, plus a narrative explaining the action taken for all failing tests within the context of the specifications. The Contractor shall correlate required tests shown in the specifications to those accomplished. Copies of all Certificates of Compliance for each material installed shall be included in the section pertaining to that material. Examples of typical Certificates of Compliance are for bituminous material, cement, fly ash, antistripping agent, pavement paint, etc. This summary shall contain all referenced material tests required by the Quality Control Program outlined in Section 100 of these specifications. In addition, it shall summarize all acceptance testing results.

The report shall be bound in booklet form with divisions for each bid item, i.e., excavation, base courses, pavement materials, electrical items, drainage items and any other materials. Each section shall be clearly marked with a divider including the section name and section table of contents. The report must contain a summary of all tests by lot or pay item, highlighted to indicate failed tests and/or reduced pay results, and reference to any approved change



order that accepted any out of tolerance material. The individual sections shall begin with a narrative discussing any failed tests followed by a summary of the testing required and accomplished during the progress of the work. Within each section, the Contractor shall summarize individual test results in the format indicated on the following test summary forms provided by the Engineer. The forms are available in Microsoft Word format upon request. Additional or updated forms may be substituted by the Engineer prior to construction.

Any airfield lighting, electrical fixtures or other equipment used in the project shall have instruction books or factory installation sheets showing exploded views of the assembled parts with trouble shooting tips clearly shown. This information is of the type normally supplied by the manufacturer but must be in a presentable form. Single line wiring diagrams and circuit directories shall also be included in the summary with any recommended maintenance procedures suggested by the supplier or manufacturer. Contractor is responsible for providing information before Notice to Proceed.



PART 6: WAGE RATES



DAVIS BACON (OR STATE) WAGE RATES

"General Decision Number: IN20240003 10/04/2024

Superseded General Decision Number: IN20230003

State: Indiana

Construction Type: Building

Counties: Clay, Gibson, Greene, Owen, Parke, Posey, Putnam, Sullivan, Vanderburgh, Vermillion, Vigo and Warrick Counties in Indiana.

BUILDING CONSTRUCTION PROJECTS (does not include residential construction consisting of single family homes and apartments up to and including 4 stories)

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658.

Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(1).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	<ul style="list-style-type: none">. Executive Order 14026 generally applies to the contract.. The contractor must pay all covered workers at least \$17.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2024.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	<ul style="list-style-type: none">. Executive Order 13658 generally applies to the contract.. The contractor must pay all covered workers at least \$12.90 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2024.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at

Terre Haute Regional Airport - HUF | West Quad 6 Unit Box Hangar Phase 2

AIP No. 3-18-0082-057-2024

Issued For Bid | 10/18/2024



<http://www.dol.gov/whd/govcontracts>.

Modification Number	Publication Date
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0	01/05/2024
1	02/02/2024
2	03/01/2024
3	04/05/2024
4	04/19/2024
5	05/17/2024
6	05/31/2024
7	06/07/2024
8	07/05/2024
9	07/12/2024
10	07/19/2024
11	07/26/2024
12	08/09/2024
13	08/16/2024
14	08/30/2024
15	09/06/2024
16	09/13/2024
17	09/20/2024
18	09/27/2024
19	10/04/2024

ASBE0018-003 06/01/2024

CLAY, GREENE, OWEN, PARKE, PUTNAM, VERMILLION AND VIGO COUNTIES

Rates

Fringes

ASBESTOS WORKER/HEAT & FROST

INSULATOR (includes

application of all insulating

materials protective

coverings, coatings and

finishes to all types of

mechanical systems).....\$ 38.55

23.53

HAZARDOUS MATERIAL HANDLER

(includes preparation,

wettings stripping, removal,

scrapping, vacuuming, bagging

& disposing of all insulation

materials, whether they

contain asbestos or not, from

mechanical systems).....\$ 23.00

14.40

ASBE0037-002 04/02/2023

GIBSON, POSEY, SULLIVAN, VANDERBURGH AND WARRICK COUNTIES

Rates

Fringes

ASBESTOS WORKER/HEAT & FROST

INSULATOR (includes

application of all insulating

materials protective

coverings, coatings an

finishes to all types of

mechanical systems. Also

the application of

firestopping material

openings and penetrations in

walls, floors, ceilings,

curtain walls and all lead



abatement).....	\$ 32.00	21.84
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BOIL0374-002 01/01/2024

	Rates	Fringes
BOILERMAKER.....	\$ 42.41	35.72

BRIN0001-001 06/01/2023

EVANSVILLE

POSEY, VANDERBURGH and WARRICK COUNTIES

	Rates	Fringes
Bricklayer, Stonemason.....	\$ 34.17	20.14
Marble, Tile & Terrazzo		
Finisher.....	\$ 22.09	16.34
Marble, Tile & Terrazzo		
Workers.....	\$ 28.49	16.46

BRIN0004-012 06/01/2024

BLOOMINGTON

OWEN COUNTY

	Rates	Fringes
Bricklayer, Stonemason.....	\$ 35.21	18.19
TERRAZZO FINISHER.....	\$ 25.33	14.19
TERRAZZO WORKER/SETTER.....	\$ 37.97	18.06
Tile & Marble Finisher.....	\$ 25.33	14.19
Tile, Marble Setter.....	\$ 37.22	18.05

BRIN0005-001 09/21/2023

TERRE HAUTE CLAY, GIBSON, REENE, PARKE, SULLIVAN, VERMILLION
and VIGO COUNTIES

	Rates	Fringes
BRICKLAYER		
BRICKLAYER, STONE MASON and POINTER/CLEANER/CAULKER.	\$ 30.13	11.65
CEMENT MASON (GREENE and SULLIVAN COUNTIES).....	\$ 27.78	11.02
CEMENT MASON (REMAINING COUNTIES).....	\$ 27.93	11.02
TERRAZZO FINISHER.....	\$ 23.38	1315
TERRAZZO.....	\$ 27.50	15.20
TILE and MARBLE FINISHER....	\$ 19.83	6.32
TILE, MARBLE, MOSAIC.....	\$ 35.63	17.23

CARP0088-001 06/01/2024

CLAY, OWEN, PARKE, PUTNAM, VERMILLION AND VIGO COUNTIES

	Rates	Fringes
Carpenters:		
Carpenters, Drywall		
Installers, Piledrivers.....	\$ 35.55	23.80
Millwright.....	\$ 36.94	25.42
Soft Floor Layers.....	\$ 33.47	20.07

CARP0224-004 04/01/2024

POSEY, VANDERBURGH AND WARRICK COUNTIES

	Rates	Fringes
CARPENTER		
Carpenter.....	\$ 31.49	25.46



Piledriver.....	\$ 32.49	25.36

CARP0224-005 04/01/2024		
GREENE, GIBSON and SULLIVAN COUNTIES		
	Rates	Fringes
CARPENTER		
Carpenter.....	\$ 31.48	25.46
Piledriver.....	\$ 28.71	22.45

CARP1080-002 04/01/2024		
	Rates	Fringes
MILLWRIGHT		
ZONE 1		
POSEY, VANDERBURGH and		
WARRICK COUNTIES.....	\$ 34.40	27.61
ZONE 2		
GIBSON, GREENE AND		
SULLIVAN COUNTIES.....	\$ 33.10	28.57

ELEC0016-004 04/01/2024		
GIBSON, POSEY, VANDERBURGH AND WARRICK COUNTIES		
	Rates	Fringes
ELECTRICIAN.....	\$ 43.51	20.92

ELEC0481-001 05/31/2024		
PUTNAM COUNTY		
	Rates	Fringes
ELECTRICIAN.....	\$ 42.15	26.88

ELEC0538-002 06/01/2023		
VERMILLION COUNTY		
	Rates	Fringes
ELECTRICIAN.....	\$ 39.09	24.37

ELEC0725-003 10/01/2022		
CLAY, GREENE, OWEN, PARKE, SULLIVAN AND VIGO COUNTIES		
	Rates	Fringes
ELECTRICIAN.....	\$ 40.00	21.96

ELEC0725-010 06/01/2022		
CLAY, GREENE, OWEN, PARKE, SULLIVAN AND VIGO COUNTIES		
	Rates	Fringes
Communication Technician.....	\$ 30.00	18.07
Includes the installation, operation, inspection,		
maintenance, repair and service of radio, television,		
recording, voice sound and vision production and		
reproduction apparatus, equipment and appliances used for		
domestic, commercial, education, entertainment and private		
telephone systems.		

ELEV0003-002 01/01/2023		
GIBSON, POSEY, VANDERBURGH and WARRICK COUNTIES		
	Rates	Fringes
ELEVATOR MECHANIC.....	\$ 57.69	37.335+a+b
FOOTNOTES:		
a) Employer contributes as a vacation pay credit 8% basic		
Terre Haute Regional Airport - HUF West Quad 6 Unit Box Hangar Phase 2		
AIP No. 3-18-0082-057-2024		
Issued For Bid 10/18/2024		



hourly rate for more than 5 years of service and 6% basic hourly rate for less than 5 years of service.

b) Eight Paid Holidays: Thanksgiving Day; New Year's Day; Memorial Day; Independence Day; Labor Day; Veteran's Day, Thanksgiving Day, the Friday after Thanksgiving Day and Christmas Day.

ELEV0034-002 01/01/2024

CLAY, GREENE, OWEN, PARKE, PUTNAM, SULLIVAN, VERMILLION and VIGO COUNTIES

	Rates	Fringes
ELEVATOR MECHANIC.....	\$ 57.68	37.885+a+b
a) PAID HOLIDAYS: New Year's Day, Memorial Day, Independence Day, Labor Day, Vetern's Day, Thanksgiving Day, the Friday after Thanksgiving, and Christmas Day.		
b) Employer contributes 8% of regular hourly rate to vacation pay credit for employee with more than 5 years of service; 6% for less than 5 years' service.		

ENGI0181-013 04/01/2024

GIBSON, POSEY, VANDERBURGH, and WARRICK COUNTIES

	Rates	Fringes
Power equipment operators:		
GROUP A.....	\$ 41.28	19.72
GROUP B.....	\$ 33.15	19.72
POWER EQUIPMENT OPERATOR CLASSIFICATIONS		
GROUP A: A-Frame Winch Truck, Articulating dump, autograde (CMI), auto patrol, ballast regulator (RR), batcher plant (electrical control concrete), bending machine (pipe), bituminous plant (engineer), bituminous plant, bituminous mixer travel plant, bituminous paver, bituminous roller, boring machine, buck hoist, bull dozer, cable way, Chicago boom, chimney hoist, clamshell, concrete mixer (21 cu. ft. or over), concrete paver, concrete pump (crete), construction elevator (Allmac or similar) crane, craneman, crawler backhoe, crawler high-lift, crusher plant, derrick, derrick boat, dinkey, directional/boring machine, dope pots (pipeline), double drum tugger (electric or air), dragline, dredge operator, dredge engineer, drill operator, elevating grader, extendable boom forklift, formless paver, gantry crane, gator (or similar type tiller), gradeall, grader, grademan, greaser (on grease facility servicing heavy equipment), G.P.S System (on equipment with the classifications), grout pump, head greaser, helicopter crew, Hetherington paver, hoist (motorized, gas or diesel), hydraulic crane, hydro blaster, Industrial type forklift (over 9,000 lbs), laser concrete screed, laser or remote contrlled equipment (within the classifications), locomotive crane, locomotive, mechanic, mobile mixer, motor crane, mucking machine, multiple tamping machine (RR) overhead crane, pile driver, pulls, push dozer, push boats, roller (sheep foot), rough terrain crane, R.T. backhoe, R.T. endloader, Ross carrier, scoop, shovel, side boom, skidstter loader (obcat or similar type), swing crane, tail boom, tar machine (pipeline), tower crane, trench machine, welder (heavey duty), truck mounted concrete pump,		



truck-mounted drill, vacuum truck, well point whirleys.
GROUP B: Air Compressor (1 or more, 600 cfm and over), air compressor with throttle valve, bituminous distributor, brakeman, bullfloat, cement gun, concrete mixer, concrete mixer, concrete saw, concrete spreader or puddlers, conveyor, deck hand oiler, deck engine, drill helper, earth roller, electric vibrator compactor (earth or rock), elevator (in-plant, automatic), finishing machine, fireman, form grader, generator, guard-rail driver, heater, oiler, Industrial type forklift (9,000 lbs and under), material pump, motor boats, paving joint machine, post hole digger, power broom, power traffic signals, rock roller, rock spreader, Roller (earth or rock), spike machine (RR), steam jenny, sub grader, tamping machine, truck crane oiler, truck mounted drill oiler, Tugger (one-drum, air or electric) vibrator, vibro-piling hammer-hydraulic hammer or auger, water pump, widener (apsco or similar type) welding machine, JLG lifts and scissor lifts or similar machine.

ENGI0841-001 04/01/2023
REMAINING COUNTIES

	Rates	Fringes
Power equipment operators:		
GROUP 1.....	\$ 33.90	23.00
GROUP 2.....	\$ 26.75	23.00
GROUP 1: Power Cranes, Draglines, Derricks, Shovels, Gradalls, Mechanics, Tractor Highlift, Tournadozer, Concrete Mixers with Skip, Tournamixer, Two-Drum Machine, One-Drum Hoist with Tower or Boom, Cableways, Tower Machines, Motor Patrol, Boom Tractor, Boom or Winch Truck, Winch or Hydraulic Boom Truck, Truck Crane, Tournapull, Tractor Operating Scoops, Bulldozer, Push Tractor, Asphalt Planer, Finishing Machine on Asphalt, Large Rollers on Earth, Rollers on Asphalt Mix, Ross Carrier or Similar Machine, Gravel Processing Machine, Asphalt Plant Engineer, Paver Operator, Farm Tractor with Half Yard Bucket and/or Backhoe Attachments, Dredge Engineer, or Dredge Operator, Central Mix Plant Engineer, CMI or Similar Type Machine, Truck or Skid Mounted Concrete Pump, Tower Crane, Engine or Rock Crusher Plant, Concrete Plant Engineer, Ditching Machine with Dual Attachment, Tractor Mounted Loaders, Cherry Picker, Hydro Crane, Standard or Dinkey Locomotives, Scoopmobiles, Euclid Loader, Soil Cement Machine, Back Filler, Elevating Machine, Power Blade, Drilling Machines Including Well Testing, Caissons, Shaft or Any Similar Type Drilling Machines, Motor Driven Paint Machine, Pipe Cleaning Machine, Pipe Wrapping Machine, Pipe Bending Machine, Apsco Paver, Boring Machine, (Equipment Greased), Barber-Greene Loaders, Formless Paver, (Well Point System), Concrete Spreader, Hydra Ax, Span Saw and Similar Types, Marine Scoops, Brush Mulcher, Brush Burner, Mesh Placer, Tree Mover, Helicopter Crew (3), Piledriver - Skid or Crawler, Stump Remover, Root Rake, Tug Boat Operator, Refrigerating Machine, Freezing Operator, Chair Cart-Self Propelled, Hydra Seeder, Straw Blower Power Sub Grader, Bull Float, Finishing Machine, Self-Propelled Pavement		



Breaker (Backhoe Attached), Lull (or Similar Type Machine), Two Air Compressors, Compressors Hooked in Maifold, Overhead Crane, Chip Spreader, Mud Cat, Sull-Air Fork Lifts (Except When Used For Landscaping Work), Soil Stabilazer (Seaman Tiller, Bo Mag, Rago Gator and Similar Types or Equipment), Tube Float, Spray Machine, Curing Machine, Concrete or Asphalt Milling Machine, Snooper Truck Operator.

GROUP 2: Concrete Mixers Without Skips, Rock Crusher, Ditching Machine Under 6', Curbing Machine, One Drum Machines without Tower or Boom, Air Tugger, Self-Propelled Concrete Saw, Machine-Mounted Post Hole Digger, Two to Four Generators, Water Pumps, or Welding Machines within 400 ft., Air Compressor 600 cu. ft. and Under, Rollers on Aggregate and Seal Coat Surfaces, Fork Lifts (When Used For Landscaping Work, Concrete and Blacktop Curb Machine, Farm Tractor with less than Half Yard Bucket, One Water Pump, Iolers, Air Valves or Steam Valves, One Welding Machine, Truck Jack, Mud Jack, Gunnite Machine, House Elevators when used for Hoisting Material, Engine Tenders, Wagon Drill, Flex Plane, Conveyor, Siphons and Pulsometer, Switchman, Fireman on Paint Pots, Fireman on Asphalt Plants, Distributor Operators on Trucks, Tampers, Self-Propelled Power Broom, Striping Machine (Motor Driven), Form Tamper, Bulk Cement Plan Equipment Greaser, Deck Hands, Truck Crane Oiler Driver, Cement Blimps, Form Grader, Temporary Heat, Throttle Valve, Farm Tractor, Super Sucker (And Similar Type of Equipment).

FOOTNOTE: Employees operating booms from 149 ft. to 199 ft. including jib, shall receive an additional seventy five cents (.75) per hour above the rate. Employees operating booms over 199 ft. including jib, shall receive an additional one dollar and twenty five cents (\$1.25) per hour above the regular rate.

IRON0022-003 06/01/2024

CLAY, DAVIESS, GREENE, KNOX, LAWRENCE, MARTIN, MONROE, MONTGOMERY, OWEN, PARKE, PUTNAM, SULLIVAN, VERMILLION AND VIGO COUNTIES

	Rates	Fringes
IRONWORKER.....	\$ 36.70	25.69

The following holidays shall be observed: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day and the day after Thanksgiving and Christmas Day. Any holiday which occurs on a Sunday shall be observed the following Monday, unless the legal observance of these holidays is changed by law.

IRON0103-003 04/01/2023

GIBSON, POSEY, VANDERBURGH AND WARRICK COUNTIES

	Rates	Fringes
IRONWORKER.....	\$ 31.99	25.55

LABO0204-002 06/01/2024

CLAY, GREENE, OWEN, PARKE, PUTNAM, SULLIVAN, VERMILLION, and VIGO COUNTIES

	Rates	Fringes
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Laborers:

Caisson and Tunnel Work in		
Compressed and Free Air		
GROUP 1.....	\$ 23.18	16.00
GROUP 2.....	\$ 23.93	16.00
GROUP 3.....	\$ 24.18	16.00
GROUP 4.....	\$ 24.18	16.00
LABORERS		
GROUP 1.....	\$ 26.93	18.00
GROUP 2.....	\$ 27.68	18.00
GROUP 3.....	\$ 28.43	18.00

LABORER CLASSIFICATIONS

GROUP1: Building and construction laborers; Scaffold builders (other than for masons or plasterers); Mechanic tenders; Flag & signal person; Window washers & cleaners; Waterboys & toolhousemen; Railroad workers; Masonry wall washers (interior & exterior); Curing compound; All portable water pumps with discharge up to 3 inches; Waterproofing; Handling of creosote lumber or like treated material (excluding railroad material); Asphalt rakers & lutemen; Kettlemen; Air tool operators and all pneumatic tool operators; Air & electric vibrators & chipping hammer operators: Earth compactors; Jackmen & sheet men working ditches deeper than 6 ft. in depth; Laborers working ditches 6 ft. in depth or deeper; Assembly of uncrete pump; Tile layers (sewer or field) & sewer pipe layer (metallic or non-metallic); Motor-driven wheelbarrows & concrete buggies; Hyster operators; Pumpcrete assemblers; Core drill operator; Cement, lime or silia clay handlers (bulk or bag); Handling of toxic materials damaging to clothing; Pneumatic spikers; Deck engine & winch operators: Water main & cable ducking (metallic/non-metallic); Screed man or screw operator on asphalt paver; Chain saw and demolition saw operators; Concrete conveyor assemblers; Asbestos removal; Hazardous waste removal.

GROUP 2: Plasterers' tenders; Mortar mixers; Welders (acetylene or electric); Cutting torch or burner; Cement nozzle laborers; Cement gun operators; Scaffold builders when working for plasterers and for masons; Water blast machine operators.

GROUP 3: Dynamite men; Mason Tenders; Drillers-air track or wagon drilling for explosives

LABORERS CLASSIFICATIONS For CAISSON And TUNNEL WORK In COMPRESSED And FREE AIR

GROUP 1: Cage Tenders, Dump Men, Flagman, Signalman, Top Laborers, Rod Men

GROUP 2: Concrete Repairmen, Lock Tenders (pressure side), Motor men, Muckers, Grout Machine, Track Layers, Air Hoist, Key Board, Agitator Car, Car Pushers, Concrete Laborers, Grout Laborers, Lock Tenders (free air side), Steel Setters, Tuggers, Tuggers, Switchmen.

GROUP 3: Mucking Machine, Laser Beam, Liner Plate & Ring Setter, Shield Drivers, Power Knife, Welders Burners, Pipe Jacking Machine, Skinners, Maintenance Technician, Miner, Bricklayer Tenders, Concrete Blowers, Drillers, Erectors, Form Men, Jackhammermen, Mining Machine.



GROUP 4: Dynamite Men, Drillers air track or wagon drilling
for explosives.

LABO0561-005 04/01/2023

GIBSON, POSEY, VANDERBURGH and WARRICK COUNTIES

	Rates	Fringes
Laborers:		
GROUP 1.....	\$ 27.12	18.10
GROUP 2.....	\$ 27.42	18.10
GROUP 3.....	\$ 28.62	18.10
GROUP 4.....	\$ 28.87	18.10

LABORER CLASSIFICATIONS

GROUP 1: Building & Construction Laborers; Scaffold Builders
(other than for Masons or Plasterers); Ironworker Tender;
Mechanic Tender; Civil Engineer Tender; Rodmen and
Chainmen; Signalmen and Flagman, Window Washer & Cleaner;
Waterboy and Toolhouseman; Roofer Tender; Railroad Worker;
Masonry Wall Washer (Interior & Exterior); Cement Finisher
Tender; Carpenter Tender; All Other Tenders not listed;
Portable Water Pump with discharge up to 3"; Wiremesh; Fire
Prevention; Fire Watch; Fire Stop Tender

GROUP 2: Waterproofing; Handling of creosote Lumber or like
treated material (Excluding Railroad Material); Asphalt
Raker & Luteman; Kettleman; handling and removal Hazardous
materials damaging to clothing; Air Tool Operator;
Vibrator; Chipping Hammer Operator and all pneumatic tool
operator and earth compactor; Jack Man & Sheeting Man
Working in Ditches 6 Feet in depth or deeper; Laborers
working ditches six (6) feet in depth or deeper; Assembly
of Unicrete Pump; Chain Saw Operator; Water line layers,
five (5) feet outside the building foundation; Tile layers
(Sewer or Field); Sewer Pipe Layer (Metallic and
Non-metallic) five (5) feet outside the building; Motor
Driven Wheelbarrow & Concrete Buggy; Hyster Operator; Grout
pump operator; Pump crete Assembler; Conveyor Assembler;
Core Drill Operator; Cement/Lime/Silica Clay Handler (Bulk
or Bar); Pneumatic Spiker; Deck/Engine/Winch Operator;
Water Main & Cable Decking (Metallic or Non-metallic);
Remote Controlled Compactor

GROUP 3: Plasterer Tender; Mason Tender; Mortar Mixer; Welder
(Acetylene or Electric); Cutting Torch or Burner; Cement
Gun Operator; Scaffold Builder (When working for Plasterer
or Mason)

GROUP 4: Dynamite Man

PAIN0156-002 04/01/2024

GIBSON, POSEY, VANDERBURGH AND WARRICK COUNTIES

	Rates	Fringes
Painters:		
BRUSH & ROLLER.....	\$ 29.62	18.32
DRYWALL FINISHERS.....	\$ 30.37	19.32
SPRAY, SANDBLAST, POWER TOOLS, WATERBLAST & STEAM CLEANING.....	\$ 30.62	19.32

FOOTNOTE A:

All Structures over 40? \$0.75/ hour above base wage



All Structures over 75? \$1.50/ hour above base wage
All Structures over 100? \$2.50/ hour above base wage

PAIN0197-002 06/01/2024

CLAY, GREENE, OWEN, PARKE, PUTNAM, SULLIVAN, VERMILLION AND
VIGO COUNTIES:

	Rates	Fringes
Painters:		
Brush & Roller.....	\$ 30.25	15.50
Drywall & Paper hangers (with tools).....	\$ 31.25	15.50
Sandblasting.....	\$ 32.25	15.50
Spray & Pot Man.....	\$ 30.75	15.50

FOOTNOTE A: \$1.00 premium for work on structures over 40 ft.
above floor/ground level
\$2.00 premium for work on structures over 100 ft
above floor/ground level

PAIN1165-007 06/01/2024

GIBSON, POSEY, VANDERBURGH, WARRICK COUNTIES

	Rates	Fringes
GLAZIER.....	\$ 32.86	19.34

PAIN1165-012 01/01/2024

CLAY; GREENE; OWEN; PARKE; PUTNAM; SULLIVAN; VERMILLION and
VIGO COUNTIES

	Rates	Fringes
GLAZIER.....	\$ 34.03	20.05

PLAS0075-001 06/01/2017

CLAY, OWEN, PARKE, PUTNAM, VERMILLION AND VIGO COUNTIES:

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER...	\$ 25.75	13.50

PLAS0075-002 06/01/2017

GREENE and SULLIVAN COUNTIES

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER...	\$ 28.50	13.50

PLAS0566-001 04/01/2018

GIBSON, POSEY, VANDERBURGH AND WARRICK COUNTIES

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER...	\$ 26.30	16.91

PLAS0692-001 06/01/2024

AREA #46

CLAY, GIBSON, GREENE, OWEN, PARKE, POSEY, PUTNAM, SULLIVAN,
VANDERBURGH, VERMILLION, VIGO and WARRICK COUNTIES

	Rates	Fringes
PLASTERER.....	\$ 30.50	17.62

PLUM0136-002 04/01/2024

REMAINING COUNTIES

	Rates	Fringes
Plumbers and Pipefitters.....	\$ 43.67	21.35



PLUM0157-001 07/01/2024

CLAY, GREENE, PARKE, PUTNAM (Part), SULLIVAN, VERMILLION and
VIGO COUNTIES

	Rates	Fringes
Plumbers and Pipefitters.....	\$ 44.45	22.50

PLUM0440-001 06/04/2024

PUTNAM COUNTY (EAST OF ROAD 43 EXCEPT TERRITORY ON A EAST MILE
RADIUS FROM THE COURT HOUSE)

	Rates	Fringes
Plumbers and Pipefitters.....	\$ 46.50	19.89

ROOF0106-001 04/01/2023

REMAINING COUNTIES:

	Rates	Fringes
Roofers:		
COMPOSITION.....	\$ 31.60	19.43
SLATE & TILE.....	\$ 31.60	19.43

* ROOF0119-001 09/01/2024

PUTNAM COUNTY

	Rates	Fringes
Roofers:.....	\$ 31.00	15.11

ROOF0150-002 07/01/2024

CLAY, GREENE, OWEN, PARKE, SULLIVAN, VERMILLION AND VIGO
COUNTIES

	Rates	Fringes
ROOFER.....	\$ 30.00	18.30

SFIN0669-002 04/01/2024

	Rates	Fringes
SPRINKLER FITTER.....	\$ 45.40	27.29

SHEE0020-018 07/01/2023

CLAY, GREENE, OWEN, PARKE, PUTNAM, SULLIVAN, VERMILLION, and
VIGO COUNTIES

	Rates	Fringes
Sheet metal worker.....	\$ 39.53	22.92
HVAC Duct Work		

SHEE0020-019 07/01/2023

GIBSON, POSEY, VANDERBURGH, and WARRICK COUNTIES

	Rates	Fringes
Sheet metal worker.....	\$ 34.58	29.98
HVAC Duct Work		

TEAM0135-006 04/01/2024

CLAY, GREENE OWEN, PARKE, PUTNAM, SULLIVAN, VERMILLION, and
VIGO COUNTIES

	Rates	Fringes
Truck drivers:		
GROUP 1.....	\$ 32.10	.42+a+b
GROUP 2.....	\$ 32.60	.42+a+b
GROUP 3.....	\$ 32.80	.42+a+b
GROUP 4.....	\$ 32.95	.42+a+b



GROUP 5.....\$ 33.45 .42+a+b
A: \$36.40 PER DAY & 450.00 PER WEEK.
TRUCK DRIVER CLASSIFICATIONS:

GROUP 1: Single Axle Trucks seven (7) cu.yds. or less than ten and One-half (10 1/2) tons, dumpsters, scoop-mobiles five (5) cu. yds. and under or less than seven and one-half (7 1/2) tons, mixer trucks three (3) cu.yds. and under, air compressors and welding machines, including those pulled by separate units, batch trucks-wet or dry-2""34-E batches or less, truck driver helpers, warehousemen, mechanic's helpers, greasers and tiremen, all pick-up trucks and other vehicles. Drivers on dumpsters or similar dumpsters, mounted on four

(4) wheel truck rated two (2) cu.yds. or less, and small pallet type fork-lift operator and drivers on pallet jacks or similar type equipment.

GROUP 2: Drivers on tandem axle eighteen (18) cu.yds.or twenty- four (24) tons gross, six (6) wheel trucks, Koehring or similar dumpsters, tract trucks, Euclids, hug bottom dumps, tournapulls, tournatrailers, tournarockers, or similar equipment when used for transportation purposes under nine (9) cu.yds. or less than thirteen and one-half (13 1/2)

tons, tandems and semi-trailer service trucks, mixer trucks over three (3) cu. yds. and including six and one-half (6 1/2) cu.yds., fork lift, four (4) wheel A frame trucks when used for transportation purposes, four (4) wheel winch trucks, pavement breakers, batch trucks - wet or dry - over 2 up to and including 4-""34-E"" batches two (2) men oil distributors, fork-lift under four (4) ton and vacuum trucks.

GROUP 3: Koehring or similar dumpsters, tract trucks, semi-trailer water trucks, Euclids, hug bottom dumps, tournapulls, tournatrailers, tournarockers, tractor trailers, tandems Q frame winch trucks, hydrolift trucks or similar equipment when used for transportation purposes, mixer trucks over six and one-half (6 1/2) cu.yds. batch trucks wet or dry over 4-""34-E"" batches single axle low boy trailers, and Contractor's mechanics when working on equipment operated by employees within this Bargaining Unit. Six (6) wheel pole trailers and one (1) man oil distributors, fork- lift over four (4) ton and mobile mixers.

GROUP 4: Drivers on heavy equipment over sixteen (16) cu.yds. or twenty-four ton, such as Koehring or similar dumpsters, tract trucks, Euclids, hug bottom dumps, tournapulls, tournarockers or similar equipment wen used for transportation purposes, pole trailers over six (6) wheels, water pulls, low-boy trailers tandem axles, quad axle or more no-weight limitation, diseal and/or heavy equipment mechanics when working on equipment operated by employees with this Bargaining Unit.

GROUP 5: Mechanic furnishing his own tools.

TEAM0215-005 04/01/2024

GIBSON, POSEY, VANDERBURGH AND WARRICK COUNTIES:



	Rates	Fringes
Truck drivers:		
GROUP 1.....	\$ 27.08	21.45
GROUP 2.....	\$ 27.54	21.45
GROUP 3.....	\$ 27.76	21.45
GROUP 1 - Pickup Trucks, Winch Trucks, Warehouseman, Mechanic, Street sweepers, Single axle trucks		
GROUP 2 - Tandem Trucks or Dump Trucks; Farm Tractor Pulling trailer; Bituminous Distributors, Pavement Breakers		
GROUP 3 - Mixer Trucks, all types; Lowboys, all types; Semi-trucks, all types; All Tri-axle Dump Trucks; Articulated End Dumps; End Dumps; Heavy Equipment Type Water Wagons; Hazardous Waste Warehouseman; Hazardous Waste Driver; and Drivers on equipment when not self-loaded or pusher loaded, such as Koehring or similar dumpsters, track trucks, Euclid bottom dump and hug bottom dump, Tournatrailers, Tournarockers or similar equipment.		

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.
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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at <https://www.dol.gov/agencies/whd/government-contracts>. Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were



prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier. Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier. A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

State Adopted Rate Identifiers

Classifications listed under the "SA" identifier indicate that the prevailing wage rate set by a state (or local) government was adopted under 29 C.F.R. §1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 01/03/2024 reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.



WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a position on a wage determination matter
- * a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.
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END OF GENERAL DECISION"

"General Decision Number: IN20240006 10/04/2024

Superseded General Decision Number: IN20230006

State: Indiana

Construction Types: Heavy and Highway

Counties: Adams, Allen, Bartholomew, Benton, Blackford, Boone, Brown, Carroll, Cass, Clark, Clay, Clinton, Crawford, Daviess, Dearborn, Decatur, DeKalb, Delaware, Dubois, Elkhart, Fayette, Floyd, Fountain, Franklin, Fulton, Gibson, Grant, Greene, Hamilton, Hancock, Harrison, Hendricks, Henry, Howard, Huntington, Jackson, Jasper, Jay, Jefferson, Jennings, Johnson, Knox, Kosciusko, Lagrange, Lawrence, Madison, Marion, Marshall,



Martin, Miami, Monroe, Montgomery, Morgan, Newton, Noble, Ohio, Orange, Owen, Parke, Perry, Pike, Posey, Pulaski, Putnam, Randolph, Ripley, Rush, Scott, Shelby, Spencer, Starke, Steuben, Sullivan, Switzerland, Tippecanoe, Tipton, Union, Vanderburgh, Vermillion, Vigo, Wabash, Warren, Warrick, Washington, Wayne, Wells, White and Whitley Counties in Indiana.

* EXCEPT LAKE, LAPORTE, PORTER AND ST. JOSEPH COUNTIES HEAVY AND HIGHWAY CONSTRUCTION PROJECTS

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(1).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	<ul style="list-style-type: none">. Executive Order 14026 generally applies to the contract.. The contractor must pay all covered workers at least \$17.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2024.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	<ul style="list-style-type: none">. Executive Order 13658 generally applies to the contract.. The contractor must pay all covered workers at least \$12.90 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2024.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at <http://www.dol.gov/whd/govcontracts>.

Modification Number	Publication Date
0	01/05/2024
1	01/19/2024
2	02/16/2024
3	03/01/2024



4	03/22/2024
5	03/29/2024
6	04/05/2024
7	04/19/2024
8	05/03/2024
9	05/17/2024
10	05/31/2024
11	06/14/2024
12	07/05/2024
13	07/12/2024
14	07/19/2024
15	07/26/2024
16	08/09/2024
17	08/16/2024
18	08/23/2024
19	08/30/2024
20	09/06/2024
21	09/13/2024
22	09/20/2024
23	10/04/2024

ASBE0008-004 03/01/2024

DEARBORN, FAYETTE, FRANKLIN, OHIO, RIPLEY SWITZERLAND AND UNION
COUNTIES

	Rates	Fringes
Asbestos Workers/Insulator (Includes application of all insulating materials, protective coverings, coatings & finishings to all types of mechanical systems).....	\$ 34.23	21.94
HAZARDOUS MATERIAL HANDLER (Includes preparation, wettings, stripping, removal, scrapping, vacuuming, bagging & disposing of all insulation materials, whether they contain asbestos or not, from mechanical systems).....	\$ 25.00	13.70

ASBE0017-008 06/01/2024

NEWTON COUNTY:

	Rates	Fringes
ASBESTOS WORKER/HEAT & FROST INSULATOR.....	\$ 55.02	35.75
HAZARDOUS MATERIAL HANDLER (INCLUDES PREPARATION, WETTING, STRIPPING REMOVAL SCRAPPING, VACUUMING, BAGGING AND DISPOSAL OF ALL INSULATION MATERIALS, WHETHER THEY CONTAIN ASBESTOS OR NOT, FROM MECHAINCAL SYSTEMS).....	\$ 44.02	32.76

ASBE0018-005 06/01/2024

BROWN, BARTHOLOMEW, BENTON, BOONE, CARROLL, CASS, CLAY,
CLINTON, DECATUR, DELAWARE, ELKHART. FOUNTAIN, FULTON, GREENE,



HAMILTON, HANCOCK, HENDRICKS, HENRY, HOWARD, JASPER, JOHNSON,
KOSCIUSKO, LAGRANGE, MARSHALL, MADISON, MARION, MONROE,
MONTGOMERY, MORGAN, OWEN, PARKE, PULASKI, PUTNAM, RUSH, SHELBY,
STARKE, TIPPECANOE, TIPTON, VERMILLION, VIGO, WARREN and WHITE
Counties

	Rates	Fringes
ASBESTOS WORKER/HEAT & FROST INSULATOR (includes application of all insulating materials, protective coverings, coatings and finishings to all types of mechanical systems).....	\$ 38.55	23.53
HAZARDOUS MATERIAL HANDLER (includes preparation, wettings, stripping, removal, scrapping, vacuuming, bagging & disposing of all insulation materials, whether they contain asbestos or not, from mechanical systems).....	\$ 23.00	14.40

ASBE0037-004 04/02/2024

DAVIESS, DUBOIS, GIBSON, KNOX, MARTIN, PIKE, POSEY, SPENCER,
SULLIVAN, VANDERBURGH AND WARRICK COUNTIES

	Rates	Fringes
ASBESTOS WORKER/HEAT & FROST INSULATOR (includes application of all insulating materials protective coverings, coatings an finishes to all types of mechanical systems. Also the application of firestopping, material openings and penetrations in walls, floors, ceilings, curtain walls and all lead abatement.)...	\$ 27.19	22.06
HAZARDOUS MATERIAL HANDLER (Includes preparation, wetting, stripping, removal, scrapping, vacuuming, bagging and disposing of all insulation materials, whether they contain asbestos or not, from mechanical systems).....	\$ 33.44	21.84

ASBE0041-002 07/01/2024

ADAMS, ALLEN, BLACKFORD, DE KALB, GRANT, HUNTINGTON, JAY,
MIAMI, NOBLE, STEUBEN, WABASH, WELLS AND WHITLEY COUNTIES:

	Rates	Fringes
ASBESTOS WORKER/HEAT & FROST INSULATOR (includes application of all insulating materials, protective coverings, coatings and		



finishings to all types of mechanical systems).....\$ 35.10	19.39
HAZARDOUS MATERIAL HANDLER (includes preparation, wettings, stripping, removal, scrapping, vaccuming, bagging & disposing of all insulation materials, whether they contain asbestos or not, from mechanical systems).....\$ 35.10	
	19.39

ASBE0051-003 03/01/2024

CLARK, CRAWFORD. FLOYD, HARRISON, JACKSON, JEFFERSON, JENNINGS,
LAWRENCE, ORANGE, PERRY, SCOTT, and WASHINGTON Counties

Rates

Fringes

ASBESTOS WORKER/HEAT & FROST INSULATOR (Includes application of all insulating materials, protective coverings, coatings and finishings to all types of mechanical systems).....\$ 29.31	18.47
HAZARDOUS MATERIAL HANDLER (includes preparation, wettings, stripping, removal, scrapping, vaccuming, bagging & disposing of all insulation materials, whether they contain asbestos or not, from mechanical systems).....\$ 19.80	
	13.30

ASBE0079-002 07/01/2023

RANDOLPH AND WAYNE COUNTIES

Rates

Fringes

ASBESTOS WORKER/HEAT & FROST INSULATOR (Includes application of all insulating materials, protective coverings, coatings & finishings to all types of mechanical systems).....\$ 33.04	16.14
HAZARDOUS MATERIAL HANDLER (Includes preparation, wetting, stripping, removal, scrapping, vacuuming, bagging & disposing of all insulation materials, whether they contain asbestos or not, from mechanical systems)).....\$ 33.04	
	16.14

BRIN0003-001 06/01/2023

INDIANAPOLIS

BOONE, HANCOCK, HENDRICKS, JOHNSON, MARION, MONTGOMERY, MORGAN
and SHELBY COUNTIES

Rates

Fringes

Bricklayer, Stone Mason,



Pointer, Caulking.....	\$ 36.24	17.39
TERRAZZO FINISHER.....	\$ 23.38	13.15
TERRAZZO WORKER/SETTER.....	\$ 36.38	17.24
Tile & Marble Finisher.....	\$ 24.33	13.16
Tile, Marble Setter.....	\$ 35.63	17.23

BRIN0004-004 06/01/2024

FORT WAYNE

ADAMS, ALLEN, DEKALB, HUNTINGTON, NOBLE, STEUBEN, WELLS AND
WHITLEY COUNTIES:

	Rates	Fringes
BRICKLAYER (STONE MASON, MARBLE MASONS, POINTER, CLEANER, AND CAULKER).....	\$ 35.00	21.60
Terrazzo Grinder Finisher.....	\$ 31.00	17.89
Terrazzo Worker Mechanic.....	\$ 36.30	22.04
Tile Setter & Marble Mason Mechanic.....	\$ 31.55	19.08
Tile, Marble & Terrazzo Finisher.....	\$ 31.55	19.08

BRIN0004-005 06/01/2024

CRAWFORD, DUBOIS, PERRY, POSEY, SPENCER, VANDERBURGH, and
WARRICK Counties

	Rates	Fringes
BRICKLAYER.....	\$ 35.34	21.72
TILE FINISHER.....	\$ 29.08	17.32
TILE SETTER.....	\$ 29.08	17.32

BRIN0004-009 06/01/2024

BARTHOLOMEW, BROWN, DEARBORN, DECATUR, JENNINGS, MONROE, OHIO,
OWENS, RIPLEY and SWITZERLAND COUNTIES

	Rates	Fringes
Bricklayer, Stonemason.....	\$ 35.21	18.19
TERRAZZO FINISHER.....	\$ 25.33	14.19
TERRAZZO WORKER/SETTER.....	\$ 37.97	18.06
Tile & Marble Finisher.....	\$ 25.33	14.19
Tile, Marble Setter.....	\$ 37.22	18.05

BRIN0004-010 06/01/2024

CLARK, FLOYD, and HARRISON Counties

	Rates	Fringes
BRICKLAYER BRICKLAYERS, STONEMASONS AND CEMENT MASONS.....	\$ 33.70	16.57

BRIN0004-015 06/01/2024

TERRE HAUTE

CLAY, DAVIESS, GIBSON, GREENE, KNOX, MARTIN, PARKE, PIKE,
PUTNAM, SULLIVAN, VERMILLION and VIGO COUNTIES

	Rates	Fringes
BRICKLAYER BRICKLAYERS, STONE MASONS and POINTER/ CLEANER/CAULKER.....	\$ 38.16	18.22
CEMENT MASON (Greene and		



Sullivan Counties).....\$ 27.78	11.02
CEMENT MASON (REMAINING	
COUNTIES).....\$ 37.16	18.22
TERRAZO FINISHER.....\$ 25.33	14.19
TERRAZZO WORKER.....\$ 37.97	18.06
TILE LAYER, MARBLE MASON,	
MOSAIC WORKER.....\$ 38.16	18.22

BRIN0004-016 06/01/2024

MUNCIE

BLACKFORD, DELAWARE, FAYETTE, FRANKLIN, HAMILTON, HENRY, JAY,
MADISON, RANDOLPH, RUSH, TIPTON, UNION and WAYNE COUNTIES

	Rates	Fringes
Bricklayer, Stonemason,		
Pointer, Caulker & Cleaner.....\$ 35.83		20.89
TERRAZZO FINISHER.....\$ 25.33		14.19
TERRAZZO WORKER/SETTER.....\$ 37.97		18.06
Tile & Marble Finisher.....\$ 25.33		14.19
Tile & Marble Setter; Mosaic		
Worker.....\$ 35.83		20.89

BRIN0006-001 06/01/2023

JASPER, NEWTON & STARKE COUNTIES

	Rates	Fringes
BRICKLAYER (Including		
Stonemason, and Pointer,		
Caulker & Cleaner).....\$ 42.05		28.22
Tile, Marble & Terrazzo Worker...\$ 42.05		28.22

BRIN0011-001 06/01/2023

LAFAYETTE

BENTON, CARROLL, CLINTON, FOUNTAIN, TIPPECANOE, WARREN and
WHITE COUNTIES

	Rates	Fringes
Bricklayer, Stonemason,		
Pointer, Caulker & Cleaner.....\$ 33.75		20.12
TERRAZZO FINISHER.....\$ 23.38		13.15
TERRAZZO WORKER/SETTER.....\$ 36.38		17.24
Tile & Marble Finisher.....\$ 24.33		13.16
Tile & Marble Setter; Mosaic		
Worker.....\$ 35.63		17.23

BRIN0018-002 06/01/2023

CASS, ELKHART, FULTON, GRANT, HOWARD, KOSCUISKO, LAGRANGE,
MARSHALL, MIAMI, PULASKI, WABASH

	Rates	Fringes
Bricklayer, Caulker, Cleaner,		
Pointer.....\$ 34.00		19.71

CARP0002-023 04/01/2024

DEARBORN, JACKSON, JENNINGS, OHIO, RIPLEY AND SWITZERLAND
COUNTIES

	Rates	Fringes
CARPENTER.....\$ 29.28		27.90

CARP0133-001 04/01/2024

Terre Haute Regional Airport - HUF | West Quad 6 Unit Box Hangar Phase 2
AIP No. 3-18-0082-057-2024
Issued For Bid | 10/18/2024



BOONE, CLAY, FOUNTAIN, MONROE, MONTGOMERY, MORGAN, OWEN,
PARKE, PUTNAM, VERMILLION AND VIGO COUNTIES

	Rates	Fringes
CARPENTER.....	\$ 32.93	24.91

CARP0133-003 04/01/2024

HAMILTON, HANCOCK, HENDRICKS, JOHNSON (Townships of Clark, Camp
Atterbury north of Hospital Road, Pleasant, White River), and
MARION Counties

	Rates	Fringes
CARPENTER.....	\$ 34.04	24.91

CARP0175-004 04/01/2024

CLARK, FLOYD, HARRISON, JEFFERSON, SCOTT AND WASHINGTON COUNTIES

	Rates	Fringes
CARPENTER.....	\$ 28.71	28.47

CARP0215-002 04/01/2024

BENTON, CARROLL, CLINTON, PULASKI, TIPPECANOE, WARREN AND WHITE
COUNTIES

	Rates	Fringes
CARPENTER.....	\$ 33.43	24.37

CARP0224-011 04/01/2024

CRAWFORD, DUBOIS, PERRY, PIKE, POSEY, SPENCER, VANDERBURGH AND
WARRICK COUNTIES:

	Rates	Fringes
CARPENTER.....	\$ 28.78	28.40

CARP0224-012 04/01/2024

DAVIESS, GIBSON, GREENE, KNOX, LAWRENCE, MARTIN, ORANGE AND
SULLIVAN COUNTIES:

	Rates	Fringes
CARPENTER.....	\$ 29.13	28.45

CARP0232-003 04/01/2024

ALLEN, DEKALB, LAGRANGE, NOBLE, STEUBEN and WHITLEY COUNTIES

	Rates	Fringes
CARPENTER.....	\$ 32.10	25.04

CARP0301-001 04/01/2024

BARTHOLOMEW, BROWN, (Camp Atterbury south of Hospital Road),
DECATUR, FRANKLIN, JOHNSON (Townships of Blue River, Franklin,
Hensley, Needham, Nineveh, Union) , RUSH AND SHELBY COUNTIES

	Rates	Fringes
CARPENTER.....	\$ 32.49	24.91

CARP0413-003 04/01/2024

ADAMS, CASS, ELKHART, FULTON, GRANT, HOWARD, HUNTINGTON,
KOSCIUSKO, MARSHALL, MIAMI, TIPTON, WABASH AND WELLS COUNTIES:

	Rates	Fringes
CARPENTER.....	\$ 32.42	24.87

CARP0999-001 06/01/2024

JASPER, NEWTON, AND STARKE COUNTIES

	Rates	Fringes
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CARPENTER.....	\$ 43.58	34.68

CARP1016-001 04/01/2024		
BLACKFORD, DELAWARE, FAYETTE, HENRY, JAY, MADISON, RANDOLPH, UNION AND WAYNE COUNTIES		
	Rates	Fringes
CARPENTER.....	\$ 32.69	24.91

CARP1076-004 04/01/2016		
HAMILTON and MARION Counties, and the following Townships in JOHNSON County: Camp Atterbury (North of Hospital Rd.), Clark, Pleasant, and White River		
	Rates	Fringes
MILLWRIGHT.....	\$ 26.81	19.28

CARP1076-005 06/01/2017		
JASPER, NEWTON, PULASKI, and STARKE Counties		
	Rates	Fringes
MILLWRIGHT.....	\$ 37.66	26.42

CARP1076-006 06/01/2018		
BARTHOLOMEW, BLACKFORD, BOONE, BROWN, CLAY, DECATUR, DELAWARE, FAYETTE, FOUNTAIN, FRANKLIN, HAMILTON, HANCOCK, HENDRICKS, HENRY, JAY, JOHNSON, MADISON, MARION, MONROE, MONTGOMERY, MORGAN, OWEN, PARKE, PUTNAM, RANDOLPH, RUSH, SHELBY, UNION, VERMILLION, VIGO, AND WAYNE COUNTIES		
	Rates	Fringes
MILLWRIGHT.....	\$ 28.18	22.39

CARP1080-001 04/01/2021		
GIBSON, GREENE, POSEY, SULLIVAN, VANDERBURGH and WARRICK COUNTIES		
	Rates	Fringes
MILLWRIGHT		
ZONE 1		
POSEY, VANDERBURGH and		
WARRICK COUNTIES.....	\$ 30.92	24.83
ZONE 2		
GIBSON, GREENE AND		
SULLIVAN COUNTIES.....	\$ 29.64	25.77

ELEC0016-003 04/01/2023		
CRAWFORD, DAVIESS, DUBOIS, GIBSON, LAWRENCE, MARTIN, ORANGE, PERRY, PIKE, POSEY, SPENCER, VANDERBURGH, WARRICK		
	Rates	Fringes
ELECTRICIAN.....	\$ 41.04	18.94

ELEC0016-006 08/31/2024		
CRAWFORD, DAVIESS, DUBOIS, GIBSON, LAWRENCE, MARTIN, ORANGE, PERRY, PIKE, POSEY, SPENCER, VANDERBURGH, WARRICK		
	Rates	Fringes
ELECTRICIAN (Communication Technician Only).....	\$ 33.98	18.04

ELEC0071-006 01/02/2024		
DEARBORN, OHIO, and SWITZERLAND COUNTIES		



	Rates	Fringes
Line Construction:		
Equipment Operator.....	\$ 39.11	4%+15.57
Groundman.....	\$ 25.90	4%+12.93
Lineman & Cable Splicers....	\$ 44.52	4%+16.65

ELEC0153-003 06/01/2023

ELKHART, KOSCIUSKO and MARSHALL COUNTIES

	Rates	Fringes
Communication Technician.....	\$ 26.50	18.33
ELECTRICIAN.....	\$ 38.00	26.47

Includes the installation, operation, inspection, modification, maintenance and repair of systems used for the transmission and reception of signals of any nature, for any purpose, including but not limited to , sound and voice transmission/transference systems, communication systems that transmit or receive information and /or control systems, television and video systems, micro-processor controlled fire alarm systems, and security systems and the performance of any task directly related to such installation or service. The scope of work shall exclude the installation of electrical power wiring and the installation of conduit raceways exceeding fifteen (15) feet in length.

ELEC0212-002 11/30/2023

DEARBORN, OHIO, and SWITZERLAND COUNTIES

	Rates	Fringes
ELECTRICIAN (Communication Technician Only).....	\$ 27.20	14.54

ELEC0212-009 06/07/2024

DEARBORN, OHIO, and SWITZERLAND COUNTIES

	Rates	Fringes
ELECTRICIAN.....	\$ 35.43	22.05

ELEC0305-003 12/01/2023

ADAMS, ALLEN, DE KALB, HUNTINGTON, LAGRANGE, NOBLE, STEUBEN, WELLS, and WHITLEY COUNTIES

	Rates	Fringes
ELECTRICIAN.....	\$ 38.31	27.43%+10.66

ELEC0305-004 08/31/2023

ADAMS, ALLEN, DE KALB, HUNTINGTON, LAGRANGE, NOBLE, STEUBEN, WELLS, and WHITLEY COUNTIES

	Rates	Fringes
ELECTRICIAN (Communication Technician Only).....	\$ 34.50	18.74

ELEC0369-005 05/29/2024

CLARK, FLOYD, HARRISON, JACKSON, JEFFERSON, SCOTT, and WASHINGTON Counties

	Rates	Fringes
ELECTRICIAN.....	\$ 37.88	21.38

ELEC0481-003 03/31/2024

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BARTHOLOMEW, BOONE, DECATUR, HAMILTON, HANCOCK, HENDRICKS,
JENNINGS, JOHNSON, MADISON, MARION, MONTGOMERY, MORGAN, PUTNAM,
RIPLEY, RUSH AND SHELBY COUNTIES

	Rates	Fringes
ELECTRICIAN.....	\$ 42.15	26.88

ELEC0481-004 01/01/2023

BARTHOLOMEW, BOONE, DECATUR, HAMILTON, HANCOCK, HENDRICKS,
JENNINGS, JOHNSON, MADISON, MARION, MONTGOMERY, MORGAN, PUTNAM,
RIPLEY, RUSH AND SHELBY COUNTIES

	Rates	Fringes
ELECTRICIAN (Communication Technician Only).....	\$ 35.76	18.96

ELEC0531-002 05/31/2023

JASPER, PULASKI, and STARKE COUNTIES

	Rates	Fringes
ELECTRICIAN.....	\$ 43.50	30.64

ELEC0531-003 05/28/2018

JASPER, PULASKI, and STARKE COUNTIES

	Rates	Fringes
ELECTRICIAN (Communication Technician Only).....	\$ 27.64	13.23

ELEC0538-005 06/01/2023

FOUNTAIN, VERMILLION, and WARREN Counties

	Rates	Fringes
ELECTRICIAN.....	\$ 39.09	24.37

ELEC0538-009 09/01/2023

FOUNTAIN, VERMILLION, and WARREN Counties

	Rates	Fringes
ELECTRICIAN (Communication Technician Only).....	\$ 38.49	17.76

ELEC0668-001 06/01/2023

BENTON, CARROLL, CASS, FULTON, TIPPECANOE and WHITE COUNTIES

	Rates	Fringes
ELECTRICIAN (Communication Technician Only).....	\$ 33.02	16.10

ELEC0668-002 06/01/2024

BENTON, CARROLL, CASS, FULTON, TIPPECANOE and WHITE COUNTIES

	Rates	Fringes
ELECTRICIAN.....	\$ 39.33	23.05

FOOTNOTE: a. PAID HOLIDAYS: New Years Day, Memorial Day,
July 4th, Labor Day, Veterans Day Thanksgiving Day and
Christmas Day

ELEC0697-003 08/31/2023

NEWTON COUNTY

	Rates	Fringes
ELECTRICIAN (Communication Technician Only).....	\$ 38.50	29.87



ELEC0697-006 06/01/2024
NEWTON COUNTY

	Rates	Fringes
ELECTRICIAN.....	\$ 48.10	31.28

ELEC0702-003 01/02/2024
DUBOIS, GIBSON, PERRY, PIKE, POSEY, SPENCER AND VANDERBURGH
COUNTIES

	Rates	Fringes
Line Construction:		
GROUNDMAN, Class A.....	\$ 32.81	30% + 8.60
GROUNDMAN-EQUIPMENT OPERATOR (All other equipment).....	\$ 41.73	30% + 8.60
HEAVY-EQUIPMENT OPERATOR (All crawler type equipment D-4 and larger)...	\$ 47.63	30% + 8.60
LINEMAN.....	\$ 58.12	30% + 8.60

ELEC0725-007 06/01/2022
BROWN, CLAY, GREENE, KNOX, MONROE, OWEN, PARKE, SULLIVAN AND
VIGO COUNTIES

	Rates	Fringes
Communication Technician.....	\$ 30.00	18.07
Includes the installation, operation, inspection, maintenance, repair and service of radio, television, recording, voice sound and vision production and reproduction apparatus, equipment and appliances used for domestic, commercial, education, entertainment and private telephone systems.		

ELEC0725-014 10/01/2022
BROWN, CLAY, GREENE, KNOX, MONROW, OWEN, PARKE, SULLIVAN AND
VIGO COUNTIES

	Rates	Fringes
ELECTRICIAN.....	\$ 40.00	21.96

ELEC0855-002 06/01/2024
BLACKFORD, DELAWARE, FAYETTE, FRANKLIN, HENRY, JAY, RANDOLPH,
UNION and WAYNE Counties

	Rates	Fringes
ELECTRICIAN (Communication Technician Only).....	\$ 36.94	17.52

ELEC0855-004 06/01/2024
BLACKFORD, DELAWARE, FAYETTE, FRANKLIN, HENRY, JAY, RANDOLPH,
UNION and WAYNE Counties

	Rates	Fringes
ELECTRICIAN.....	\$ 38.53	21.42

ELEC0873-001 06/01/2021
CLINTON, GRANT, HOWARD, MIAMI, TIPTON, AND WABASH COUNTIES

	Rates	Fringes
ELECTRICIAN (Communication Technician Only).....	\$ 30.08	17.23



ELEC0873-002 03/01/2022

CLINTON, GRANT, HOWARD, MIAMI, TIPTON AND WABASH COUNTIES:

	Rates	Fringes
ELECTRICIAN.....	\$ 36.59	20.12

ELEC1393-001 01/02/2024

REMAINING COUNTIES

	Rates	Fringes
Line Construction:		
EQUIPMENT OPERATOR 1:		
Diggers, 5th wheel type		
trucks, crawler type, D-4		
and smaller, bucket trucks		
and live boom type line		
trucks.....	\$ 36.86	28%+7.64
EQUIPMENT OPERATOR 3		
(Backhoes over 1/2 yard		
bucket capacity, cranes		
rated at 15 ton or more		
capacity) 95% J.L. rate.....	\$ 45.53	28%+7.64
GROUNDMAN TRUCK DRIVER.....	\$ 30.79	15.08
GROUNDMAN.....	\$ 25.04	29%+6.75
LINEMAN.....	\$ 44.40	19.03

ENGI0103-003 04/01/2023

INCLUDING UNDERGROUND AND UTILITY CONSTRUCTION

ADAMS, ALLEN, BENTON, BLACKFORD, CARROLL, CASS, CLINTON,
DEKALB, DELAWARE, FAYETTE, GRANT, HAMILTON, HANCOCK, HENRY,
HOWARD, HUNTINGTON, JAY, JOHNSON, MADISON, MARION, MIAMI,
RANDOLPH, RUSH, SHELBY, STEUBEN, TIPPECANOE, TIPTON, UNION,
WABASH, WAYNE, WELLS, WHITE AND WHITLEY COUNTIES

	Rates	Fringes
Power equipment operators:		
GROUP 1.....	\$ 40.55	21.80
GROUP 2.....	\$ 38.83	21.80
GROUP 3.....	\$ 37.91	21.80
GROUP 4.....	\$ 36.41	21.80

POWER EQUIPMENT OPERATOR CLASSIFICATIONS

GROUP 1: Air compressors in manifold with throttle valve;
Asphalt plant engineer; Auto grade or similar type machine;
Auto patrol; Backhoe or farm-type tractor, 45 hp and over;
Ballast regulator (RR); Bituminous mixer; Bituminous paver;
Bituminous plant engineer; Bulldozer; Caisson drilling
machine; Cherry picker, 15 ton or over; Chip spreader;
Concrete mixer 21 cu. ft. or over; Core drilling machine;
Crane or derrick with any attachment (including clamshell,
dragline, shovel, backhoe, etc.); Dredge engineer; Dredge
operator; Drilling machine on which the drill is an integral
part; Earth mover, rubber-tired (paddle wheel, 616, 631,
TS-24 or similar type); Earth mover, rubber-tired, tandem
(\$0.50 per hour additional for each bowl); Elevating
grader; Fork lift, 10 ton or over; P.C.C. formless paver
post driver; Highlift shovel, 1 1/2 cu. yd. or over; Hoist,
2 drums and over; Helicopter, crew; Hydraulic boom truck;
keystone, skimmer scoop; Loader, self-propelled (belt,
chain, wheel); Locomotive operator; Mechanic; Mucking

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machine; Panel board concrete plant, central mix type; Paver, Hetherington; Pile driver, skid or crawler; Road paving mixer; Rock breaking plant; Rock crushing plant, portable; Roller (asphalt, waterbound macadam, bituminous macadam, brick surface); Roller with dozer blade; Root rake, tractor-mounted; Self-propelled widener; Stump remover, tractor-mounted; Surface heater and planer; Tandem push tractor (\$0.50 per hour additional); Tractor, boom; Winch or hoe head; Tractor, push; Tractor with scoop; Tractor-mounted spreader; Tree mover; Trench machine, over 24"; Tug boat operator; Well drilling machine; Winch truck with A-frame

GROUP 2: Air compressor with throttle valve or clever brooks-type combination; Backfiller; Backhoe on farm-type tractor, under 45 hp; Bull float; Cherry picker under 15 ton; Chip spreader, self-propelled; Concrete pump; Concrete mesh depressor, independently operated; Concrete spreader, power-driven; End loader under 1 1/2 cu. yd.; Excavating loader, portable; Finishing machine and bull float; Guniting machine; Head greaser; Mesh or steel placer; Multiple tamping machine (RR); P.C.C. concrete belt placer; Pull grader, power control; Refrigerating machine, freezing operation; Ross carrier; Sheepfoot roller (self-propelled); Tamper (multiple vibrating, asphalt, waterbound macadam, bituminous macadam, brick surface); Trench machine, 24" and under; Tube float; Welder

GROUP 3: Assistant plant engineer; Base paver (Jersey or similar type machine); Concrete finishing machine; Concrete mixer, less than 21 cu. ft.; Curb machine; Farm tractor, including farm tractor with all attachments except backhoe and including high lift end loaders of 1 cu. yd. capacity or less; Fire tender on boiler; Hoist, 1 drum; Operator, 5 pieces of minor equipment; Paving breaker; Power broom, self-propelled; Roller, earth and sub-base material; Slurry seal machine; Spike machine (RR); Tamper (multiple vibrating, earth and sub-base material); Throttle valve and fire tender combination on horizontal or upright boiler; Tractaire with drill; Tractor, 50 h.p. or over; Well point system; Widener, APSCO or similar type

GROUP 4: Air compressor; Assistant to engineer, oiler; Automatic dry batch plant; Bituminous distributor; Bituminous patching tamper; Belt spreader; Broom and belt machine; Chair cart, self-propelled; Coleman-type screen; Conveyor, portable; Digger post hole, power-driven; Fork lift, under 10 ton; Form grader; Form tamper, motor-driven; Generator; Hetherington driver; Hydra seeder; Operator, 1 through 4 pieces of minor equipment; Outboard or inboard motor boat; Power curing spraying machine; Power saw, concrete, power-driven; Pug mill; Pull broom, power-type; Seaman tiller; Straw blower or brush mulcher; Striping machine paint, motor-driven; Sub grader; Tractaire, tractor, below 50 h.p.; Truck crane oiler, driver; Spreader; Water pump; Welding machine, 2 of 300 amps or over

ENGI0150-009 04/01/2023

HEAVY, HIGHWAY AND RAILROAD CONSTRUCTION

Terre Haute Regional Airport - HUF | West Quad 6 Unit Box Hangar Phase 2
AIP No. 3-18-0082-057-2024
Issued For Bid | 10/18/2024



ELKHART, FULTON, JASPER, KOSCIUSKO, LAGRANGE, MARSHALL, NEWTON,
NOBLE, PULASKI, and STARKE COUNTIES

	Rates	Fringes
POWER EQUIPMENT OPERATOR		
GROUP 1.....	\$ 33.90	33.75
GROUP 2.....	\$ 32.30	33.75
GROUP 3.....	\$ 31.00	33.75
GROUP 4.....	\$ 29.60	33.75
GROUP 5.....	\$ 24.30	30.85

POWER EQUIPMENT OPERATOR CLASSIFICATIONS

GROUP 1: Air compressors in manifold with throttle valve; Asphalt plant engineer; Auto grade or similar type machine; Auto patrol; Automatic Sub-Grade; Backhoe or farm type tractor, 45 hp and over; Ballast regulator (RR); Barrier Wall Machine; Batch Plants (Concrete & Asphalt); Bituminous mixer; Bituminous paver; Bituminous plant engineer; Boring Machine; Bulldozer; Caisson drilling machine; Cherry picker, 15 ton or over; Chip spreader; Concrete mixer, 21 cu. ft. or over; Concrete Belt Placer; Concrete Paver; Concrete Pump (Truck Mounted); Concrete Saw (track mounted); Concrete Spreader (power driven); Core drilling machine; Crane or derrick with any attachment (including clamshell, dragline, shovel, backhoe, etc.); Curb Machine; Gutter Machine; Dredge engineer; Dredge operator; Drilling machine on which the drill is an integral part; Earthmover, rubber-tired (paddle wheel, 616, 631, TS-24 or similar type); Earthmover, rubber-tired, tandem (.50 per hr. additional for each bowl); Elevating Grader; Forklift (10 ton or over); P.C.C. Formless Paver; Gradall; Gravel Processing Plant (portable); Operator of Guard Rail Post Driver; Highlift Shovel 1-1/2 cu.yd. or over) Frame; Hoist (2 drum & over); Helicopter crew; Hydraulic boom truck; Hydraulic Excavator; Loaded-Self propelled (belt chain wheel); Laser Screed; Locomotive operator; Mechanic; Mucking machine; P.C.C. Concrete Belt Placer; Panel board concrete plant (central mix type); Paver (Hetherington); Pavement Breaker; Pile driver, skid or crawler; Road paving mixer; Rock breaking plant; Rock crushing plant (portable); Roller (asphalt, waterbound macadam, bituminous macadam, brick surface); Roller with dozer blade; Road Widener; Root rake (tractor-mounted); Roto Mill Grinder; Self-propelled widener; Stump remover; Surface heater and planer; Tandem push tractor (\$0.50 per hour additional); Tractor, boom; Winch or hoe head; Tractor (push); Tractor with scoop; Tractor-mounted spreader; Tree mover; Trench machine, over 24"; Tug boat operator; Well drilling machine; Widener (Apsco or similar type); Winch truck with A-frame

GROUP 2: Air compressor with throttle valve or Clever Brooks type combination; Backfiller; Farm type tractor (under 45 H.P.); Cherry picker under 15 ton; Chip spreader (self-propelled); Concrete pump (trailer type); Concrete mesh depressor, independently operated; End loader under 1 1/2 cu. yd.; Excavating loader (portable); Finishing machine and bull float; Gunite machine; Hydraulic Power unit; Head greaser; Mesh or



steel placer; Multiple tamping backhoe on machine (RR); Bull float (bidwell Machine); Refrigerating machine-operation; Ross Carrier; Sheepfoot roller (self-propelled); Tamper-Multiple Vibrating (Asphalt, Waterbound, Macadam, Bituminous Macadam, Brick Surface); Trench machine (24" and under); Tube float; Water Pull/Wagon; Welder
GROUP 3: Plant engineer; Base paver (Jersey or similar type machine); Concrete finishing machine; Concrete mixer, less than 21 cu. ft.; Curb machine; Farm tractor, including farm tractor with all attachments except backhoe and including high lift end loaders of 1 cu. yd. capacity or less; Fireman, on boiler; Hoist, 1 drum; Operator, 3-5 pieces of minor equipment; Paving breaker; Power broom, self-propelled; Roller, earth and sub-base material; Power Saw-Concrete (Power Driven); Slurry seal machine; Spike machine (RR); Sub-surface Material Distributor; Tamper (multiple vibrating, earth and sub-base material); Throttle valve; Throttle Valve and fireman combination on horizontal or upright boiler; Tractaire with drill; Well Point
GROUP 4: Air compressor; Assistant to engineer, oiler; Bituminous patching tamper; Belt spreader; Broom and belt machine; Chair cart, self-propelled; Coleman-type screen; Conveyor, portable; Deck-hand Digger post hole, power-driven; Forklift, under 10 ton; Form grader; Form tamper, motor-driven; Generator; Hetherington driver; Hydra seeder; Mechanic heater; Operator, 2 pieces of minor equipment; Outboard or inboard motor boat; Power curing spraying machine; Pug mill; Pull broom, power type; Seaman tiller; Skid steer loader over 3/4 cu. yd.; Straw blower or brush mulcher; Striping machine paint, motor-driven; Sub-grader; Tractaire; Tractor, below 50 h.p.; Truck crane oiler; Spreader; Water pump

GROUP 5: Skid steer loader under 3/4 cu. yds

ENGI0150-039 06/01/2024

UNDERGROUND & UTILITY CONSTRUCTION:

JASPER, NEWTON, PULASKI AND STARKE COUNTIES:

	Rates	Fringes
POWER EQUIPMENT OPERATOR		
GROUP 1.....	\$ 46.55	44.48
GROUP 2.....	\$ 45.75	44.48
GROUP 3.....	\$ 41.45	44.48
GROUP 4.....	\$ 39.25	44.48
GROUP 5.....	\$ 33.80	44.48

POWER EQUIPMENT OPERATOR CLASSIFICATIONS

GROUP 1: Asphalt plants (construction), Asphalt plant (permanent), Auto Patrol (Maintainer), Automatic Dry Batch Plant, Automated Concrete Placer, Automated Sub-Grader, Automated Slip Form Paver, Automated Finish Machine, Combination Backhoe Front, End Loader Machine (1/2 cu. yd.), Backhoe bucket or over or with attachments), Combination backhoe 1 cu yd, Backhoe bucket or over or with attachments, Ballast Regulator (RR), Belt Loader (stationary), Boring Machine (road), Bulldozer, Concrete Mixer (27 cu. ft. or over), Concrete Pump (truck mounted), Concrete Breaker (truck mounted and self-propelled), Core



Drilling Machine, Cranes and Backhoes (all attachments), Cranes, Hammerhead, Creter Crane, Crushers (concrete, rock, recycling, etc.), Derricks , Derricks (traveling), Dredge Operator, Formless Curb and Gutter Machine (36 inches and over), Formless Curb and Gutter Machine under 36 inches, Gradall and Machines (of a like nature), Guardrail Post Driver (truck mounted), Lead Greaser, Helicopter, Highlift Shovel (3 yd. and over), Hoist (1 drum), Hoist (2, and 3 drums), Hydraulic Power Units (grouting, piledriving and extracting) Hydro or water blaster (self-propelled), Locomotive Operators, Mechanic, Welder, Mucking Machine, Panelboard Concrete Plant (central mix type), Paver (Hetherington), Pile Driver (Skid or Crawler), Road Paving Mixer, Rock Drill Crawler or Skid Rig, Rock Drill (truck Mounted), Ross Carrier, Roto Mill Grinder (36" and over), Roto mill grinder (less than 36"), Throttle Valve and Compressor or Clever Brooks Type Combination, Throttle Valve and Fireman Combination or Horizontal or Upright Boiler, Tournapull or similar type equipment, Tractor (boom), Tractor Drawn Belt Loader with attached Pusher (requires two engineers), Trench Machine, Tug Boat Operator, Wheel Excavator, Winch Tractor with "a" frame, Scoops, Turnapull or similar types machine used in Tandem (add \$1.00 to class 1 hourly rate for each machine attached there to).

GROUP 2: Combination Backhoe Front End Loader Machine with less than 1/2 cu. yd., Backhoe Bucket or with attachments, Bituminous Mixer, Bituminous Paver, Bridge Deck Finisher, Concrete Mixer (less than 27 cu. ft.), Compressor and throttle valve, Compressor (common receiver 3), Greaser, Highlift Shovels (under 3 cu. yds.), Jersey Spreader or Base Paver, Pavement Bump Grinder (self-propelled), Roller (Asphalt, waterbound, Macadam, Bituminous Macadam, Brick Surface, Sheepfoot Roller (self-propelled with blade), Surface Heater and Planer, Tamper (multiple vibrating, asphalt waterbound macadam, bituminous macadam, brick surface), Tractor (push), Tractor with scoop, Widener, Apsco or similar type.

GROUP 3: Back Filler, Bituminous Distributor, Broom and Belt Machine, Bull Float, Compressor (common receiver 2), Concrete cutter wheel type (rockwell), Concrete Finishing Machine, Concrete Spreader (power driven), Digger, Post Hole (power driven), Finishing Machine and Bull Float, Forklift, Form Grader, Form Tamper (motor driven), Hydraulic (boom truck) when used for hauling materials, Laser screed, Multiple Tamping Machine, Paving Breaker, Roller (earth and subbase material), Roller sheepfoot (self-propelled), Sub-grader, Tamper, Multiple Vibrating (earth and subbase material), Tractaire with Drill, Tractor (with all drawn attachments except backhoe and including Highlift, Endloader of 1 cu. yd. capacity and less.

GROUP 4: Air Compressors, Conveyor (all), Fireman on Boiler, Generator, Grout Machine, Power curing Spraying Machine (self-propelled), Broom (self-propelled), Seaman Tiller, Skid steer loaders, Spike Machine (RR), Stripping Machine (paint, self-propelled), Throttle Valve, Welding Machine,



Well Points System.

GROUP 5: Deck Hand, Hetherington Driver, Mechanical Heater (1 to 5), Outboard or Inboard Motor Boat, Oiler, Power Saw (Concrete Power Driven), Water Pump, Grasscutter.

ENGI0181-014 04/01/2024

HEAVY AND HIGHWAY CONSTRUCTION:

BARTHOLOMEW, BROWN, CLARK, CRAWFORD, DEARBORN, DECATUR, DUBOIS, FLOYD, FRANKLIN, GIBSON, HARRISON, JACKSON, JEFFERSON, JENNINGS, LAWRENCE, MARTIN, OHIO, ORANGE, PERRY, PIKE, POSEY, RIPLEY, SCOTT, SPENCER, SWITZERLAND, VANDERBURGH, WARRICK, and WASHINGTON COUNTIES

	Rates	Fringes
Power equipment operators:		
GROUP A.....	\$ 44.70	19.10
GROUP B.....	\$ 42.05	19.10
GROUP C.....	\$ 39.92	19.10

POWER EQUIPMENT OPERATOR CLASSIFICATIONS

GROUP A: Air compressor in manifold with throttle valve; Asphalt plant engineer; Auto grade or similar type machine; Bituminous mixer; Bituminous paver; Bituminous plant engineer; Bulldozer; Caisson drilling machine; Cherry picker, all; Ballast regulator (RR); Chip spreader, self-propelled; Cold grinder or similar type equipment; Concrete mixer, 21 cu. ft. or over; Concrete pump, truck-mounted; Core drilling machine; Crane or derrick with any attachment (including clamshell, dragline, shovel, backhoe, etc.); Dredge operator; Drilling machine on which the drill is an integral part; Earth mover, rubber-tired, tandem 0.50 per hour additional; Elevating grader; Endloader, Hi- lift shovel; P.C.C. formless paver; Gradall; Gravel processing plant, portable; Guardrail post driver operator; Head greaser; Hi-lift shovel, endloader; Hoist (2 drums and over); Helicopter crew; Hydraulic boom truck, Keystone, Skimmer Scoop; Loader, self-propelled (belt, chain wheel); Locomotive operator; Mechanic; Mucking machine; Multi-bank drill operator; Panel board concrete plant, central mix type; Paver, Hetherington; Pile driver, skid or crawler; Road paving mixer; Rock breaking plant; Rock crushing plant, portable; Roller (asphalt, waterbound, macadam, bituminous macadam, brick surface); Roller, with dozer blade; Root rake, tractor-mounted; Stump remover, tractor- mounted; Surface heater and planer; Tandem push tractor, \$0.50 per hour additional; Tractor, boom winch or hoe head; Tractor, push; Tractor with scoop; Tractor-mounted spreader; Tree mover; Trench machine, over 24"; Tug boat operator; Welder; Well drilling machine; Self-propelled widener.

GROUP B: Air compressor with throttle valve or clever brooks-type combination; Backfiller, base paver, Jersey or similar type machine; Bull float; Concrete finishing machine; Concrete mesh depressor, independently operated; Concrete spreader, power- driven; Dredge engineer; Excavator loader, portable; Fire tender on boiler; Forklift, regardless of ton; Hoists, 1 drum; Mesh or steel placer; Minor equipment operator, 5 pieces; Multiple



tamping machine (RR); P.C.C. concrete placer; Paving breaker; Power broom, self-propelled; Pull grader, power-controlled; Refrigerating machine, freezing operation; Roller, earth and sub- base material; Ross carrier (Straddle buggy); Sheepfoot roller, self-propelled without blade; Tamper, multiple\ vibrating (asphalt, waterbound macadam, bituminous macadam, brick surface); Tamper, multiple vibrating (earth and sub-base material); Trench machine, 24" and under; Tube float; Well point system; Widener, Apsco or similar type; Winch truck with A-frame.

GROUP C: Air compressor, oiler; Automatic dry batch plant; Bituminous distributor; Bituminous patching tamper; Belt spreader; Broom and belt machine; Brush burner; Chair cart, self- propelled; Coleman-type screen; Cold grinder oiler; Concrete mixer, less than 21 cu. ft.; Conveyor, portable; Curb machine; Deckhand; Digger (post hole, power-driven); Farm tractor, including farm tractor with all attachments (except backhoe, Hi- lift endloaders); Form grader; Form tamper, motor-driven; Generator; Gunitite machine; Hetherington driver; Hydra seeder; Mechanical heater; Minor equipment operator, 1 through 4 pieces; Curing spraying machine; Power saw, concrete (power-driven); Pug mill pull broom, power type; Seaman tiller; Slurry seal machine; Spike machine; Straw blower or brush mulcher; Stripping machine (paint, motor-driven); Sub grader; Throttle valve; Tractaire with drill; Truck crane and multi-drill oiler, driver; Spreader; Water pump.

ENGI0181-015 04/01/2022

SEWER WATERLINE & UTILITY CONSTRUCTION:

BARTHOLOMEW, BROWN, CLARK, CRAWFORD, DEARBORN, DECATUR, DUBOIS, FLOYD, FRANKLIN, GIBSON, HARRISON, JACKSON, JEFFERSON, JENNINGS, LAWRENCE, MARTIN, OHIO, ORANGE, PERRY, PIKE, POSEY, RIPLEY, SCOTT, SPENCER, SWITZERLAND, VANDERBURGH, WARRICK, and WASHINGTON COUNTIES

	Rates	Fringes
Power equipment operators:		
GROUP A.....	\$ 39.50	19.28
GROUP B.....	\$ 36.85	19.28

SEWER WATERLINE & UTILITY CONSTRUCTION

GROUP A: A-frame winch truck; Air compressor 900 cu. ft. and over; Air tugger; Autograde (CMI); Auto patrol; Backhoe; Ballast regulator (RR); Batch plant (electrical control concrete); Bending machine (pipe); Bituminous plant (engineer); Bituminous plant; Bituminous mixer travel plant; Bituminous paver; Bituminous roller; Buck hoist; Bulldozer; Cableway; Chicago boom; Clamshell; Concrete mixer, 21 cu. ft. or over; Concrete paver, concrete pump, crete; Crane; Craneman; Crusher plant; Derrick; Derrick boat; Dinky; Dope pots (pipeline); Dragline; Dredge operator; Dredge engineer; Drill operator; Elevator grader; Elevator; Ford hoe, or similar type equipment; Forklift; Formless paver; Gantry crane; Gradall; Graderman; Hopto; Hough loader or similar type; Hydro crane; Motor crane; Mucking machine; Multiple tamping machine (RR); Overhead



crane; Pile driver; Pulls; Push dozer; Push boats; Roller (sheep foot); Ross Carrier; Scoop; Shovel; Side boom; Swing crane; Trench machine; Welder (heavy duty; Truck-mounted concrete pump; Truck-mounted drill; Well point; Whirleys. GROUP B: Air compressor, up to 900 cu. ft.; Brakeman; Bull float; Concrete mixer, over 10S and under 21S; Concrete spreader or puddler; Deck engine; Electric vibrator compactor (earth or rock); Finishing machine; Fireman; Greaser, on grease facilities servicing heavy equipment; Material pump; Motor boats; Portable loader; Post hole digger; Power broom; Rock roller; Roller, wobble wheel (earth and rock); Spike machine (RR); Seaman tiller; Spreader rock; Sub grader; Tamping machine; Welding machine; Widener, Apsco or similar type: Bituminous distributor; Cement gun; Concrete saw; Conveyor; Deckhand oiler; Earth roller; Form grader; Generator; Guard rail driver; Heater; JLG lifts; Oiler; Paving joint machine; Power traffic signal; Scissor lift; Steam Jenny; Truck crane oiler; Vibrator; Water pump.

ENGI0841-011 04/01/2024

HEAVY, HIGHWAY AND UTILITY CONSTRUCTION

BOONE, CLAY, DAVIESS, FOUNTAIN, GREENE, HENDRICKS, KNOX,
MONROE, MONTGOMERY, MORGAN OWEN, PARKE, PUTNAM, SULLIVAN,
VERMILLIAN, VIGO, and WARREN COUNTIES

	Rates	Fringes
Power equipment operators:		
GROUP 1.....	\$ 38.80	27.15+a
GROUP 2.....	\$ 32.55	27.15+a

POWER EQUIPMENT OPERATOR CLASSIFICATIONS

GROUP 1: Air Compressor Over 600 CU FT, Air Compressors (2), Compressors hooked in Manifold, Asphalt Plant Engineer, Auto Grade and/or C.M.I. or similar type Machine, Auto Patrol, Motor Patrol, Power Blade, Aspco Paver, Asphalt Planer, Asphalt Rollers, Asphalt Paver Operator, Concrete or Asphalt Milling Machine, Self Propelled Widener, Backhoe and/or Pavement Breaker Attachment, Self Propelled Pavement Breaker, Ballast Regulator (R.R), Bituminous Mixer, Bituminous Paver, Bituminous Plant Engineer, Bulk Cement Plant Engineer, Bulldozer, One Drum Hoist with Tower or Boom, Cableways, Tower Machines, Back Filler, Boom Tractor, Boom or Winch Truck, Winch or Hydraulic Boom Truck, Boring Machine, Bolier Operator, Brush Mulcher, Bull Float, Finishing Machine, Power Cranes, Overhead Cranes, Truck cranes, Piledriver, Skid or Crawler, Guard Rail Post Driver, Tower Cranes, Hydro Crane, Cherry Picker, Draglines, Derricks, Shovels, Clam, Gradalls, Two Drum Machine, Concrete or Asphalt Curb Machine, Self Propelled, Concrete Mixers with Skid, Tournamixer, Concrete Pump (Truck or Skid Mounted), Concrete Plant Engineer, Soil Cement Machine, Formless Paver, Concrete Spreader, Span Saw (and similar types), Chip Spreader, Mesh Placer, Dredging Equipment or Dredge Engineer or Dredge Operator, Tug Boat Operator, Marine Scoops, Ditching Machine with Dual Attachment, Standard or Dinkey Locomotives, Drilling Machine, including Well Testing, Caissons, Shaft or any



similar type Drilling Machine (Well Point Systems), 4 Point Life System (Power Lift or similar type), Mud Cat, Mucking Machine, Sull-Air, Mechanics, Welder, Head Equipment Greaser, Tournapull, Tractor Operating Scoops, Push Tractors, Large Rollers on Earth, Loaders (Track or Rubber Mounted), or similar type Machine, Lull, Tornadozer, Scoopmobiles, Elevating Machines, Power Broom (Self Propelled), Power Sub Grader, Hydra Ax, Farm Tractor with Attachments, Soil Stabilizer (Seaman Tiller, Bo mag, Rago Gator and similar types of equipment), Tree Mover, Stump Remover, Root Rake, Hydra Seeder, Straw Blower, Refrigerating Machine, Freezing Operator, Chair Cart-Self Propelled, Helicopter Crew (3), Ross Carrier or Straddle Buggy or similar Machine, Rock Crusher Plant, Gravel Processing Machine, Pipe Cleaning Machine, Pipe Wrapping Machine, Pipe Bending Machine, Pug Mill, Concrete Bump Grinder Machine, Power Curing Spray Machine, Forklift (except when used for landscaping), Snooper Truck Operator. GROUP 2: Air Compressor 600 cu. ft. and under, Air Tugger, Air Valves, Assistant Concrete Plant Engineer, Assistant Asphalt Plant Engineer, Asphalt Plant Fireman, Bulk Cement Plant Equipment Greaser, Concrete Mixers without Skips, Curbing Machine, Concrete Saw (Self Propelled), Conveyors, Cement Blimps, Ditching Machine under 6", Distributor Operator On trucks, Deck Hands, Elevators when used for hoisting material, Engine Tenders, Fork Lift (when used for landscaping), Farm Tractor, Fireman, Fireman on Paint or Dope Pots, Form Tamper, Form Grader, Flex Plane, Generators (two to four), or Welding Machines or Water Pumps, within 400 feet, Guniting Machine, Machine Mounted Post Hole Digger, Mude Jack, One Drum Machines without Tower or Boom, One Water Pump, One Welding Machine, Outboard or Inboard Motor Boat, Pull Broom (Power Type, Siphons and Pulsometer, Switchman, Striping and or Painting Machine (motor driven), Slurry Seal Machine, Track Jack, Temporary Heat, Throttle Valve, Tube Float, Tractaire, Wagon Drill, Multiple Tamping Machine (R.R.), Spike Machine (R.R.), Mechanical Heaters, Brush Burner, Vacuum Truck (Super Sucker and similar types).

FOOTNOTES:

- A. Employees operating booms from 149Ft. to 199 Ft. including jib, shall receive an additional seventy-five Cents (.75) per hour above the rate. Employees operating booms over 199 Ft. including jib, shall receive an additional one dollar and twenty-five cents (\$1.25) per hour above the regular rate.
- B. Employees operating scoops, pulls, or tractors hooked in tandem shall receive an additional one dollar (\$1.00) per hour above the regular rate.
- C. Employees operating scoops, pulls, or tractors pulling any other hauling unit in tandem shall receive an additional one dollar (\$1.00) per hour above the regular rate.
- D. Underground work - Employees working in tunnels, shafts, etc. shall be paid a thirty percent (30%) premium above the wage rate.



IRON0022-001 06/01/2024

BARTHOLOMEW, BENTON, BOONE, BROWN, CARROLL, CASS, CLAY,
CLINTON, DAVIESS (REMAINDER OF COUNTY), DECATUR (W 3/4),
DELAWARE (REMAINDER OF COUNTY), FAYETTE (W 1/3),
FOUNTAIN, FRANKLIN (NW TIP), FULTON (REMAINDER OF COUNTY), GRANT
(REMAINDER OF COUNTY), GREENE, HAMILTON, HANCOCK, HENDRICKS,
HENRY, HOWARD, JACKSON, JASPER (SOUTHEASTERN 1/2), JENNINGS
(NORTHWEST 2/3), JOHNSON, KNOX (REMAINDER OF COUNTY), LAWRENCE,
MADISON, MARION, MARTIN (NW 2/3), MIAMI (REMAINDER OF COUNTY),
MONROE, MONTGOMERY, MORGAN, NEWTON (SOUTHERN 1/2), OWEN, PARKE,
PULASKI (REMAINDER OF COUNTY), PUTNAM, RANDOLPH (SW TIP), RUSH
(REMAINDER OF COUNTY), SHELBY, SULLIVAN, TIPPECANOE, TIPTON,
VERMILLION, VIGO, WAYNE, WARREN AND WHITE COUNTIES:

	Rates	Fringes
IRONWORKER.....	\$ 36.70	25.69

The following holidays shall be observed: New Year's Day,
Memorial Day, Independence Day, Labor Day, Thanksgiving Day
and the day after Thanksgiving and Christmas Day. Any
holiday which occurs on a Sunday shall be observed the
following Monday, unless the legal observance of these
holidays is changed by law.

IRON0044-010 06/01/2024

DEARBORN, DECATUR (REMAINDER OF COUNTY), FAYETTE (REMAINDER OF
COUNTY), FRANKLIN (REMAINDER OF COUNTY), JEFFERSON (REMAINDER
OF COUNTY), JENNINGS (REMAINDER OF COUNTY), OHIO, RIPLEY, RUSH
(SOUTHEASTERN TIP), SWITZERLAND, AND UNION (SOUTHERN 1/3)

	Rates	Fringes
Ironworkers:		
FENCE ERECTORS.....	\$ 30.75	22.30
ORNAMENTAL.....	\$ 35.39	24.80
STRUCTURAL, MACHINERY		
MOVERS, RIGGERS.....	\$ 35.39	24.80

IRON0070-002 06/01/2024

CLARK, CRAWFORD, FLOYD, HARRISON, JACKSON (SOUTHERN 3/4);
JEFFERSON (EXCLUDING NORTHEASTERN TIP); JENNINGS (SOUTHERN
3/4), LAWRENCE (SOUTHERN 2/3), MARTIN (SOUTHEASTERN 2/3),
ORANGE, PERRY (EASTERN 3/4); SCOTT AND WASHINGTON COUNTIES:

	Rates	Fringes
IRONWORKER.....	\$ 34.59	25.00

IRON0070-016 06/01/2024

DEARBORN, DECATUR (REMAINDER OF COUNTY), FAYETTE (SE CORNER),
FRANKLIN (S 3/4), OHIO, RIPLEY (REM. OF COUNTY), SWITZERLAND
(REMAINDER OF COUNTY) and JENNINGS (NE TIP) COUNTIES

	Rates	Fringes
IRONWORKER (Reinforcing).....	\$ 34.59	25.00

IRON0103-001 04/01/2023

DAVIESS (S 1/2), DUBOIS, GIBSON, KNOX (S 1/2), MARTIN (SW 1/3),
PERRY (W 1/4), PIKE, POSEY, SPENCER, VANDERBURGH, AND WARRICK

	Rates	Fringes
IRONWORKER.....	\$ 31.99	25.55



IRON0147-004 06/01/2024

ADAMS, ALLEN, BLACKFORD, DEKALB, DELAWARE (NORTHEAST THIRD OF COUNTY), FULTON (EASTERN PART), GRANT (EXCLUDING SOUTHWEST PORTION), HUNTINGTON, JAY, MIAMI (NORTHEAST HALF), NOBLE (EXCLUDING NORTHEAST TIP), STEUBEN, WABASH, WELLS, and WHITLEY COUNTIES

	Rates	Fringes
IRONWORKER.....	\$ 34.20	30.51

IRON0290-004 06/01/2024

FAYETTE (NE 1/4), RANDOLPH (S. PART OF COUNTY EXCLUDING WINCHESTER BUT INCLUDING UNION CITY) UNION (NORTHERN 2/3) AND WAYNE (REMAINDER OF COUNTY) COUNTIES

	Rates	Fringes
Ironworkers:.....	\$ 35.39	24.35

IRON0292-005 06/01/2024

ELKHART, FULTON (North 2/3), KOSCIUSKO (Remainder of County), LAGRANGE (West 1/3), MARSHALL, MIAMI (Northwestern Tip), NOBLE (Northwestern Tip), PULASKI (Northeast Half), and STARKE COUNTIES

	Rates	Fringes
IRONWORKER.....	\$ 37.83	24.75

IRON0395-002 06/01/2024

JASPER (NORTHERN 1/2), NEWTON (NORTHERN 1/2), PULASKI (NORTHWESTERN TIP) COUNTIES

	Rates	Fringes
IRONWORKER		
IRONWORKERS.....	\$ 46.33	39.67
SHEETER.....	\$ 46.58	39.67

LABO0041-003 04/01/2024

HEAVY & HIGHWAY CONSTRUCTION
NEWTON COUNTY

	Rates	Fringes
LABORERS		
Group 1.....	\$ 32.95	26.50
Group 2.....	\$ 33.25	26.50
Group 3.....	\$ 33.95	26.50

LABORERS CLASSIFICATIONS (HEAVY AND HIGHWAY)

GROUP 1: Construction Laborer, Carpenter Tender, Fence Erector, Grade Checker, Guard Rail Erector, Continuous Steel Rod or Mat Installer, Wire Mesh Layer, Joint Man (Mortar, Mastic, and all other types), Lighting Installer (Permanent or Temporary), Lineman for Automatic Grade Maker on Paving Machines, Mortar Man, Multi-Plant Erector, Rip-rap Installer (all Products and Materials), Road Marking and Delineation Laborer, Setting and Placing of all Precast Concrete Products, Sing Installation including supporting structure, Spraying of all Epoxy, Curing Compound, or Like Material, Flagperson, Air Tool, Power Tool Operator, Asphalt Raker Man, Batch Truck Dumper, Bridge Hand Rail EREctor, Handler (bulk or bag cement), Chain Saw Man, Concrete Puddler, Concrete Rubber, Concrete



Saw Operator, Core Drill Operator, Eye Level, Hand Blade Operator Hydro Seeder Man, Motor Driven Georgia Buggy Operator, Power Driven Compactor or Taper Operator, Power Saw Operator, Pump Crete Assembly Man, Sreed Man or Screw Man on Asphalt Paver, Regar Installer, Sandblaster Man, Sealer Applicator for Asphalt (toxic), Setting and Placing pre-stressed on Pre-cast Concrete Structural Members, Side Rail Setters (for Sidewalk, Side Ditches, Radii, and Pavement), Spreader Box Tender (manua or power driven), Straw Blower Man, Subsureface Drain and Culvert Pipe Layer, Concrete Conveyor, Horizontal Boring and Jackman and Sheetman, Pipe Greade Man, Winch and Windless Operator Conduit Installer, Sod Layer
GROUP 2: Cutting Torch Burner, Laser Beam Aligner, Manhole Erector, Sewer Pipe Layer, Water Line Installer, Temporary or Permanent Welders (electric or Oxy Acetylene)
GROUP 3: Air Track and Wagon Drillman, Dynamite and Powder Man, Concrete Barrier Rail Form Setter, Concrete Saw Joint Control Cutting

LABO0041-005 04/01/2024
UTILITY CONSTRUCTION
JASPER & NEWTON COUNTIES

	Rates	Fringes
Laborers:		
GROUP 1.....	\$ 32.95	26.50
GROUP 2.....	\$ 33.25	26.50
GROUP 3.....	\$ 33.95	26.50

LABORERS CLASSIFICATIONS (UTILITY CONSTRUCTION)

GROUP 1: Construction laborer; Fence erector; Flagger; Grade checker; Guard rail erector; Wire mesh layer; Joint man (mortar, mastic and all other types); Lighting installer (permanent or temporary); Lineman for automatic grade maker on paving machines; Mortar man; Multi-plate erector; Rip-rap installer (all products and materials); Road marking and delineation laborer; Setting and placing of all precast concrete products; Sign installation including supporting structure; Spraying of all epoxy, curing compound, or like material; sod layer; Air tool, power tool, and power equipment operator; Asphalt lute man; Asphalt raker man; Batch truck dumper; Bridge handrail erector; Handler (bulk or bag cement); Chain saw man; concrete puddler; concrete rubber; Concrete saw operator; Core drill operator, eye level; Hand blade operator; Hydro seeder man; Motor-driven Georgia buggy operator; Power-driven compactor or tamper operator; Power saw operator; Pumpcrete assembly man; Screed man or screw man on asphalt paver; Rebar installer; Sandblaster man; Sealer applicator for asphalt (toxic); Setting and placing prestressed or precast concrete structural memebers; Side rail setter (for sidewalks, side ditches, radii, and pavements); Spreader box tender (manual or power-driven); Straw blower man; Subsurface drain and culvert pipe layer; Transverse and longitudinal hand bull float man; Concrete conveyor assembly man; Horizontal boring and jacking man; Jackman and sheetman; Pipe grade man; Winch and windlass



operator

GROUP 2: Cutting torch burner; Laser beam aligner; Manhole erector; Sewer pipe layer; Water line installer, temporary or permanent; Welder (electric or oxy-acetylene) in connection with waterline and sewer work, Hod Carrier (tending bricklayers); Tying and associated grouting of utility lines

GROUP 3: Air track and wagon drillman; Concrete barrier rail form setter; Dynamite and powder man; General leadman; Concrete Saw Joint Control cutting

LABO0041-006 04/01/2024

HEAVY & HIGHWAY CONSTRUCTION

JASPER & STARKE COUNTIES

	Rates	Fringes
LABORERS		
Group 1.....	\$ 30.18	26.50
Group 2.....	\$ 33.25	26.50
Group 3.....	\$ 33.95	26.50
LABORERS CLASSIFICATIONS (HEAVY AND HIGHWAY)		

GROUP 1: Construction Laborer, Carpenter Tender, Fence Erector, Grade Checker, Guard Rail Erector, Continuous Steel Rod or Mat Installer, Wire Mesh Layer, Joint Man (Mortar, Mastic, and all other types), Lighting Installer (Permanent or Temporary), Lineman for Automatic Grade Maker on Paving Machines, Mortar Man, Multi-Plant Erector, Rip-rap Installer (all Products and Materials), Road Marking and Delineation Laborer, Setting and Placing of all Precast Concrete Products, Sing Installation including supporting structure, Spraying of all Epoxy, Curing Compound, or Like Material, Flagperson, Air Tool, Power Tool Operator, Asphalt Raker Man, Batch Truck Dumper, Bridge Hand Rail Erector, Handler (bulk or bag cement), Chain Saw Man, Concrete Puddler, Concrete Rubber, Concrete Saw Operator, Core Drill Operator, Eye Level, Hand Blade Operator Hydro Seeder Man, Motor Driven Georgia Buggy Operator, Power Driven Compactor or Taper Operator, Power Saw Operator, Pumpcrete Assembly Man, Sreed Man or Screw Man on Asphalt Paver, Regar Installer, Sandblaster Man, Sealer Applicator for Asphalt (toxic), Setting and Placing pre-stressed on Pre-cast Concrete Structural Members, Side Rail Setters (for Sidewalk, Side Ditches, Radii, and Pavement), Spreader Box Tender (manual or power driven), Straw Blower Man, Subsurface Drain and Culvert Pipe Layer, Concrete Conveyor, Horizontal Boring and Jackman and Sheetman, Pipe Greade Man, Winch and Windless Operator Conduit Installer, Sod Layer

GROUP 2: Cutting Torch Burner, Laser Beam Aligner, Manhole Erector, Sewer Pipe Layer, Water Line Installer, Temporary or Permanent Welders (electric or Oxy Acetylene)

GROUP 3: Air Track and Wagon Drillman, Dynamite and Powder Man, Concrete Barrier Rail Form Setter, Concrete Saw Joint Control Cutting

LABO0081-003 04/01/2024



UTILITY CONSTRUCTION
STARKE COUNTY

	Rates	Fringes
Laborers:		
GROUP 1.....	\$ 30.18	26.50
GROUP 2.....	\$ 33.25	26.50
GROUP 3.....	\$ 33.95	26.50
LABORERS CLASSIFICATIONS (UTILITY CONSTRUCTION)		
GROUP 1: Construction laborer; Fence erector; Flagger; Grade checker; Guard rail erector; Wire mesh layer; Joint man (mortar, mastic and all other types); Lighting installer (permanent or temporary); Lineman for automatic grade maker on paving machines; Mortar man; Multi-plate erector; Rip-rap installer (all products and materials); Road marking and delineation laborer; Setting and placing of all precast concrete products; Sign installation including supporting structure; Spraying of all epoxy, curing compound, or like material; sod layer; Air tool, power tool, and power equipment operator; Asphalt lute man; Asphalt raker man; Batch truck dumper; Bridge handrail erector; Handler (bulk or bag cement); Chain saw man; concrete puddler; concrete rubber; Concrete saw operator; Core drill operator, eye level; Hand blade operator; Hydro seeder man; Motor-driven Georgia buggy operator; Power-driven compactor or tamper operator; Power saw operator; Pumpcrete assembly man; Screed man or screw man on asphalt paver; Rebar installer; Sandblaster man; Sealer applicator for asphalt (toxic); Setting and placing prestressed or precast concrete structural members; Side rail setter (for sidewalks, side ditches, radii, and pavements); Spreader box tender (manual or power-driven); Straw blower man; Subsurface drain and culvert pipe layer; Transverse and longitudinal hand bull float man; Concrete conveyor assembly man; Horizontal boring and jacking man; Jackman and sheetman; Pipe grade man; Winch and windlass operator		
GROUP 2: Cutting torch burner; Laser beam aligner; Manhole erector; Sewer pipe layer; Water line installer, temporary or permanent; Welder (electric or oxy-acetylene) in connection with waterline and sewer work, Hod Carrier (tending bricklayers); TVing and associated grouting of utility lines		
GROUP 3: Air track and wagon drillman; Concrete barrier rail form setter; Dynamite and powder man; General leadman; Concrete Saw Joint Control cutting		

LABO0120-003 04/01/2024
UTILITY CONSTRUCTION
MARION & SHELBY COUNTIES

	Rates	Fringes
Laborers:		
GROUP 1.....	\$ 29.60	18.22
GROUP 2.....	\$ 30.10	18.22
GROUP 3.....	\$ 30.60	18.22
LABORERS CLASSIFICATIONS (UTILITY CONSTRUCTION)		
GROUP 1: Construction laborer; Fence erector; Flagger; Grade		



checker; Guard rail erector; Wire mesh layer; Joint man (mortar, mastic and all other types); Lighting installer (permanent or temporary); Lineman for automatic grade maker on paving machines; Mortar man; Multi-plate erector; Rip-rap installer (all products and materials); Road marking and delineation laborer; Setting and placing of all precast concrete products; Sign installation including supporting structure; Spraying of all epoxy, curing compound, or like material; sod layer; Air tool, power tool, and power equipment operator; Asphalt lute man; Asphalt raker man; Batch truck dumper; Bridge handrail erector; Handler (bulk or bag cement); Chain saw man; concrete puddler; concrete rubber; Concrete saw operator; Core drill operator, eye level; Hand blade operator; Hydro seeder man; Motor-driven Georgia buggy operator; Power-driven compactor or tamper operator; Power saw operator; Pumpcrete assembly man; Screed man or screw man on asphalt paver; Rebar installer; Sandblaster man; Sealer applicator for asphalt (toxic); Setting and placing prestressed or precast concrete structural members; Side rail setter (for sidewalks, side ditches, radii, and pavements); Spreader box tender (manual or power-driven); Straw blower man; Subsurface drain and culvert pipe layer; Transverse and longitudinal hand bull float man; Concrete conveyor assembly man; Horizontal boring and jacking man; Jackman and sheetman; Pipe grade man; Winch and windlass operator

GROUP 2: Cutting torch burner; Laser beam aligner; Manhole erector; Sewer pipe layer; Water line installer, temporary or permanent; Welder (electric or oxy-acetylene) in connection with waterline and sewer work, Tying and associated grouting of utility lines

GROUP 3: Air track and wagon drillman; Concrete barrier rail form setter; Dynamite and powder man; General leadman; Concrete Saw Joint Control cutting; Hod Carrier (tending bricklayers)

LABO0204-003 04/01/2024

UTILITY CONSTRUCTION

CLAY, FOUNTAIN, GREENE, HENDRICKS, OWEN, PARKE, PUTNAM,
SULLIVAN, VERMILLION, VIGO, & WARREN COUNTIES

	Rates	Fringes
Laborers:		
GROUP 1.....	\$ 29.60	18.22
GROUP 2.....	\$ 30.10	18.22
GROUP 3.....	\$ 30.60	18.22

LABORERS CLASSIFICATIONS (UTILITY CONSTRUCTION)

GROUP 1: Construction laborer; Fence erector; Flagger; Grade checker; Guard rail erector; Wire mesh layer; Joint man (mortar, mastic and all other types); Lighting installer (permanent or temporary); Lineman for automatic grade maker on paving machines; Mortar man; Multi-plate erector; Rip-rap installer (all products and materials); Road marking and delineation laborer; Setting and placing of all precast concrete products; Sign installation including supporting structure; Spraying of all epoxy, curing



compound, or like material; sod layer; Air tool, power tool, and power equipment operator; Asphalt lute man; Asphalt raker man; Batch truck dumper; Bridge handrail erector; Handler (bulk or bag cement); Chain saw man; concrete puddler; concrete rubber; Concrete saw operator; Core drill operator, eye level; Hand blade operator; Hydro seeder man; Motor-driven Georgia buggy operator; Power-driven compactor or tamper operator; Power saw operator; Pumpcrete assembly man; Screed man or screw man on asphalt paver; Rebar installer; Sandblaster man; Sealer applicator for asphalt (toxic); Setting and placing prestressed or precast concrete structural memebbers; Side rail setter (for sidewalks, side ditches, radii, and pavements); Spreader box tender (manual or power-driven); Straw blower man; Subsurface drain and culvert pipe layer; Transverse and longitudinal hand bull float man; Concrete conveyor assembly man; Horizontal boring and jacking man; Jackman and sheetman; Pipe grade man; Winch and windlass operator

GROUP 2: Cutting torch burner; Laser beam aligner; Manhole erector; Sewer pipe layer; Water line installer, temporary or permanent; Welder (electric or exy-acetylene) in connection with waterline and sewer work, TVing and associated grouting of utility lines

GROUP 3: Air track and wagon drillman; Concrete barrier rail form setter; Dynamite and powder man; General leadman; Hod Carrier (tending bricklayers); Concrete Saw Joint Control cutting

LABO0213-003 04/01/2024

UTILITY CONSTRUCTION

ADAMS, ALLEN, DEKALB, HUNTINGTON, NOBLE, STEUBEN, WABASH, WELLS, & WHITLEY COUNTIES

	Rates	Fringes
Laborers:		
GROUP 1.....	\$ 29.60	18.22
GROUP 2.....	\$ 30.10	18.22
GROUP 3.....	\$ 30.60	18.22

LABORERS CLASSIFICATIONS (UTILITY CONSTRUCTION)

GROUP 1: Construction laborer; Fence erector; Flagger; Grade checker; Guard rail erector; Wire mesh layer; Joint man (mortar, mastic and all other types); Lighting installer (permanent or temporary); Lineman for automatic grade maker on paving machines; Mortar man; Multi-plate erector; Rip-rap installer (all products and materials); Road marking and delineation laborer; Setting and placing of all precast concrete products; Sign installation including supporting structure; Spraying of all epoxy, curing compound, or like material; sod layer; Air tool, power tool, and power equipment operator; Asphalt lute man; Asphalt raker man; Batch truck dumper; Bridge handrail erector; Handler (bulk or bag cement); Chain saw man; concrete puddler; concrete rubber; Concrete saw operator; Core drill operator, eye level; Hand blade operator; Hydro seeder man; Motor-driven Georgia buggy operator; Power-driven compactor or tamper operator; Power saw



operator; Pumpcrete assembly man; Screed man or screw man on asphalt paver; Rebar installer; Sandblaster man; Sealer applicator for asphalt (toxic); Setting and placing prestressed or precast concrete structural members; Side rail setter (for sidewalks, side ditches, radii, and pavements); Spreader box tender (manual or power-driven); Straw blower man; Subsurface drain and culvert pipe layer; Transverse and longitudinal hand bull float man; Concrete conveyor assembly man; Horizontal boring and jacking man; Jackman and sheetman; Pipe grade man; Winch and windlass operator

GROUP 2: Cutting torch burner; Laser beam aligner; Manhole erector; Sewer pipe layer; Water line installer, temporary or permanent; Welder (electric or oxy-acetylene) in connection with waterline and sewer work, Tying and associated grouting of utility lines

GROUP 3: Air track and wagon drillman; Concrete barrier rail form setter; Dynamite and powder man; General leadman; Hod Carrier (tending bricklayers); Concrete Saw Joint Control cutting

LABO0274-005 04/01/2024

UTILITY CONSTRUCTION

BENTON, BOONE, CARROLL, CASS, CLINTON, FULTON, HOWARD, MIAMI, MONTGOMERY, PULASKI, TIPPECANOE, TIPTON, and WHITE COUNTIES

Rates Fringes

Laborers:

GROUP 1.....	\$ 29.60	18.22
GROUP 2.....	\$ 30.10	18.22
GROUP 3.....	\$ 30.60	18.22

LABORERS CLASSIFICATIONS (UTILITY CONSTRUCTION)

GROUP 1: Construction laborer; Fence erector; Flagger; Grade checker; Guard rail erector; Wire mesh layer; Joint man (mortar, mastic and all other types); Lighting installer (permanent or temporary); Lineman for automatic grade maker on paving machines; Mortar man; Multi-plate erector; Rip-rap installer (all products and materials); Road marking and delineation laborer; Setting and placing of all precast concrete products; Sign installation including supporting structure; Spraying of all epoxy, curing compound, or like material; sod layer; Air tool, power tool, and power equipment operator; Asphalt lute man; Asphalt raker man; Batch truck dumper; Bridge handrail erector; Handler (bulk or bag cement); Chain saw man; concrete puddler; concrete rubber; Concrete saw operator; Core drill operator, eye level; Hand blade operator; Hydro seeder man; Motor-driven Georgia buggy operator; Power-driven compactor or tamper operator; Power saw operator; Pumpcrete assembly man; Screed man or screw man on asphalt paver; Rebar installer; Sandblaster man; Sealer applicator for asphalt (toxic); Setting and placing prestressed or precast concrete structural members; Side rail setter (for sidewalks, side ditches, radii, and pavements); Spreader box tender (manual or power-driven); Straw blower man; Subsurface drain and culvert pipe layer; Transverse and longitudinal hand bull float man; Concrete



conveyor assembly man; Horizontal boring and jacking man; Jackman and sheetman; Pipe grade man; Winch and windlass operator

GROUP 2: Cutting torch burner; Laser beam aligner; Manhole erector; Sewer pipe layer; Water line installer, temporary or permanent; Welder (electric or oxy-acetylene) in connection with waterline and sewer work, TVing and associated grouting of utility lines

GROUP 3: Air track and wagon drillman; Concrete barrier rail form setter; Dynamite and powder man; General leadman; Hod Carrier (tending bricklayers); Concrete Saw Joint Control cutting

LABO0561-015 04/01/2024

UTILITY CONSTRUCTION

DAVIESS, DUBOIS, GIBSON, KNOX, PIKE, POSEY, SPENCER, VANDERBURGH, & WARRICK COUNTIES

	Rates	Fringes
Laborers:		
GROUP 1.....	\$ 29.60	18.22
GROUP 2.....	\$ 30.10	18.22
GROUP 3.....	\$ 30.60	18.22

LABORERS CLASSIFICATIONS (UTILITY CONSTRUCTION)

GROUP 1: Construction laborer; Fence erector; Flagger; Grade checker; Guard rail erector; Wire mesh layer; Joint man (mortar, mastic and all other types); Lighting installer (permanent or temporary); Lineman for automatic grade maker on paving machines; Mortar man; Multi-plate erector; Rip-rap installer (all products and materials); Road marking and delineation laborer; Setting and placing of all precast concrete products; Sign installation including supporting structure; Spraying of all epoxy, curing compound, or like material; sod layer; Air tool, power tool, and power equipment operator; Asphalt lute man; Asphalt raker man; Batch truck dumper; Bridge handrail erector; Handler (bulk or bag cement); Chain saw man; concrete puddler; concrete rubber; Concrete saw operator; Core drill operator, eye level; Hand blade operator; Hydro seeder man; Motor-driven Georgia buggy operator; Power-driven compactor or tamper operator; Power saw operator; Pumpcrete assembly man; Screed man or screw man on asphalt paver; Rebar installer; Sandblaster man; Sealer applicator for asphalt (toxic); Setting and placing prestressed or precast concrete structural members; Side rail setter (for sidewalks, side ditches, radii, and pavements); Spreader box tender (manual or power-driven); Straw blower man; Subsurface drain and culvert pipe layer; Transverse and longitudinal hand bull float man; Concrete conveyor assembly man; Horizontal boring and jacking man; Jackman and sheetman; Pipe grade man; Winch and windlass operator

GROUP 2: Cutting torch burner; Laser beam aligner; Manhole erector; Sewer pipe layer; Water line installer, temporary or permanent; Welder (electric or oxy-acetylene) in connection with waterline and sewer work, Hod Carrier (tending bricklayers); TVing and associated grouting of



utility lines

GROUP 3: Air track and wagon drillman; Concrete barrier rail
form setter; Dynamite and powder man; General leadman;
Concrete Saw Joint Control cutting

LABO0645-005 04/01/2024

UTILITY CONSTRUCTION

ELKHART COUNTY

	Rates	Fringes
Laborers:		
GROUP 1.....	\$ 29.60	18.22
GROUP 2.....	\$ 30.10	18.22
GROUP 3.....	\$ 30.60	18.22

LABORERS CLASSIFICATIONS (UTILITY CONSTRUCTION)

GROUP 1: Construction laborer; Fence erector; Flagger; Grade checker; Guard rail erector; Wire mesh layer; Joint man (mortar, mastic and all other types); Lighting installer (permanent or temporary); Lineman for automatic grade maker on paving machines; Mortar man; Multi-plate erector; Rip-rap installer (all products and materials); Road marking and delineation laborer; Setting and placing of all precast concrete products; Sign installation including supporting structure; Spraying of all epoxy, curing compound, or like material; sod layer; Air tool, power tool, and power equipment operator; Asphalt lute man; Asphalt raker man; Batch truck dumper; Bridge handrail erector; Handler (bulk or bag cement); Chain saw man; concrete puddler; concrete rubber; Concrete saw operator; Core drill operator, eye level; Hand blade operator; Hydro seeder man; Motor-driven Georgia buggy operator; Power-driven compactor or tamper operator; Power saw operator; Pumpcrete assembly man; Screed man or screw man on asphalt paver; Rebar installer; Sandblaster man; Sealer applicator for asphalt (toxic); Setting and placing prestressed or precast concrete structural members; Side rail setter (for sidewalks, side ditches, radii, and pavements); Spreader box tender (manual or power-driven); Straw blower man; Subsurface drain and culvert pipe layer; Transverse and longitudinal hand bull float man; Concrete conveyor assembly man; Horizontal boring and jacking man; Jackman and sheetman; Pipe grade man; Winch and windlass operator

GROUP 2: Cutting torch burner; Laser beam aligner; Manhole erector; Sewer pipe layer; Water line installer, temporary or permanent; Welder (electric or oxy-acetylene) in connection with waterline and sewer work, Hod Carrier (tending bricklayers); TVing and associated grouting of utility lines

GROUP 3: Air track and wagon drillman; Concrete barrier rail form setter; Dynamite and powder man; General leadman; Concrete Saw Joint Control cutting

LABO0645-006 04/01/2024

UTILITY CONSTRUCTION

KOSCIUSKO, LAGRANGE, & MARSHALL COUNTIES

	Rates	Fringes
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Laborers:

GROUP 1.....	\$ 29.60	18.22
GROUP 2.....	\$ 30.10	18.22
GROUP 3.....	\$ 30.60	18.22

LABORERS CLASSIFICATIONS (UTILITY CONSTRUCTION)

GROUP 1: Construction laborer; Fence erector; Flagger; Grade checker; Guard rail erector; Wire mesh layer; Joint man (mortar, mastic and all other types); Lighting installer (permanent or temporary); Lineman for automatic grade maker on paving machines; Mortar man; Multi-plate erector; Rip-rap installer (all products and materials); Road marking and delineation laborer; Setting and placing of all precast concrete products; Sign installation including supporting structure; Spraying of all epoxy, curing compound, or like material; sod layer; Air tool, power tool, and power equipment operator; Asphalt lute man; Asphalt raker man; Batch truck dumper; Bridge handrail erector; Handler (bulk or bag cement); Chain saw man; concrete puddler; concrete rubber; Concrete saw operator; Core drill operator, eye level; Hand blade operator; Hydro seeder man; Motor-driven Georgia buggy operator; Power-driven compactor or tamper operator; Power saw operator; Pumpcrete assembly man; Screed man or screw man on asphalt paver; Rebar installer; Sandblaster man; Sealer applicator for asphalt (toxic); Setting and placing prestressed or precast concrete structural members; Side rail setter (for sidewalks, side ditches, radii, and pavements); Spreader box tender (manual or power-driven); Straw blower man; Subsurface drain and culvert pipe layer; Transverse and longitudinal hand bull float man; Concrete conveyor assembly man; Horizontal boring and jacking man; Jackman and sheetman; Pipe grade man; Winch and windlass operator

GROUP 2: Cutting torch burner; Laser beam aligner; Manhole erector; Sewer pipe layer; Water line installer, temporary or permanent; Welder (electric or oxy-acetylene) in connection with waterline and sewer work, Hod Carrier (tending bricklayers); TVing and associated grouting of utility lines

GROUP 3: Air track and wagon drillman; Concrete barrier rail form setter; Dynamite and powder man; General leadman; Concrete Saw Joint Control cutting

LABO0741-007 04/01/2024

UTILITY CONSTRUCTION

BARTHOLOMEW, BROWN, DEARBORN, DECATUR, FRANKLIN, JACKSON, JENNINGS, JOHNSON, LAWRENCE, MARTIN, MONROE, MORGAN, OHIO, ORANGE & RIPLEY COUNTIES

Rates Fringes

Laborers:

GROUP 1.....	\$ 29.60	18.22
GROUP 2.....	\$ 30.10	18.22
GROUP 3.....	\$ 30.60	18.22

LABORERS CLASSIFICATIONS (UTILITY CONSTRUCTION)

GROUP 1: Construction laborer; Fence erector; Flagger; Grade checker; Guard rail erector; Wire mesh layer; Joint man



(mortar, mastic and all other types); Lighting installer (permanent or temporary); Lineman for automatic grade maker on paving machines; Mortar man; Multi-plate erector; Rip-rap installer (all products and materials); Road marking and delineation laborer; Setting and placing of all precast concrete products; Sign installation including supporting structure; Spraying of all epoxy, curing compound, or like material; sod layer; Air tool, power tool, and power equipment operator; Asphalt lute man; Asphalt raker man; Batch truck dumper; Bridge handrail erector; Handler (bulk or bag cement); Chain saw man; concrete puddler; concrete rubber; Concrete saw operator; Core drill operator, eye level; Hand blade operator; Hydro seeder man; Motor-driven Georgia buggy operator; Power-driven compactor or tamper operator; Power saw operator; Pumpcrete assembly man; Screed man or screw man on asphalt paver; Rebar installer; Sandblaster man; Sealer applicator for asphalt (toxic); Setting and placing prestressed or precast concrete structural members; Side rail setter (for sidewalks, side ditches, radii, and pavements); Spreader box tender (manual or power-driven); Straw blower man; Subsurface drain and culvert pipe layer; Transverse and longitudinal hand bull float man; Concrete conveyor assembly man; Horizontal boring and jacking man; Jackman and sheetman; Pipe grade man; Winch and windlass operator

GROUP 2: Cutting torch burner; Laser beam aligner; Manhole erector; Sewer pipe layer; Water line installer, temporary or permanent; Welder (electric or oxy-acetylene) in connection with waterline and sewer work, Tving and associated grouting of utility lines

GROUP 3: Air track and wagon drillman; Concrete barrier rail form setter; Dynamite and powder man; General leadman; Hod Carrier (tending bricklayers); Concrete Saw Joint Control cutting

LABO0795-004 04/01/2024

UTILITY CONSTRUCTION

CLARK, CRAWFORD, FLOYD, HARRISON, JEFFERSON, PERRY, SCOTT, SWITZERLAND, & WASHINGTON COUNTIES

	Rates	Fringes
Laborers:		
GROUP 1.....	\$ 29.60	18.22
GROUP 2.....	\$ 30.10	18.22
GROUP 3.....	\$ 30.60	18.22

LABORERS CLASSIFICATIONS (UTILITY CONSTRUCTION)

GROUP 1: Construction laborer; Fence erector; Flagger; Grade checker; Guard rail erector; Wire mesh layer; Joint man (mortar, mastic and all other types); Lighting installer (permanent or temporary); Lineman for automatic grade maker on paving machines; Mortar man; Multi-plate erector; Rip-rap installer (all products and materials); Road marking and delineation laborer; Setting and placing of all precast concrete products; Sign installation including supporting structure; Spraying of all epoxy, curing compound, or like material; sod layer; Air tool, power



tool, and power equipment operator; Asphalt lute man; Asphalt raker man; Batch truck dumper; Bridge handrail erector; Handler (bulk or bag cement); Chain saw man; concrete puddler; concrete rubber; Concrete saw operator; Core drill operator, eye level; Hand blade operator; Hydro seeder man; Motor-driven Georgia buggy operator; Power-driven compactor or tamper operator; Power saw operator; Pumpcrete assembly man; Screed man or screw man on asphalt paver; Rebar installer; Sandblaster man; Sealer applicator for asphalt (toxic); Setting and placing prestressed or precast concrete structural memebbers; Side rail setter (for sidewalks, side ditches, radii, and pavements); Spreader box tender (manual or power-driven); Straw blower man; Subsurface drain and culvert pipe layer; Transverse and longitudinal hand bull float man; Concrete conveyor assembly man; Horizontal boring and jacking man; Jackman and sheetman; Pipe grade man; Winch and windlass operator

GROUP 2: Cutting torch burner; Laser beam aligner; Manhole erector; Sewer pipe layer; Water line installer, temporary or permanent; Welder (electric or exy-acetylene) in connection with waterline and sewer work, Hod Carrier (tending bricklayers); TVing and associated grouting of utility lines

GROUP 3: Air track and wagon drillman; Concrete barrier rail form setter; Dynamite and powder man; General leadman; Concrete Saw Joint Control cutting

LABO0999-001 04/01/2023

HEAVY AND HIGHWAY CONSTRUCTION

ALL COUNTIES EXCEPT: Jasper, Newton, & Starke

	Rates	Fringes
Laborers:		
GROUP 1.....	\$ 28.50	17.72
GROUP 2.....	\$ 29.00	17.72
GROUP 3.....	\$ 29.50	17.72

LABORERS CLASSIFICATIONS

GROUP 1: Construction laborer; Fence erector; Flagger; Grade checker; Guard rail erector; Wire mesh layer; Joint man (mortar, mastic and all other types); Lighting installer (permanent or temporary); Lineman for automatic grade maker on paving machines; Mortar man; Multi-plate erector; Rip-rap installer (all products and materials); Road marking and delineation laborer; Setting and placing of all precast concrete products; Sign installation including supporting structure; Spraying of all epoxy, curing compound, or like material; sod layer; Air tool, power tool, and power equipment operator; Asphalt lute man; Asphalt raker man; Batch truck dumper; Bridge handrail erector; Handler (bulk or bag cement); Chain saw man; concrete puddler; concrete rubber; Concrete saw operator; Core drill operator, eye level; Hand blade operator; Hydro seeder man; Motor-driven Georgia buggy operator; Power-driven compactor or tamper operator; Power saw operator; Pumpcrete assembly man; Screed man or screw man on asphalt paver; Rebar installer; Sandblaster man; Sealer



applicator for asphalt (toxic); Setting and placing prestressed or precast concrete structural members; Side rail setter (for sidewalks, side ditches, radii, and pavements); Spreader box tender (manual or power-driven); Straw blower man; Subsurface drain and culvert pipe layer; Transverse and longitudinal hand bull float man; Concrete conveyor assembly man; Horizontal boring and jacking man; Jackman and sheetman; Pipe grade man; Winch and windlass operator

GROUP 2: Cutting torch burner; Laser beam aligner; Manhole erector; Sewer pipe layer; Water line installer, temporary or permanent; Welder (electric or oxy-acetylene) in connection with waterline and sewer work, Tying and associated grouting of utility lines

GROUP 3: Air track and wagon drillman; Concrete barrier rail form setter; Dynamite and powder man; General leadman; Hod Carrier (tending bricklayers); Concrete Saw Joint Control cutting

LABO1112-003 04/01/2024

UTILITY CONSTRUCTION

BLACKFORD, DELAWARE, FAYETTE, GRANT, HAMILTON, HANCOCK, HENRY, JAY, MADISON, RANDOLPH, RUSH, UNION & WAYNE COUNTIES

	Rates	Fringes
Laborers:		
GROUP 1.....	\$ 29.10	18.22
GROUP 2.....	\$ 30.10	18.22
GROUP 3.....	\$ 30.60	18.22

LABORERS CLASSIFICATIONS (UTILITY CONSTRUCTION)

GROUP 1: Construction laborer; Fence erector; Flagger; Grade checker; Guard rail erector; Wire mesh layer; Joint man (mortar, mastic and all other types); Lighting installer (permanent or temporary); Lineman for automatic grade maker on paving machines; Mortar man; Multi-plate erector; Rip-rap installer (all products and materials); Road marking and delineation laborer; Setting and placing of all precast concrete products; Sign installation including supporting structure; Spraying of all epoxy, curing compound, or like material; sod layer; Air tool, power tool, and power equipment operator; Asphalt lute man; Asphalt raker man; Batch truck dumper; Bridge handrail erector; Handler (bulk or bag cement); Chain saw man; concrete puddler; concrete rubber; Concrete saw operator; Core drill operator, eye level; Hand blade operator; Hydro seeder man; Motor-driven Georgia buggy operator; Power-driven compactor or tamper operator; Power saw operator; Pumpcrete assembly man; Screed man or screw man on asphalt paver; Rebar installer; Sandblaster man; Sealer applicator for asphalt (toxic); Setting and placing prestressed or precast concrete structural members; Side rail setter (for sidewalks, side ditches, radii, and pavements); Spreader box tender (manual or power-driven); Straw blower man; Subsurface drain and culvert pipe layer; Transverse and longitudinal hand bull float man; Concrete conveyor assembly man; Horizontal boring and jacking man; Jackman and sheetman; Pipe grade man; Winch and windlass



operator

GROUP 2: Cutting torch burner; Laser beam aligner; Manhole erector; Sewer pipe layer; Water line installer, temporary or permanent; Welder (electric or oxy-acetylene) in connection with waterline and sewer work, Tving and associated grouting of utility lines

GROUP 3: Air track and wagon drillman; Concrete barrier rail form setter; Dynamite and powder man; Hod Carrier (tending bricklayers); General leadman; Concrete Saw Joint Control cutting

PAIN0012-006 05/01/2024
COMMERCIAL AND INDUSTRIAL
DEARBORN, OHIO, RIPLEY AND SWITZERLAND COUNTIES:

	Rates	Fringes
PAINTER		
Bridges, Lead Abatement.....	\$ 31.68	14.46
Brush & Roller,		
Paperhanger, Drywall Taping.\$	30.34	14.46
Sandblasting, Waterblasting.\$	31.68	14.46
Spray.....	\$ 28.79	14.46

PAIN0027-005 06/01/2024
NEWTON COUNTY, West of Highway #41

	Rates	Fringes
GLAZIER.....	\$ 51.55	43.99

PAIN0047-005 06/01/2024
BARTHOLOMEW, BOONE, BROWN, DECATUR, HAMILTON, HANCOCK,
HENDRICKS, JACKSON, JENNINGS, JOHNSON, LAWRENCE, MARION,
MARTIN, MONROE, MORGAN, ORANGE, AND SHELBY COUNTIES

	Rates	Fringes
PAINTER		
BRIDGE WORK		
Concrete/Masonry Bridges...\$	26.44	13.30
Steel Bridges.....\$	30.50	14.50
NON-BRIDGE WORK		
Brush, Roller.....\$	31.02	16.89
Spray and Sand-Blasting....\$	30.52	15.89

PAIN0080-001 06/01/2024
BENTON, CARROLL, CASS, CLINTON, FOUNTAIN, MONTGOMERY TIPPECANOE
AND WARREN COUNTIES

	Rates	Fringes
PAINTER		
Brush and Roller.....\$	30.00	17.96
Spray and Sandblasting.....\$	30.95	17.96

PAIN0091-007 06/01/2024
ELKHART, FULTON, KOSCIUSKO AND MARSHALL COUNTIES

	Rates	Fringes
PAINTER		
Brush & Roller, Drywall		
Taping & Finishing,		
Vinyl/Paper Hanging.....\$	31.00	18.62
Spray.....\$	31.50	18.62



PAIN0118-005 06/01/2024
CLARK, CRAWFORD, FLOYD, HARRISON JEFFERSON, SCOTT AND
WASHINGTON COUNTIES

	Rates	Fringes
Painters:		
Heavy Construction		
Brush, Roller &		
Paperhanger.....	\$ 22.20	14.07
Spray, Sandblast &		
Waterblast.....	\$ 23.45	13.19
Highway Construction &		
Railroad Bridges		
Brush, Roller &		
Paperhanger.....	\$ 36.30	15.85
Spray, Sandblast &		
Waterblast.....	\$ 36.30	15.85

PAIN0156-001 04/01/2024
DAVIESS, DUBOIS, GIBZSON, KNOX, PERRY, PIKE, POSSEY, SPENCER,
VANDERBURGH, AND WARRICK COUNTIES

	Rates	Fringes
Painters:		
BRUSH & ROLLER OF MASTICS,		
CREOSOTES, KEWINCH KOATE,		
& COAL TAR EPOXY.....	\$ 30.62	19.32
BRUSH & ROLLER.....	\$ 29.62	19.32
DRYWALL FINISHERS.....	\$ 30.37	19.32
SPRAY of MASTICS		
CREOSOTES, KWINCH KOATE,		
COAL TAR EPOXY.....	\$ 30.62	19.32
SPRAY, SANDBLAST, POWER		
TOOLS, WATERBLAST & STEAM		
CLEANING.....	\$ 30.62	19.32

FOOTNOTE A:

All Structures over 40? \$0.75/ hour above base wage
All Structures over 75? \$1.50/ hour above base wage
All Structures over 100? \$2.50/ hour above base wage

PAIN0197-001 06/01/2024
CLAY, GREENE, OWEN, PARKE, PUTNAM, SULLIVAN, VERMILLION AND
VIGO COUNTIES:

	Rates	Fringes
Painters:		
Brush & Roller.....	\$ 30.25	15.50
Sandblasting.....	\$ 32.25	15.50
Spray & Pot Man.....	\$ 30.75	15.50

FOOTNOTE A: \$1.00 premium for work on structures over 40 ft.
above floor/ground level
\$2.00 premium for work on structures over 100 ft
above floor/ground level

PAIN0387-004 11/01/2023
DEARBORN, FRANKLIN, OHIO, RIPLEY, and SWITZERLAND COUNTIES

	Rates	Fringes
GLAZIER.....	\$ 31.95	17.75



PAIN0460-004 06/01/2024

JASPER, NEWTON, PULASKI, STARKE AND WHITE COUNTIES

	Rates	Fringes
Painters:		
Brush & Roller		
Building.....	\$ 39.00	30.96
Brush and Roller		
Heavy and Highway.....	\$ 39.00	30.96
Drywall Taping & Finishing..	\$ 39.80	30.96

PAIN0469-002 06/01/2023

ADAMS, ALLEN, DEKALB, GRANT, HUNTINGTON, LAGRANGE, NOBLE,
STEUBEN, WABASH, WELLS, and WHITLEY COUNTIES

	Rates	Fringes
Painters:		
Brush, Roller,		
Paperhanger, & Drywall		
Finishing.....	\$ 25.04	15.32
Lead Abatement.....	\$ 30.24	15.32
Spray & Sandblast Pot		
Tenders and Ground		
Personnel.....	\$ 25.05	15.32
Spray, Sandblast, Power		
Tools, Waterblast, & Steam		
Cleaning.....	\$ 25.04	15.32

PAIN0669-001 05/01/2023

BLACKFORD, DELAWARE, FAYETTE, FRANKLIN, HENRY, HOWARD, JAY,
MADISON, MIAMI, RANDOLPH, RUSH, TIPTON, UNION and WAYNE COUNTIES

	Rates	Fringes
Painters:		
Brush; Roller;		
Paperhanging; Drywall		
Finishers.....	\$ 23.70	15.79
Spray/Waterblasting;		
Sandblasting.....	\$ 24.70	15.79

PAIN1165-014 07/01/2024

CLARK, CRAWFORD, DAVIESS, DUBOIS, FLOYD, GIBSON, HARRISION,
JEFFERSON, KNOX, MARTIN, ORANGE, PERRY, PIKE, POSEY, SCOTT,
SPENCER, VANDERBURGH, WARRICK AND WASHINGTON

	Rates	Fringes
GLAZIER.....	\$ 32.86	19.34

PAIN1165-017 07/01/2024

ADAMS, ALLEN, BLACKFORD, DE KALB, GRANT, HUNTINGTON, JAY,
NOBLE, STEUBEN, WABASH, WELLS AND WHITLEY COUNTIES

	Rates	Fringes
GLAZIER.....	\$ 28.75	18.72

PAIN1165-018 07/01/2023

JASPER and NEWTON (East of Highway #41) COUNTIES

	Rates	Fringes
GLAZIER.....	\$ 40.09	27.98



PAIN1165-019 07/01/2024

ELKHART, FULTON, KOSCIUSKO, LAGRANGE, MARSHALL, PULASKI, and
STARKE COUNTY

	Rates	Fringes
GLAZIER.....	\$ 32.22	23.57

PAIN1165-022 01/01/2024

BARTHOLOMEW, BENTON, BOONE, BROWN, CARROLL, CASS, CLAY,
CLINTON, DECATUR, DELEWARE, FAYETTE, FOUNTAIN, GREENE, HAMILTON,
HANCOCK, HENDRICKS, HENRY, HOWARD, JACKSON, JENNINGS, JOHNSON,
LAWRENCE, MADISON, MARION, MIAMI, MONROE, MONTGOMERY, MORGAN,
OWEN, PARKE, PUTNAM, RANDOLPH, RUSH, SHELBY, SULLIVAN,
TIPPECANOE, TIPTON, UNION, VIGO, VERMILLION, WARREN, WAYNE, and
WHITE COUNTIES

	Rates	Fringes
GLAZIER.....	\$ 34.03	20.05

PLAS0075-001 06/01/2017

CLAY, OWEN, PARKE, PUTNAM, VERMILLION AND VIGO COUNTIES:

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER...	\$ 25.75	13.50

PLAS0075-002 06/01/2017

GREENE and SULLIVAN COUNTIES

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER...	\$ 28.50	13.50

PLAS0101-001 06/01/2018

ELKHART, FULTON AND MARSHALL COUNTIES; PULASKI COUNTY (SOUTHERN
1/2):

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER...	\$ 31.50	14.30

PLAS0101-008 06/01/2014

ADAMS, ALLEN, DEKALB, HUNTINGTON, KOSCIUSKO, LAGRANGE, NOBLE,
STEUBEN, WELLS AND WHITLEY COUNTIES

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER...	\$ 23.38	11.94
PLASTERER.....	\$ 25.69	11.75

PLAS0438-003 06/01/2018

PULASKI (NORTHERN 2/3), JASPER (N. EASTERN PORTION OF WEST TO
BUT NOT INCLUDING WHEATFIELD), ALL OF STARKE COUNTY

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER...	\$ 36.01	25.40

PLAS0692-002 06/01/2024

AREA #46

BARTHOLOMEW, BOONE, BROWN, CLARK, CLAY, CRAWFORD, DAVIESS,
DUBOIS, GIBSON, HENDRICKS, JACKSON, JEFFERSON, JENNINGS,
JOHNSON, KNOX, LAWRENCE, MARION, MARTIN, MONROE, MORGAN,
ORANGE, OWEN, PARKE, PERRY, PIKE, POSEY, PUTNAM, SCOTT, SHELBY,
SPENCER, VANDERBURGH, VERMILLION, VIGO and WARRICK COUNTIES

	Rates	Fringes
PLASTERER.....	\$ 30.50	17.62



PLAS0692-008 05/01/2024

BARTHOLOMEW, BROWN, CLARK, DEARBORN, FLOYD, JACKSON, JEFFERSON, JENNINGS, LAWRENCE, OHIO, ORANGE, RIPLEY, SCOTT, SHELBY, SWITZERLAND, and WASHINGTON Counties

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER		
AREA #821.....	\$ 29.02	17.60

PLAS0692-009 06/01/2024

AREA #83

BLACKFORD, DELAWARE, GRANT, HAMILTON (Northern Part), HANCOCK (Northern Part), JAY, MADISON, TIPTON, and WABASH COUNTIES

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER...	\$ 31.25	20.34
PLASTERER.....	\$ 29.99	16.60

PLAS0692-011 06/01/2024

AREA #83

DECATUR, FAYETTE, FRANKLIN, HENRY, RANDOLPH, RUSH, UNION and WAYNE COUNTIES

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER...	\$ 31.25	20.34
PLASTERER.....	\$ 29.99	16.60

PLAS0692-015 06/01/2024

AREA #121

BENTON, CARROLL, CASS, CLINTON, FOUNTAIN, HOWARD, MIAMI, MONTGOMERY, TIPPECANOE, WARREN, WHITE and VERMILLION (Northern Part) COUNTIES

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER...	\$ 31.25	20.20
PLASTERER.....	\$ 33.76	20.05

PLAS0692-018 06/01/2024

AREA #165

NEWTON COUNTIES

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER...	\$ 39.74	24.05

PLAS0692-022 06/01/2024

Southward on Rt. No. 49 to the JASPER, BENTON and WHITE County lines, including the City Limits of Wheatfield, Rensselaer and Remington, Indiana. To the West, the boundary of NEWTON County

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER		
AREA #406.....	\$ 38.50	25.29

PLAS0692-023 06/01/2024

AREA #532

BOONE, HAMILTON (SOUTH HALF OF COUNTY NORTH TO NEW ROUTE INDIANA #32 INCLUDING NOBLESVILLE); HANCOCK COUNTY (SOUTHERN AND WESTERN PART OF HANCOCK COUNTY, NORTH TO BUT NOT INCLUDING FORTVILLE); HENDRICKS, JOHNSON, MARION and MORGAN COUNTIES

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER...	\$ 33.15	20.06
Slip Form Shift Work.....	\$ 33.00	19.56



Swinging/Suspended Scaffold.\$ 32.25 19.56

PLAS0692-027 04/01/2024

AREA #566

CRAWFORD, DAVIESS, DUBOIS, GIBSON, HARRISON, KNOX, MARTIN,
PERRY, PIKE, POSEY, SPENCER, VANDERBURGH and WARRICK COUNTIES

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER....	\$ 31.25	19.71

PLUM0136-003 04/01/2024

BROWN, DAVIESS, DUBOIS, GIBSON, JACKSON, LAWRENCE, MARTIN,
MONROE, ORANGE, OWEN, PERRY, PIKE, POSEY, SPENCER, VANDERBURGH,
WARRICK, and WASHINGTON Counties

	Rates	Fringes
Plumbers and Pipefitters.....	\$ 43.67	21.35

PLUM0157-002 07/01/2024

BENTON, CARROLL, CLINTON, FOUNTAIN, MONTGOMERY, TIPPECANOE,
WARREN AND WHITE COUNTIES:

	Rates	Fringes
Plumbers and Pipefitters.....	\$ 44.50	22.50

PLUM0166-001 06/01/2024

ADAMS, ALLEN, BLACKFORD, DE KALB, GRANT, HUNTINGTON, NOBLE,
STEUBEN, WABASH, WELLS, and WHITLEY COUNTIES

	Rates	Fringes
Plumber and Steamfitter.....	\$ 41.50	21.66

PLUM0166-002 06/01/2024

ELKHART, KOSCIUSKO, and LAGRANGE COUNTIES

	Rates	Fringes
PLUMBER.....	\$ 41.50	21.66

PLUM0172-001 06/01/2024

JASPER (S of the N. Side of the City of Rensselaer), MARSHALL,
PULASKI and STARKE COUNTIES

	Rates	Fringes
Plumber, Pipefitter, Steamfitter.....	\$ 40.78	23.09

PLUM0210-003 09/01/2024

JASPER (to the City of Rensselaer) and NEWTON COUNTIES

	Rates	Fringes
PLUMBER.....	\$ 47.52	28.41

PLUM0392-006 06/01/2024

DEARBORN, OHIO, RIPLEY, AND SWITZERLAND COUNTIES

	Rates	Fringes
Plumbers and Pipefitters.....	\$ 40.70	29.52

PLUM0440-002 06/04/2024

BARTHOLOMEW, BOONE, HAMILTON, HANCOCK, HENDRICKS, HOWARD,
JOHNSON AND MARION COUNTIES; MIAMI COUNTY (SOUTH OF A STRAIGHT
LINE WHERE ROUTE 218 ENTERS W. BOUNDARY); MORGAN, SHELBY and
TIPTON COUNTIES

	Rates	Fringes
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Plumbers and Pipefitters.....	\$ 46.50	19.89
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PLUM0440-004 06/01/2024

FAYETTE, FRANKLIN, HENRY, RANDOLPH, RUSH, UNION and WAYNE
COUNTIES

	Rates	Fringes
Plumber and Steamfitter.....	\$ 46.50	19.89

PLUM0502-001 08/01/2016

CLARK, FLOYD AND HARRISON COUNTIES

	Rates	Fringes
PLUMBER/PIPEFITTER.....	\$ 32.00	20.13

PLUM0597-004 06/01/2018

JASPER (Excluding the city limits of Rensselaer), AND NEWTON
(Entire County)

	Rates	Fringes
PIPEFITTER.....	\$ 48.50	31.12

ROOF0023-004 06/01/2024

ADAMS, ALLEN, DEKALB, ELKHART, FULTON, HUNTINGTON, KOSCIUSKO,
LAGRANGE, MARSHALL, MIAMI, NOBLE, PULASKI, STARKE, STEUBEN,
WABASH, WELLS, and WHITLEY COUNTIES

	Rates	Fringes
ROOFER		
COMPOSITION.....	\$ 34.55	21.04
SLATE & TILE.....	\$ 36.05	21.04

ROOF0026-002 06/01/2023

JASPER AND NEWTON COUNTIES

	Rates	Fringes
ROOFER.....	\$ 42.50	25.76

ROOF0042-002 08/01/2024

DEARBORN, OHIO and RIPLEY COUNTIES

	Rates	Fringes
ROOFER.....	\$ 33.00	19.51

ROOF0075-001 05/01/2024

FAYETTE, RANDOLPH, UNION, and WAYNE Counties

	Rates	Fringes
ROOFER		
Composition.....	\$ 28.73	20.81
Slate & Tile.....	\$ 28.95	20.81

ROOF0075-002 05/01/2021

CLINTON COUNTY

	Rates	Fringes
ROOFER		
Composition.....	\$ 24.38	20.09
Slate & Tile.....	\$ 24.60	20.09

ROOF0106-006 04/01/2023

CRAWFORD, DAVIESS, DUBOIS, GIBSON KNOX, MARTIN, ORANGE PERRY,
PIKE, POSEY, SPENCER, VANDERBURGH AND WARRICK

	Rates	Fringes
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ROOFER

COMPOSITION.....	\$ 31.60	19.43
SLATE & TILE.....	\$ 31.60	19.43

ROOF0106-012 07/01/2024CLARK, FLOYD, HARRISON JEFFERSON, SCOTT, SWITZERLAND, and
WASHINGTON Counties

	Rates	Fringes
ROOFER.....	\$ 30.25	13.71

* ROOF0119-002 09/01/2024BARTHOLOMEW, BLACKFORD, BOONE, BROWN, DECATUR, DELAWARE,
FRANKLIN, GRANT, HAMILTON, HANCOCK, HENDRICKS, HENRY, HOWARD,
JACKSON, JAY, JENNINGS, JOHNSON, LAWRENCE, MADISON, MARION,
MONROE, MONTGOMERY, MORGAN, PUTNAM, RUSH, SHELBY, and TIPTON
Counties

	Rates	Fringes
ROOFER.....	\$ 31.00	15.11

ROOF0150-002 07/01/2024CLAY, GREENE, OWEN, PARKE, SULLIVAN, VERMILLION AND VIGO
COUNTIES

	Rates	Fringes
ROOFER.....	\$ 30.00	18.30

SHEE0020-003 07/01/2023

	Rates	Fringes
Sheet metal worker (HVAC Duct Work).....	\$ 34.58	29.98

SHEE0020-010 07/01/2023BARTHOLOMEW, BOONE, BROWN, DECATUR, DELAWARE, FAYETTE,
FRANKLIN, HAMILTON, HANCOCK, HENDRICKS, HENRY, JACKSON,
JENNINGS, JOHNSON, LAWRENCE, MADISON, MARION, MONROE,
MONTGOMERY, MORGAN, ORANGE, RIPLEY, RUSH, SHELBY, TIPTON, UNION
AND WASHINGTON COUNTIES

	Rates	Fringes
SHEET METAL WORKER.....	\$ 40.91	25.22

SHEE0020-011 07/01/2023

CLINTON COUNTY

	Rates	Fringes
SHEET METAL WORKER.....	\$ 37.82	26.37

SHEE0020-024 07/01/2023CLAY, GREENE, MARTIN, OWEN, PARKE, PUTNAM, SULLIVAN,
VERMILLION, and VIGO COUNTIES

	Rates	Fringes
Sheet metal worker.....	\$ 40.91	25.22

TEAM0135-003 04/01/2024

REMAINING COUNTIES

	Rates	Fringes
TRUCK DRIVER		
GROUP 1.....	\$ 33.86	19.74
GROUP 2.....	\$ 33.91	19.74



GROUP 3.....	\$ 33.96	19.74
GROUP 4.....	\$ 34.01	19.74
GROUP 5.....	\$ 34.06	19.74
GROUP 6.....	\$ 34.11	19.74
GROUP 7.....	\$ 34.16	19.74
GROUP 8.....	\$ 34.21	19.74
GROUP 9.....	\$ 34.26	19.74
GROUP10.....	\$ 33.71	19.74
GROUP11.....	\$ 34.26	19.74
GROUP12.....	\$ 34.36	19.74

TRUCK DRIVER CLASSIFICATIONS

GROUP 1: Single/batches axle straight trucks; Batch trucks, wet or dry 3 (34E) axle or less; Single axle Grease and maintenance truck

GROUP 2: Single axle fuel and water trucks

GROUP 3: Single axle "dog-legs", and tandem truck or dog-legs; Winch trucks or A-frames when used for transportation purposes; Drivers on batch trucks, wet or dry over 3 (34E) batches and tandem axle grease and maintenance truck

GROUP 4: Tandem axle fuel trucks; tandem axle water trucks; butuminous distributors (two-man)

GROUP 5: Tandem trucks over 15 tons payload; Single axle semi trucks; Farm tractors hauling material; Mixer trucks (all types); Trucks pulling tilt-top trailer single axle; Single axle low- boys; Truck-mounted pavement breakers

GROUP 6: Tandem trucks or "dog-legs"; Semi-water Truck; Sprinkler Truck; Heavy equipment-type water wagons, 5,000 gallons and under; butuminous distributors (one-man)

GROUP 7: Tri-axle trucks; Tandem axle semi trucks; Equipment when not self-loaded or pusher loaded, such as Koehring or similar dumpsters, track trucks, Euclid bottom dump and hug bottom dump, tournatrailers, tournarockers, Acey wagons or for similar equipment (12 cu yds or less); Mobile mixer truck; Tandem Axle trucks pulling tilt-top trailer; Tandem - Axle lowboy; Tri- Axle batch Truck; Tri-Axle grease and maintenance truck

GROUP 8: Tandem-tandem semi trucks; Truck mechanics and welders; Heavy equipment-type water wagon over 5,000 gallons; Tri-Axle Trucks pulling tilt-top trailer; Low-boys, tandem-tandem axle

GROUP 9: Low-boys, tandem tri-axle; Acey wagons up to and including 3 buckets; Equipment when not self-loaded or pusher loaded, such as koehring or similar dumpsters, Track Trucks, Euclid bottom dump and hug bottom dump, Tournatrailers, Tournarockers, Acey wagons or for similar equipment (over 12 cu yds.)

GROUP 10: Pick-up trucks

GROUP 11: Helpers; Greasers; Tire men; Batch board tenders; Warehouseman

GROUP 12: Acey wagon (over 3 buckets); Quad Axle Trucks; Articulating Dump

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.
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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave



for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at <https://www.dol.gov/agencies/whd/government-contracts>. Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average



calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier. Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier. A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

State Adopted Rate Identifiers

Classifications listed under the "SA" identifier indicate that the prevailing wage rate set by a state (or local) government was adopted under 29 C.F.R. §1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 01/03/2024 reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a position on a wage determination matter
- * a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.



Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION"



PART 7: SAFETY DOCUMENTS



COORDINATION

During construction, airport operational safety is of paramount importance. Coordination of project information to all individuals involved with the project is essential for ensuring safe operations are maintained at all times. In order to minimize potential for incidents during construction, it is imperative that all individuals involved with the project and/or airport users be kept informed of any and all changes to operations. Discussions of operational safety will need to take place throughout the entire life of the project, including design, bidding, pre-construction, and construction. Meetings between the Resident Engineer, Terre Haute Regional Airport Authority, Contractor, sub-contractors, FAA Safety Inspectors, and any potential stakeholders may be required to discuss specific project related impacts to operations. All parties involved have an involvement in making sure operational safety on the airport is maintained during construction per the requirements set forth in this plan. Notice to users of operational changes due to construction will be issued via NOTAM's by the airport. No closures will be permitted without the pertinent NOTAM in place for each specific closure. Emergency access for both airport (ARFF) and off-airport (Police, Fire, and EMT) based emergency service shall be maintained at all times. Routing for such traffic shall be determined and made known to all supervisor personnel involved in the construction project. Coordination of this access will be proposed by the Contractor and approved by the Resident Engineer.

A pre-construction meeting will be held after the project has been awarded and prior to the Contractor beginning work or staging major construction material and equipment on-site. The Airport Sponsor, the Contractor's on-site supervisory staff, and representatives from the Engineer shall be present. Safety and this document will be a significant topic on the agenda. Operational safety during construction will be a main topic of discussion at the pre-construction meeting.

Contractor Progress Meetings

The Contractor is required to have weekly construction progress meetings to discuss all relevant construction topics including safety reminders, scheduling, and general construction issues. Attendance of the Contractor, Resident Engineer, Airport, and any other pertinent personnel are required at these meetings. Operational safety will be a standing agenda item for discussion during these progress meetings. A review of the Contractor's adherence to the project's Construction Safety and Phasing Plan (CSPP) and Safety Plan Compliance Document (SPCD) will be made at each meeting. Immediate correction of any deficiencies or violations will be required. The location and time of the weekly meetings will be determined during the pre-construction meeting. Where operational safety is concerned, the Contractor shall update the Resident Engineer overseeing construction on daily basis or more frequently if needed, of any changes or Contractor concerns.

Scope or Schedule Changes

In the event of a scope or schedule change, the Contractor shall notify the Resident Engineer immediately. All parties involved will need to evaluate the impact(s) of the change and will determine what measures will need to be taken to maintain a safe construction site. Change in the scope or duration of the project may necessitate revisions to the Construction Safety and Phase Plan (CSPP).

FAA ATO Coordination

The FAA ATO will need to be notified immediately of any changes that affect aircraft movement within the airport which include airway facility shutdowns and restarts. The Airport will be responsible for coordinating any changes including NOTAM's to the FAA ATO. It is not anticipated that any shutdown to FAA facilities will be required for this project. All project limits are outside the critical area of any navigational aid (NAVAID).



PHASING

In order to minimize disruptions to airport operations during construction, construction will be broken up by work areas to limit the amount of aircraft operational areas affected at any given time. The phasing plan proposed was developed with help from the Airport Sponsor and is considered to be the most effective way of maintaining the required aircraft access, while imposing the least amount of impact on construction operations, and without sacrificing safety. The phasing for this project is presented below, and is visually depicted in the Construction Safety Drawings (C006 through C-007) attached at the back of this document.

This project contains both a Base and Alternative Bid and have the same schedules with the exception of building sizes and contract times. They both contain the same phases, with the exception of the alternative bid being permitted more contract time due to the larger size of the building.

Construction Safety Drawings

The Construction Safety Drawings can be found in the construction plan set.



AIRPORT SAFETY AND PHASING REQUIREMENTS

The Contractor must give special attention to the Construction Safety and Phasing Plan sheets, and the Airport Safety Requirements on the Safety Notes sheet. All requirements will be strictly enforced. Failure to comply will be grounds for dismissal of any employee, subcontractor, supplier, and contractor.

Vehicle/Pedestrian Deviations (V/PDs) into an active runway or taxiway will face a penalty of varying amount depending on the severity of the deviation. Should the Contractor or its subcontracting forces be responsible for a runway incursion or incident where an unauthorized construction vehicle or person is on an active runway or taxiway that may or have adversely affect safety (airplane taking off or landing will collide with the object) in the opinion of the Terre Haute Regional Airport and FAA shall result in financial damages to be deducted from the final contract payment amount as shown in the table below:

Airport Requirements		
Runway Incursion Category	Description	Penalty
Category A	A serious incident in which a collision was narrowly avoided	Up to \$100,000 Fine, Rescission of Driving Privileges, And Removal from Site.
Category B	An incident in which separation decreases and there is a significant potential for collision, which may result in a time critical corrective/evasive response to avoid a collision	Up to \$50,000 Fine, Rescission of Driving Privileges, And Removal from Site.
Category C	An incident characterized by ample time and/or distance to avoid a collision	Up to \$25,000 – 1 st Fine (Up to \$50,000 2 nd Fine) with Written Warning and Removal from Site
Category D	An incident that meets the definition of runway incursion such as incorrect presence of a single vehicle/person/aircraft on the protected area of a surface designated for the landing, take-off or taxiing of aircraft but with no immediate safety consequences	Up to \$25,000 – 1 st Fine (Up to \$50,000 2 nd Fine and Removal from Site) with Written Warning and Removal from Site
Vehicle/Pedestrian Deviation	An incident of unauthorized access of a single person/vehicle/aircraft on the movement area, non-runway, without prior permission from the air traffic control tower.	Up to \$25,000 – 1 st Fine (Up to \$50,000 2 nd Fine and Removal from Site) with Written Warning and Removal from Site

CONSTRUCTION PROJECT DAILY SAFETY INSPECTION CHECKLIST

The Project Daily Safety Inspection Checklist is on the following pages.



Airport: Terre Haute Regional Airport
AIP Project No.: 3-18-0082-0057-2024
Project Name: West Quad Development Phase II
Date: _____

Construction Project Daily Safety Inspection Checklist

The situations identified below are potentially hazardous conditions that may occur during airport construction projects. Safety area encroachments, unauthorized and improper ground vehicle operations, and unmarked or uncovered holes and trenches near aircraft operating surfaces pose the most prevalent threats to airport operational safety during airport construction projects. The list below is one tool that the airport operator or contractor may use to aid in identifying and correcting potentially hazardous conditions. It should be customized as appropriate for each project including information such as the date, time and name of the person conducting the inspection.

Potentially Hazardous Conditions

Item	Action Required (Describe)	No Action Required (Check)
Excavation adjacent to runways, taxiways, and aprons improperly backfilled.		<input type="checkbox"/>
Mounds of earth, construction materials, temporary structures, and other obstacles near any open runway, taxiway, or taxi lane; in the related Object Free area and aircraft approach or departure areas/zones; or obstructing any sign or marking.		<input type="checkbox"/>
Runway resurfacing projects resulting in lips exceeding 3 inch (7.6 cm) from pavement edges and ends.		<input type="checkbox"/>
Heavy equipment (stationary or mobile) operating or idle near AOA, in runway approaches and departures areas, or in OFZ.		<input type="checkbox"/>
Equipment or material near NAVAIDs that may degrade or impair radiated signals and/or the monitoring of navigation and visual aids. Unauthorized or improper vehicle operations in localizer or glide slope critical areas, resulting in electronic interference and/or facility shutdown.		<input type="checkbox"/>
Tall and especially relatively low visibility units (that is, equipment with slim profiles) — cranes, drills, and similar objects — located in critical areas, such as OFZ and approach zones.		<input type="checkbox"/>
Improperly positioned or malfunctioning lights or unlighted airport hazards, such as holes or excavations, on any apron, open taxiway, or open taxi lane or in a related safety, approach, or departure area.		<input type="checkbox"/>



Item	Action Required (Describe)	No Action Required (Check)
Obstacles, loose pavement, trash, and other debris on or near AOA. Construction debris (gravel, sand, mud, paving materials) on airport pavements may result in aircraft propeller, turbine engine, or tire damage. Also, loose materials may blow about, potentially causing personal injury or equipment damage.		<input type="checkbox"/>
Inappropriate or poorly maintained fencing during construction intended to deter human and animal intrusions into the AOA. Fencing and other markings that are inadequate to separate construction areas from open AOA create aviation hazards.		<input type="checkbox"/>
Improper or inadequate marking or lighting of runways (especially thresholds that have been displaced or runways that have been closed) and taxiways that could cause pilot confusion and provide a potential for a runway incursion. Inadequate or improper methods of marking, barricading, and lighting of temporarily closed portions of AOA create aviation hazards.		<input type="checkbox"/>
Wildlife attractants — such as trash (food scraps not collected from construction personnel activity), grass seeds, tall grass, or standing water — on or near airports.		<input type="checkbox"/>
Obliterated or faded temporary markings on active operational areas.		<input type="checkbox"/>
Misleading or malfunctioning obstruction lights. Unlighted or unmarked obstructions in the approach to any open runway pose aviation hazards.		<input type="checkbox"/>
Failure to issue, update, or cancel NOTAMs about airport or runway closures or other construction related airport conditions.		<input type="checkbox"/>
Failure to mark and identify utilities or power cables. Damage to utilities and power cables during construction activity can result in the loss of runway / taxiway lighting; loss of navigation, visual, or approach aids; disruption of weather reporting services; and/or loss of communications.		<input type="checkbox"/>
Restrictions on ARFF access from fire stations to the runway / taxiway system or airport buildings.		<input type="checkbox"/>
Lack of radio communications with construction vehicles in airport movement areas.		<input type="checkbox"/>
Objects, regardless of whether they are marked or flagged, or activities anywhere on or near an airport that could be distracting, confusing, or alarming to pilots during aircraft operations.		<input type="checkbox"/>



Item	Action Required (Describe)	No Action Required (Check)
Water, snow, dirt, debris, or other contaminants that temporarily obscure or derogate the visibility of runway/taxiway marking, lighting, and pavement edges. Any condition or factor that obscures or diminishes the visibility of areas under construction.		<input type="checkbox"/>
Spillage from vehicles (gasoline, diesel fuel, oil) on active pavement areas, such as runways, taxiways, aprons, and airport roadways.		<input type="checkbox"/>
Failure to maintain drainage system integrity during construction (for example, no temporary drainage provided when working on a drainage system).		<input type="checkbox"/>
Failure to provide for proper electrical lockout and tagging procedures. At larger airports with multiple maintenance shifts/workers, construction contractors should make provisions for coordinating work on circuits.		<input type="checkbox"/>
Failure to control dust. Consider limiting the amount of area from which the contractor is allowed to strip turf.		<input type="checkbox"/>
Exposed wiring that creates an electrocution or fire ignition hazard. Identify and secure wiring, and place it in conduit or bury it.		<input type="checkbox"/>
Site burning, which can cause possible obscuration.		<input type="checkbox"/>
Construction work taking place outside of designated work areas and out of phase.		<input type="checkbox"/>

CONSTRUCTION SAFETY AND PHASING COMPLIANCE DOCUMENT (CSPCD)

Contractor shall provide as a required submittal to the Engineer and/or RPR at or before the pre-construction conference this supplemental information in the SPCD should be written to match the format of the CSPP indicating each subject by corresponding CSPP subject number and title. If no supplemental information is necessary for any specific subject, the statement, "No supplemental information," should be written after the corresponding subject title. The SPCD should not duplicate information in the CSPP:

CSPCD Shall include a certification statement that reads as follows:

I, Name of Contractor, have read the West Quad 6 Unit Box Hangar Phase 2 CSPP, approved on Date, and will abide by it as written and with the following additions as noted:

CSPCD shall address the following items and be structured according to the outline below:

- 1) Coordination. Discuss details of proposed safety meetings with the airport operator and with contractor employees and subcontractors.
- 2) Phasing. Discuss proposed construction schedule elements, including:
 -) Duration of each phase
 -) Daily start and finish of construction, including "night only" construction.



-) Duration of construction activities during:
 -) Normal runway operations.
 -) Closed runway operations.
 -) Modified runway "Aircraft Reference Code" usage.
- 3) Areas and operations affected by the construction activity. These areas and operations should be identified in the CSPP and should not require an entry in the SPCD.
- 4) Protection of NAVAIDs. Discuss specific methods proposed to protect operating NAVAIDs.
- 5) Contractor access. Provide the following:
 -) Details on how the contractor will maintain the integrity of the airport security fence (gate guards, daily log of construction personnel, and other).
 -) Listing of individuals requiring driver training (for certificated airports and as requested).
 -) Radio communications.
 -) Types of radios and backup capabilities.
 -) Who will be monitoring radios.
 -) Whom to contact if the ATCT cannot reach the contractor's designated person by radio.
 -) Details on how the contractor will escort material delivery vehicles.
- 6) Wildlife management. Discuss the following:
 -) Methods and procedures to prevent wildlife attraction.
 -) Wildlife reporting procedures.
- 7) Foreign Object Debris (FOD) management. Discuss equipment and methods for control of FOD, including construction debris and dust.
- 8) Hazardous material (HAZMAT) management. Discuss equipment and methods for responding to hazardous spills.
- 9) Notification of construction activities. Provide the following:
 -) Contractor points of contact.
 -) Contractor emergency contact.
 -) Listing of tall or other requested equipment proposed for use on the airport and the timeframe for submitting 7460-1 forms not previously submitted by the airport operator.
 -) Batch plant details, including 7460-1 submittal.
- 10) Inspection requirements. Discuss daily (or more frequent) inspections and special inspection procedures.
- 11) Underground utilities. Discuss proposed methods of identifying and protecting underground utilities.
- 12) Penalties. Penalties should be identified in the CSPP and should not require an entry in the SPCD.
- 13) Special conditions. Discuss proposed actions for each special condition identified in the CSPP.
- 14) Runway and taxiway visual aids. Including marking, lighting, signs, and visual NAVAIDs. Discuss proposed visual aids including the following:
 -) Equipment and methods for covering signage and airfield lights.
 -) Equipment and methods for temporary closure markings (paint, fabric, other).
 -) Types of temporary Visual Guidance Slope Indicators (VGSI).
- 15) Marking and signs for access routes. Discuss proposed methods of demarcating access routes for vehicle drivers.
- 16) Hazard marking and lighting. Discuss proposed equipment and methods for identifying excavation areas.
- 17) Protection of runway and taxiway safety areas. including object free areas, obstacle free zones, and approach/departure surfaces. Discuss proposed methods of identifying, demarcating, and protecting airport surfaces including:
 -) Equipment and methods for maintaining Taxiway Safety Area standards.
 -) Equipment and methods for separation of construction operations from aircraft operations, including details of barricades.
- 18) Other limitations on construction should be identified in the CSPP and should not require an entry in the SPCD.



PART 8: FAA TECHNICAL SPECIFICATIONS

Item C-102 Temporary Air and Water Pollution, Soil Erosion, and Siltation Control

DESCRIPTION

102-1. This item shall consist of temporary control measures as shown on the plans or as ordered by the Resident Project Representative (RPR) during the life of a contract to control pollution of air and water, soil erosion, and siltation through the use of silt fences, berms, dikes, dams, sediment basins, fiber mats, gravel, mulches, grasses, slope drains, and other erosion control devices or methods.

Temporary erosion control shall be in accordance with the approved erosion control plan; the approved Construction Safety and Phasing Plan (CSPP) and AC 150/5370-2, *Operational Safety on Airports During Construction*. The temporary erosion control measures contained herein shall be coordinated with the permanent erosion control measures specified as part of this contract to the extent practical to assure economical, effective, and continuous erosion control throughout the construction period.

Temporary control may include work outside the construction limits such as borrow pit operations, equipment and material storage sites, waste areas, and temporary plant sites.

Temporary control measures shall be designed, installed and maintained to minimize the creation of wildlife attractants that have the potential to attract hazardous wildlife on or near public-use airports.

MATERIALS

102-2.1 Grass. Grass that will not compete with the grasses sown later for permanent cover per Item T-901 shall be a quick-growing species (such as ryegrass, Italian ryegrass, or cereal grasses) suitable to the area providing a temporary cover. Selected grass species shall not create a wildlife attractant.

102-2.2 Mulches. Mulches may be hay, straw, fiber mats, netting, bark, wood chips, or other suitable material reasonably clean and free of noxious weeds and deleterious materials per Item T-908. Mulches shall not create a wildlife attractant.

102-2.3 Fertilizer. Fertilizer shall be a standard commercial grade and shall conform to all federal and state regulations and to the standards of the Association of Official Agricultural Chemists.

102-2.4 Slope drains. Slope drains may be constructed of pipe, fiber mats, rubble, concrete, asphalt, or other materials that will adequately control erosion.

102-2.5 Silt fence. Silt fence shall consist of polymeric filaments which are formed into a stable network such that filaments retain their relative positions. Synthetic filter fabric shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of six months of expected usable construction life. Silt fence shall meet the requirements of ASTM D6461.

102-2.6 Other. All other materials shall meet commercial grade standards and shall be approved by the RPR before being incorporated into the project.

CONSTRUCTION REQUIREMENTS

102-3.1 General. In the event of conflict between these requirements and pollution control laws, rules, or regulations of other federal, state, or local agencies, the more restrictive laws, rules, or regulations shall apply.

The RPR shall be responsible for assuring compliance to the extent that construction practices, construction operations, and construction work are involved.

102-3.2 Schedule. Prior to the start of construction, the Contractor shall submit schedules in accordance with the approved Construction Safety and Phasing Plan (CSPP) and the plans for accomplishment of temporary and permanent erosion control work for clearing and grubbing; grading; construction; paving; and structures at watercourses. The Contractor shall also submit a proposed method of erosion and dust control on haul roads and borrow pits and a plan for disposal of waste materials. Work shall not be started until the erosion control schedules and methods of operation for the applicable construction have been accepted by the RPR.

102-3.3 Construction details. The Contractor will be required to incorporate all permanent erosion control features into the project at the earliest practicable time as outlined in the plans and approved CSPP. Except where future construction operations will damage slopes, the Contractor shall perform the permanent seeding and mulching and other specified slope protection work in stages, as soon as substantial areas of exposed slopes can be made available. Temporary erosion and pollution control measures will be used to correct conditions that develop during construction that were not foreseen during the design stage; that are needed prior to installation of permanent control features; or that are needed temporarily to control erosion that develops during normal construction practices, but are not associated with permanent control features on the project.

Where erosion may be a problem, schedule and perform clearing and grubbing operations so that grading operations and permanent erosion control features can follow immediately if project conditions permit. Temporary erosion control measures are required if permanent measures cannot immediately follow grading operations. The RPR shall limit the area of clearing and grubbing, excavation, borrow, and embankment operations in progress, commensurate with the Contractor's capability and progress in keeping the finish grading, mulching, seeding, and other such permanent control measures current with the accepted schedule. If seasonal limitations make such coordination unrealistic, temporary erosion control measures shall be taken immediately to the extent feasible and justified as directed by the RPR.

The Contractor shall provide immediate permanent or temporary pollution control measures to minimize contamination of adjacent streams or other watercourses, lakes, ponds, or other areas of water impoundment as directed by the RPR. If temporary erosion and pollution control measures are required due to the Contractor's negligence, carelessness, or failure to install permanent controls as a part of the work as scheduled or directed by the RPR, the work shall be performed by the Contractor and the cost shall be incidental to this item.

The RPR may increase or decrease the area of erodible earth material that can be exposed at any time based on an analysis of project conditions.

The erosion control features installed by the Contractor shall be maintained by the Contractor during the construction period.

Provide temporary structures whenever construction equipment must cross watercourses at frequent intervals. Pollutants such as fuels, lubricants, bitumen, raw sewage, wash water from concrete mixing operations, and other harmful materials shall not be discharged into any waterways, impoundments or into natural or manmade channels.

102-3.4 Installation, maintenance and removal of silt fence. Silt fences shall extend a minimum of 16 inches and a maximum of 34 inches above the ground surface. Posts shall be set no more than 10 feet on center. Filter fabric shall be cut from a continuous roll to the length required minimizing joints where possible. When joints are necessary,

the fabric shall be spliced at a support post with a minimum 12-inch overlap and securely sealed. A trench shall be excavated approximately 4 inches deep by 4 inches wide on the upslope side of the silt fence. The trench shall be backfilled and the soil compacted over the silt fence fabric. The Contractor shall remove and dispose of silt that accumulates during construction and prior to establishment of permanent erosion control. The fence shall be maintained in good working condition until permanent erosion control is established. Silt fence shall be removed upon approval of the RPR.

METHOD OF MEASUREMENT

102-4.1 Temporary erosion and pollution control work required will be performed as scheduled or directed by the RPR. Completed and accepted work will be measured as follows:

- a. Temporary seeding and mulching will be measured by the square yard.
- b. Installation and removal of silt fence will be measured by the linear foot.
- c. Installation and removal of temporary inlet protection will be measured by each.

102-4.2 Control work performed for protection of construction areas outside the construction limits, such as borrow and waste areas, haul roads, equipment and material storage sites, and temporary plant sites, will not be measured and paid for directly but shall be considered as a subsidiary obligation of the Contractor.

BASIS OF PAYMENT

102-5.1 Accepted quantities of temporary water pollution, soil erosion, and siltation control work ordered by the RPR and measured as provided in paragraph 102-4.1 will be paid for under:

Item C-102-5.1a	Temporary seeding and mulching - per square yard
Item C-102-5.1b	Installation and removal of silt fence – per linear feet
Item C-102-5.1.c	Installation and removal of temporary inlet protection – per each

Where other directed work falls within the specifications for a work item that has a contract price, the units of work shall be measured and paid for at the contract unit price bid for the various items.

Temporary control features not covered by contract items that are ordered by the RPR will be paid for in accordance with Section 90, paragraph 90-05 *Payment for Extra Work*.

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

Advisory Circulars (AC)

AC 150/5200-33	<i>Hazardous Wildlife Attractants on or Near Airports</i>
AC 150/5370-2	<i>Operational Safety on Airports During Construction</i>

ASTM International (ASTM)

ASTM D6461

Standard Specification for Silt Fence Materials

United States Department of Agriculture (USDA)

FAA/USDA Wildlife Hazard Management at Airports, A Manual for Airport Personnel

END OF ITEM C-102

Item C-105 Mobilization

105-1 Description. This item of work shall consist of, but is not limited to, work and operations necessary for the movement of personnel, equipment, material and supplies to and from the project site for work on the project except as provided in the contract as separate pay items.

105-2 Mobilization limit. Mobilization shall be limited to 10 percent of the total project cost.

105-3 Posted notices. Prior to commencement of construction activities, the Contractor must post the following documents in a prominent and accessible place where they may be easily viewed by all employees of the prime Contractor and by all employees of subcontractors engaged by the prime Contractor: Equal Employment Opportunity (EEO) Poster "Equal Employment Opportunity is the Law" in accordance with the Office of Federal Contract Compliance Programs Executive Order 11246, as amended; Davis Bacon Wage Poster (WH 1321) - DOL "Notice to All Employees" Poster; and Applicable Davis-Bacon Wage Rate Determination. These notices must remain posted until final acceptance of the work by the Owner.

105-4 Engineer/RPR field office. An Engineer/RPR field office is not required.

METHOD OF MEASUREMENT

105-5 Basis of measurement and payment. Based upon the contract lump sum price for "Mobilization" partial payments will be allowed as follows:

- a. With first pay request, 25%.
- b. When 25% or more of the original contract is earned, an additional 25%.
- c. When 50% or more of the original contract is earned, an additional 40%.
- d. After Final Inspection, Staging area clean-up and delivery of all Project Closeout materials as required by Section 90, paragraph 90-11, *Contractor Final Project Documentation*, the final 10%.

BASIS OF PAYMENT

105-6 Payment will be made under:

Item C-105-6.1 Mobilization – Lump Sum

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

Office of Federal Contract Compliance Programs (OFCCP)

Executive Order 11246, as amended

EEOC-P/E-1 – Equal Employment Opportunity is the Law Poster
United States Department of Labor, Wage and Hour Division (WHD)
WH 1321 – Employee Rights under the Davis-Bacon Act Poster

END OF ITEM C-105

Item P-101 Preparation/Removal of Existing Pavements

DESCRIPTION

101-1 This item shall consist of preparation of existing pavement surfaces for overlay, surface treatments, removal of existing pavement, and other miscellaneous items. The work shall be accomplished in accordance with these specifications and the applicable plans.

EQUIPMENT AND MATERIALS

101-2 All equipment and materials shall be specified here and in the following paragraphs or approved by the Resident Project Representative (RPR). The equipment shall not cause damage to the pavement to remain in place. Locate and clearly mark all subsurface utilities in the areas of excavation.

CONSTRUCTION

101-3.1 Removal of existing pavement.

The Contractor's removal operation shall be controlled to not damage adjacent pavement structure, and base material, cables, utility ducts, pipelines, or drainage structures which are to remain under the pavement.

a. Concrete pavement removal. Full depth saw cuts shall be made perpendicular to the slab surface. The Contractor shall saw through the full depth of the slab including any dowels at the joint, removing the pavement and installing new dowels as shown on the plans and per the specifications. Where the perimeter of the removal limits is not located on the joint and there are no dowels present, the perimeter shall be saw cut the full depth of the pavement. The pavement inside the saw cut shall be removed by methods which will not cause distress in the pavement which is to remain in place. If the material is to be wasted on the airport site, it shall be reduced to a maximum size of 2 inches. Concrete slabs that are damaged by under breaking shall be repaired or removed and replaced as directed by the RPR.

The edge of existing concrete pavement against which new pavement abuts shall be protected from damage at all times. Spall and underbreak repair shall be in accordance with the plans. Any underlying material that is to remain in place, shall be recompacted and/or replaced as shown on the plans. Adjacent areas damaged during repair shall be repaired or replaced at the Contractor's expense.

b. Asphalt pavement removal. Asphalt pavement to be removed shall be cut to the full depth of the asphalt pavement around the perimeter of the area to be removed.

c. Repair or removal of Base, Subbase, and/or Subgrade. All failed material including surface, base course, subbase course, and subgrade shall be removed and repaired as shown on the plans or as directed by the RPR. Materials and methods of construction shall comply with the applicable sections of these specifications. Any damage caused by Contractor's removal process shall be repaired at the Contractor's expense.

101-3.2 Preparation of joints and cracks prior to overlay/surface treatment. Remove all vegetation and debris from cracks to a minimum depth of 1 inch. If extensive vegetation exists, treat the specific area with a concentrated solution of a water-based herbicide approved by the RPR. Fill all cracks greater than 1/4 inch wide with a crack sealant per ASTM D6690. The crack sealant, preparation, and application shall be compatible with the surface treatment/overlay to be used. To minimize contamination of the asphalt with the crack sealant, underfill the crack

sealant a minimum of 1/8 inch, not to exceed ¼ inch. Any excess joint or crack sealer shall be removed from the pavement surface.

Wider cracks (over 1-1/2 inch wide), along with soft or sunken spots, indicate that the pavement or the pavement base should be repaired or replaced as stated below.

Cracks and joints may be filled with a mixture of emulsified asphalt and aggregate. The aggregate shall consist of limestone, volcanic ash, sand, or other material that will cure to form a hard substance. The combined gradation shall be as shown in the following table.

Gradation

Sieve Size	Percent Passing
No. 4	100
No. 8	90-100
No. 16	65-90
No. 30	40-60
No. 50	25-42
No. 100	15-30
No. 200	10-20

Up to 3% cement can be added to accelerate the set time. The mixture shall not contain more than 20% natural sand without approval in writing from the RPR.

The proportions of asphalt emulsion and aggregate shall be determined in the field and may be varied to facilitate construction requirements. Normally, these proportions will be approximately one part asphalt emulsion to five parts aggregate by volume. The material shall be poured or placed into the joints or cracks and compacted to form a voidless mass. The joint or crack shall be filled to within +0 to -1/8 inches of the surface. Any material spilled outside the width of the joint shall be removed from the pavement surface prior to constructing the overlay. Where concrete overlays are to be constructed, only the excess joint material on the pavement surface and vegetation in the joints need to be removed.

101-3.3 Removal of Foreign Substances/contaminates prior to remarking. Removal of foreign substances/contaminates from existing pavement that will affect the bond of the new treatment shall consist of removal of rubber, fuel spills, oil, crack sealer, at least 90% of paint, and other foreign substances from the surface of the pavement. Areas that require removal are designated on the plans and as directed by the RPR in the field during construction.

High-pressure water may be used. All other methods require approval by the RPR. If chemicals are used, they shall comply with the state's environmental protection regulations. Removal methods used shall not cause major damage to the pavement, or to any structure or utility within or adjacent to the work area. Major damage is defined as changing the properties of the pavement, removal of asphalt causing the aggregate to ravel, or removing pavement over 1/8 inch deep. If it is deemed by the RPR that damage to the existing pavement is caused by operational error, such as permitting the application method to dwell in one location for too long, the Contractor shall repair the damaged area without compensation and as directed by the RPR.

Removal of foreign substances shall not proceed until approved by the RPR. Water used for high-pressure water equipment shall be provided by the Contractor at the Contractor's expense. No material shall be deposited on the pavement shoulders. All wastes shall be disposed of in areas indicated in this specification or shown on the plans.

101-3.4 Concrete spall or failed asphaltic concrete pavement repair.

a. Repair of concrete spalls in areas to be overlaid with asphalt. The Contractor shall repair all spalled concrete as shown on the plans or as directed by the RPR. The perimeter of the repair shall be saw cut a minimum of 2 inches outside the affected area and 2 inches deep. The deteriorated material shall be removed to a depth where the existing material is firm or cannot be easily removed with a geologist pick. The removed area shall be filled with asphalt mixture with aggregate sized appropriately for the depth of the patch. The material shall be compacted with equipment approved by the RPR until the material is dense and no movement or marks are visible. The material shall not be placed in lifts over 4 inches in depth. This method of repair applies only to pavement to be overlaid.

b. Asphalt pavement repair. The Contractor shall repair all spalled concrete as shown on the plans or as directed by the RPR. The failed areas shall be removed as specified in paragraph 101-3.1b. All failed material including surface, base course, subbase course, and subgrade shall be removed. Materials and methods of construction shall comply with the applicable sections of these specifications.

101-3.5 Cold milling. Milling shall be performed with a power-operated milling machine or grinder, capable of producing a uniform finished surface. The milling machine or grinder shall operate without tearing or gouging the underlying surface. The milling machine or grinder shall be equipped with grade and slope controls, and a positive means of dust control. All millings shall be removed and disposed off Airport property. If the Contractor mills or grinds deeper or wider than the plans specify, the Contractor shall replace the material removed with new material at the Contractor's Expense.

a. Patching. The milling machine shall be capable of cutting a vertical edge without chipping or spalling the edges of the remaining pavement and it shall have a positive method of controlling the depth of cut. The RPR shall layout the area to be milled with a straightedge in increments of 1-foot widths. The area to be milled shall cover only the failed area. Any excessive area that is milled because the Contractor doesn't have the appropriate milling machine, or areas that are damaged because of his negligence, shall be repaired by the Contractor at the Contractor's Expense.

b. Profiling, grade correction, or surface correction. The milling machine shall have a minimum width of 7 feet and it shall be equipped with electronic grade control devices that will cut the surface to the grade specified. The tolerances shall be maintained within +0 inch and -1/4 inch of the specified grade. The machine must cut vertical edges and have a positive method of dust control. The machine must have the ability to remove the millings or cuttings from the pavement and load them into a truck. All millings shall be removed and disposed of off the airport.

c. Clean-up. The Contractor shall sweep the milled surface daily and immediately after the milling until all residual materials are removed from the pavement surface. Prior to paving, the Contractor shall wet down the milled pavement and thoroughly sweep and/or blow the surface to remove loose residual material. Waste materials shall be collected and removed from the pavement surface and adjacent areas by sweeping or vacuuming. Waste materials shall be removed and disposed off Airport property.

101-3.6. Preparation of asphalt pavement surfaces prior to surface treatment. Existing asphalt pavements to be treated with a surface treatment shall be prepared as follows:

a. Patch asphalt pavement surfaces that have been softened by petroleum derivatives or have failed due to any other cause. Remove damaged pavement to the full depth of the damage and replace with new asphalt pavement similar to that of the existing pavement in accordance with paragraph 101-3.4b.

b. Repair joints and cracks in accordance with paragraph 101-3.2.

c. Remove oil or grease that has not penetrated the asphalt pavement by scrubbing with a detergent and washing thoroughly with clean water. After cleaning, treat these areas with an oil spot primer.

d. Clean pavement surface immediately prior to placing the surface treatment so that it is free of dust, dirt, grease, vegetation, oil or any type of objectionable surface film.

101-3.7 Maintenance. The Contractor shall perform all maintenance work necessary to keep the pavement in a satisfactory condition until the full section is complete and accepted by the RPR. The surface shall be kept clean and

free from foreign material. The pavement shall be properly drained at all times. If cleaning is necessary or if the pavement becomes disturbed, any work repairs necessary shall be performed at the Contractor's expense.

101-3.8 Preparation of Joints in Rigid Pavement prior to resealing. Prior to application of sealant material, clean and dry the joints of all scale, dirt, dust, old sealant, curing compound, moisture and other foreign matter. The Contractor shall demonstrate, in the presence of the RPR, that the method used cleans the joint and does not damage the joint.

101-3.8.1 Removal of Existing Joint Sealant. All existing joint sealants will be removed by plowing or use of hand tools. Any remaining sealant and or debris will be removed by use of wire brushes or other tools as necessary. Resaw joints removing no more than 1/16 inch from each joint face. Immediately after sawing, flush out joint with water and other tools as necessary to completely remove the slurry.

101-3.8.2 Cleaning prior to sealing. Immediately before sealing, joints shall be cleaned by removing any remaining laitance and other foreign material. Allow sufficient time to dry out joints prior to sealing. Joint surfaces will be surface-dry prior to installation of sealant.

101-3.8.3 Joint sealant. Joint material and installation will be in accordance with Item P-605.

101-3.9 Preparation of Cracks in Flexible Pavement prior to sealing. Prior to application of sealant material, clean and dry the joints of all scale, dirt, dust, old sealant, curing compound, moisture and other foreign matter. The Contractor shall demonstrate, in the presence of the RPR, that the method used cleans the cracks and does not damage the pavement.

101-3.9.1 Preparation of Crack. Widen crack with router or random crack saw by removing a minimum of 1/16 inch from each side of crack. Immediately before sealing, cracks will be blown out with a hot air lance combined with oil and water-free compressed air.

101-3.9.2 Removal of Existing Crack Sealant. Existing sealants will be removed by routing or random crack saw. Following routing or sawing any remaining debris will be removed by use of a hot lance combined with oil and water-free compressed air.

101-3.9.3 Crack Sealant. Crack sealant material and installation will be in accordance with Item P-605.

101-3.9.4 Removal of Pipe and other Buried Structures.

a. Removal of Existing Pipe Material. Remove the types of pipe as indicated on the plans. The pipe material shall be legally disposed of off-site in a timely manner following removal. Trenches shall be backfilled with material equal to or better in quality than adjacent embankment. Trenches under paved areas must be compacted to 95% of ASTM D1557.

b. Removal of Inlets/Manholes. Where indicated on the plans or as directed by the RPR, inlets and/or manholes shall be removed and legally disposed of off-site in a timely fashion after removal. Excavations after removal shall be backfilled with material equal or better in quality than adjacent embankment. When under paved areas must be compacted to 95% of ASTM D1557, when outside of paved areas must be compacted to 95% of ASTM D698.

c. Removal and Salvage of Existing Fire Hydrant. Remove the existing fire hydrant as indicated on the plans and salvage for reinstallation on-site. Excavations after removal shall be backfilled with material equal or better in quality than adjacent embankment. When under paved areas must be compacted to 95% of ASTM D1557, when outside of paved areas must be compacted to 95% of ASTM D698.

METHOD OF MEASUREMENT

101-4.1 Cold milling. The unit of measure for cold milling shall be 2 inches of milling per square yard. The location and average depth of the cold milling shall be as shown on the plans. If the initial cut does not correct the condition, the Contractor shall re-mill the area and will be paid for the total depth of milling.

101-4.2 Removal of Pipe and other Buried Structures. The unit of measurement for removal of pipe and other buried structures will be made at the contract unit price for each completed and accepted item. This price shall be full compensation for all labor, equipment, tools, and incidentals necessary to complete this item in accordance with paragraph 101-3.9.4. Utility cuts and pavement removal associated with this item shall be incidental.

101-4.3 Removal and Salvage of Existing Fire Hydrant. The unit of measurement for removal and salvage of the existing fire hydrant will be made at the contract unit price for each completed and accepted item. This price shall be full compensation for all labor, equipment, tools, and incidentals necessary to complete this item in accordance with paragraph 101-3.9.4. Utility cuts and pavement removal associated with this item shall be incidental.

101-4.4 Asphalt/Asphalt Interface Joints. The unit of measure for asphalt/asphalt interface joints shall be per linear foot of joint installed.

101-4.5 Asphalt/Concrete Interface Joints. The unit of measure for asphalt/concrete interface joints shall be per linear foot of joint installed.

BASIS OF PAYMENT

101-5.1 Payment. Payment shall be made at contract unit price for the unit of measurement as specified above. This price shall be full compensation for furnishing all materials and for all preparation, hauling, and placing of the material and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item P-101-5.1	Cold Milling – per square yard
Item P-101-5.2	Removal of Existing Waterline – per linear foot
Item P-101-5.3	Removal and Salvage of Existing Fire Hydrant – per each
Item P-101-5.4	Asphalt/Asphalt Interface Joints – per linear foot
Item P-101-5.5	Asphalt/Concrete Interface Joints – per linear foot

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

Advisory Circulars (AC)

AC 150/5380-6	Guidelines and Procedures for Maintenance of Airport Pavements.
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ASTM International (ASTM)

ASTM D6690	Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements
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END OF ITEM P-101

Item P-152 Excavation, Subgrade, and Embankment

DESCRIPTION

152-1.1 This item covers excavation, disposal, placement, and compaction of all materials within the limits of the work required to construct safety areas, runways, taxiways, aprons, and intermediate areas as well as other areas for drainage, building construction, parking, or other purposes in accordance with these specifications and in conformity to the dimensions and typical sections shown on the plans.

152-1.2 Classification. All material excavated shall be classified as defined below:

a. Unclassified excavation. Unclassified excavation shall consist of the excavation and disposal of all material, regardless of its nature.

152-1.3 Unsuitable excavation. Unsuitable material shall be disposed in designated waste areas as shown on the plans. Materials containing vegetable or organic matter, such as muck, peat, organic silt, or sod shall be considered unsuitable for use in embankment construction. Material suitable for topsoil may be used on the embankment slope when approved by the RPR.

CONSTRUCTION METHODS

152-2.1 General. Before beginning excavation, grading, and embankment operations in any area, the area shall be cleared or cleared and grubbed in accordance with Item P-151.

The suitability of material to be placed in embankments shall be subject to approval by the RPR. All unsuitable material shall be disposed of in waste areas as shown on the plans. All waste areas shall be graded to allow positive drainage of the area and adjacent areas. The surface elevation of waste areas shall be specified on the plans or approved by the RPR.

When the Contractor's excavating operations encounter artifacts of historical or archaeological significance, the operations shall be temporarily discontinued and the RPR notified per Section 70, paragraph 70-20. At the direction of the RPR, the Contractor shall excavate the site in such a manner as to preserve the artifacts encountered and allow for their removal. Such excavation will be paid for as extra work.

Areas outside the limits of the pavement areas where the top layer of soil has become compacted by hauling or other Contractor activities shall be scarified and disked to a depth of 4 inches (100 mm), to loosen and pulverize the soil. Stones or rock fragments larger than 4 inches (100 mm) in their greatest dimension will not be permitted in the top 6 inches (150 mm) of the subgrade.

If it is necessary to interrupt existing surface drainage, sewers or under-drainage, conduits, utilities, or similar underground structures, the Contractor shall be responsible for and shall take all necessary precautions to preserve them or provide temporary services. When such facilities are encountered, the Contractor shall notify the RPR, who shall arrange for their removal if necessary. The Contractor, at their own expense, shall satisfactorily repair or pay the cost of all damage to such facilities or structures that may result from any of the Contractor's operations during the period of the contract.

a. Blasting. Blasting shall not be allowed.

152-2.2 Excavation. No excavation shall be started until the work has been staked out by the Contractor and the RPR has obtained from the Contractor, the survey notes of the elevations and measurements of the ground surface. The Contractor and RPR shall agree that the original ground lines shown on the original topographic mapping are accurate, or agree to any adjustments made to the original ground lines.

Digital terrain model (DTM) files of the existing surfaces, finished surfaces and other various surfaces were used to develop the design plans.

Volumetric quantities were calculated by comparing DTM files of the applicable design surfaces and generating Triangle Volume Reports. Electronic copies of DTM files and a paper copy of the original topographic map will be issued to the successful bidder.

Existing grades on the design cross sections or DTM's, where they do not match the locations of actual spot elevations shown on the topographic map, were developed by computer interpolation from those spot elevations. Prior to disturbing original grade, Contractor shall verify the accuracy of the existing ground surface by verifying spot elevations at the same locations where original field survey data was obtained as indicated on the topographic map. Contractor shall recognize that, due to the interpolation process, the actual ground surface at any particular location may differ somewhat from the interpolated surface shown on the design cross sections or obtained from the DTM's. Contractor's verification of original ground surface, however, shall be limited to verification of spot elevations as indicated herein, and no adjustments will be made to the original ground surface unless the Contractor demonstrates that spot elevations shown are incorrect. For this purpose, spot elevations which are within 0.1 foot of the stated elevations for ground surfaces, or within 0.04 foot for hard surfaces (pavements, buildings, foundations, structures, etc.) shall be considered "no change". Only deviations in excess of these will be considered for adjustment of the original ground surface. If Contractor's verification identifies discrepancies in the topographic map, Contractor shall notify the RPR in writing at least two weeks before disturbance of existing grade to allow sufficient time to verify the submitted information and make adjustments to the design cross sections or DTM's. Disturbance of existing grade in any area shall constitute acceptance by the Contractor of the accuracy of the original elevations shown on the topographic map for that area.

All areas to be excavated shall be stripped of vegetation and topsoil. Topsoil shall be stockpiled for future use in areas designated on the plans or by the RPR. All suitable excavated material shall be used in the formation of embankment, subgrade, or other purposes as shown on the plans. All unsuitable material shall be disposed of as shown on the plans.

The grade shall be maintained so that the surface is well drained at all times.

When the volume of the excavation exceeds that required to construct the embankments to the grades as indicated on the plans, the excess shall be used to grade the areas of ultimate development or disposed as directed by the RPR. When the volume of excavation is not sufficient for constructing the embankments to the grades indicated, the deficiency shall be obtained from borrow areas.

a. Selective grading. When selective grading is indicated on the plans, the more suitable material designated by the RPR shall be used in constructing the embankment or in capping the pavement subgrade. If, at the time of excavation, it is not possible to place this material in its final location, it shall be stockpiled in approved areas until it can be placed. The more suitable material shall then be placed and compacted as specified. Selective grading shall be considered incidental to the work involved. The cost of stockpiling and placing the material shall be included in the various pay items of work involved.

b. Undercutting. Rock, shale, hardpan, loose rock, boulders, or other material unsatisfactory for safety areas, subgrades, roads, shoulders, or any areas intended for turf shall be excavated to a minimum depth of 12 inches below the subgrade or to the depth specified by the RPR. Muck, peat, matted roots, or other yielding material, unsatisfactory for subgrade foundation, shall be removed to the depth specified. Unsuitable materials shall be disposed off the airport. The cost is incidental to this item. This excavated material shall be paid for at the contract

unit price per cubic yard for unclassified excavation. The excavated area shall be backfilled with suitable material obtained from the grading operations or borrow areas and compacted to specified densities. The necessary backfill will constitute a part of the embankment. Where rock cuts are made, backfill with select material. Any pockets created in the rock surface shall be drained in accordance with the details shown on the plans. Undercutting will be paid as unclassified excavation.

c. Over-break. Over-break, including slides, is that portion of any material displaced or loosened beyond the finished work as planned or authorized by the RPR. All over-break shall be graded or removed by the Contractor and disposed of as directed by the RPR. The RPR shall determine if the displacement of such material was unavoidable and their own decision shall be final. Payment will not be made for the removal and disposal of over-break that the RPR determines as avoidable. Unavoidable over-break will be classified as "Unclassified Excavation."

d. Removal of utilities. The removal of existing structures and utilities required to permit the orderly progress of work will be accomplished by someone other than the Contractor or by the Contractor as indicated on the plans. All existing foundations shall be excavated at least 2 feet below the top of subgrade or as indicated on the plans, and the material disposed of as directed by the RPR. All foundations thus excavated shall be backfilled with suitable material and compacted as specified for embankment or as shown on the plans.

152-2.3 Borrow excavation. Borrow areas are not required.

152-2.4 Drainage excavation. Drainage excavation shall consist of excavating drainage ditches including intercepting, inlet, or outlet ditches; or other types as shown on the plans. The work shall be performed in sequence with the other construction. Ditches shall be constructed prior to starting adjacent excavation operations. All satisfactory material shall be placed in embankment fills; unsuitable material shall be placed in designated waste areas or as directed by the RPR. All necessary work shall be performed true to final line, elevation, and cross-section. The Contractor shall maintain ditches constructed on the project to the required cross-section and shall keep them free of debris or obstructions until the project is accepted.

152-2.5 Preparation of cut areas or areas where existing pavement has been removed. In those areas on which a subbase or base course is to be placed, the top 12 inches of subgrade shall be compacted to not less than 95 % of maximum density for non-cohesive soils, and 90% of maximum density for cohesive soils as determined by ASTM D698. As used in this specification, "non-cohesive" shall mean those soils having a plasticity index (PI) of less than 3 as determined by ASTM D4318.

152-2.6 Preparation of embankment area. All sod and vegetative matter shall be removed from the surface upon which the embankment is to be placed. The cleared surface shall be broken up by plowing or scarifying to a minimum depth of 6 inches and shall then be compacted per paragraph 152-2.10.

Sloped surfaces steeper than one (1) vertical to four (4) horizontal shall be plowed, stepped, benched, or broken up so that the fill material will bond with the existing material. When the subgrade is part fill and part excavation or natural ground, the excavated or natural ground portion shall be scarified to a depth of 12 inches and compacted as specified for the adjacent fill.

No direct payment shall be made for the work performed under this section. The necessary clearing and grubbing and the quantity of excavation removed will be paid for under the respective items of work.

152-2.7 Control Strip. The first half-day of construction of subgrade and/or embankment shall be considered as a control strip for the Contractor to demonstrate, in the presence of the RPR, that the materials, equipment, and construction processes meet the requirements of this specification. The sequence and manner of rolling necessary to obtain specified density requirements shall be determined. The maximum compacted thickness may be increased to a maximum of 12 inches upon the Contractor's demonstration that approved equipment and operations will uniformly compact the lift to the specified density. The RPR must witness this demonstration and approve the lift thickness prior to full production.

Control strips that do not meet specification requirements shall be reworked, re-compacted, or removed and replaced at the Contractor's expense. Full operations shall not begin until the control strip has been accepted by the RPR. The Contractor shall use the same equipment, materials, and construction methods for the remainder of construction, unless adjustments made by the Contractor are approved in advance by the RPR.

152-2.8 Formation of embankments. The material shall be constructed in lifts as established in the control strip, but not less than 6 inches nor more than 12 inches of compacted thickness.

When more than one lift is required to establish the layer thickness shown on the plans, the construction procedure described here shall apply to each lift. No lift shall be covered by subsequent lifts until tests verify that compaction requirements have been met. The Contractor shall rework, re-compact and retest any material placed which does not meet the specifications.

The lifts shall be placed, to produce a soil structure as shown on the typical cross-section or as directed by the RPR. Materials such as brush, hedge, roots, stumps, grass and other organic matter, shall not be incorporated or buried in the embankment.

Earthwork operations shall be suspended at any time when satisfactory results cannot be obtained due to rain, freezing, or other unsatisfactory weather conditions in the field. Frozen material shall not be placed in the embankment nor shall embankment be placed upon frozen material. Material shall not be placed on surfaces that are muddy, frozen, or contain frost. The Contractor shall drag, blade, or slope the embankment to provide surface drainage at all times.

The material in each lift shall be within $\pm 2\%$ of optimum moisture content before rolling to obtain the prescribed compaction. The material shall be moistened or aerated as necessary to achieve a uniform moisture content throughout the lift. Natural drying may be accelerated by blending in dry material or manipulation alone to increase the rate of evaporation.

The Contractor shall make the necessary corrections and adjustments in methods, materials or moisture content to achieve the specified embankment density.

The RPR will take samples of excavated materials which will be used in embankment for testing and develop a Moisture-Density Relations of Soils Report (Proctor) in accordance with ASTM D698. A new Proctor shall be developed for each soil type based on visual classification.

Density tests will be taken by the RPR for every 1,000 square yards of compacted embankment for each lift which is required to be compacted, or other appropriate frequencies as determined by the RPR.

If the material has greater than 30% retained on the 3/4-inch sieve, follow AASHTO T-180 Annex Correction of maximum dry density and optimum moisture for oversized particles.

Rolling operations shall be continued until the embankment is compacted to not less than 95% of maximum density for non-cohesive soils, and 90% of maximum density for cohesive soils as determined by ASTM D698. Under all areas to be paved, the embankments shall be compacted to a depth of 6 inches and to a density of not less than 95% percent of the maximum density as determined by ASTM D698. As used in this specification, "non-cohesive" shall mean those soils having a plasticity index (PI) of less than 3 as determined by ASTM D4318.

On all areas outside of the pavement areas, no compaction will be required on the top 4 inches which shall be prepared for a seedbed in accordance with Item T-901.

The in-place field density shall be determined in accordance with ASTM 6938 using Procedure A, the direct transmission method, and ASTM D6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D6938. The Contractor's laboratory shall perform all density

tests in the RPR's presence and provide the test results upon completion to the RPR for acceptance. If the specified density is not attained, the area represented by the test or as designated by the RPR shall be reworked and/or re-compacted and additional random tests made. This procedure shall be followed until the specified density is reached.

Compaction areas shall be kept separate, and no lift shall be covered by another lift until the proper density is obtained.

During construction of the embankment, the Contractor shall route all construction equipment evenly over the entire width of the embankment as each lift is placed. Lift placement shall begin in the deepest portion of the embankment fill. As placement progresses, the lifts shall be constructed approximately parallel to the finished pavement grade line.

When rock, concrete pavement, asphalt pavement, and other embankment material are excavated at approximately the same time as the subgrade, the material shall be incorporated into the outer portion of the embankment and the subgrade material shall be incorporated under the future paved areas. Stones, fragmentary rock, and recycled pavement larger than 4 inches in their greatest dimensions will not be allowed in the top 12 inches of the subgrade. Rockfill shall be brought up in lifts as specified or as directed by the RPR and the finer material shall be used to fill the voids forming a dense, compact mass. Rock, cement concrete pavement, asphalt pavement, and other embankment material shall not be disposed of except at places and in the manner designated on the plans or by the RPR.

When the excavated material consists predominantly of rock fragments of such size that the material cannot be placed in lifts of the prescribed thickness without crushing, pulverizing or further breaking down the pieces, such material may be placed in the embankment as directed in lifts not exceeding 2 feet in thickness. Each lift shall be leveled and smoothed with suitable equipment by distribution of spalls and finer fragments of rock. The lift shall not be constructed above an elevation 4 feet below the finished subgrade.

There will be no separate measurement of payment for compacted embankment. All costs incidental to placing in lifts, compacting, discing, watering, mixing, sloping, and other operations necessary for construction of embankments will be included in the contract price for excavation, borrow, or other items.

152-2.9 Proof rolling. The purpose of proof rolling the subgrade is to identify any weak areas in the subgrade and not for compaction of the subgrade. After compaction is completed, the subgrade area shall be proof rolled with a 20 ton Tandem axle Dual Wheel Dump Truck loaded to the legal limit with tires inflated to 80/100/150 psi in the presence of the RPR. Apply a minimum of 2 coverages, or as specified by the RPR, under pavement areas. A coverage is defined as the application of one tire print over the designated area. Soft areas of subgrade that deflect more than 1 inch or show permanent deformation greater than 1 inch shall be removed and replaced with suitable material or reworked to conform to the moisture content and compaction requirements in accordance with these specifications. Removal and replacement of soft areas is incidental to this item.

152-2.10 Compaction requirements. The subgrade under areas to be paved shall be compacted to a depth of 12 inches and to a density of not less than 95 percent of the maximum dry density as determined by ASTM D698. The subgrade in areas outside the limits of the pavement areas shall be compacted to a depth of 6 inches and to a density of not less than 95 percent of the maximum density as determined by ASTM D698.

The material to be compacted shall be within $\pm 2\%$ of optimum moisture content before being rolled to obtain the prescribed compaction (except for expansive soils). When the material has greater than 30 percent retained on the $\frac{3}{4}$ inch (19.0 mm) sieve, follow the procedures in AASHTO T180 Annex for correction of maximum dry density and optimum moisture for oversized particles. Tests for moisture content and compaction will be taken at a minimum of 1,000 S.Y. of subgrade. All quality assurance testing shall be done by the Contractor's laboratory in the presence of the RPR, and density test results shall be furnished upon completion to the RPR for acceptance determination.

The in-place field density shall be determined in accordance with ASTM D6938 using Procedure A, the direct transmission method, and ASTM D6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D6938 within 12 months prior to its use on this contract. The gage shall be field standardized daily.

Maximum density refers to maximum dry density at optimum moisture content unless otherwise specified.

If the specified density is not attained, the entire lot shall be reworked and/or re-compacted and additional random tests made. This procedure shall be followed until the specified density is reached.

All cut-and-fill slopes shall be uniformly dressed to the slope, cross-section, and alignment shown on the plans or as directed by the RPR and the finished subgrade shall be maintained.

152-2.11 Finishing and protection of subgrade. Finishing and protection of the subgrade is incidental to this item. Grading and compacting of the subgrade shall be performed so that it will drain readily. All low areas, holes or depressions in the subgrade shall be brought to grade. Scarifying, blading, rolling and other methods shall be performed to provide a thoroughly compacted subgrade shaped to the lines and grades shown on the plans. All ruts or rough places that develop in the completed subgrade shall be graded, re-compacted, and retested. The Contractor shall protect the subgrade from damage and limit hauling over the finished subgrade to only traffic essential for construction purposes.

The Contractor shall maintain the completed course in satisfactory condition throughout placement of subsequent layers. No subbase, base, or surface course shall be placed on the subgrade until the subgrade has been accepted by the RPR.

152-2.12 Haul. All hauling will be considered a necessary and incidental part of the work. The Contractor shall include the cost in the contract unit price for the pay of items of work involved. No payment will be made separately or directly for hauling on any part of the work.

The Contractor's equipment shall not cause damage to any excavated surface, compacted lift or to the subgrade as a result of hauling operations. Any damage caused as a result of the Contractor's hauling operations shall be repaired at the Contractor's expense.

The Contractor shall be responsible for providing, maintaining and removing any haul roads or routes within or outside of the work area, and shall return the affected areas to their former condition, unless otherwise authorized in writing by the Owner. No separate payment will be made for any work or materials associated with providing, maintaining and removing haul roads or routes.

152-2.13 Surface Tolerances. In those areas on which a subbase or base course is to be placed, the surface shall be tested for smoothness and accuracy of grade and crown. Any portion lacking the required smoothness or failing in accuracy of grade or crown shall be scarified to a depth of at least 3 inches, reshaped and re-compacted to grade until the required smoothness and accuracy are obtained and approved by the RPR. The Contractor shall perform all final smoothness and grade checks in the presence of the RPR. Any deviation in surface tolerances shall be corrected by the Contractor at the Contractor's expense.

- a. **Smoothness.** The finished surface shall not vary more than $\pm \frac{1}{2}$ inch when tested with a 12-foot straightedge applied parallel with and at right angles to the centerline. The straightedge shall be moved continuously forward at half the length of the 12-foot straightedge for the full length of each line on a 50-foot grid.
- b. **Grade.** The grade and crown shall be measured on a 50-foot grid and shall be within ± 0.05 feet of the specified grade.

On safety areas, turfed areas and other designated areas within the grading limits where no subbase or base is to be placed, grade shall not vary more than 0.10 feet from specified grade. Any deviation in excess of this amount shall be corrected by loosening, adding or removing materials, and reshaping.

152-2.14 Topsoil. When topsoil is specified or required as shown on the plans or under Item T-905, it shall be salvaged from stripping or other grading operations. The topsoil shall meet the requirements of Item T-905. If, at the time of excavation or stripping, the topsoil cannot be placed in its final section of finished construction, the material shall be stockpiled at approved locations. Stockpiles shall be located as shown on the plans and the approved CSPP, and shall not be placed on areas that subsequently will require any excavation or embankment fill. If, in the judgment of the RPR, it is practical to place the salvaged topsoil at the time of excavation or stripping, the material shall be placed in its final position without stockpiling or further re-handling.

Upon completion of grading operations, stockpiled topsoil shall be handled and placed as shown on the plans and as required in Item T-905. Topsoil shall be paid for as provided in Item T-905. No direct payment will be made for topsoil under Item P-152.

METHOD OF MEASUREMENT

152-3.1 Measurement for payment specified by the cubic yard shall be computed by the comparison of digital terrain model (DTM) surfaces for computation of neat line design quantities. The end area is that bound by the original ground line established by field cross-sections and the final theoretical pay line established by cross-sections shown on the plans, subject to verification by the RPR.

152-3.1 The quantity of unclassified excavation to be paid for shall be the number of cubic yards measured in its original position. Measurement shall not include the quantity of materials excavated without authorization beyond normal slope lines, or the quantity of material used for purposes other than those directed

152-3.3 Stockpiled material shall not be measured for payment in the stockpiled position.

BASIS OF PAYMENT

152-4.1 Unclassified excavation payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-152-4.1	Unclassified Excavation - per cubic yard
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REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

American Association of State Highway and Transportation Officials (AASHTO)

AASHTO T-180	Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop
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ASTM International (ASTM)

ASTM D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft ³ (600 kN-m/m ³))
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ASTM D1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft ³ (2700 kN-m/m ³))
ASTM D6938	Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
Advisory Circulars (AC)	
AC 150/5370-2	Operational Safety on Airports During Construction Software
Software	
FAARFIELD – FAA Rigid and Flexible Iterative Elastic Layered Design	
U.S. Department of Transportation	
FAA RD-76-66	Design and Construction of Airport Pavements on Expansive Soils

END OF ITEM P-152

Item P-153 Controlled Low-Strength Material (CLSM)

DESCRIPTION

153-1.1 This item shall consist of furnishing, transporting, and placing a controlled low-strength material (CLSM) as flowable backfill in trenches or at other locations shown on the plans or as directed by the Resident Project Representative (RPR).

MATERIALS

153-2.1 Materials.

a. Cement. ASTM C150, Types I, II, or V; ASTM C595, Types IS, IP, IL, or IT.

b. Fly ash. Fly ash shall conform to ASTM C618, Class C or F.

c. Fine aggregate (sand). Fine aggregate shall conform to the requirements of ASTM C33 except for aggregate gradation. Any aggregate gradation which produces the specified performance characteristics of the CLSM and meets the following requirements, will be accepted.

Sieve Size	Percent Passing by weight
3/4 inch	100
No. 200	0 - 12

d. Water. Water used in mixing or curing shall be from potable water sources. Other sources shall be tested in accordance with ASTM C1602 prior to use.

MIX DESIGN

153-3.1 Proportions. The Contractor shall submit, to the RPR, a mix design including the proportions and source of aggregate, fly ash, cement, water, and approved admixtures. No CLSM mixture shall be produced for payment until the RPR has given written approval of the proportions. The proportions shall be prepared by a laboratory and shall remain in effect for the duration of the project. The proportions shall establish a single percentage or weight for aggregate, fly ash, cement, water, and any admixtures proposed. Laboratory costs are incidental to this item.

a. Compressive strength. CLSM shall be designed to achieve a 28-day compressive strength of 100 to 200 psi when tested in accordance with ASTM D4832, with no significant strength gain after 28 days.

b. Consistency. Design CLSM to achieve a consistency that will produce an approximate 8-inch diameter circular-type spread without segregation. CLSM consistency shall be determined per ASTM D6103.

CONSTRUCTION METHODS

153-4.1 Placement.

a. Placement. CLSM may be placed by any reasonable means from the mixing unit into the space to be filled. Agitation is required during transportation and waiting time. Placement shall be performed so structures or pipes

are not displaced from their final position and intrusion of CLSM into unwanted areas is avoided. The material shall be brought up uniformly to the fill line shown on the plans or as directed by the RPR. Each placement of CLSM shall be as continuous an operation as possible. If CLSM is placed in more than one lift, the base lift shall be free of surface water and loose foreign material prior to placement of the next lift.

b. Contractor Quality Control. The Contractor shall collect all batch tickets to verify the CLSM delivered to the project conforms to the mix design. The Contractor shall verify daily that the CLSM is consistent with 153-3.1a and 153-3.1b. Adjustments shall be made as necessary to the proportions and materials as needed. The Contractor shall provide all batch tickets to the RPR.

c. Limitations of placement. CLSM shall not be placed on frozen ground. Mixing and placing may begin when the air or ground temperature is at least 35°F and rising. Mixing and placement shall stop when the air temperature is 40°F and falling or when the anticipated air or ground temperature will be 35°F or less in the 24-hour period following proposed placement. At the time of placement, CLSM shall have a temperature of at least 40°F.

153-4.2 Curing and protection

a. Curing. The air in contact with the CLSM shall be maintained at temperatures above freezing for a minimum of 72 hours. If the CLSM is subjected to temperatures below 32°F, the material may be rejected by the RPR if damage to the material is observed.

b. Protection. The CLSM shall not be subject to loads and shall remain undisturbed by construction activities for a period of 48 hours or until a compressive strength of 15 psi is obtained. The Contractor shall be responsible for providing evidence to the RPR that the material has reached the desired strength. Acceptable evidence shall be based upon compressive tests made in accordance with paragraph 153-3.1a.

153-4.3 Quality Assurance (QA) Acceptance. CLSM QA acceptance shall be based upon batch tickets provided by the Contractor to the RPR to confirm that the delivered material conforms to the mix design.

METHOD OF MEASUREMENT

153-5.1 Measurement.

No separate measurement for payment shall be made for controlled low strength material (CLSM). CLSM shall be considered necessary and incidental to the work of this Contract.

BASIS OF PAYMENT

153-6.1 Payment.

No payment will be made separately or directly for controlled low strength material (CLSM). CLSM shall be considered necessary and incidental to the work of this Contract.

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM C33	Standard Specification for Concrete Aggregates
ASTM C150	Standard Specification for Portland Cement

ASTM C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C595	Standard Specification for Blended Hydraulic Cements
ASTM C1602	Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
ASTM D4832	Standard Test Method for Preparation and Testing of Controlled Low-Strength Material (CLSM) Test Cylinders
ASTM D6103	Flow Consistency of Controlled Low Strength Material (CLSM)

END OF ITEM P-153

Item P-156 Cement Treated Subgrade

DESCRIPTION

156-1.1 This item shall consist of constructing one or more courses of a mixture of soil, stabilizer, and water in accordance with this specification, and in conformity with the lines, grades, thickness, and typical cross-sections shown on the plans.

MATERIALS

156-2.1 Cement. Cement shall conform to the requirements of ASTM C150, Type I, IA, II, or IIA or ASTM C595, Type IS, IL, IP, or IS(A).

156-2.2 Water. Water used in mixing or curing shall be from potable water sources. Other sources shall be tested in accordance with ASTM C1602 prior to use.

156-2.3 Soil. The soil for this work shall consist of on-site materials free of roots, sod, weeds, and stones larger than 2-1/2 inches and have a sulfate content of less than 0.3%.

COMPOSITION

156-3.1 Soil-cement mixture. Cement shall be added at an application rate of 5 percent of dry unit weight of soil.

156-3.2 Tolerances. At final compaction, the cement and water content for each course of subgrade treatment shall conform to the following tolerances:

Tolerances

Material/Properties	Target	Tolerance	Specifications
Cement	5%	0 to +1%	% Total Dry Materials
Moisture Content	Optimum +2%	0 to +1%	ASTM D1557

WEATHER LIMITATIONS

156-4.1 Weather limitation. Do not construct subgrade when weather conditions detrimentally affect the quality of the materials. Do not apply cement unless the air temperature is at least 40°F and rising. Do not apply cement to soils that are frozen or contain frost. Do not apply cement when conditions are too windy to allow even distribution of the cement to the subgrade. If the air temperature falls below 35°F, protect completed treated areas against freezing. Remove and replace any damaged portion of the completed treated area with new material in accordance with this specification.

EQUIPMENT

156-5.1 Equipment. All equipment necessary to grade, scarify, spread, mix and compact the material shall be provided. The Resident Project Representative (RPR) must approve the Contractor's proposed equipment prior to the start of the treatment.

CONSTRUCTION METHODS

156-6.1 General. This specification is to construct a subgrade consisting of a uniform cement mixture which shall be free from loose or segregated areas. The subgrade shall be of uniform density and moisture content, well mixed for its full depth and have a smooth surface suitable for placing subsequent courses. The Contractor shall be responsible for meeting the above requirements.

Prior to any treatment, the subgrade shall be constructed as specified in Item P-152, Excavation, Subgrade and Embankment, and shaped to conform to the typical sections, lines, and grades as shown on the plans.

The mixing machine must give visible indication at all times that it is cutting, pulverizing and mixing the material uniformly to the proper depth over the full width of the cut.

156-6.2 Application. Cement shall be uniformly spread only over an area where the initial mixing operations and compaction can be completed during the same workday. The cement shall not be applied when wind conditions are detrimental to proper application. A motor grader shall not be used to spread the lime. Adequate moisture shall be added to the cement/soil mixture to maintain the proper moisture content. Materials shall be handled, stored, and applied in accordance with all federal, state, and local requirements.

156-6.3 Mixing Procedure. The full depth of the treated subgrade shall be mixed with equipment as approved by the RPR. Cement shall not be left exposed for more than one (1) hour after distribution. Mixing and pulverization shall continue until the soil cement mixture contains no clods greater than 1-1/2 inches (38 mm) in size. Final moisture content of the mix shall be determined by the Contractor immediately prior to compaction in accordance with ASTM D2216 or ASTM D4959.

156-6.4 Control Strip. The first half-day of construction shall be considered the control strip. The Contractor shall demonstrate, in the presence of the RPR, that the materials, equipment, and construction processes meet the requirements of the specification. The sequence and manner of rolling necessary to obtain specified density requirements shall be determined. Control strips that do not meet specification requirements shall be reworked, re-compacted, or removed and replaced at the Contractor's expense. Full operations shall not continue until the control strip has been accepted by the RPR. Upon acceptance of the control strip by the RPR, the Contractor shall use the same equipment, materials, and construction methods for the remainder of construction, unless adjustments made by the Contractor are approved in advance by the RPR.

156-6.5 Treatment Application and Depth Checks. The amount of cement applied shall be monitored by the Contractor to assure that no less than the amount of cement required by the mix design is applied. The depth of stabilization shall be measured by the Contractor no less than 2 tests per day of material placed; test shall be witnessed by the RPR. Measurements shall be made in test holes excavated to show the full depth of mixing.

156-6.6 Compaction. The moisture content shall be within the tolerance as specified in paragraph 156-3.2. The field density of the compacted mixture shall be at least 95% of the maximum density as specified in paragraph 156-6.10. Compaction of the soil/cement mixture shall begin within 30 minutes after mixing the cement into the subgrade. All compaction operations shall be completed within 2 hours from the start of mixing.

Perform in-place density test immediately after completion of compaction to determine degree of compaction. If the material fails to meet the density requirements, compaction shall continue or the material shall be removed and

replaced. Maximum density refers to maximum dry density at optimum moisture content unless otherwise specified.

156-6.7 Finishing and curing. After the final lift or course of treated subgrade has been compacted, it shall be brought to the required lines and grades in accordance with the typical sections. Finished portions of treated subgrade shall be protected to prevent equipment from marring, permanently deforming, or damaging completed work.

Not later than 24 hours after completion of final finishing, the surface shall be cured by being kept continuously moist for a period of 7 days with a fog-type water spray or application of an curing compound or other moisture retention methods as approved by the RPR.

Sufficient protection from freezing shall be provided for at least 7 days after its construction or as approved by the RPR.

156-6.8 Maintenance. The Contractor shall maintain the entire treated subgrade in good condition from the start of work until all the work has been completed, cured, and accepted by the RPR. When material has been exposed to excessive rain, snow, or freeze-thaw conditions, prior to placement of additional material, the Contractor shall verify that materials still meets all specification requirements. The cost shall be incidental to this item.

156-6.9 Surface tolerance. In those areas on which a subbase or base course is to be placed, the surface shall be tested for smoothness and accuracy of grade and crown. Any portion lacking the required smoothness or failing in accuracy of grade or crown shall be scarified to a depth of at least 3 inches, reshaped and re-compacted to grade until the required smoothness and accuracy are obtained and approved by the RPR. The Contractor shall perform all final smoothness and grade checks in the presence of the RPR. Any deviation in surface tolerances shall be corrected by the Contractor at the Contractor's expense.

a. Smoothness. The finished surface shall not vary more than $\pm \frac{1}{2}$ inch when tested with a 12-foot straightedge applied parallel with and at right angles to the centerline. The straightedge shall be moved continuously forward at half the length of the 12-foot straightedge for the full length of each line on a 50-foot grid.

b. Grade. The grade and crown shall be measured on a 50-foot grid and shall be within ± 0.05 feet of the specified grade.

156-6.10 Acceptance sampling and testing. Aggregate base course shall be accepted for density and thickness on an area basis. Testing frequency shall be a minimum of one (1) compaction and thickness test per 1000 square yards of stabilized subgrade, but not less than four (4) tests per day of production. Sampling locations will be determined on a random basis per ASTM D3665.

a. Density. All testing shall be done by the Contractor's laboratory in the presence of the RPR and density test results shall be furnished upon completion to the RPR for acceptance determination.

The field density of the compacted mixture shall be at least 95% of the maximum density as determined by ASTM D558. The in-place field density shall be determined in accordance with ASTM D6938, Procedure A, direct transmission method. The in-place moisture content shall be determined in accordance with ASTM D2216. If the material fails to meet the density requirements, compaction shall continue or the material shall be removed and replaced. Maximum density refers to maximum dry density at optimum moisture content unless otherwise specified.

b. Thickness. The thickness of the base course shall be within +0 and -1/2 inch of the specified thickness as determined by depth tests taken by the Contractor in the presence of the RPR for each subplot. Where the thickness is deficient by more than 1/2-inch, the material shall be removed to full depth and replaced, at Contractor's expense.

METHOD OF MEASUREMENT

156-7.1 Cement Treated Subgrade. The amount of cement treated subgrade shall be based on the number of square yards complete and accepted.

156-7.2 Cement (Undistributed). The amount of cement used is based upon an application rate as specified in paragraph 156-3.1. The amount of cement shall be paid by the number of tons of cement used in the completed and accepted work.

BASIS OF PAYMENT

156-8.1 Cement Treated Subgrade. Payment for placement shall be made at the contract unit price per square yard for the cement treated subgrade for the thickness specified. The price shall be full compensation for all preparation, delivering, placing and mixing these materials, and all labor, equipment, tools and incidentals necessary to complete this item.

156-8.2 Cement (Undistributed). Payment for cement shall be made at the contract unit price per ton for the cement. The price shall be full compensation for all preparation, delivering, placing and mixing these materials, and all labor, equipment, tools and incidentals necessary to complete this item.

Payment will be made under:

Item P-156-8.1	Cement treated subgrade per square yard
Item P-156-8.2	Cement (Undistributed) per ton

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM C150	Standard Specification for Portland Cement
ASTM C595	Standard Specification for Blended Hydraulic Cements
ASTM C1602	Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
ASTM D558	Standard Test Methods for Moisture-Density (Unit Weight) Relations of Soil-Cement Mixtures
ASTM D1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft ³ (2,700 kN-m/m ³))
ASTM D1663	Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders
ASTM D2216	Test Methods for Laboratory Determination of Water (Moisture) Soil and Rock by Mass

ASTM D2487	Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D4318	Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils
ASTM D4959	Standard Test Method for Determination of Water Content of Soil by Direct Heating
ASTM D6938	Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

END OF ITEM P-156

Item P-605 Joint Sealants for Pavements

DESCRIPTION

605-1.1 This item shall consist of providing and installing a resilient and adhesive joint sealing material capable of effectively sealing joints in pavement; joints between different types of pavements; and cracks in existing pavement.

MATERIALS

605-2.1 Joint sealants. Joint sealant materials shall meet the requirements of ASTM D5893 for concrete/concrete interface joints and ASTM D6690 for asphalt/asphalt or asphalt/concrete interface joints.

Each lot or batch of sealant shall be delivered to the jobsite in the manufacturer's original sealed container. Each container shall be marked with the manufacturer's name, batch or lot number, the safe heating temperature, and shall be accompanied by the manufacturer's certification stating that the sealant meets the requirements of this specification.

605-2.2 Backer rod. The material furnished shall be a compressible, non-shrinking, non-staining, non-absorbing material that is non-reactive with the joint sealant in accordance with ASTM D5249. The backer-rod material shall be $25\% \pm 5\%$ larger in diameter than the nominal width of the joint.

605-2.3 Bond breaking tapes. Provide a bond breaking tape or separating material that is a flexible, non-shrinkable, non-absorbing, non-staining, and non-reacting adhesive-backed tape. The material shall have a melting point at least 5°F greater than the pouring temperature of the sealant being used when tested in accordance with ASTM D789. The bond breaker tape shall be approximately 1/8 inch wider than the nominal width of the joint and shall not bond to the joint sealant.

CONSTRUCTION METHODS

605-3.1 Time of application. Joints shall be sealed as soon after completion of the curing period as feasible and before the pavement is opened to traffic, including construction equipment. The pavement temperature shall be 50°F (10°C) and rising at the time of application of the poured joint sealing material. Do not apply sealant if moisture is observed in the joint.

605-3.2 Equipment. Machines, tools, and equipment used in the performance of the work required by this section shall be approved before the work is started and maintained in satisfactory condition at all times. Submit a list of proposed equipment to be used in performance of construction work including descriptive data, 14 days prior to use on the project.

a. Tractor-mounted routing tool. Provide a routing tool, used for removing old sealant from the joints, of such shape and dimensions and so mounted on the tractor that it will not damage the sides of the joints. The tool shall be designed so that it can be adjusted to remove the old material to varying depths as required. The use of V-shaped tools or rotary impact routing devices will not be permitted. Hand-operated spindle routing devices may be used to clean and enlarge random cracks.

b. Concrete saw. Provide a self-propelled power saw, with water-cooled diamond or abrasive saw blades, for cutting joints to the depths and widths specified.

c. Sandblasting equipment. Sandblasting is not allowed.

d. Waterblasting equipment. The Contractor must demonstrate waterblasting equipment including the pumps, hose, guide and nozzle size, under job conditions, before approval in accordance with paragraph 605-3.3. The Contractor shall demonstrate, in the presence of the RPR, that the method cleans the joint and does not damage the joint.

e. Hand tools. Hand tools may be used, when approved, for removing defective sealant from a crack and repairing or cleaning the crack faces. Hand tools should be carefully evaluated for potential spalling effects prior to approval for use.

f. Hot-poured sealing equipment. The unit applicators used for heating and installing ASTM D6690 joint sealant materials shall be mobile and shall be equipped with a double-boiler, agitator-type kettle with an oil medium in the outer space for heat transfer; a direct-connected pressure-type extruding device with a nozzle shaped for inserting in the joint to be filled; positive temperature devices for controlling the temperature of the transfer oil and sealant; and a recording type thermometer for indicating the temperature of the sealant. The applicator unit shall be designed so that the sealant will circulate through the delivery hose and return to the inner kettle when not in use.

g. Cold-applied, single-component sealing equipment. The equipment for installing ASTM D5893 single component joint sealants shall consist of an extrusion pump, air compressor, following plate, hoses, and nozzle for transferring the sealant from the storage container into the joint opening. The dimension of the nozzle shall be such that the tip of the nozzle will extend into the joint to allow sealing from the bottom of the joint to the top. Maintain the initially approved equipment in good working condition, serviced in accordance with the supplier's instructions, and unaltered in any way without obtaining prior approval. Small hand-held air-powered equipment (i.e., caulking guns) may be used for small applications.

605-3.3 Preparation of joints. Pavement joints for application of material in this specification must be dry, clean of all scale, dirt, dust, curing compound, and other foreign matter. The Contractor shall demonstrate, in the presence of the RPR, that the method cleans the joint and does not damage the joint.

a. Sawing. All joints shall be sawed in accordance with specifications and plan details. Immediately after sawing the joint, the resulting slurry shall be completely removed from joint and adjacent area by flushing with a jet of water, and by use of other tools as necessary.

b. Sealing. Immediately before sealing, the joints shall be thoroughly cleaned of all remaining laitance, curing compound, filler, protrusions of hardened concrete, old sealant and other foreign material from the sides and upper edges of the joint space to be sealed. Cleaning shall be accomplished by tractor-mounted routing equipment, concrete saw, or waterblaster as specified in paragraph 605-3.2. The newly exposed concrete joint faces and the pavement surface extending a minimum of 1/2 inch from the joint edge shall be sandblasted clean. Sandblasting shall be accomplished in a minimum of two passes. One pass per joint face with the nozzle held at an angle directly toward the joint face and not more than 3 inches from it. After final cleaning and immediately prior to sealing, blow out the joints with compressed air and leave them completely free of debris and water. The joint faces shall be surface dry when the seal is applied.

c. Backer Rod. When the joint opening is of a greater depth than indicated for the sealant depth, plug or seal off the lower portion of the joint opening using a backer rod in accordance with paragraph 605-2.2 to prevent the entrance of the sealant below the specified depth. Take care to ensure that the backer rod is placed at the specified depth and is not stretched or twisted during installation.

d. Bond-breaking tape. Where inserts or filler materials contain bitumen, or the depth of the joint opening does not allow for the use of a backup material, insert a bond-separating tape breaker in accordance with paragraph 605-2.3 to prevent incompatibility with the filler materials and three-sided adhesion of the sealant. Securely bond the tape to the bottom of the joint opening so it will not float up into the new sealant.

605-3.4 Installation of sealants. Joints shall be inspected for proper width, depth, alignment, and preparation, and shall be approved by the RPR before sealing is allowed. Sealants shall be installed in accordance with the following requirements:

Immediately preceding, but not more than 50 feet ahead of the joint sealing operations, perform a final cleaning with compressed air. Fill the joints from the bottom up to 1/4 inch \pm 1/16 inch below the top of pavement surface; or bottom of groove for grooved pavement. Remove and discard excess or spilled sealant from the pavement by approved methods. Install the sealant in such a manner as to prevent the formation of voids and entrapped air. In no case shall gravity methods or pouring pots be used to install the sealant material. Traffic shall not be permitted over newly sealed pavement until authorized by the RPR. When a primer is recommended by the manufacturer, apply it evenly to the joint faces in accordance with the manufacturer's instructions. Check the joints frequently to ensure that the newly installed sealant is cured to a tack-free condition within the time specified.

605-3.5 Inspection. The Contractor shall inspect the joint sealant for proper rate of cure and set, bonding to the joint walls, cohesive separation within the sealant, reversion to liquid, entrapped air and voids. Sealants exhibiting any of these deficiencies at any time prior to the final acceptance of the project shall be removed from the joint, wasted, and replaced as specified at no additional cost to the airport.

605-3.6 Clean-up. Upon completion of the project, remove all unused materials from the site and leave the pavement in a clean condition.

METHOD OF MEASUREMENT

605-4.1 Joint sealing material shall be measured by the linear foot of sealant in place, completed, and accepted.

BASIS OF PAYMENT

605-5.1 Payment for joint sealing material shall be made at the contract unit price per linear foot. The price shall be full compensation for furnishing all materials, for all preparation, delivering, and placing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-605-5.1	Joint Sealing Filler, concrete/concrete interface joints per linear foot
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REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM D789	Standard Test Method for Determination of Relative Viscosity of Polyamide (PA)
ASTM D5249	Standard Specification for Backer Material for Use with Cold- and Hot-Applied Joint Sealants in Portland-Cement Concrete and Asphalt Joints
ASTM D5893	Standard Specification for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements
ASTM D6690	Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt

Advisory Circulars (AC)

AC 150/5340-30	Design and Installation Details for Airport Visual Aids
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END ITEM P-605

Item P-610 Concrete for Miscellaneous Structures

DESCRIPTION

610-1.1 This item shall consist of concrete and reinforcement, as shown on the plans, prepared and constructed in accordance with these specifications. This specification shall be used for all concrete other than airfield pavement which are cast-in-place.

MATERIALS

610-2.1 General. Only approved materials, conforming to the requirements of these specifications, shall be used in the work. Materials may be subject to inspection and tests at any time during their preparation or use. The source of all materials shall be approved by the Resident Project Representative (RPR) before delivery or use in the work. Representative preliminary samples of the materials shall be submitted by the Contractor, when required, for examination and test. Materials shall be stored and handled to ensure preservation of their quality and fitness for use and shall be located to facilitate prompt inspection. All equipment for handling and transporting materials and concrete must be clean before any material or concrete is placed in them.

The use of pit-run aggregates shall not be permitted unless the pit-run aggregate has been screened and washed, and all fine and coarse aggregates stored separately and kept clean. The mixing of different aggregates from different sources in one storage stockpile or alternating batches of different aggregates shall not be permitted.

a. Reactivity. Fine aggregate and coarse aggregates to be used in all concrete shall have been tested separately within six months of the project in accordance with ASTM C1260. Test results shall be submitted to the RPR. The aggregate shall be considered innocuous if the expansion of test specimens, tested in accordance with ASTM C1260, does not exceed 0.08% at 14 days (16 days from casting). If the expansion either or both test specimen is greater than 0.08% at 14 days, but less than 0.20%, a minimum of 25% of Type F fly ash, or between 40% and 55% of slag cement shall be used in the concrete mix. If expansion of either the coarse or fine aggregate exceeds 0.08% at 14 days, limit the alkali of the concrete to be less than or equal to 3.0 lb per cubic yard, calculated in accordance with EB 106.

If the expansion is greater than 0.20%, the aggregates shall not be used, and test results for other aggregates must be submitted for evaluation; or aggregates that meet P-501 reactivity test requirements may be utilized.

610-2.2 Coarse aggregate. The coarse aggregate for concrete shall meet the requirements of ASTM C33 and the requirements of Table 4, Class Designation 5S; and the grading requirements shown below, as required for the project.

Coarse Aggregate Grading Requirements

Maximum Aggregate Size	ASTM C33, Table 3 Grading Requirements (Size No.)
1 1/2 inch (37.5 mm)	467 or 4 and 67
1 inch (25 mm)	57
¾ inch (19 mm)	67
½ inch (12.5 mm)	7

610-2.2.1 Coarse Aggregate susceptibility to durability (D) cracking. Coarse aggregate may only be accepted from sources that have a 20-year service history for the same gradation to be supplied with no history of D-Cracking. Aggregates that do not have a 20-year record of service free from major repairs (less than 5% of slabs replaced) in similar conditions without D-cracking shall not be used unless the material currently being produced has a durability factor greater than or equal to 95 per ASTM C666. The Contractor shall submit a current certification and test results to verify the aggregate acceptability. Test results will only be accepted from a State Department of Transportation (DOT) materials laboratory or an accredited laboratory. Certification and test results which are not dated or which are over one (1) year old or which are for different gradations will not be accepted.

Crushed granite, calcite cemented sandstone, quartzite, basalt, diabase, rhyolite or trap rock are considered to meet the D-cracking test requirements but must meet all other quality tests specified in Item INDOT 501.

610-2.3 Fine aggregate. The fine aggregate for concrete shall meet all fine aggregate requirements of ASTM C33.

610-2.4 Cement. Cement shall conform to the requirements of ASTM C150, Types I, II, or V or ASTM C595, Type IL.

610-2.5 Cementitious materials.

a. Fly ash. Fly ash shall meet the requirements of ASTM C618, with the exception of loss of ignition, where the maximum shall be less than 6%. Fly ash shall have a Calcium Oxide (CaO) content of less than 15% and a total available alkali content less than 3% per ASTM C311. Fly ash produced in furnace operations using liming materials or soda ash (sodium carbonate) as an additive shall not be acceptable. The Contractor shall furnish the previous three most recent, consecutive ASTM C618 reports for each source of fly ash proposed in the concrete mix, and shall furnish each additional report as they become available during the project. The reports can be used for acceptance or the material may be tested independently by the RPR.

b. Slag cement (ground granulated blast furnace (GGBF)). Slag cement shall conform to ASTM C989, Grade 100 or Grade 120. Slag cement shall be used only at a rate between 25% and 55% of the total cementitious material by mass.

610-2.6 Water. Water used in mixing or curing shall be from potable water sources. Other sources shall be tested in accordance with ASTM C1602 prior to use.

610-2.7 Admixtures. The Contractor shall submit certificates indicating that the material to be furnished meets all of the requirements indicated below. In addition, the RPR may require the Contractor to submit complete test data from an approved laboratory showing that the material to be furnished meets all of the requirements of the cited specifications. Subsequent tests may be made of samples taken by the RPR from the supply of the material being furnished or proposed for use on the work to determine whether the admixture is uniform in quality with that approved.

a. Air-entraining admixtures. Air-entraining admixtures shall meet the requirements of ASTM C260 and shall consistently entrain the air content in the specified ranges under field conditions. The air-entrainment agent and any water reducer admixture shall be compatible.

b. Water-reducing admixtures. Water-reducing admixture shall meet the requirements of ASTM C494, Type A, B, or D. ASTM C494, Type F and G high range water reducing admixtures and ASTM C1017 flowable admixtures shall not be used.

c. Other chemical admixtures. The use of set retarding, and set-accelerating admixtures shall be approved by the RPR. Retarding shall meet the requirements of ASTM C494, Type A, B, or D and set-accelerating shall meet the requirements of ASTM C494, Type C. Calcium chloride and admixtures containing calcium chloride shall not be used.

610-2.8 Premolded joint material. Premolded joint material for expansion joints shall meet the requirements of ASTM D1751.

610-2.9 Joint filler. The filler for joints shall meet the requirements of Item P-605, unless otherwise specified.

610-2.10 Steel reinforcement. Reinforcing shall consist of Grade 60 reinforcing steel conforming to the requirements of ASTM A615.

610-2.11 Materials for curing concrete. Curing materials shall conform to **one of the following:**

Waterproof paper	ASTM C171
Clear or white Polyethylene Sheeting	ASTM C171
White-pigmented Liquid Membrane-Forming Compound, Type 2, Class B	ASTM C309

CONSTRUCTION METHODS

610-3.1 General. The Contractor shall furnish all labor, materials, and services necessary for, and incidental to, the completion of all work as shown on the drawings and specified here. All machinery and equipment used by the Contractor on the work, shall be of sufficient size to meet the requirements of the work. All work shall be subject to the inspection and approval of the RPR.

610-3.2 Concrete Mixture. The concrete shall develop a compressive strength of 4000 psi in 28 days as determined by test cylinders made in accordance with ASTM C31 and tested in accordance with ASTM C39. The concrete shall contain not less than 470 pounds of cementitious material per cubic yard. The water cementitious ratio shall not exceed 0.45 by weight. The air content of the concrete shall be 5% +/- 1.2% as determined by ASTM C231 and shall have a slump of not more than 4 inches as determined by ASTM C143.

610-3.3 Mixing. Concrete may be mixed at the construction site, at a central point, or wholly or in part in truck mixers. The concrete shall be mixed and delivered in accordance with the requirements of ASTM C94 or ASTM C685.

The concrete shall be mixed only in quantities required for immediate use. Concrete shall not be mixed while the air temperature is below 40°F (4°C) without the RPRs approval. If approval is granted for mixing under such conditions, aggregates or water, or both, shall be heated and the concrete shall be placed at a temperature not less than 50°F (10°C) nor more than 100°F (38°C). The Contractor shall be held responsible for any defective work, resulting from freezing or injury in any manner during placing and curing, and shall replace such work at his expense.

Retempering of concrete by adding water or any other material is not permitted.

The rate of delivery of concrete to the job shall be sufficient to allow uninterrupted placement of the concrete.

610-3.4 Forms. Concrete shall not be placed until all the forms and reinforcements have been inspected and approved by the RPR. Forms shall be of suitable material and shall be of the type, size, shape, quality, and strength to build the structure as shown on the plans. The forms shall be true to line and grade and shall be mortar-tight and sufficiently rigid to prevent displacement and sagging between supports. The surfaces of forms shall be smooth and free from irregularities, dents, sags, and holes. The Contractor shall be responsible for their adequacy.

The internal form ties shall be arranged so no metal will show in the concrete surface or discolor the surface when exposed to weathering when the forms are removed. All forms shall be wetted with water or with a non-staining mineral oil, which shall be applied immediately before the concrete is placed. Forms shall be constructed so they can be removed without injuring the concrete or concrete surface.

610-3.5 Placing reinforcement. All reinforcement shall be accurately placed, as shown on the plans, and shall be firmly held in position during concrete placement. Bars shall be fastened together at intersections. The reinforcement shall be supported by approved metal chairs. Shop drawings, lists, and bending details shall be supplied by the Contractor when required.

610-3.6 Embedded items. Before placing concrete, all embedded items shall be firmly and securely fastened in place as indicated. All embedded items shall be clean and free from coating, rust, scale, oil, or any foreign matter. The concrete shall be spaded and consolidated around and against embedded items. The embedding of wood shall not be allowed.

610-3.7 Concrete Consistency. The Contractor shall monitor the consistency of the concrete delivered to the project site; collect each batch ticket; check temperature; and perform slump tests on each truck at the project site in accordance with ASTM C143.

610-3.8 Placing concrete. All concrete shall be placed during daylight hours, unless otherwise approved. The concrete shall not be placed until the depth and condition of foundations, the adequacy of forms and falsework, and the placing of the steel reinforcing have been approved by the RPR. Concrete shall be placed as soon as practical after mixing, but in no case later than one (1) hour after water has been added to the mix. The method and manner of placing shall avoid segregation and displacement of the reinforcement. Troughs, pipes, and chutes shall be used as an aid in placing concrete when necessary. The concrete shall not be dropped from a height of more than 5 feet. Concrete shall be deposited as nearly as practical in its final position to avoid segregation due to rehandling or flowing. Do not subject concrete to procedures which cause segregation. Concrete shall be placed on clean, damp surfaces, free from running water, or on a properly consolidated soil foundation.

610-3.9 Vibration. Vibration shall follow the guidelines in American Concrete Institute (ACI) Committee 309R, Guide for Consolidation of Concrete.

610-3.10 Joints. Joints shall be constructed as indicated on the plans.

610-3.11 Finishing. All exposed concrete surfaces shall be true, smooth, and free from open or rough areas, depressions, or projections. All concrete horizontal plane surfaces shall be brought flush to the proper elevation with the finished top surface struck-off with a straightedge and floated.

610-3.12 Curing and protection. All concrete shall be properly cured in accordance with the recommendations in American Concrete Institute (ACI) 308R, Guide to External Curing of Concrete. The concrete shall be protected from damage until project acceptance.

610-3.13 Cold weather placing. When concrete is placed at temperatures below 40°F, follow the cold weather concreting recommendations found in ACI 306R, Cold Weather Concreting.

610-3.14 Hot weather placing. When concrete is placed in hot weather greater than 85°F, follow the hot weather concreting recommendations found in ACI 305R, Hot Weather Concreting.

QUALITY ASSURANCE (QA)

610-4.1 Quality Assurance sampling and testing. Concrete for each day's placement will be accepted on the basis of the compressive strength specified in paragraph 610-3.2. The RPR will sample the concrete in accordance with ASTM C172; test the slump in accordance with ASTM C143; test air content in accordance with ASTM C231; make and cure compressive strength specimens in accordance with ASTM C31; and test in accordance with ASTM C39. The QA testing agency will meet the requirements of ASTM C1077.

The Contractor shall provide adequate facilities for the initial curing of cylinders.

610-4.2 Defective work. Any defective work that cannot be satisfactorily repaired as determined by the RPR, shall be removed and replaced at the Contractor's expense. Defective work includes, but is not limited to, uneven dimensions, honeycombing and other voids on the surface or edges of the concrete.

METHOD OF MEASUREMENT

610-5.1 Concrete shall be measured by the number of square yards based on the dimensions shown on the plans of concrete complete in place and accepted.

610-5.2 All remaining concrete shall be considered incidental and no separate measurement shall be made.

BASIS OF PAYMENT

610-6.1 Payment shall be made at the contract price by the number of square yards. This price shall be full compensation for furnishing all materials including reinforcement and embedded items and for all preparation, delivery, installation, and curing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

610-6.2 All remaining concrete shall be considered incidental and no separate payment shall be made.

Payment will be made under:

Item P-610-6.1	Concrete, per square yards
Item P-610-6.2	Concrete, incidental to other work items, no direct payment

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM A184	Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A704	Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement
ASTM A706	Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement

ASTM A775	Standard Specification for Epoxy-Coated Steel Reinforcing Bars
ASTM A884	Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement
ASTM A934	Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars
ASTM A1064	Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM C31	Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C33	Standard Specification for Concrete Aggregates
ASTM C39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C94	Standard Specification for Ready-Mixed Concrete
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C114	Standard Test Methods for Chemical Analysis of Hydraulic Cement
ASTM C136	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C143	Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C150	Standard Specification for Portland Cement
ASTM C171	Standard Specification for Sheet Materials for Curing Concrete
ASTM C172	Standard Practice for Sampling Freshly Mixed Concrete
ASTM C231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C260	Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C311	Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland-Cement Concrete
ASTM C494	Standard Specification for Chemical Admixtures for Concrete
ASTM C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C666	Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing
ASTM C685	Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing
ASTM C989	Standard Specification for Slag Cement for Use in Concrete and Mortars
ASTM C1017	Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C1077	Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
ASTM C1157	Standard Performance Specification for Hydraulic Cement
ASTM C1260	Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)

ASTM C1365	Standard Test Method for Determination of the Proportion of Phases in Portland Cement and Portland-Cement Clinker Using X-Ray Powder Diffraction Analysis
ASTM C1602	Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
ASTM D1751	Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Asphalt Types)
ASTM D1752	Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction

American Concrete Institute (ACI)

ACI 305R	Hot Weather Concreting
ACI 306R	Cold Weather Concreting
ACI 308R	Guide to External Curing of Concrete
ACI 309R	Guide for Consolidation of Concrete

END OF ITEM P-610

Item P-620 Runway and Taxiway Marking

DESCRIPTION

620-1.1 This item shall consist of the preparation and painting of numbers, markings, and stripes on the surface of runways, taxiways, and aprons, in accordance with these specifications and at the locations shown on the plans, or as directed by the Resident Project Representative (RPR). The terms “paint” and “marking material” as well as “painting” and “application of markings” are interchangeable throughout this specification.

MATERIALS

620-2.1 Materials acceptance. The Contractor shall furnish manufacturer’s certified test reports, for materials shipped to the project. The certified test reports shall include a statement that the materials meet the specification requirements. This certification along with a copy of the paint manufacturer’s surface preparation; marking materials, including adhesion, flow promoting and/or floatation additive; and application requirements must be submitted and approved by the Resident Project Representative (RPR) prior to the initial application of markings. The reports can be used for material acceptance or the RPR may perform verification testing. The reports shall not be interpreted as a basis for payment. The Contractor shall notify the RPR upon arrival of a shipment of materials to the site. All material shall arrive in sealed containers that are easily quantifiable for inspection by the RPR.

620-2.2 Marking materials.

Table 1. Marking Materials

Paint ¹				Glass Beads ²	
Type	Color	Fed Std. 595 Number	Application Rate Maximum	Type	Application Rate Minimum
I	White	37925	115 SF/GAL	III	10 LB/GAL
I	Yellow	33538 or 33655	115 SF/GAL	III	10 LB/GAL
I	Black	37038	115 SF/GAL	---	---

¹See paragraph 620-2.2a

²See paragraph 620-2.2b

a. Paint. Paint shall be waterborne in accordance with the requirements of this paragraph. Paint colors shall comply with Federal Standard No. 595.

Waterborne. Paint shall meet the requirements of Federal Specification TT-P-1952F, Type I. The non-volatile portion of the vehicle for all paint types shall be composed of a 100% acrylic polymer as determined by infrared spectral analysis.

b. Reflective media. Glass beads for white and yellow paint shall meet the requirements for Federal Specification TT-B-1325D Type III.

Glass beads for red and pink paint shall meet the requirements for Type I, Gradation A.

Glass beads shall be treated with all compatible coupling agents recommended by the manufacturers of the paint and reflective media to ensure adhesion and embedment.

Glass beads shall not be used in black and green paint.

Type III glass beads shall not be used in red and pink paint.

CONSTRUCTION METHODS

620-3.1 Weather limitations. Painting shall only be performed when the surface is dry, and the ambient temperature and the pavement surface temperature meet the manufacturer's recommendations in accordance with paragraph 620-2.1. Painting operations shall be discontinued when the ambient or surface temperatures does not meet the manufacturer's recommendations. Markings shall not be applied when the wind speed exceeds 10 mph unless windscreens are used to shroud the material guns. Markings shall not be applied when weather conditions are forecasts to not be within the manufacturers' recommendations for application and dry time.

620-3.2 Equipment. Equipment shall include the apparatus necessary to properly clean the existing surface, a mechanical marking machine, a bead dispensing machine, and such auxiliary hand-painting equipment as may be necessary to satisfactorily complete the job.

The mechanical marker shall be an atomizing spray-type or airless type marking machine with automatic glass bead dispensers suitable for application of traffic paint. It shall produce an even and uniform film thickness and appearance of both paint and glass beads at the required coverage and shall apply markings of uniform cross-sections and clear-cut edges without running or spattering and without over spray. The marking equipment for both paint and beads shall be calibrated daily.

620-3.3 Preparation of surfaces. Immediately before application of the paint, the surface shall be dry and free from dirt, grease, oil, laitance, or other contaminants that would reduce the bond between the paint and the pavement. Use of any chemicals or impact abrasives during surface preparation shall be approved in advance by the RPR. After the cleaning operations, sweeping, blowing, or rinsing with pressurized water shall be performed to ensure the surface is clean and free of grit or other debris left from the cleaning process.

a. Preparation of new pavement surfaces. The area to be painted shall be cleaned by broom, blower, water blasting, or by other methods approved by the RPR to remove all contaminants, including PCC curing compounds, minimizing damage to the pavement surface.

b. Preparation of pavement to remove existing markings. Existing pavement markings shall be removed by rotary grinding, water blasting, or by other methods approved by the RPR minimizing damage to the pavement surface. The removal area may need to be larger than the area of the markings to eliminate ghost markings. After removal of markings on asphalt pavements, apply a fog seal or seal coat to 'block out' the removal area to eliminate 'ghost' markings.

c. Preparation of pavement markings prior to remarking. Prior to remarking existing markings, loose existing markings must be removed minimizing damage to the pavement surface, with a method approved by the RPR. After removal, the surface shall be cleaned of all residue or debris.

Prior to the application of markings, the Contractor shall certify in writing that the surface is dry and free from dirt, grease, oil, laitance, or other foreign material that would prevent the bond of the paint to the pavement or existing markings. This certification along with a copy of the paint manufactures application and surface preparation requirements must be submitted to the RPR prior to the initial application of markings.

620-3.4 Layout of markings. The proposed markings shall be laid out in advance of the paint application. The locations of markings to receive glass beads shall be shown on the plans.

620-3.5 Application. A period of 30 days shall elapse between placement of surface course or seal coat and application of the permanent paint markings. Paint shall be applied at the locations and to the dimensions and spacing shown on the plans. Paint shall not be applied until the layout and condition of the surface has been approved by the RPR.

The edges of the markings shall not vary from a straight line more than 1/2 inch in 50 feet, and marking dimensions and spacing shall be within the following tolerances:

Marking Dimensions and Spacing Tolerance

Dimension and Spacing	Tolerance
36 inch or less	±1/2 inch
greater than 36 inch to 6 feet	±1 inch
greater than 6 feet to 60 feet	±2 inch
greater than 60 feet	±3 inch

The paint shall be mixed in accordance with the manufacturer's instructions and applied to the pavement with a marking machine at the rate shown in Table 1. The addition of thinner will not be permitted.

Glass beads shall be distributed upon the marked areas at the locations shown on the plans to receive glass beads immediately after application of the paint. A dispenser shall be furnished that is properly designed for attachment to the marking machine and suitable for dispensing glass beads. Glass beads shall be applied at the rate shown in Table 1. Glass beads shall not be applied to black paint or green paint. Glass beads shall adhere to the cured paint or all marking operations shall cease until corrections are made. Different bead types shall not be mixed. Regular monitoring of glass bead embedment and distribution should be performed.

620-3.6 Application--preformed thermoplastic airport pavement markings. Not used.

620-3.7 Control strip. Prior to the full application of airfield markings, the Contractor shall prepare a control strip in the presence of the RPR. The Contractor shall demonstrate the surface preparation method and all striping equipment to be used on the project. The marking equipment must achieve the prescribed application rate of paint and population of glass beads (per Table 1) that are properly embedded and evenly distributed across the full width of the marking. Prior to acceptance of the control strip, markings must be evaluated during darkness to ensure a uniform appearance.

620-3.8 Retro-reflectance. Reflectance shall be measured with a portable retro-reflectometer meeting ASTM E1710 (or equivalent). A total of 6 reading shall be taken over a 6 square foot area with 3 readings taken from each direction. The average shall be equal to or above the minimum levels of all readings which are within 30% of each other.

Minimum Retro-Reflectance Values

Material	Retro-reflectance mcd/m ² /lux		
	White	Yellow	Red
Initial Type I	300	175	35
Initial Type III	600	300	35
Initial Thermoplastic	225	100	35
All materials, remark when less than ¹	100	75	10

¹ Prior to remarking determine if removal of contaminants on markings will restore retro-reflectance

620-3.9 Protection and cleanup. After application of the markings, all markings shall be protected from damage until dry. All surfaces shall be protected from excess moisture and/or rain and from disfiguration by spatter, splashes, spillage, or drippings. The Contractor shall remove from the work area all debris, waste, loose reflective media, and by-products generated by the surface preparation and application operations to the satisfaction of the RPR. The Contractor shall dispose of these wastes in strict compliance with all applicable state, local, and federal environmental statutes and regulations.

METHOD OF MEASUREMENT

620-4.1a The quantity of surface preparation shall not be measured separately and shall be incidental to markings.

620-4.1b The quantity of markings shall be paid for shall be measured by the number of square feet of painting.

620-4.1c The quantity of reflective media shall be paid for by the number of pounds of reflective media.

620-4.1d The quantity of pavement message marking, ADA shall be paid for per each.

BASIS OF PAYMENT

620-5.1 This price shall be full compensation for furnishing all materials and for all labor, equipment, tools, and incidentals necessary to complete the item complete in place and accepted by the RPR in accordance with these specifications.

620-5.1a Payment for surface preparation shall not be made separately and shall be incidental to markings.

620-5.1b Payment for markings shall be made at the contract price for the number of square feet of painting.

620-5.1c Payment for reflective media shall be made at the contract unit price for the number of pounds of reflective media.

620-5.1.d Payment for pavement message marking, ADA shall be made at the contract unit price per each.

Payment will be made under:

Item P-620-5.1b Marking per square foot

Item P-620-5.1c	Reflective Media per pound
Item P-620-5.1d	Pavement message marking, ADA per each

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM D476	Standard Classification for Dry Pigmentary Titanium Dioxide Products
ASTM D968	Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive
ASTM D1652	Standard Test Method for Epoxy Content of Epoxy Resins
ASTM D2074	Standard Test Method for Total, Primary, Secondary, and Tertiary Amine Values of Fatty Amines by Alternative Indicator Method
ASTM D2240	Standard Test Method for Rubber Property - Durometer Hardness
ASTM D7585	Standard Practice for Evaluating Retroreflective Pavement Markings Using Portable Hand-Operated Instruments
ASTM E303	Standard Test Method for Measuring Surface Frictional Properties Using the British Pendulum Tester
ASTM E1710	Standard Test Method for Measurement of Retroreflective Pavement Marking Materials with CEN-Prescribed Geometry Using a Portable Retroreflectometer
ASTM E2302	Standard Test Method for Measurement of the Luminance Coefficient Under Diffuse Illumination of Pavement Marking Materials Using a Portable Reflectometer
ASTM G154	Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials

Code of Federal Regulations (CFR)

40 CFR Part 60, Appendix A-7, Method 24	Determination of volatile matter content, water content, density, volume solids, and weight solids of surface coatings
29 CFR Part 1910.1200	Hazard Communication

Federal Specifications (FED SPEC)

FED SPEC TT-B-1325D	Beads (Glass Spheres) Retro-Reflective
FED SPEC TT-P-1952F	Paint, Traffic and Airfield Marking, Waterborne
FED STD 595	Colors used in Government Procurement

Commercial Item Description

A-A-2886B	Paint, Traffic, Solvent Based
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Advisory Circulars (AC)

AC 150/5340-1	Standards for Airport Markings
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AC 150/5320-12

Measurement, Construction, and Maintenance of Skid Resistant Airport
Pavement Surfaces

Indiana Department of Transportation (INDOT) Standard Specifications

INDOT 808

Pavement Traffic Markings

END OF ITEM P-620

Item D-701 Pipe for Storm Drains and Culverts

DESCRIPTION

701-1.1 This item shall consist of the construction of pipe culverts and storm drains in accordance with these specifications and in reasonably close conformity with the lines and grades shown on the plans.

MATERIALS

701-2.1 Materials shall meet the requirements shown on the plans and specified below. Underground piping and components used in drainage systems for terminal and aircraft fueling ramp drainage shall be noncombustible and inert to fuel in accordance with National Fire Protection Association (NFPA) 415.

701-2.2 Pipe. The pipe shall be of the type called for on the plans or in the proposal and shall be in accordance with the following appropriate requirements:

American Association of State Highway and Transportation Officials (AASHTO)

AASHTO R73	Standard Practice for Evaluation of Precast Concrete Drainage Productions
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ASTM International (ASTM)

ASTM A760	Standard Specification for Corrugated Steel Pipe, Metallic-Coated for Sewers and Drains
ASTM A849	Standard Specification for Post Applied Coatings, Pavings, and Linings for Corrugated Steel Sewer and Drainage Pipe
ASTM C76	Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM C507	Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe
ASTM C655	Standard Specification for Reinforced Concrete D-Load Culvert, Storm Drain, and Sewer Pipe
ASTM C1479	Standard Practice for Installation of Precast Concrete Sewer, Storm Drain, and Culvert Pipe Using Standard Installations
ASTM C1840	Standard Practice for Inspection and Acceptance of Installed Reinforced Concrete Culvert, Storm Drain, and Storm Sewer Pipe

701-2.3 Concrete. Concrete for pipe cradles shall have a minimum compressive strength of 2000 psi at 28 days and conform to the requirements of ASTM C94.

701-2.4 Rubber gaskets. Rubber gaskets for rigid pipe shall conform to the requirements of ASTM C443. Rubber gaskets for PVC pipe, polyethylene, and polypropylene pipe shall conform to the requirements of ASTM F477. Rubber gaskets for zinc-coated steel pipe and precoated galvanized pipe shall conform to the requirements of ASTM D1056, for the "RE" closed cell grades. Rubber gaskets for steel reinforced thermoplastic ribbed pipe shall conform to the requirements of ASTM F477.

701-2.5 Joint mortar. Pipe joint mortar shall consist of one part Portland cement and two parts sand. The Portland cement shall conform to the requirements of ASTM C150, Type I. The sand shall conform to the requirements of ASTM C144.

701-2.6 Joint fillers. Not used.

701-2.7 Plastic gaskets. Not used.

701-2.8. Controlled low-strength material (CLSM). Controlled low-strength material shall conform to the requirements of Item P-153. When CLSM is used, all joints shall have gaskets.

701-2.9 Precast box culverts. Manufactured in accordance with and conforming to ASTM C1433.

701-2.10 Precast concrete pipe. Precast concrete structures shall be furnished by a plant meeting National Precast Concrete Association Plant Certification Program or American Concrete Pipe Association QCast Plant Certification program.

CONSTRUCTION METHODS

701-3.1 Excavation. The width of the pipe trench shall be sufficient to permit satisfactory jointing of the pipe and thorough tamping of the bedding material under and around the pipe, but it shall not be less than the external diameter of the pipe plus 12 inches on each side. The trench walls shall be approximately vertical.

The Contractor shall comply with all current federal, state and local rules and regulations governing the safety of men and materials during the excavation, installation and backfilling operations. Specifically, the Contractor shall observe that all requirements of the Occupational Safety and Health Administration (OSHA) relating to excavations, trenching and shoring are strictly adhered to. The width of the trench shall be sufficient to permit satisfactory jointing of the pipe and thorough compaction of the bedding material under the pipe and backfill material around the pipe, but it shall not be greater than the widths shown on the plans trench detail.

Where rock, hardpan, or other unyielding material is encountered, the Contractor shall remove it from below the foundation grade for a depth of at least 8 inch or 1/2 inch for each foot of fill over the top of the pipe (whichever is greater) but for no more than three-quarters of the nominal diameter of the pipe. The excavation below grade should be filled with granular material to form a uniform foundation.

Where a firm foundation is not encountered at the grade established, due to soft, spongy, or other unstable soil, the unstable soil shall be removed and replaced with approved granular material for the full trench width. The RPR shall determine the depth of removal necessary. The granular material shall be compacted to provide adequate support for the pipe.

The excavation for pipes placed in embankment fill shall not be made until the embankment has been completed to a height above the top of the pipe as shown on the plans.

701-3.2 Bedding. The bedding surface for the pipe shall provide a foundation of uniform density to support the pipe throughout its entire length.

a. Rigid pipe. The pipe bedding shall be constructed uniformly for the full length of the pipe barrel, as required on the plans. The maximum aggregate size shall be 1 in when the bedding thickness is less than 6 inches, and 1-1/2 in when the bedding thickness is greater than 6 inches. Bedding shall be loosely placed uncompacted material under the middle third of the pipe prior to placement of the pipe.

b. Flexible pipe. For flexible pipe, the bed shall be roughly shaped to fit the pipe, and a bedding blanket of sand or fine granular material shall be provided as follows:

Flexible Pipe Bedding

Pipe Corrugation Depth		Minimum Bedding Depth	
inch	mm	inch	mm
1/2	12	1	25
1	25	2	50
2	50	3	75
2-1/2	60	3-1/2	90

c. Other pipe materials. For PVC, polyethylene, polypropylene, or fiberglass pipe, the bedding material shall consist of coarse sands and gravels with a maximum particle size of 3/4 inches. For pipes installed under paved areas, no more than 12% of the material shall pass the No. 200 sieve. For all other areas, no more than 50% of the material shall pass the No. 200 sieve. The bedding shall have a thickness of at least 6 inches below the bottom of the pipe and extend up around the pipe for a depth of not less than 50% of the pipe's vertical outside diameter.

701-3.3 Laying pipe. The pipe laying shall begin at the lowest point of the trench and proceed upgrade. The lower segment of the pipe shall be in contact with the bedding throughout its full length. Bell or groove ends of rigid pipes and outside circumferential laps of flexible pipes shall be placed facing upgrade.

Paved or partially lined pipe shall be placed so that the longitudinal center line of the paved segment coincides with the flow line.

Elliptical and elliptically reinforced concrete pipes shall be placed with the manufacturer's reference lines designating the top of the pipe within five degrees of a vertical plane through the longitudinal axis of the pipe.

701-3.4 Joining pipe. Joints shall be made with (1) cement mortar, (2) cement grout, (3) rubber gaskets, or (4) coupling bands.

Mortar joints shall be made with an excess of mortar to form a continuous bead around the outside of the pipe and shall be finished smooth on the inside. Molds or runners shall be used for grouted joints to retain the poured grout. Rubber ring gaskets shall be installed to form a flexible watertight seal.

a. Concrete pipe. Concrete pipe may be either bell and spigot or tongue and groove. Pipe sections at joints shall be fully seated and the inner surfaces flush and even. Concrete pipe joints shall be sealed with rubber gaskets meeting ASTM C443.

b. Metal pipe. Metal pipe shall be firmly joined by form-fitting bands conforming to the requirements of ASTM A760 for steel pipe.

c. PVC, Polyethylene, or Polypropylene pipe. Joints for PVC, Polyethylene, or Polypropylene pipe shall conform to the requirements of ASTM D3212 when leak resistant joints are required. Joints for PVC and Polyethylene pipe shall conform to the requirements of AASHTO M304 when soil tight joints are required. Fittings for polyethylene pipe shall conform to the requirements of AASHTO M252 or ASTM M294. Fittings for polypropylene pipe shall conform to ASTM F2881, ASTM F2736, or ASTM F2764.

d. Fiberglass pipe. Not used.

701-3.5 Embedment and Overfill. Pipes shall be inspected before any fill material is placed; any pipes found to be out of alignment, unduly settled, or damaged shall be removed and re-laid or replaced at the Contractor's expense.

701-3.5-1 Embedment Material Requirements

a. Concrete Pipe. Embedment material and compaction requirements shall be in accordance with the applicable Type of Standard Installation (Types 1, 2, 3, or 4) per ASTM C1479. If a concrete cradle or CLSM embedment material is used, it shall conform to the plan details.

b. Plastic and fiberglass Pipe. Embedment material shall meet the requirements of ASTM D3282, A-1, A-2-4, A-2-5, or A-3. Embedment material shall be free of organic material, stones larger than 1.5 inches in the greatest dimension, or frozen lumps. Embedment material shall extend to 12 inches above the top of the pipe.

c. Metal Pipe. Embedment material shall be granular as specified in the contract document and specifications, and shall be free of organic material, rock fragments larger than 1.5 inches in the greatest dimension and frozen lumps. As a minimum, backfill materials shall meet the requirements of ASTM D3282, A-1, A-2, or A-3. Embedment material shall extend to 12 inches above the top of the pipe.

701-3.5-2 Placement of Embedment Material

The embedment material shall be compacted in layers not exceeding 6 inches on each side of the pipe and shall be brought up one foot above the top of the pipe or to natural ground level, whichever is greater. Thoroughly compact the embedment material under the haunches of the pipe without displacing the pipe. Material shall be brought up evenly on each side of the pipe for the full length of the pipe.

When the top of the pipe is above the top of the trench, the embedment material shall be compacted in layers not exceeding 6 inches and shall be brought up evenly on each side of the pipe to one foot above the top of the pipe. All embedment material shall be compacted to a density required under Item P-152.

Concrete cradles and flowable fills, such as controlled low strength material (CLSM) or controlled density fill (CDF), may be used for embedment provided adequate flotation resistance can be achieved by restraints, weighing, or placement technique.

It shall be the Contractor's responsibility to protect installed pipes and culverts from damage due to construction equipment operations. The Contractor shall be responsible for installation of any extra strutting or backfill required to protect pipes from the construction equipment.

701-3.6 Overfill

Pipes shall be inspected before any overfill is in place. Any pipes found to be out of alignment, unduly settled, or damaged shall be removed and relaid or replaced at the Contractor's expense. Evaluation of any damage to RCP shall be evaluated based on AASHTO R73.

Overfill material shall be placed and compacted in layers as required to achieve compaction to at least 95 percent standard proctor per ASTM D1557. The soil shall contain no debris, organic matter, frozen material, or stones with a diameter greater than one half the thickness of the compacted layers being placed.

701-3.7 Inspection Requirements

An initial post installation inspection shall be performed by the Contractor no sooner than 30 days after completion of installation and final backfill. Clean or flush all lines prior to inspection.

Use a camera with lighting suitable to allow a clear picture of the entire periphery of the pipe interior. Center the camera in the pipe both vertically and horizontally and be able to pan and tilt to a 90 degree angle with the axis of the pipe rotating 360 degrees. Use equipment to move the camera through the pipe that will not obstruct the camera's view or interfere with proper documentation of the pipe's condition. The video image shall be clear, focused, and relatively free from roll, static, or other image distortion qualities that would prevent the reviewer from evaluating the condition of the pipe.

Incorporate specific inspection requirements for the various types of pipes beneath the general inspection requirements.

Reinforced concrete pipe shall be inspected, evaluated, and reported on in accordance with ASTM C1840, "Standard Practice for Inspection and Acceptance of Installed Reinforced Concrete Culvert, Storm Drain, and Storm Sewer Pipe." Any issues reported shall include still photo and video documentation. The zoom ratio shall be provided for all still or video images that document any issues of concern by the inspection firm.

Flexible pipes shall be inspected for rips, tears, joint separations, soil migration, cracks, localized buckling, settlement, alignment, and deflection. Determine whether the allowable deflection has been exceeded by use of a laser profiler for internal pipe diameters of 48 inches or less, or direct measurement for internal pipe diameters greater than 48 inches. Laser profile equipment shall utilize low barrel distortion video equipment. Deflection of installed pipe shall not exceed the limits provided in the table below, as a percentage of the average inside diameter of the pipe.

Maximum Allowable Pipe Deflection

Type of Pipe	Maximum Allowable Deflection (%)
Corrugated Metal Pipe	5
Concrete Lined CMP	3
Thermoplastic Pipe	5
Fiberglass	5

If deflection readings in excess of the allowable deflection are obtained, remove the pipe with excessive deflection and replace with new pipe. Isolated areas may exceed allowable by 2.5% with concurrence of RPR. Repair or replace any pipe with cracks exhibiting displacement across the crack, bulges, creases, tears, spalls, or delaminations. The report for flexible pipe shall include as a minimum, the deflection results and final post installation inspection report. The inspection report shall include: a copy of all video taken, pipe location identification, equipment used for inspection, inspector name, deviation from design line and grade, and inspector's notes.

METHOD OF MEASUREMENT

701-4.1 The length of pipe shall be measured in linear feet of pipe in place, completed, and accepted. It shall be measured along the centerline of the pipe from end or inside face of structure to the end or inside face of structure, whichever is applicable. Each size and type of pipe shall be measured separately. All fittings shall be included in the footage as typical pipe sections in the pipe being measured.

BASIS OF PAYMENT

701-5.0 These prices shall fully compensate the Contractor for furnishing all materials and for all preparation, excavation, and installation of these materials; and for all labor, equipment, tools, and incidentals necessary to complete the item.

701-5.1 Payment will be made at the contract unit price per linear foot of pipe installed.

Payment will be made under:

Item 701-5.1 12 inch, 16 gauge corrugated steel pipe per linear foot

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM A760	Standard Specification for Corrugated Steel Pipe, Metallic Coated for Sewers and Drains
ASTM A849	Standard Specification for Post-Applied Coatings, Pavings, and Linings for Corrugated Steel Sewer and Drainage Pipe
ASTM C14	Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe
ASTM C76	Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM C94	Standard Specification for Ready Mixed Concrete
ASTM C144	Standard Specification for Aggregate for Masonry Mortar
ASTM C150	Standard Specification for Portland Cement
ASTM C443	Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
ASTM C506	Standard Specification for Reinforced Concrete Arch Culvert, Storm Drain, and Sewer Pipe
ASTM C507	Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain and Sewer Pipe
ASTM C655	Standard Specification for Reinforced Concrete D-Load Culvert, Storm Drain and Sewer Pipe
ASTM D1056	Standard Specification for Flexible Cellular Materials Sponge or Expanded Rubber
ASTM D3212	Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM D3282	Standard Practice for Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes

National Fire Protection Association (NFPA)

NFPA 415	Standard on Airport Terminal Buildings, Fueling Ramp Drainage, and Loading Walkways
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END ITEM D-701

Item D-702 Slotted Drains

DESCRIPTION

702-1.1 This item shall consist of the construction of steel slotted drains or cast iron slotted vane drains in accordance with these specifications and in reasonably close conformity with the lines and grades shown on the plans. Typical details shall be shown on the plans.

MATERIALS

702-2.1 General. All slotted drains shall meet the requirements shown on the plans and specified below. All slotted drains shall meet specified hydraulic design requirements and shall support the loadings specified.

702-2.2 Pipe.

a. Steel slotted drain. Pipe shall be metallic coated (galvanized or aluminized type 2) corrugated steel type I meeting the requirements of ASTM A760. Pipe diameter and gauge shall be as shown on the plans. The corrugated steel pipe shall have a minimum of two rerolled annular ends.

b. Cast iron slotted vane drain. Not used.

702-2.3 Grates and castings.

a. Steel Slotted Drain. Grates shall be manufactured from ASTM A36 Grade 36 steel. Spacers and bearing bars (sides) shall be 3/16-inch material. The spacers shall be welded to each bearing bar with four 1-1/4 inch long by 3/16 inch wide fillet welds on each side of the bearing bar at spacings not exceeding 6 inches. The grates shall be 6 inches high or as shown on the plans and shall have a maximum 1-3/4 inch opening in the top.

Grates shall be galvanized in accordance with ASTM A123 except with a 2 ounce / square feet galvanized coating.

The grates shall be fillet welded to the corrugated steel pipe with a minimum weld one inch long on each side of the grate at every other corrugation. Weld areas and the heat affected zones where the slot is welded to the corrugated pipe shall be thoroughly cleaned and painted with a zinc-rich paint in accordance with repair of damaged coatings in ASTM A760.

Each 20-foot length of drain delivered to the job site shall be within the following tolerances: vertical bow $\pm 3/8$ inch, horizontal bow $\pm 5/8$ inch, twist $\pm 1/2$ inch.

b. Cast iron slotted vane drain. Not used.

702-2.4 Concrete. Concrete shall have a minimum compressive strength of 3,000 psi at 28-days when tested in accordance with ASTM C39. Concrete used shall conform to the requirements of Item P-610.

CONSTRUCTION METHODS

702-3.1 Excavation. The width of the trench shall be sufficient to permit satisfactory installation and jointing of the slotted drain and placing of a concrete backfill material under and around the drain, but shall not be less than the external pipe diameter plus 6 inches on each side. The depth of the trench shall be a minimum of 2 inches below the invert for steel slotted drain and 6 inches below the invert for a cast iron slotted vane drain.

702-3.2 Installation. Slotted drains shall be laid in sections joined firmly together as shown on the plans. The top of all drains shall be held firmly in place to the proper grade, to preclude movement during the backfilling operation.

702-3.3 Joining. Slotted steel drain joints shall be firmly joined by modified hugger type bands, or as indicated, to secure the pipe and prevent infiltration of the backfill. When the slotted steel drain is banded together, the adjacent grates shall have a maximum 3-inch gap.

702-3.4 Backfilling. Slotted drains shall be inspected before any backfill is placed. Damaged drains shall be aligned or replaced at the expense of the Contractor.

The trench holding the slotted drain assembly shall be backfilled with concrete that will easily flow under and around the drain and the trench wall. The opening in the top of grates and castings shall be covered to prevent unwanted material from entering the drain during the backfilling and subsequent surfacing operations.

METHOD OF MEASUREMENT

702-4.1 The length of steel slotted drain shall be measured in linear feet of slotted drain in place, completed, and approved. It shall be measured along the centerline of the drain from end or inside face of structure to the end or inside face of structure, whichever is applicable. Each kind of slotted drain type and size designated shall be measured separately. All fittings shall be included in the footage as typical pipe sections being measured.

BASIS OF PAYMENT

702-5.1 Payment shall be made at the contract unit price per linear foot for each diameter of slotted drain pipe. These prices shall be full compensation for all materials, all preparation, excavation, backfill, and installation of the slotted drain; and all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item 702-5.1	12 inch, 16 gauge slotted drain pipe per linear foot
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REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM A36	Standard Specification for Carbon Structural Steel
ASTM A48	Standard Specification for Gray Iron Castings
ASTM A123	Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A760	Standard Specification for Corrugated Steel Pipe, Metallic-Coated for Sewers and Drains
ASTM C39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM D3034	Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings

American Association of State Highway and Transportation Officials (AASHTO)

AASHTO-AGC-ARTBA Task Force 13 Report A Guide to Standardized Highway Drainage Products

END OF ITEM D-702

Item D-751 Manholes, Catch Basins, Inlets and Inspection Holes

DESCRIPTION

751-1.1 This item shall consist of construction of manholes, catch basins, inlets, and inspection holes, in accordance with these specifications, at the specified locations and conforming to the lines, grades, and dimensions shown on the plans or required by the RPR.

MATERIALS

751-2.1 Brick. The brick shall conform to the requirements of ASTM C32, Grade MS.

751-2.2 Mortar. Mortar shall consist of one part Portland cement and two parts sand. The cement shall conform to the requirements of ASTM C150, Type I. The sand shall conform to the requirements of ASTM C144.

751-2.3 Concrete. Plain and reinforced concrete used in structures, connections of pipes with structures, and the support of structures or frames shall conform to the requirements of Item P-610.

751-2.4 Precast concrete pipe manhole rings. Precast concrete pipe manhole rings shall conform to the requirements of ASTM C478. Unless otherwise specified, the risers and offset cone sections shall have an inside diameter of not less than 36 inches nor more than 48 inches. There shall be a gasket between individual sections and sections cemented together with mortar on the inside of the manhole. Gaskets shall conform to the requirements of ASTM C443.

751-2.5 Corrugated metal. Corrugated metal shall conform to the requirements of American Association of State Highway and Transportation Officials (AASHTO) M36.

751-2.6 Frames, covers, and grates. The castings shall conform to one of the following requirements:

- a. ASTM A48, Class 35B: Gray iron castings
- b. ASTM A47: Malleable iron castings
- c. ASTM A27: Steel castings
- d. ASTM A283, Grade D: Structural steel for grates and frames
- e. ASTM A536, Grade 65-45-12: Ductile iron castings
- f. ASTM A897: Austempered ductile iron castings

All castings or structural steel units shall conform to the dimensions shown on the plans and shall be designed to support the loadings, aircraft gear configuration and/or direct loading, specified.

Each frame and cover or grate unit shall be provided with fastening members to prevent it from being dislodged by traffic but which will allow easy removal for access to the structure.

All castings shall be thoroughly cleaned. After fabrication, structural steel units shall be galvanized to meet the requirements of ASTM A123.

751-2.7 Steps. The steps or ladder bars shall be gray or malleable cast iron or galvanized steel. The steps shall be the size, length, and shape shown on the plans and those steps that are not galvanized shall be given a coat of asphalt paint, when directed.

751-2.8 Precast inlet structures. Manufactured in accordance with and conforming to ASTM C913.

CONSTRUCTION METHODS

751-3.1 Unclassified excavation.

a. The Contractor shall excavate for structures and footings to the lines and grades or elevations, shown on the plans, or as staked by the RPR. The excavation shall be of sufficient size to permit the placing of the full width and length of the structure or structure footings shown. The elevations of the bottoms of footings, as shown on the plans, shall be considered as approximately only; and the RPR may direct, in writing, changes in dimensions or elevations of footings necessary for a satisfactory foundation.

b. Boulders, logs, or any other objectionable material encountered in excavation shall be removed. All rock or other hard foundation material shall be cleaned of all loose material and cut to a firm surface either level, stepped, or serrated, as directed by the RPR. All seams or crevices shall be cleaned out and grouted. All loose and disintegrated rock and thin strata shall be removed. Where concrete will rest on a surface other than rock, the bottom of the excavation shall not be disturbed and excavation to final grade shall not be made until immediately before the concrete or reinforcing is placed.

c. The Contractor shall do all bracing, sheathing, or shoring necessary to implement and protect the excavation and the structure as required for safety or conformance to governing laws. The cost of bracing, sheathing, or shoring shall be included in the unit price bid for the structure.

d. All bracing, sheathing, or shoring involved in the construction of this item shall be removed by the Contractor after the completion of the structure. Removal shall not disturb or damage finished masonry. The cost of removal shall be included in the unit price bid for the structure.

e. After excavation is completed for each structure, the Contractor shall notify the RPR. No concrete or reinforcing steel shall be placed until the RPR has approved the depth of the excavation and the character of the foundation material.

751-3.2 Brick structures.

a. Foundations. A prepared foundation shall be placed for all brick structures after the foundation excavation is completed and accepted. Unless otherwise specified, the base shall consist of reinforced concrete mixed, prepared, and placed in accordance with the requirements of Item P-610.

b. Laying brick. All brick shall be clean and thoroughly wet before laying so that they will not absorb any appreciable amount of additional water at the time they are laid. All brick shall be laid in freshly made mortar. Mortar not used within 45 minutes after water has been added shall be discarded. Retempering of mortar shall not be permitted. An ample layer of mortar shall be spread on the beds and a shallow furrow shall be made in it that can be readily closed by the laying of the brick. All bed and head joints shall be filled solid with mortar. End joints of stretchers and side or cross joints of headers shall be fully buttered with mortar and a shoved joint made to squeeze out mortar at the top of the joint. Any bricks that may be loosened after the mortar has taken its set, shall be removed, cleaned, and re-laid with fresh mortar. No broken or chipped brick shall be used in the face, and no spalls or bats shall be used except where necessary to shape around irregular openings or edges; in which case, full bricks shall be placed at ends or corners where possible, and the bats shall be used in the interior of the course. In making closures, no piece of brick shorter than the width of a whole brick shall be used; and wherever practicable, whole brick shall be used and laid as headers.

c. Joints. All joints shall be filled with mortar at every course. Exterior faces shall be laid up in advance of backing. Exterior faces shall be plastered or parged with a coat of mortar not less than 3/8 inch thick before the backing is

laid up. Prior to parging, all joints on the back of face courses shall be cut flush. Unless otherwise noted, joints shall be not less than 1/4 inch nor more than 1/2 inch wide and the selected joint width shall be maintained uniform throughout the work.

d. Pointing. Face joints shall be neatly struck, using the weather-struck joint. All joints shall be finished properly as the laying of the brick progresses. When nails or line pins are used, the holes shall be immediately plugged with mortar and pointed when the nail or pin is removed.

e. Cleaning. Upon completion of the work all exterior surfaces shall be thoroughly cleaned by scrubbing and washing with water. If necessary to produce satisfactory results, cleaning shall be done with a 5% solution of muriatic acid which shall then be rinsed off with liberal quantities of water.

f. Curing and cold weather protection. The brick masonry shall be protected and kept moist for at least 48 hours after laying the brick. Brick masonry work or pointing shall not be done when there is frost on the brick or when the air temperature is below 50°F unless the Contractor has, on the project ready to use, suitable covering and artificial heating devices necessary to keep the atmosphere surrounding the masonry at a temperature of not less than 60°F for the duration of the curing period.

751-3.3 Concrete structures. Concrete structures which are to be cast-in-place within the project boundaries shall be built on prepared foundations, conforming to the dimensions and shape indicated on the plans. The construction shall conform to the requirements specified in Item P-610. Any reinforcement required shall be placed as indicated on the plans and shall be approved by the RPR before the concrete is placed.

All invert channels shall be constructed and shaped accurately to be smooth, uniform, and cause minimum resistance to flowing water. The interior bottom shall be sloped to the outlet.

751-3.4 Precast concrete structures. Precast concrete structures shall be furnished by a plant meeting National Precast Concrete Association Plant Certification Program or another RPR approved third party certification program.

Precast concrete structures shall conform to ASTM C478. Precast concrete structures shall be constructed on prepared or previously placed slab foundations conforming to the dimensions and locations shown on the plans. All precast concrete sections necessary to build a completed structure shall be furnished. The different sections shall fit together readily. Joints between precast concrete risers and tops shall be full-bedded in cement mortar and shall: (1) be smoothed to a uniform surface on both interior and exterior of the structure or (2) utilize a rubber gasket per ASTM C443. The top of the upper precast concrete section shall be suitably formed and dimensioned to receive the metal frame and cover or grate, or other cap, as required. Provision shall be made for any connections for lateral pipe, including drops and leads that may be installed in the structure. The flow lines shall be smooth, uniform, and cause minimum resistance to flow. The metal or metal encapsulated steps that are embedded or built into the side walls shall be aligned and placed in accordance to ASTM C478. When a metal ladder replaces the steps, it shall be securely fastened into position.

751-3.5 Corrugated metal structures. Corrugated metal structures shall be prefabricated. All standard or special fittings shall be furnished to provide pipe connections or branches with the correct dimensions and of sufficient length to accommodate connecting bands. The fittings shall be welded in place to the metal structures. The top of the metal structure shall be designed so that either a concrete slab or metal collar may be attached to allow the fastening of a standard metal frame and grate or cover. Steps or ladders shall be furnished as shown on the plans. Corrugated metal structures shall be constructed on prepared foundations, conforming to the dimensions and locations as shown on the plans. When indicated, the structures shall be placed on a reinforced concrete base.

751-3.6 Inlet and outlet pipes. Inlet and outlet pipes shall extend through the walls of the structures a sufficient distance beyond the outside surface to allow for connections. They shall be cut off flush with the wall on the inside surface of the structure, unless otherwise directed. For concrete or brick structures, mortar shall be placed around these pipes to form a tight, neat connection.

751-3.7 Placement and treatment of castings, frames, and fittings. All castings, frames, and fittings shall be placed in the positions indicated on the plans or as directed by the RPR, and shall be set true to line and elevation. If frames or fittings are to be set in concrete or cement mortar, all anchors or bolts shall be in place before the concrete or mortar is placed. The unit shall not be disturbed until the mortar or concrete has set.

When frames or fittings are placed on previously constructed masonry, the bearing surface of the masonry shall be brought true to line and grade and shall present an even bearing surface so the entire face or back of the unit will come in contact with the masonry. The unit shall be set in mortar beds and anchored to the masonry as indicated on the plans or as directed by the RPR. All units shall set firm and secure.

After the frames or fittings have been set in final position, the concrete or mortar shall be allowed to harden for seven (7) days before the grates or covers are placed and fastened down.

751-3.8 Installation of steps. The steps shall be installed as indicated on the plans or as directed by the RPR. When the steps are to be set in concrete, they shall be placed and secured in position before the concrete is placed. When the steps are installed in brick masonry, they shall be placed as the masonry is being built. The steps shall not be disturbed or used until the concrete or mortar has hardened for at least seven (7) days. After seven (7) days, the steps shall be cleaned and painted, unless they have been galvanized.

When steps are required with precast concrete structures they shall meet the requirements of ASTM C478. The steps shall be cast into the side of the sections at the time the sections are manufactured or set in place after the structure is erected by drilling holes in the concrete and cementing the steps in place.

When steps are required with corrugated metal structures, they shall be welded into aligned position at a vertical spacing of 12 inches.

Instead of steps, prefabricated ladders may be installed. For brick or concrete structures, the ladder shall be held in place by grouting the supports in drilled holes. For metal structures, the ladder shall be secured by welding the top support to the structure and grouting the bottom support into drilled holes in the foundation or as directed by the RPR.

751-3.9 Backfilling.

a. After a structure has been completed, the area around it shall be backfilled with approved material, in horizontal layers not to exceed 8 inches in loose depth, and compacted to the density required in Item P-152. Each layer shall be deposited evenly around the structure to approximately the same elevation. The top of the fill shall meet the elevation shown on the plans or as directed by the RPR.

b. Backfill shall not be placed against any structure until approved by the RPR. For concrete structures, approval shall not be given until the concrete has been in place seven (7) days, or until tests establish that the concrete has attained sufficient strength to withstand any pressure created by the backfill and placing methods.

c. Backfill shall not be measured for direct payment. Performance of this work shall be considered an obligation of the Contractor covered under the contract unit price for the structure involved.

751-3.10 Cleaning and restoration of site. After the backfill is completed, the Contractor shall dispose of all surplus material, dirt, and rubbish from the site. Surplus dirt may be deposited in embankments, shoulders, or as approved by the RPR. The Contractor shall restore all disturbed areas to their original condition. The Contractor shall remove all tools and equipment, leaving the entire site free, clear, and in good condition.

751-3.11 Manhole elevation adjustments. The Contractor shall adjust the tops of existing manhole structures in areas designated in the Contract Documents to the new elevations shown. The Contractor shall be responsible for determining the exact height adjustment required to raise or lower the top of each manhole to the new elevations. The existing top elevation of each manhole to be adjusted shall be determined in the field and subtracted/added from the proposed top elevation.

The Contractor shall remove/extend the existing top section or ring and cover on the manhole structure or manhole access. The Contractor shall install precast concrete sections or grade rings of the required dimensions to adjust the manhole top to the new proposed elevation or shall cut the existing manhole walls to shorten the existing structure, as required by final grades. The Contractor shall reinstall the manhole top section or ring and cover on top and check the new top elevation.

METHOD OF MEASUREMENT

751-4.1 Manholes, catch basins, inlets, and inspection holes shall be measured by the unit.

BASIS OF PAYMENT

751-5.1 The accepted quantities of manholes, catch basins, inlets, and inspection holes will be paid for at the contract unit price per each in place when completed. This price shall be full compensation for furnishing all materials and for all preparation, excavation, backfilling and placing of the materials; furnishing and installation of such specials and connections to pipes and other structures as may be required to complete the item as shown on the plans; and for all labor equipment, tools and incidentals necessary to complete the structure.

Payment will be made under:

Item D-751-5.1	Type B Inlet – per each
Item D-751-5.2	Adjust existing storm structure – per each
Item D-751-5.3	Type C Manhole – per each

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM A27	Standard Specification for Steel Castings, Carbon, for General Application
ASTM A47	Standard Specification for Ferritic Malleable Iron Castings
ASTM A48	Standard Specification for Gray Iron Castings
ASTM A123	Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A283	Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
ASTM A536	Standard Specification for Ductile Iron Castings
ASTM A897	Standard Specification for Austempered Ductile Iron Castings
ASTM C32	Standard Specification for Sewer and Manhole Brick (Made from Clay or Shale)

ASTM C144	Standard Specification for Aggregate for Masonry Mortar
ASTM C150	Standard Specification for Portland Cement
ASTM C443	Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
ASTM C478	Standard Specification for Precast Reinforced Concrete Manhole Sections
ASTM C913	Standard Specification for Precast Concrete Water and Wastewater Structures.

American Association of State Highway and Transportation Officials (AASHTO)

AASHTO M36	Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains
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END OF ITEM D-751

Item T-901 Seeding

DESCRIPTION

901-1.1 This item shall consist of soil preparation, seeding, and fertilizing the areas shown on the plans or as directed by the RPR in accordance with these specifications.

MATERIALS

901-2.1 Seed. The species and application rates of grass, legume, and cover-crop seed furnished shall be those stipulated herein. Seed shall conform to the requirements of Federal Specification JJJ-S-181, Federal Specification, Seeds, Agricultural.

Seed shall be furnished separately or in mixtures in standard containers labeled in conformance with the Agricultural Marketing Service (AMS) Seed Act and applicable state seed laws with the seed name, lot number, net weight, percentages of purity and of germination and hard seed, and percentage of maximum weed seed content clearly marked for each kind of seed. The Contractor shall furnish the RPR duplicate signed copies of a statement by the vendor certifying that each lot of seed has been tested by a recognized laboratory for seed testing within six (6) months of date of delivery. This statement shall include: name and address of laboratory, date of test, lot number for each kind of seed, and the results of tests as to name, percentages of purity and of germination, and percentage of weed content for each kind of seed furnished, and, in case of a mixture, the proportions of each kind of seed. Wet, moldy, or otherwise damaged seed will be rejected.

Seeds shall be applied as follows:

Seed Properties and Rate of Application

Seed	Minimum Seed Purity (Percent)	Minimum Germination (Percent)	Rate of Application lb/acre (or lb/1,000 S.F.)
Kentucky 31 Fescue	98	85	105
Perennial Rye Grass	98	90	50
Creeping Red Fescue	98	85	50

Seeding shall be performed during the period between May 1 and October 15 inclusive, unless otherwise approved by the RPR.

901-2.2 Lime. Not required.

901-2.3 Fertilizer. Fertilizer shall be standard commercial fertilizers supplied separately or in mixtures containing the percentages of total nitrogen, available phosphoric acid, and water-soluble potash. They shall be applied at the rate and to the depth specified, and shall meet the requirements of applicable state laws. They shall be furnished in standard containers with name, weight, and guaranteed analysis of contents clearly marked thereon. No cyanamide compounds or hydrated lime shall be permitted in mixed fertilizers.

The fertilizers may be supplied in one of the following forms:

- a. A dry, free-flowing fertilizer suitable for application by a common fertilizer spreader;

- b. A finely-ground fertilizer soluble in water, suitable for application by power sprayers; or
- c. A granular or pellet form suitable for application by blower equipment.

Fertilizers shall be 12-12-12 commercial fertilizer and shall be spread at the rate of 800 lbs per acre.

901-2.4 Soil for repairs. The soil for fill and topsoiling of areas to be repaired shall be at least of equal quality to that which exists in areas adjacent to the area to be repaired. The soil shall be relatively free from large stones, roots, stumps, or other materials that will interfere with subsequent sowing of seed, compacting, and establishing turf, and shall be approved by the RPR before being placed.

CONSTRUCTION METHODS

901-3.1 Advance preparation and cleanup. After grading of areas has been completed and before applying fertilizer and ground limestone, areas to be seeded shall be raked or otherwise cleared of stones larger than 2 inches in any diameter, sticks, stumps, and other debris that might interfere with sowing of seed, growth of grasses, or subsequent maintenance of grass-covered areas. If any damage by erosion or other causes has occurred after the completion of grading and before beginning the application of fertilizer and ground limestone, the Contractor shall repair such damage include filling gullies, smoothing irregularities, and repairing other incidental damage.

An area to be seeded shall be considered a satisfactory seedbed without additional treatment if it has recently been thoroughly loosened and worked to a depth of not less than 5 inches as a result of grading operations and, if immediately prior to seeding, the top 3 inches of soil is loose, friable, reasonably free from large clods, rocks, large roots, or other undesirable matter, and if shaped to the required grade.

When the area to be seeded is sparsely sodded, weedy, barren and unworked, or packed and hard, any grass and weeds shall first be cut or otherwise satisfactorily disposed of, and the soil then scarified or otherwise loosened to a depth not less than 5 inches. Clods shall be broken and the top 3 inches of soil shall be worked into a satisfactory seedbed by discing, or by use of cultipackers, rollers, drags, harrows, or other appropriate means.

901-3.2 Dry application method.

a. Liming. Not required.

b. Fertilizing. Following advance preparations and cleanup fertilizer shall be uniformly spread at the rate that will provide not less than the minimum quantity stated in paragraph 901-2.3.

c. Seeding. Grass seed shall be sown at the rate specified in paragraph 901-2.1 immediately after fertilizing. The fertilizer and seed shall be raked within the depth range stated in the special provisions. Seeds of legumes, either alone or in mixtures, shall be inoculated before mixing or sowing, in accordance with the instructions of the manufacturer of the inoculant. When seeding is required at other than the seasons shown on the plans or in the special provisions, a cover crop shall be sown by the same methods required for grass and legume seeding.

d. Rolling. After the seed has been properly covered, the seedbed shall be immediately compacted by means of an approved lawn roller, weighing 40 to 65 pounds per foot of width for clay soil (or any soil having a tendency to pack), and weighing 150 to 200 pounds per foot of width for sandy or light soils.

901-3.3 Wet application method.

a. General. The Contractor may elect to apply seed and fertilizer (and lime, if required) by spraying them on the previously prepared seedbed in the form of an aqueous mixture and by using the methods and equipment described herein. The rates of application shall be as specified in the special provisions.

b. Spraying equipment. The spraying equipment shall have a container or water tank equipped with a liquid level gauge calibrated to read in increments not larger than 50 gallons over the entire range of the tank capacity,

mounted so as to be visible to the nozzle operator. The container or tank shall also be equipped with a mechanical power-driven agitator capable of keeping all the solids in the mixture in complete suspension at all times until used.

The unit shall also be equipped with a pressure pump capable of delivering 100 gallons per minute at a pressure of 100 lb / sq inches. The pump shall be mounted in a line that will recirculate the mixture through the tank whenever it is not being sprayed from the nozzle. All pump passages and pipe lines shall be capable of providing clearance for 5/8 inch solids. The power unit for the pump and agitator shall have controls mounted so as to be accessible to the nozzle operator. There shall be an indicating pressure gauge connected and mounted immediately at the back of the nozzle.

The nozzle pipe shall be mounted on an elevated supporting stand in such a manner that it can be rotated through 360 degrees horizontally and inclined vertically from at least 20 degrees below to at least 60 degrees above the horizontal. There shall be a quick-acting, three-way control valve connecting the recirculating line to the nozzle pipe and mounted so that the nozzle operator can control and regulate the amount of flow of mixture delivered to the nozzle. At least three different types of nozzles shall be supplied so that mixtures may be properly sprayed over distance varying from 20 to 100 feet. One shall be a close-range ribbon nozzle, one a medium-range ribbon nozzle, and one a long-range jet nozzle. For ease of removal and cleaning, all nozzles shall be connected to the nozzle pipe by means of quick-release couplings.

In order to reach areas inaccessible to the regular equipment, an extension hose at least 50 feet in length shall be provided to which the nozzles may be connected.

c. Mixtures. Lime, if required, shall be applied separately, in the quantity specified, prior to the fertilizing and seeding operations. Not more than 220 pounds of lime shall be added to and mixed with each 100 gallons of water. Seed and fertilizer shall be mixed together in the relative proportions specified, but not more than a total of 220 pounds of these combined solids shall be added to and mixed with each 100 gallons of water.

All water used shall be obtained from fresh water sources and shall be free from injurious chemicals and other toxic substances harmful to plant life. The Contractor shall identify to the RPR all sources of water at least two (2) weeks prior to use. The RPR may take samples of the water at the source or from the tank at any time and have a laboratory test the samples for chemical and saline content. The Contractor shall not use any water from any source that is disapproved by the RPR following such tests.

All mixtures shall be constantly agitated from the time they are mixed until they are finally applied to the seedbed. All such mixtures shall be used within two (2) hours from the time they were mixed or they shall be wasted and disposed of at approved locations.

d. Spraying. Lime, if required, shall be sprayed only upon previously prepared seedbeds. After the applied lime mixture has dried, the lime shall be worked into the top 3 inches, after which the seedbed shall again be properly graded and dressed to a smooth finish.

Mixtures of seed and fertilizer shall only be sprayed upon previously prepared seedbeds on which the lime, if required, shall already have been worked in. The mixtures shall be applied by means of a high-pressure spray that shall always be directed upward into the air so that the mixtures will fall to the ground like rain in a uniform spray. Nozzles or sprays shall never be directed toward the ground in such a manner as might produce erosion or runoff.

Particular care shall be exercised to ensure that the application is made uniformly and at the prescribed rate and to guard against misses and overlapped areas. Proper predetermined quantities of the mixture in accordance with specifications shall be used to cover specified sections of known area.

Checks on the rate and uniformity of application may be made by observing the degree of wetting of the ground or by distributing test sheets of paper or pans over the area at intervals and observing the quantity of material deposited thereon.

On surfaces that are to be mulched as indicated by the plans or designated by the RPR, seed and fertilizer applied by the spray method need not be raked into the soil or rolled. However, on surfaces on which mulch is not to be used, the raking and rolling operations will be required after the soil has dried.

901-3.4 Maintenance of seeded areas. The Contractor shall protect seeded areas against traffic or other use by warning signs or barricades, as approved by the RPR. Surfaces gullied or otherwise damaged following seeding shall be repaired by regrading and reseeding as directed. The Contractor shall mow, water as directed, and otherwise maintain seeded areas in a satisfactory condition until final inspection and acceptance of the work.

When either the dry or wet application method outlined above is used for work done out of season, it will be required that the Contractor establish a good stand of grass of uniform color and density to the satisfaction of the RPR. A grass stand shall be considered adequate when bare spots are one square foot or less, randomly dispersed, and do not exceed 3% of the area seeded.

METHOD OF MEASUREMENT

901-4.1 The quantity of seeding to be paid for shall be the number of units 1,000 square feet measured on the ground surface, completed and accepted.

BASIS OF PAYMENT

901-5.1 Payment shall be made at the contract unit price per 1,000 square feet or fraction thereof, which price and payment shall be full compensation for furnishing and placing all material and for all labor, equipment, tools, and incidentals necessary to complete the work prescribed in this item.

Payment will be made under:

Item 901-5.1	Seeding – per 1,000 square feet
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REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM C602	Standard Specification for Agricultural Liming Materials
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Federal Specifications (FED SPEC)

FED SPEC	JJJ-S-181, Federal Specification, Seeds, Agricultural
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Advisory Circulars (AC)

AC 150/5200-33	Hazardous Wildlife Attractants on or Near Airports
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FAA/United States Department of Agriculture

Wildlife Hazard Management at Airports, A Manual for Airport Personnel

END OF ITEM T-901

Item T-905 Topsoil

DESCRIPTION

905-1.1 This item shall consist of preparing the ground surface for topsoil application, removing topsoil from designated stockpiles or areas to be stripped on the site or from approved sources off the site, and placing and spreading the topsoil on prepared areas in accordance with this specification at the locations shown on the plans or as directed by the RPR.

MATERIALS

905-2.1 Topsoil. Topsoil shall be the surface layer of soil with no admixture of refuse or any material toxic to plant growth, and it shall be reasonably free from subsoil and stumps, roots, brush, stones (2 inches or more in diameter), and clay lumps or similar objects. Brush and other vegetation that will not be incorporated with the soil during handling operations shall be cut and removed. Ordinary sod and herbaceous growth such as grass and weeds are not to be removed, but shall be thoroughly broken up and intermixed with the soil during handling operations. Heavy sod or other cover, which cannot be incorporated into the topsoil by discing or other means, shall be removed. The topsoil or soil mixture, unless otherwise specified or approved, shall have a pH range of approximately 5.5 pH to 7.6 pH, when tested in accordance with the methods of testing of the Association of Official Agricultural Chemists in effect on the date of invitation of bids. The organic content shall be not less than 3% nor more than 20% as determined by the wet-combustion method (chromic acid reduction). There shall be not less than 20% nor more than 80% of the material passing the 200 mesh sieve as determined by the wash test in accordance with ASTM C117.

Natural topsoil may be amended by the Contractor with approved materials and methods to meet the above specifications.

905-2.2 Inspection and tests. Within 10 days following acceptance of the bid, the RPR shall be notified of the source of topsoil to be furnished by the Contractor. The topsoil shall be inspected to determine if the selected soil meets the requirements specified and to determine the depth to which stripping will be permitted. At this time, the Contractor may be required to take representative soil samples from several locations within the area under consideration and to the proposed stripping depths, for testing purposes as specified in paragraph 905-2.1.

CONSTRUCTION METHODS

905-3.1 General. Areas to be topsoiled shall be shown on the plans. If topsoil is available on the site, the location of the stockpiles or areas to be stripped of topsoil and the stripping depths shall be shown on the plans.

Suitable equipment necessary for proper preparation and treatment of the ground surface, stripping of topsoil, and for the handling and placing of all required materials shall be on hand, in good condition, and approved by the RPR before the various operations are started.

905-3.2 Preparing the ground surface. Immediately prior to dumping and spreading the topsoil on any area, the surface shall be loosened by discs or spike-tooth harrows, or by other means approved by the RPR, to a minimum depth of 2 inches to facilitate bonding of the topsoil to the covered subgrade soil. The surface of the area to be topsoiled shall be cleared of all stones larger than 2 inches (50 mm) in any diameter and all litter or other material which may be detrimental to proper bonding, the rise of capillary moisture, or the proper growth of the desired

planting. Limited areas, as shown on the plans, which are too compact to respond to these operations shall receive special scarification.

Grades on the area to be topsoiled, which have been established by others as shown on the plans, shall be maintained in a true and even condition. Where grades have not been established, the areas shall be smooth-graded and the surface left at the prescribed grades in an even and compacted condition to prevent the formation of low places or pockets where water will stand.

905-3.3 Obtaining topsoil. Prior to the stripping of topsoil from designated areas, any vegetation, briars, stumps and large roots, rubbish or stones found on such areas, which may interfere with subsequent operations, shall be removed using methods approved by the RPR. Heavy sod or other cover, which cannot be incorporated into the topsoil by discing or other means shall be removed.

When suitable topsoil is available on the site, the Contractor shall remove this material from the designated areas and to the depth as directed by the RPR. The topsoil shall be spread on areas already tilled and smooth-graded, or stockpiled in areas approved by the RPR. Any topsoil stockpiled by the Contractor shall be rehandled and placed without additional compensation. Any topsoil that has been stockpiled on the site by others, and is required for topsoil purposes, shall be removed and placed by the Contractor. The sites of all stockpiles and areas adjacent thereto which have been disturbed by the Contractor shall be graded if required and put into a condition acceptable for seeding.

When suitable topsoil is secured off the airport site, the Contractor shall locate and obtain the supply, subject to the approval of the RPR. The Contractor shall notify the RPR sufficiently in advance of operations in order that necessary measurements and tests can be made. The Contractor shall remove the topsoil from approved areas and to the depth as directed. The topsoil shall be hauled to the site of the work and placed for spreading, or spread as required. Any topsoil hauled to the site of the work and stockpiled shall be rehandled and placed without additional compensation.

905-3.4 Placing topsoil. The topsoil shall be evenly spread on the prepared areas to a uniform depth of 2 inches after compaction, unless otherwise shown on the plans or stated in the special provisions. Spreading shall not be done when the ground or topsoil is frozen, excessively wet, or otherwise in a condition detrimental to the work. Spreading shall be carried on so that turfing operations can proceed with a minimum of soil preparation or tilling.

After spreading, any large, stiff clods and hard lumps shall be broken with a pulverizer or by other effective means, and all stones or rocks (2 inches or more in diameter), roots, litter, or any foreign matter shall be raked up and disposed of by the Contractor. After spreading is completed, the topsoil shall be satisfactorily compacted by rolling with a cultipacker or by other means approved by the RPR. The compacted topsoil surface shall conform to the required lines, grades, and cross-sections. Any topsoil or other dirt falling upon pavements as a result of hauling or handling of topsoil shall be promptly removed.

METHOD OF MEASUREMENT

905-4.1 Topsoil obtained on the site shall not be measured directly but measured under P-152 by the number of cubic yards of topsoil measured in its original position and stripped or excavated. Topsoil shall be measured by volume in cubic yards computed by the method of end areas.

BASIS OF PAYMENT

905-5.1 Payment will be made at the contract unit price per cubic yard for topsoil (obtained on the site) under P-152. This price shall be full compensation for furnishing all materials and for all preparation, placing, and spreading of the materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM C117 Materials Finer than 75 μm (No. 200) Sieve in Mineral Aggregates by Washing

Advisory Circulars (AC)

AC 150/5200-33 Hazardous Wildlife Attractants on or Near Airports

FAA/United States Department of Agriculture

Wildlife Hazard Management at Airports, A Manual for Airport Personnel

END OF ITEM T-905

Item T-908 Mulching

DESCRIPTION

908-1.1 This item shall consist of furnishing, hauling, placing, and securing mulch on surfaces indicated on the plans or designated by the RPR.

MATERIALS

908-2.1 Mulch material. Acceptable mulch shall be the materials listed below or any approved locally available material that is similar to those specified. Mulch shall be free from noxious weeds, mold, and other deleterious materials. Mulch materials, which contain matured seed of species that would volunteer and be detrimental to the proposed overseeding, or to surrounding farm land, will not be acceptable. Straw or other mulch material which is fresh and/or excessively brittle, or which is in such an advanced stage of decomposition as to smother or retard the planted grass, will not be acceptable.

a. Manufactured mulch. Cellulose-fiber or wood-pulp mulch shall be products commercially available for use in spray applications.

b. Asphalt binder. Asphalt binder material shall conform to the requirements of ASTM D977, Type SS-1 or RS-1.

908-2.2 Inspection. The RPR shall be notified of sources and quantities of mulch materials available and the Contractor shall furnish him with representative samples of the materials to be used 30 days before delivery to the project. These samples may be used as standards with the approval of the RPR and any materials brought on the site that do not meet these standards shall be rejected.

CONSTRUCTION METHODS

908-3.1 Mulching. Before spreading mulch, all large clods, stumps, stones, brush, roots, and other foreign material shall be removed from the area to be mulched. Mulch shall be applied immediately after seeding. The spreading of the mulch may be by hand methods, blower, or other mechanical methods, provided a uniform covering is obtained.

Mulch material shall be furnished, hauled, and evenly applied on the area shown on the plans or designated by the RPR. Straw or hay shall be spread over the surface to a uniform thickness at the rate of 2 to 3 tons per acre to provide a loose depth of not less than 1-1/2 inches nor more than 3 inches. Other organic material shall be spread at the rate directed by the RPR. Mulch may be blown on the slopes and the use of cutters in the equipment for this purpose will be permitted to the extent that at least 95% of the mulch in place on the slope shall be 6 inches or more in length. When mulches applied by the blowing method are cut, the loose depth in place shall be not less than one inch nor more than 2 inches.

908-3.2 Securing mulch. The mulch shall be held in place by light discing, a very thin covering of topsoil, pins, stakes, wire mesh, asphalt binder, or other adhesive material approved by the RPR. Where mulches have been secured by either of the asphalt binder methods, it will not be permissible to walk on the slopes after the binder has been applied. When an application of asphalt binder material is used to secure the mulch, the Contractor must take every precaution to guard against damaging or disfiguring structures or property on or adjacent to the areas worked and will be held responsible for any such damage resulting from the operation.

If the “peg and string” method is used, the mulch shall be secured by the use of stakes or wire pins driven into the ground on 5-foot centers or less. Binder twine shall be strung between adjacent stakes in straight lines and crisscrossed diagonally over the mulch, after which the stakes shall be firmly driven nearly flush to the ground to draw the twine down tight onto the mulch.

908-3.3 Care and repair.

a. The Contractor shall care for the mulched areas until final acceptance of the project. Care shall consist of providing protection against traffic or other use by placing warning signs, as approved by the RPR, and erecting any barricades that may be shown on the plans before or immediately after mulching has been completed on the designated areas.

b. The Contractor shall be required to repair or replace any mulch that is defective or becomes damaged until the project is finally accepted. When, in the judgment of the RPR, such defects or damages are the result of poor workmanship or failure to meet the requirements of the specifications, the cost of the necessary repairs or replacement shall be borne by the Contractor.

c. If the “asphalt spray” method is used, all mulched surfaces shall be sprayed with asphalt binder material so that the surface has a uniform appearance. The binder shall be uniformly applied to the mulch at the rate of approximately 8 gallons per 1,000 square feet, or as directed by the RPR, with a minimum of 6 gallons and a maximum of 10 gallons per 1,000 square feet depending on the type of mulch and the effectiveness of the binder securing it. Asphalt binder material may be sprayed on the mulched slope areas from either the top or the bottom of the slope. An approved spray nozzle shall be used. The nozzle shall be operated at a distance of not less than 4 feet from the surface of the mulch and uniform distribution of the asphalt material shall be required. A pump or an air compressor of adequate capacity shall be used to ensure uniform distribution of the asphalt material.

d. If the “asphalt mix” method is used, the mulch shall be applied by blowing, and the asphalt binder material shall be sprayed into the mulch as it leaves the blower. The binder shall be uniformly applied to the mulch at the rate of approximately 8 gallons per 1,000 square feet or as directed by the RPR, with a minimum of 6 gallons and a maximum of 10 gallons per 1,000 square feet depending on the type of mulch and the effectiveness of the binder securing it.

METHOD OF MEASUREMENT

908-4.1 Mulching shall be measured in square yards on the basis of the actual surface area acceptably mulched.

BASIS OF PAYMENT

908-5.1 Payment will be made at the contract unit price per square yard for mulching. The price shall be full compensation for furnishing all materials and for placing and anchoring the materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item T-908-5.1	Mulching - per square yard
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REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM D977

Standard Specification for Emulsified Asphalt

Advisory Circulars (AC)

AC 150/5200-33

Hazardous Wildlife Attractants on or Near Airports

FAA/United States Department of Agriculture

Wildlife Hazard Management at Airports, A Manual for Airport Personnel

END OF ITEM T-908

Item L-110 Airport Underground Electrical Duct Banks and Conduits

DESCRIPTION

110-1.1 This item shall consist of underground electrical conduits and duct banks (single or multiple conduits encased in concrete or buried in sand) installed per this specification at the locations and per the dimensions, designs, and details shown on the plans. This item shall include furnishing and installing of all underground electrical duct banks and individual and multiple underground conduits. It shall also include all turfing trenching, backfilling, removal, and restoration of any paved or turfed areas; concrete encasement, mandrelling, pulling lines, duct markers, plugging of conduits, and the testing of the installation as a completed system ready for installation of cables per the plans and specifications. This item shall also include furnishing and installing conduits and all incidentals for providing positive drainage of the system. Verification of existing ducts is incidental to the pay items provided in this specification.

EQUIPMENT AND MATERIALS

110-2.1 General.

a. All equipment and materials covered by referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when requested by the RPR.

b. Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications and acceptable to the RPR. Materials supplied and/or installed that do not comply with these specifications shall be removed, when directed by the RPR and replaced with materials, that comply with these specifications, at the Contractor's cost.

c. All materials and equipment used to construct this item shall be submitted to the RPR for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment for which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). The Contractor is solely responsible for delays in project that accrue directly or indirectly from late submissions or resubmissions of submittals.

d. The data submitted shall be sufficient, in the opinion of the RPR, to determine compliance with the plans and specifications. The Contractor's submittals shall be electronically submitted in pdf format, tabbed by specification section. The RPR reserves the right to reject any and all equipment, materials or procedures that do not meet the system design and the standards and codes specified in this document.

e. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

110-2.2 Steel conduit. Rigid galvanized steel (RGS) conduit and fittings shall be hot dipped galvanized inside and out and conform to the requirements of Underwriters Laboratories Standards 6, 514B, and 1242. All RGS conduits or RGS elbows installed below grade, in concrete, permanently wet locations or other similar environments shall be painted with a 10-mil thick coat of asphaltum sealer or shall have a factory-bonded polyvinyl chloride (PVC) cover.

Any exposed galvanizing or steel shall be coated with 10 mils of asphaltum sealer. When using PVC coated RGS conduit, care shall be exercised not to damage the factory PVC coating. Damaged PVC coating shall be repaired per the manufacturer's written instructions. In lieu of PVC coated RGS, corrosion wrap tape shall be permitted to be used where RGS is in contact with direct earth."

110-2.3 Plastic conduit. Plastic conduit and fittings shall conform to the following requirements:

- UL 514B covers W-C-1094-Conduit fittings all types, classes 1 thru 3 and 6 thru 10.
- UL 514C covers W-C-1094- all types, Class 5 junction box and cover in plastic (PVC).
- UL 651 covers W-C-1094-Rigid PVC Conduit, types I and II, Class 4.
- UL 651A covers W-C-1094-Rigid PVC Conduit and high-density polyethylene (HDPE) Conduit type III and Class 4.

Underwriters Laboratories Standards UL-651 and Article 352 of the current National Electrical Code shall be one of the following, as shown on the plans:

- a. Type I—Schedule 40 and Schedule 80 PVC suitable for underground use either direct-buried or encased in concrete.
- b. Type II—Schedule 40 PVC suitable for either above ground or underground use.
- c. Type III – Schedule 80 PVC suitable for either above ground or underground use either direct-buried or encased in concrete.
- d. Type III –HDPE pipe, minimum standard dimensional ratio (SDR) 11, suitable for placement with directional boring under pavement.

The type of solvent cement shall be as recommended by the conduit/fitting manufacturer.

110-2.4 Split conduit. Split conduit shall be pre-manufactured for the intended purpose and shall be made of steel or plastic.

110-2.5 Conduit spacers. Conduit spacers shall be prefabricated interlocking units manufactured for the intended purpose. They shall be of double wall construction made of high grade, high density polyethylene complete with interlocking cap and base pads. They shall be designed to accept No. 4 reinforcing bars installed vertically.

110-2.6 Concrete. Concrete shall be proportioned, placed, and cured per Item P-610, Concrete for Miscellaneous Structures.

110-2.7 Precast concrete structures. Precast concrete structures shall be furnished by a plant meeting National Precast Concrete Association Plant Certification Program or another RPR approved third party certification program. Precast concrete structures shall conform to ASTM C478.

110-2.8 Flowable backfill. Flowable material used to back fill conduit and duct bank trenches shall conform to the requirements of Item P-153, Controlled Low Strength Material.

110-2.9 Detectable warning tape. Plastic, detectable, American Public Works Association (APWA) red (electrical power lines, cables, conduit and lighting cable), orange (telephone/fiber optic cabling) with continuous legend magnetic tape shall be polyethylene film with a metallized foil core and shall be 3-6 inches wide. Detectable tape is incidental to the respective bid item.

CONSTRUCTION METHODS

110-3.1 General. The Contractor shall install underground duct banks and conduits at the approximate locations indicated on the plans. The RPR shall indicate specific locations as the work progresses, if required to differ from the plans. Duct banks and conduits shall be of the size, material, and type indicated on the plans or specifications. Where no size is indicated on the plans or in the specifications, conduits shall be not less than 2 inches inside diameter or comply with the National Electrical Code based on cable to be installed, whichever is larger. All duct bank and conduit lines shall be laid so as to grade toward access points and duct or conduit ends for drainage. Unless shown otherwise on the plans, grades shall be at least 3 inches per 100 feet. On runs where it is not practicable to maintain the grade all one way, the duct bank and conduit lines shall be graded from the center in both directions toward access points or conduit ends, with a drain into the storm drainage system. Pockets or traps where moisture may accumulate shall be avoided. Under pavement, the top of the duct bank shall not be less than 18 inches below the subgrade; in other locations, the top of the duct bank or underground conduit shall be not less than 18 inches below finished grade.

The Contractor shall mandrel each individual conduit whether the conduit is direct-buried or part of a duct bank. An iron-shod mandrel, not more than 1/4 inch smaller than the bore of the conduit shall be pulled or pushed through each conduit. The mandrel shall have a leather or rubber gasket slightly larger than the conduit hole.

The Contractor shall swab out all conduits/ducts and clean base can, manhole, pull boxes, etc., interiors immediately prior to pulling cable. Once cleaned and swabbed the light bases, manholes, pull boxes, etc., and all accessible points of entry to the duct/conduit system shall be kept closed except when installing cables. Cleaning of ducts, base cans, manholes, etc., is incidental to the pay item of the item being cleaned. All raceway systems left open, after initial cleaning, for any reason shall be recleaned at the Contractor's expense. All accessible points shall be kept closed when not installing cable. The Contractor shall verify existing ducts proposed for use in this project as clear and open. The Contractor shall notify the RPR of any blockage in the existing ducts.

For pulling the permanent wiring, each individual conduit, whether the conduit is direct-buried or part of a duct bank, shall be provided with a 200-pound (90 kg) test polypropylene pull rope. The ends shall be secured and sufficient length shall be left in access points to prevent it from slipping back into the conduit. Where spare conduits are installed, as indicated on the plans, the open ends shall be plugged with removable tapered plugs, designed for this purpose.

All conduits shall be securely fastened in place during construction and shall be plugged to prevent contaminants from entering the conduits. Any conduit section having a defective joint shall not be installed. Ducts shall be supported and spaced apart using approved spacers at intervals not to exceed 5 feet.

Unless otherwise shown on the plans, concrete encased duct banks shall be used when crossing under pavements expected to carry aircraft loads, such as runways, taxiways, taxilanes, ramps and aprons. When under paved shoulders and other paved areas, conduit and duct banks shall be encased using flowable fill for protection.

All conduits within concrete encasement of the duct banks shall terminate with female ends for ease in current and future use. Install factory plugs in all unused ends. Do not cover the ends or plugs with concrete.

Where turf is well established and the sod can be removed, it shall be carefully stripped and properly stored.

Trenches for conduits and duct banks may be excavated manually or with mechanical trenching equipment unless in pavement, in which case they shall be excavated with mechanical trenching equipment. Walls of trenches shall be essentially vertical so that a minimum of shoulder surface is disturbed. Blades of graders shall not be used to excavate the trench.

When rock is encountered, the rock shall be removed to a depth of at least 3 inches below the required conduit or duct bank depth and it shall be replaced with bedding material of earth or sand containing no mineral aggregate particles that would be retained on a 1/4-inch sieve. Flowable backfill may alternatively be used

Underground electrical warning (Caution) tape shall be installed in the trench above all underground duct banks and conduits in unpaved areas. Contractor shall submit a sample of the proposed warning tape for approval by the RPR. If not shown on the plans, the warning tape shall be located 6 inches above the duct/conduit or the counterpoise wire if present.

Joints in plastic conduit shall be prepared per the manufacturer's recommendations for the particular type of conduit. Plastic conduit shall be prepared by application of a plastic cleaner and brushing a plastic solvent on the outside of the conduit ends and on the inside of the couplings. The conduit fitting shall then be slipped together with a quick one-quarter turn twist to set the joint tightly. Where more than one conduit is placed in a single trench, or in duct banks, joints in the conduit shall be staggered a minimum of 2 feet.

Changes in direction of runs exceeding 10 degrees, either vertical or horizontal, shall be accomplished using manufactured sweep bends.

Whether or not specifically indicated on the drawings, where the soil encountered at established duct bank grade is an unsuitable material, as determined by the RPR, the unsuitable material shall be removed per Item P-152 and replaced with suitable material. Additional duct bank supports shall be installed, as approved by the RPR.

All excavation shall be unclassified and shall be considered incidental to Item L-110. Dewatering necessary for duct installation, and erosion per federal, state, and local requirements is incidental to Item L-110.

Unless otherwise specified, excavated materials that are deemed by the RPR to be unsuitable for use in backfill or embankments shall be removed and disposed of offsite.

Any excess excavation shall be filled with suitable material approved by the RPR and compacted per Item P-152.

It is the Contractor's responsibility to locate existing utilities within the work area prior to excavation. Where existing active cables cross proposed installations, the Contractor shall ensure that these cables are adequately protected. Where crossings are unavoidable, no splices will be allowed in the existing cables, except as specified on the plans. Installation of new cable where such crossings must occur shall proceed as follows:

a. Existing cables shall be located manually. Unearthed cables shall be inspected to assure absolutely no damage has occurred

b. Trenching, etc., in cable areas shall then proceed with approval of the RPR, with care taken to minimize possible damage or disruption of existing cable, including careful backfilling in area of cable.

In the event that any previously identified cable is damaged during the course of construction, the Contractor shall be responsible for the complete repair.

110-3.2 Duct banks. Unless otherwise shown in the plans, duct banks shall be installed so that the top of the concrete envelope is not less than 18 inches below the bottom of the base or stabilized base course layers where installed under runways, taxiways, aprons, or other paved areas, and not less than 18 inches below finished grade where installed in unpaved areas.

Unless otherwise shown on the plans, duct banks under paved areas shall extend at least 3 feet beyond the edges of the pavement or 3 feet beyond any under drains that may be installed alongside the paved area. Trenches for duct banks shall be opened the complete length before concrete is placed so that if any obstructions are encountered, provisions can be made to avoid them. Unless otherwise shown on the plans, all duct banks shall be placed on a layer of concrete not less than 3 inches thick prior to its initial set. The Contractor shall space the conduits

not less than 3 inches apart (measured from outside wall to outside wall). All such multiple conduits shall be placed using conduit spacers applicable to the type of conduit. As the conduit laying progresses, concrete shall be placed around and on top of the conduits not less than 3 inches thick unless otherwise shown on the plans. All conduits shall terminate with female ends for ease of access in current and future use. Install factory plugs in all unused ends. Do not cover the ends or plugs with concrete.

Conduits forming the duct bank shall be installed using conduit spacers. No. 4 reinforcing bars shall be driven vertically into the soil a minimum of 6 inches to anchor the assembly into the earth prior to placing the concrete encasement. For this purpose, the spacers shall be fastened down with locking collars attached to the vertical bars. Spacers shall be installed at 5-foot intervals. Spacers shall be in the proper sizes and configurations to fit the conduits. Locking collars and spacers shall be submitted to the RPR for review prior to use.

When specified, the Contractor shall reinforce the bottom side and top of encasements with steel reinforcing mesh or fabric or other approved metal reinforcement. When directed, the Contractor shall supply additional supports where the ground is soft and boggy, where ducts cross under roadways, or where shown on the plans. Under such conditions, the complete duct structure shall be supported on reinforced concrete footings, piers, or piles located at approximately 5-foot intervals.

All pavement surfaces that are to have ducts installed therein shall be neatly saw cut to form a vertical face. All excavation shall be included in the contract with price for the duct.

Install a plastic, detectable, color as noted, 3 to 6 inches wide tape, 8 inches minimum below grade above all underground conduit or duct lines not installed under pavement. Utilize the 3-inch wide tape only for single conduit runs. Utilize the 6-inch wide tape for multiple conduits and duct banks. For duct banks equal to or greater than 24 inches in width, utilize more than one tape for sufficient coverage and identification of the duct bank as required.

When existing cables are to be placed in split duct, encased in concrete, the cable shall be carefully located and exposed by hand tools. Prior to being placed in duct, the RPR shall be notified so that he may inspect the cable and determine that it is in good condition. Where required, split duct shall be installed as shown on the drawings or as required by the RPR.

110-3.3 Conduits without concrete encasement. Trenches for single-conduit lines shall be not less than 6 inches nor more than 12 inches wide. The trench for 2 or more conduits installed at the same level shall be proportionately wider. Trench bottoms for conduits without concrete encasement shall be made to conform accurately to grade so as to provide uniform support for the conduit along its entire length.

Unless otherwise shown on the plans, a layer of fine earth material, at least 4 inches (thick (loose measurement) shall be placed in the bottom of the trench as bedding for the conduit. The bedding material shall consist of soft dirt, sand or other fine fill, and it shall contain no particles that would be retained on a 1/4-inch sieve. The bedding material shall be tamped until firm. Flowable backfill may alternatively be used.

Unless otherwise shown on plans, conduits shall be installed so that the tops of all conduits within the Airport's secured area where trespassing is prohibited are at least 18 inches below the finished grade. Conduits outside the Airport's secured area shall be installed so that the tops of the conduits are at least 24 inches below the finished grade per National Electric Code (NEC), Table 300.5.

When two or more individual conduits intended to carry conductors of equivalent voltage insulation rating are installed in the same trench without concrete encasement, they shall be spaced not less than 3 inches apart (measured from outside wall to outside wall) in a horizontal direction and not less than 6 inches apart in a vertical direction. Where two or more individual conduits intended to carry conductors of differing voltage insulation rating are installed in the same trench without concrete encasement, they shall be placed not less than 3 inches apart (measured from outside wall to outside wall) in a horizontal direction and not less than 6 inches apart in a vertical direction.

Trenches shall be opened the complete length between normal termination points before conduit is installed so that if any unforeseen obstructions are encountered, proper provisions can be made to avoid them.

Conduits shall be installed using conduit spacers. No. 4 reinforcing bars shall be driven vertically into the soil a minimum of 6 inches to anchor the assembly into the earth while backfilling. For this purpose, the spacers shall be fastened down with locking collars attached to the vertical bars. Spacers shall be installed at 5-foot intervals. Spacers shall be in the proper sizes and configurations to fit the conduits. Locking collars and spacers shall be submitted to the RPR for review prior to use.

110-3.4 Markers. The location of each end and of each change of direction of conduits and duct banks shall be marked by a concrete slab marker 2 feet square and 4 - 6 inches thick extending approximately one inch above the surface. The markers shall also be located directly above the ends of all conduits or duct banks, except where they terminate in a junction/access structure or building. Each cable or duct run from a line of lights and signs to the equipment vault must be marked at approximately every 200 feet along the cable or duct run, with an additional marker at each change of direction of cable or duct run.

The Contractor shall impress the word "DUCT" or "CONDUIT" on each marker slab. Impression of letters shall be done in a manner, approved by the RPR, for a neat, professional appearance. All letters and words must be neatly stenciled. After placement, all markers shall be given one coat of high-visibility orange paint, as approved by the RPR. The Contractor shall also impress on the slab the number and size of conduits beneath the marker along with all other necessary information as determined by the RPR. The letters shall be 4 inches high and 3 inches wide with width of stroke 1/2 inch and 1/4 inch deep or as large as the available space permits. Furnishing and installation of duct markers is incidental to the respective duct pay item.

110-3.5 Backfilling for conduits. For conduits, 8 inches of sand, soft earth, or other fine fill (loose measurement) shall be placed around the conduits ducts and carefully tamped around and over them with hand tampers. The remaining trench shall then be backfilled and compacted per Item P-152 except that material used for back fill shall be select material not larger than 4 inches in diameter.

Flowable backfill may alternatively be used.

Trenches shall not contain pools of water during back filling operations.

The trench shall be completely backfilled and tamped level with the adjacent surface; except that, where sod is to be placed over the trench, the backfilling shall be stopped at a depth equal to the thickness of the sod to be used, with proper allowance for settlement.

Any excess excavated material shall be removed and disposed of per instructions issued by the RPR.

110-3.6 Backfilling for duct banks. After the concrete has cured, the remaining trench shall be backfilled and compacted per Item P-152 "Excavation and Embankment" except that the material used for backfill shall be select material not larger than 4 inches in diameter. In addition to the requirements of Item P-152, where duct banks are installed under pavement, one moisture/density test per lift shall be made for each 250 linear feet of duct bank or one work period's construction, whichever is less.

Flowable backfill may alternatively be used.

Trenches shall not contain pools of water during backfilling operations.

The trench shall be completely backfilled and tamped level with the adjacent surface; except that, where sod is to be placed over the trench, the backfilling shall be stopped at a depth equal to the thickness of the sod to be used, with proper allowance for settlement.

Any excess excavated material shall be removed and disposed of per instructions issued by the RPR.

110-3.7 Restoration. Where sod has been removed, it shall be replaced as soon as possible after the backfilling is completed. All areas disturbed by the work shall be restored to its original condition. The restoration shall include topsoiling, seeding, and mulching shown on the plans. The Contractor shall be held responsible for maintaining all disturbed surfaces and replacements until final acceptance. All restoration shall be considered incidental to the respective L-110 pay item. Following restoration of all trenching near airport movement surfaces, the Contractor shall thoroughly visually inspect the area for foreign object debris (FOD), and remove any such FOD that is found. This FOD inspection and removal shall be considered incidental to the pay item of which it is a component part.

METHOD OF MEASUREMENT

110-4.1 Underground conduits and duct banks shall be measured by the linear feet of conduits and duct banks installed, including encasement, locator tape, trenching and backfill with designated material, and restoration, and for drain lines, the termination at the drainage structure, all measured in place, completed, and accepted. Separate measurement shall be made for the various types and sizes.

BASIS OF PAYMENT

110-5.1 Payment will be made at the contract unit price per linear foot for each type and size of conduit and duct bank completed and accepted, including trench and backfill with the designated material, and, for drain lines, the termination at the drainage structure. This price shall be full compensation for removal and disposal of existing duct banks and conduits as shown on the plans, furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item per the provisions and intent of the plans and specifications.

Payment will be made under:

Item L-110-5.1	Split Conduit, 2" SCH 80 PVC - per linear foot
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REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

Advisory Circular (AC)

AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-53	Airport Lighting Equipment Certification Program

ASTM International (ASTM)

ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
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National Fire Protection Association (NFPA)

NFPA-70	National Electrical Code (NEC)
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Underwriters Laboratories (UL)

UL Standard 6	Electrical Rigid Metal Conduit - Steel
UL Standard 514B	Conduit, Tubing, and Cable Fittings

UL Standard 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
UL Standard 1242	Electrical Intermediate Metal Conduit Steel
UL Standard 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
UL Standard 651A	Type EB and A Rigid PVC Conduit and HDPE Conduit

END OF ITEM L-110

Item L-125 Installation of Airport Lighting Systems

DESCRIPTION

125-1.1 This item shall consist of airport lighting systems furnished and installed in accordance with this specification, the referenced specifications, and the applicable advisory circulars (ACs). The systems shall be installed at the locations and in accordance with the dimensions, design, and details shown in the plans. This item shall include the furnishing of all equipment, materials, services, and incidentals necessary to place the systems in operation as completed units to the satisfaction of the RPR.

EQUIPMENT AND MATERIALS

125-2.1 General.

a. Airport lighting equipment and materials covered by Federal Aviation Administration (FAA) specifications shall be certified under the Airport Lighting Equipment Certification Program in accordance with AC 150/5345-53, current version. FAA certified airfield lighting shall be compatible with each other to perform in compliance with FAA criteria and the intended operation. If the Contractor provides equipment that does not perform as intended because of incompatibility with the system, the Contractor assumes all costs to correct the system for to operate properly.

b. Manufacturer's certifications shall not relieve the Contractor of their responsibility to provide materials in accordance with these specifications and acceptable to the RPR. Materials supplied and/or installed that do not comply with these specifications shall be removed, when directed by the RPR and replaced with materials, which do comply with these specifications, at the sole cost of the Contractor.

c. All materials and equipment used shall be submitted to the RPR for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Clearly mark each copy to identify pertinent products or models applicable to this project. Indicate all optional equipment and delete non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment for which they apply on each submittal sheet. Markings shall be clearly made with arrows or circles (highlighting is not acceptable). The Contractor shall be responsible for delays in the project accruing directly or indirectly from late submissions or resubmissions of submittals.

d. The data submitted shall be sufficient, in the opinion of the RPR, to determine compliance with the plans and specifications. The Contractor's submittals shall be submitted in electronic PDF format, tabbed by specification section. The RPR reserves the right to reject any or all equipment, materials or procedures, which, in the RPR's opinion, does not meet the system design and the standards and codes, specified herein.

e. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

EQUIPMENT AND MATERIALS

125-2.2 Conduit/Duct. Not required.

125-2.3 Cable and Counterpoise. Not required.

125-2.4 Tape. Not required.

125-2.5 Cable Connections. Not required.

125-2.6 Retroreflective Markers. Retroreflective markers shall be type L-853 and shall conform to the requirements of AC 150/5345-39.

125-2.7 Runway and Taxiway Lights. Not required.

125-2.8 Runway and Taxiway Signs. Not required.

125-2.9 Runway End Identifier Light (REIL). Not required.

125-2.10 Precision Approach Path Indicator (PAPI). Not required.

125-2.11 Circuit Selector Cabinet. Not required.

125-2.12 Light Base and Transformer Housings. Not required.

125-2.13 Isolation Transformers. Not required.

INSTALLATION

125-3.1 Installation. The Contractor shall furnish, install, connect and test all equipment, accessories, conduit, cables, wires, buses, grounds and support items necessary to ensure a complete and operable airport lighting system as specified here and shown in the plans.

The equipment installation and mounting shall comply with the requirements of the National Electrical Code and state and local code agencies having jurisdiction.

The Contractor shall install the specified equipment in accordance with the applicable advisory circulars and the details shown on the plans.

125-3.2 Testing. Not required.

125-3.3 Shipping and Storage. Equipment shall be shipped in suitable packing material to prevent damage during shipping. Store and maintain equipment and materials in areas protected from weather and physical damage. Any equipment and materials, in the opinion of the RPR, damaged during construction or storage shall be replaced by the Contractor at no additional cost to the owner. Painted or galvanized surfaces that are damaged shall be repaired in accordance with the manufacturer's recommendations.

125-3.4 Elevated and In-pavement Lights. Not required.

METHOD OF MEASUREMENT

125-4.1 Reflective markers will be measured by the number installed as completed units in place, ready for operation, and accepted by the RPR.

BASIS OF PAYMENT

125-5.1 Payment will be made at the Contract unit price for each complete reflective marker. This payment will be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools and incidentals necessary to complete this item.

Payment will be made under:

Item L-125-5.1	Taxilane Edge Reflective Marker – per each
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REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

Advisory Circulars (AC)

AC 150/5340-18	Standards for Airport Sign Systems
AC 150/5340-26	Maintenance of Airport Visual Aid Facilities
AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-39	Specification for L-853, Runway and Taxiway Retroreflective Markers
AC 150/5345-46	Specification for Runway and Taxiway Light Fixtures
AC 150/5345-53	Airport Lighting Equipment Certification Program

Engineering Brief (EB)

EB No. 67	Light Sources Other than Incandescent and Xenon for Airport and Obstruction Lighting Fixtures
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END OF ITEM L-125



PART 9: SUPPLEMENTAL TECHNICAL SPECIFICATIONS

Item C-95 Construction Engineering

DESCRIPTION

95-1.1. If set out as a pay item in the itemized proposal, the Contractor shall perform the construction layout responsibilities as outlined in Section 50-06 Construction layout and stakes, located in the contract document General Provisions.

The Engineer shall establish horizontal and vertical control only. The Contractor must establish all layout required for the construction of the work. Such stakes and markings as the Engineer may set for either their own or the Contractor's guidance shall be preserved by the Contractor. In case of negligence on the part of the Contractor, or their employees, resulting in the destruction of such stakes or markings, the Contractor shall be responsible for replacing such stakes or markings at no additional cost, or an amount equal to the cost of replacing the same may be deducted from subsequent estimates due the Contractor at the discretion of the Engineer.

The Contractor will be required to furnish all lines, grades and measurements from the control points necessary for the proper execution and control of the work contracted for under these specifications.

The Contractor must give copies of survey notes to the Engineer for each area of construction and for each placement of material as specified to allow the Engineer to make periodic checks for conformance with plan grades, alignments and grade tolerances required by the applicable material specifications. All surveys must be provided to the Engineer prior to commencing work items that will cover or disturb the survey staking as set by the Contractor's surveyor. Survey(s) and notes shall be provided in the following format(s): hardcopy, AutoCAD .DWG files, or .PDF files. In the case of error, on the part of the Contractor, their surveyor, employees or subcontractors, resulting in established grades, alignment or grade tolerances that do not concur with those specified or shown on the plans, the Contractor is solely responsible for correction, removal, replacement and all associated costs at no additional cost to the Owner.

CONSTRUCTION METHODS

95-2.1. Construction staking and layout includes but is not limited to:

- a. Verify elevations and dimensions shown in the construction plan drawings prior to the commencement of construction activities. Where new work is to be fitted to existing, the Contractor shall verify dimensions and conditions prior to the start of new work. Any errors or discrepancies shall be reported to the Engineer or the Contractor shall assume responsibility for the new work.
- b. Contractor shall run a level circuit to verify benchmark elevations prior to staking and construction. Any errors or discrepancies shall be reported to the Engineer or the Contractor shall assume responsibility for the new work.
- c. Clearing and grubbing perimeter staking.
- d. Rough grade slope stakes at 100-foot stations.
- e. Drainage swale slope stakes and flow line blue tops at 50-foot stations.

- f. Subgrade blue tops at 25-foot offset distance (maximum) for the following;
 - Runway – minimum five (5) per station
 - Taxiways – minimum three (3) per station
 - Apron areas – minimum three (3) per station
 - Roadways – minimum three (3) per station
- g. Subbase blue tops at 25-foot offset distance (maximum) for the following;
 - Runway – minimum five (5) per station
 - Taxiways – minimum three (3) per station
 - Apron areas – minimum three (3) per station
 - Roadways – minimum three (3) per station
- h. Pavement areas:
 - Edge of pavement hubs and tacks (for stringline by Contractor) at 100-foot stations.
 - Between lifts at 25-foot stations for each paving lane width.
- i. Shoulder and safety area blue tops at 50-foot stations and at all break points with maximum of 50-foot offsets.
- j. Fence lines at 100-foot stations minimum.
- k. Electrical and communication system locations, lines, and grades including but not limited to duct runs, connections, fixtures, signs, lights, Vertical Guidance Slope Indicators (PAPI), Runway End Identifier Lighting (REIL), Wind cones, markers, pull boxes, junction structures, and manholes.
- l. Drain lines, cut stakes, and alignment on 25-foot stations for inlets and manholes.
- m. Painting and striping layout (pinned with 1.5-inch PK nails) marked for paint Contractor (all nails shall be removed after painting).
- n. Laser, or other automatic control devices, shall be checked with temporary control point or grade hub at minimum of once per 400-feet per pass (that is paving lane).
- o. Any other actions, instructions, or operations noted as Construction Engineering responsibilities in the construction plan drawings or contract documents.

The establishment of Survey Control and/or reestablishment of survey control shall be performed by a State Licensed Land Surveyor.

Controls and stakes disturbed or suspected of having been disturbed shall be checked and/or reset as directed by the Engineer without additional cost to the Owner.

The Engineer may check the accuracy of the Construction Engineering as necessary, but will assume no responsibility for the accuracy of layout, staking, or the final result of construction accuracy.

METHOD OF MEASUREMENT

95-3.1 No measurement will be made.

BASIS OF PAYMENT

95-4.1. Construction Engineering, as specified herein, shall be paid for on a lump sum basis which shall include furnishing all necessary personnel, equipment, and supplies to accomplish the work.

Payment will be under:

Item C-95-4.1 Construction Engineering - Per Lump Sum

END OF ITEM C-95

C-115 Maintenance of Traffic

DESCRIPTION

115-1.1 Maintenance of Traffic This item shall consist of the erection, placement, and maintenance of all maintenance of traffic items including, but not limited to, barricades, closure crosses, and cones in reasonably close conformity as shown on the plans.

115-1.2 Haul Route Construction This item shall include the maintenance of the existing aggregate access drive to be used as a construction haul route. Items in this specification include, but are not limited to, excavation, placement of stone, compaction, and maintenance of said haul route in reasonably close conformity as identified on the plans and details.

GENERAL REQUIREMENTS

115-2.1 Maintenance of Traffic. The Contractor shall erect and maintain all traffic control devices - signs, barricades, closure crosses, etc., as indicated on the plans and in the special provisions.

Unless specified otherwise, the following standards for traffic control will be applicable:

1. Manual of Uniform Traffic Control Devices for Streets and Highways, latest edition.
2. FAA AC 150/5370-2, latest edition.

The Contractor shall phase his operations as indicated on the plans and in the special provisions.

The number and placement of barricades may be altered as determined by the Engineer at no additional cost to the Authority.

115-2.2 Haul Route. The Contractor shall periodically top dress stone, as required, to eliminate areas of depression, ponding, rutting, etc. The Contractor shall establish and maintain the haul route via his own established means and methods. Material used for top dressing shall be as identified in the plans or as approved by the RPR.

The Contractor shall provide regrading and redressing of the aggregate drive necessary to connect to the proposed pavement parking area with no direct payment. The aggregate drive shall consist of INDOT No. 53 stone or as approved by the RPR.

METHOD OF MEASUREMENT

115-3.1 Maintenance of Traffic. Maintenance of Traffic will be measured for payment as a lump sum item.

115-3.2 Haul Route. Haul Route will be incidental to Maintenance of Traffic in this specification.

BASIS OF PAYMENT

115-4.1 Payment will be made at the contract lump sum price for Maintenance of Traffic. Payment shall be based upon the approximate amount of this work actually completed, but in no case shall more than 30% of this item be paid on the first progress payment. This work shall include furnishing all necessary personnel, equipment, and supplies to accomplish the work.

Payment will be made under:

Item C-115-4.1 Maintenance of Traffic -- per lump sum

END OF SECTION C-115

DIVISION 300 – AGGREGATE PAVEMENT AND BASES

SECTION 301 – AGGREGATE BASE

301.01 Description

This work shall consist of placing coarse aggregate on a prepared grade in accordance with 105.03.

MATERIALS

301.02 Materials

10 Materials shall be in accordance with the following:

Coarse Aggregate, Class D or Higher.....	904.03
Geosynthetic Materials.....	918

ACBF shall not be used for subgrade treatment Type ID, Type IV, and Type IVA.

CONSTRUCTION REQUIREMENTS

301.03 Preparation of Subgrade

20 Subgrade shall be prepared in accordance with 207.04. Proofrolling will not be required in trench sections and other areas where proofrolling equipment cannot be used.

301.04 Temperature Limitations

Aggregate shall not be placed when the air temperature is less than 35°F. Aggregate shall not be placed on a frozen subgrade. Frozen aggregate shall not be placed.

301.05 Spreading

30 The moisture content of the aggregate shall be between 4% and the optimum moisture content when the aggregate is delivered to the project. Unless otherwise directed, water shall not be added to the aggregate on the grade.

Aggregate shall be spread in uniform lifts with a spreading and leveling device approved by the Engineer. The spreading and leveling device shall be capable of placing aggregate to the depth, width, and slope specified. The compacted depth of each lift shall be a minimum of 3 in. and a maximum of 6 in.

40 Aggregate shall be handled and transported to minimize segregation and the loss of moisture. In areas inaccessible to mechanical equipment, each lift shall be 3 in. and an approved hand spreading method may be used.

301.06 Compacting

Dense graded aggregate shall be compacted to achieve the allowable average deflection as determined with LWD testing in accordance with 203.24(b).

The allowable average deflection for aggregate over the chemically modified soils and untreated soils shall be in accordance with the Tables shown in 203.24(b).

- 50 As an alternate, aggregates shall be compacted to a minimum of 100% of the maximum dry densities in accordance with AASHTO T 99. In situ density will be determined in accordance with 203.24(b). Aggregate shall meet the compaction requirements at the time subsequent courses are placed.

Coarse graded aggregates shall be compacted in accordance with 203.25.

In areas inaccessible to compaction equipment, such as private drives and mailbox approaches, the compaction requirements may be accepted by visual inspection.

- 60 All displacement or rutting of the aggregate shall be repaired prior to placing subsequent material.

301.07 Checking and Correcting Base

The top of each aggregate course shall be checked transversely to the cross-section and all deviations in excess of 1/2 in. shall be corrected. If additional aggregate is required, the course shall be remixed and re-compacted.

301.08 Priming

A prime coat, when required, shall be in accordance with 405.

70

301.09 Method of Measurement

Compacted aggregate base will be measured by the cubic yard based on the theoretical volume to the neat line as shown on the plans. Geotextiles will be measured in accordance with 616.12.

301.10 Basis of Payment

The accepted quantities of compacted aggregate base will be paid for at the contract unit price per cubic yard, complete in place. Geotextiles will be paid for in accordance with 616.13.

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Payment will be made under:

Pay Item	Pay Unit Symbol
Compacted Aggregate, No. 2	CYS
Compacted Aggregate, No. 5	CYS
Compacted Aggregate, No. 8	CYS
Compacted Aggregate, No. 53	CYS

- 90 The cost of placing, compacting, water, aggregate placed outside neat lines as shown on the plans, and necessary incidentals shall be included in the cost of the pay item.

Payment will not be made for material placed outside of a 1:1 slope from the planned typical section.

Replacement of pavement damaged by the Contractor's operations shall be at no additional payment.

SECTION 302 – SUBBASE

302.01 Description

This work shall consist of a foundation course of selected materials, placed and compacted on a prepared subgrade in accordance with 105.03.

- Subbase for PCCP shall consist of a 3 in. layer of coarse aggregate No. 8 as the aggregate drainage layer placed over a 6 in. layer of coarse aggregate No. 53 as the separation layer. Dense graded subbase shall consist of a 6 in. layer of coarse aggregate
- 10 No. 53.

MATERIALS

302.02 Materials

Materials shall be in accordance with the following:

Coarse Aggregate, Class B or Higher, Size No. 8904

Coarse Aggregate, Class D or Higher, Size No. 53904

- 20 Coarse aggregate No. 8 used as an aggregate drainage layer shall consist of 100% crushed stone or ACBF.

CONSTRUCTION REQUIREMENTS

302.03 Preparation of Subgrade

Subgrade shall be prepared in accordance with 207.

302.04 Temperature Limitations

- Aggregate shall not be placed when the air temperature is less than 35°F.
- 30 Aggregate shall not be placed on a frozen subgrade. Frozen aggregate shall not be placed.

302.05 Spreading

Aggregate shall be spread in uniform lifts with a spreading and leveling device approved by the Engineer. The spreading and leveling device shall be capable of placing aggregate to the depth, width, and slope specified. The compacted depth of each lift shall be a minimum of 3 in. and a maximum of 6 in.

40 Aggregate shall be handled and transported to minimize segregation and the loss of moisture. In areas inaccessible to mechanical equipment, approved hand spreading methods may be used.

The moisture content of the aggregate shall be between 4% and the optimum moisture content when the aggregate is delivered to the project. Water shall not be added to the aggregate on the grade.

302.06 Compacting

Subbases shall be compacted as follows:

50 **(a) Aggregate Separation Layers and Dense Graded Subbase**

Compaction shall be in accordance with 301.06.

All displacement or rutting of the aggregate separation layers shall be repaired prior to placing subsequent material.

(b) Aggregate Drainage Layer

60 Compaction shall consist of two passes with a vibratory roller before trimming, and one pass with the same roller in static mode after trimming. A vibratory roller shall be equipped with a variable amplitude system, a speed control device, and have a minimum vibration frequency of 1,000 vibrations per minute. A roller in accordance with 409.03(d)4 may be used.

Construction traffic shall not be allowed on the aggregate drainage layer, except where placement of the PCCP is restricted. Exceptions shall be subject to approval by the Engineer. Displacement or rutting of the aggregate drainage layers shall be repaired prior to placing subsequent material.

70 In areas inaccessible to standard size compacting equipment a specialty roller/compactor in accordance with 409.03(d)7 shall be used.

302.07 Checking and Correcting Subbase

The top of each aggregate course shall be checked transversely and all deviations in excess of 1/2 in. shall be corrected. If additional aggregate is required, the course shall be remixed and recompact.

302.08 Method of Measurement

Subbase for PCCP or dense graded subbase will be measured by the cubic yard based on the theoretical volume to the neat lines as shown on the plans. The quantity

shown in the Schedule of Pay Items will be adjusted if it is shown to be different by
80 more than 2% of the measured quantity.

302.09 Basis of Payment

The accepted quantities of subbase for PCCP or dense graded subbase will be paid for at the contract unit price per cubic yard, complete in place.

Payment will be made under:

	Pay Item	Pay Unit Symbol
90	Dense Graded Subbase	CYS
	Subbase for PCCP	CYS

The cost of compacting, water, aggregate placed outside neat lines as shown on the plans, and necessary incidentals shall be included in the cost of the subbase.

SECTION 303 – AGGREGATE PAVEMENTS OR SHOULDERS

303.01 Description

This work shall consist of placing a dense-graded compacted aggregate on prepared subgrade in accordance with 105.03.

MATERIALS

303.02 Materials

10 Materials shall be in accordance with the following:

Coarse Aggregate, Class D or Higher, Size No. 53 904

Coarse Aggregate, Class D or Higher, Size No. 73* ... 904

* Surface courses only, when specified.

CONSTRUCTION REQUIREMENTS

303.03 Preparation of Subgrade

20 Subgrade shall be prepared in accordance with 207.04. Proofrolling will not be required in trench sections and other areas where proofrolling equipment cannot be used.

303.04 Temperature Limitations

Aggregate shall not be placed when the air temperature is less than 35°F. Aggregate shall not be placed on a frozen subgrade. Frozen aggregate shall not be placed.

303.05 Spreading

Aggregate shall be spread in uniform lifts with a spreading and leveling device

- 30 approved by the Engineer. The spreading and leveling device shall be capable of placing aggregate to the depth, width, and slope specified. The compacted depth of each lift shall be a minimum of 3 in. and a maximum of 6 in., except where utilized as a shoulder. The compacted depth of a lift for a shoulder shall be a minimum of 3 in. and a maximum of 9 in.

Aggregate shall be handled and transported to minimize segregation and the loss of moisture. In areas inaccessible to mechanical equipment, approved hand spreading methods may be used.

- 40 The moisture content of the aggregate shall be between 4% and the optimum moisture content when the aggregate is delivered to the project. Water shall not be added to the aggregate on the grade.

303.06 Compacting

Compaction shall be in accordance with 301.06.

All displacement or rutting of the compacted aggregate shall be repaired prior to placing subsequent material.

- 50 **303.07 Checking and Correcting Base and Surface**

The top of each aggregate course shall be checked transversely and all deviations in excess of 1/2 in. shall be corrected. If additional aggregate is required, the course shall be remixed and recompact.

303.08 Dust Palliative

A dust palliative, if required, shall be in accordance with 407.

303.09 Method of Measurement

- 60 Compacted aggregate will be measured by the ton in accordance with 109.01(b) for the type specified.

303.10 Basis of Payment

The accepted quantities of compacted aggregate will be paid for at the contract unit price per ton, for the type specified, complete in place.

Payment will be made under:

	Pay Item	Pay Unit Symbol
70	Compacted Aggregate, No. 53	TON
	Compacted Aggregate, No. 73	TON

The cost of placing, compacting, water, and necessary incidentals shall be included in the costs of the compacted aggregate.

Payment will not be made for material placed outside of a 1:1 slope from the planned typical section.

Replacement or repair of pavement or shoulders damaged by the Contractor's
80 operations shall be at no additional payment.

SECTION 304 – ASPHALT BASES

304.01 Description

This work shall consist of constructing an HMA base on a prepared surface or preparing an existing asphalt pavement for use as an asphalt base in accordance with 105.03.

MATERIALS

10 304.02 Materials

Materials shall be in accordance with the appropriate sections.

304.03 Sealing Cracks and Joints

Cracks and joints shall be sealed in accordance with 408.

304.04 Partial Depth and Full Depth Patching

Areas to be patched will be marked on the surface by the Engineer. The marked pavement shall be removed to the depth shown on the typical section or as directed. A minimum 2 in. vertical joint shall be constructed with the pavement that remains in
20 place. If it is determined that the marked pavement is to be removed full depth, the patch depth shall be to the bottom of the existing asphalt material or as directed.

The subgrade of the aggregate base under the patches shall be compacted in accordance with 203.25. If the excavation for patches reveals unsuitable subgrade material, such material shall be removed to a depth of 6 in. and backfilled to the top of subgrade with compacted aggregate in accordance with 301. Unauthorized excavation beyond neat lines shall be replaced with compacted aggregate in accordance with 301.

The excavated patch areas shall be filled with HMA for patching of the type
30 specified in the pay item and as shown on the plans. HMA used for patching shall be in accordance with 402. An MAF in accordance with 402.05 will not apply. The 175°F temperature requirement for the previously paved course in accordance with 402.13 will not apply. Mixtures will be accepted in accordance with 402.09.

Each course shall be compacted using mechanical equipment in accordance with 409.03(d).

A smooth riding surface shall be maintained on HMA patches at all times. Deformation due to traffic or other conditions shall be corrected immediately. HMA
40 of the type specified in the pay item shall be used to maintain patches.

Unless otherwise specified, patches shall be completed during daylight hours and opened to traffic at the close of the workday. Patches that cannot be completed prior to the end of daily operations shall be backfilled, compacted, and a temporary surface placed to carry traffic, unless otherwise specified.

304.05 Widening

The outside face of the excavated area shall be left as nearly vertical as the nature of the material will allow and not wider than the outside limits of the widening section.

50 The subgrade in the widened area shall be compacted in accordance with 207.

Widening mixtures shall be HMA mixtures in accordance with 402 and as shown on the typical section or as directed.

For widening 3 ft or less and 330 lb/sq yd or less, six passes of trench rollers in accordance with 409.03(d)6 shall be used. For widening 3 ft or less and greater than 330 lb/sq yd, 12 passes of trench rollers in accordance with 409.03(d)6 shall be used.

60 For widening greater than 3 ft and 330 lb/sq yd or less, six passes of rollers with a compaction wheel bearing of no less than 300 lb/in. shall be used.

For widening greater than 3 ft and greater than 330 lb/sq yd, 12 passes of rollers with a compaction wheel bearing of no less than 300 lb/in. shall be used.

Except for surface mixtures, the course flush with the top of the existing surface shall be compacted with equipment entirely on the widening.

An MAF in accordance with 401.05 or 402.05 will not apply. HMA mixtures will be accepted in accordance with 402.09.

70

304.06 Method of Measurement

Widening and patching will be measured by the ton of the type of HMA specified, in accordance with 109.01(b). Compacted aggregate for base will be measured by the ton in accordance with 109.01(b).

304.07 Basis of Payment

The accepted quantities for widening and patching will be paid for at the contract unit price per ton, of the type of HMA specified, complete in place. Compacted aggregate for base will be paid for in accordance with 301.10.

80

Payment will be made under:

Pay Item

Pay Unit Symbol

HMA Patching, Full Depth, $\frac{*}{\text{type}}$ TON

- HMA Patching, Partial Depth, $\frac{*}{\text{type}}$ TON
- 90 Widening with HMA, $\frac{*}{\text{type}}$ TON

* Mixture type in accordance with 402.04.

Excavation for patching will not be paid for separately but shall be included in the cost of the patching material.

- 100 The cost of furnishing, storage, hauling, and placing of all materials; pavement removal as required; temporary pavement required to carry traffic; choke aggregate required to eliminate pickup; disposal; excavation; preparation of subgrade; compacting; and finishing except as otherwise provided shall be included in the cost of the patching materials.

The cost of excavation and disposal of existing materials required for the compacted aggregate or HMA widening material shall be included in the cost of the HMA widening material.

Replacement of pavement damaged by the Contractor's operations shall be at no additional payment.

SECTION 305 – CONCRETE BASES

305.01 Description

This work shall consist of constructing a PCC base on a prepared surface or preparing an existing concrete surface for use as a base in accordance with 105.03.

MATERIALS

305.02 Materials

- 10 Materials shall be in accordance with the following:

Asphalt for Undersealing..... 612.02
 Coarse Aggregate, Class A or Higher, Size No. 8..... 904
 Coarse Aggregate, Class D or Higher, Size No. 53..... 904
 Coarse Aggregate, Class D or Higher, Size No. 73..... 904

CONSTRUCTION REQUIREMENTS

305.03 New PCC Base

- 20 Construction of new PCC bases shall be in accordance with 502, except for 502.14 and 502.20. The CMDS shall be in accordance with 502.03, except utilization of the Department provided spreadsheet is not required. The surface shall be finished with wet burlap or by wood floats. Smoothness of the base shall be controlled by the Contractor with a 16 ft straightedge longitudinally and will be controlled by the

Department with a 10 ft straightedge transversely. The 16 ft straightedge shall be in accordance with 306.03(d). The 10 ft straightedge will be in accordance with 306.03(d).

Joints shall be in accordance with 503, except for the following:

30

- (a) the second saw cut and sealing shall not be performed for transverse joints;
- (b) sealing shall not be performed for longitudinal joints; and
- (c) sawing and sealing shall not be performed for construction joints.

305.04 Existing PCCP

Preparation of PCCP for use as a base shall be in accordance with 507, except for:

40

(a) Patching

Patching PCC base shall be in accordance with 506 except the coarse aggregate shall be Class A or higher.

(b) Surface Milling

Surface milling shall be in accordance with 306.

(c) Retrofit Load Transfer

Retrofit load transfer shall be in accordance with 507.08.

50

(d) Rubblizing Existing PCCP

The existing pavement shall be rubblized with a self-contained, self-propelled, resonant frequency pavement breaking unit capable of producing low amplitude, 2,000 lbf blows at a rate of not less than 44 per second or with a self-contained, self-propelled, multiple headed, impact hammer with the heads directly adjacent to each other and the lift height of each head independently adjustable. The sequence of impacts shall be on a random basis. The unit shall be equipped with a water system to suppress dust generated by the operation.

60

The operating speed of the unit shall be such that the existing pavement is reduced to particles ranging from sand sized to pieces not exceeding 6 in. in the largest dimension, the majority being a nominal 1 to 2 in. in size. The concrete from the surface to the top of the reinforcement shall be reduced to the 1 to 2 in. size to the fullest extent possible. Continuous coverage, overlapped if necessary, with the breaking shoe or impact hammers shall be used. Additional passes of the resonator or multiple headed impact hammer may be required if larger sizes remain above the reinforcement.

70 Subsurface drains shall be installed along the edges of the pavement prior to the rubblization.

Rubblizing shall begin at the edge of pavement and proceed to the center of the pavement. The rubblization of the first lane shall extend 6 in. into the adjoining lane.

Prior to placing HMA mixtures, the complete width of the rubblized pavement shall be compacted by means of vibratory steel wheel and pneumatic-tired rollers in accordance with 409.03(d) in the following sequence: two initial passes with a vibratory roller, two passes with a pneumatic-tired roller, and then four final passes with a vibratory roller. The last two roller passes shall be immediately prior to priming operations. When the multiple headed impact hammer is used, a Z-pattern grid cladding bolted to the surface of the drum of the vibratory roller shall be used at least for the final two passes.

The vibratory roller shall be operated in the vibration mode at a speed not to exceed 6 ft per s. All depressions 1 in. or greater in depth from that of the immediate surrounding area that result from the rubblizing or compaction effort shall be filled with coarse aggregate No. 53 or 73 and struck off level with the surrounding area. Filled depressions shall be compacted with the same roller and compactive effort previously described.

Reinforcement in the rubblized pavement shall be left in place. Any reinforcement protruding above the surface as a result of rubblizing or compaction operations shall be cut off below the surface and removed from the site. All loose joint fillers, expansion material, or other similar materials shall also be removed from the rubblized surface.

Traffic will not be allowed on the rubblized pavement before the HMA base or immediate courses are in place unless otherwise directed. Rubblized material dislodged by traffic shall be removed from the pavement. The initial HMA course shall be placed within 48 h of rubblizing. However, in the event of rain, this time limitation may be waived to allow sufficient time for the rubblized pavement to dry to the satisfaction of the Engineer. Crossover and ramp crossings shall be maintained in the same compacted state as other areas until the initial HMA course is placed.

The preceding rubblizing operations shall be scheduled after widening or shoulder work has progressed up to the elevation of the existing pavement grade. These areas may then be utilized to support the breaking unit while the existing pavement is being rubblized. Shoulders may then be completed in conjunction with the placement of HMA pavement courses over the compacted rubblized pavement.

A joint shall be saw cut full depth or load transfer devices shall be severed at an existing joint on ramps or mainline where the rubblizing abuts concrete pavement to remain in place.

305.05 Widening with PCC Base

The subgrade shall be prepared in accordance with 207. Subbase shall be in accordance with 302.

120 The concrete shall be placed directly against the existing pavement edges, which shall be free from all foreign materials. The surface of the concrete widening shall be at the same elevation as the top of the existing concrete base.

Materials and construction requirements shall be in accordance with the applicable requirements of 502, except the following:

- (a) coarse aggregate shall be Class A or higher;
- 130 (b) joints shall be sawed in one pass and not sealed. Transverse joints constructed in the widening shall be aligned with existing transverse joints or cracks;
- (c) tining is not required;
- (d) shoulder corrugations are not required;
- (e) pavement smoothness shall be controlled by a 16 ft straightedge; and
- (f) utilization of the Department provided spreadsheet is not required.

140 When the widening is closed to traffic prior to placing the overlay, liquid membrane compounds shall not be used and an alternative curing option shall be used. Tack coat in accordance with 406 may be used as a curing option.

305.06 Method of Measurement

150 Compacted aggregate will be measured by the ton in accordance with 109.01(b) for the type specified. Retrofit load transfer will be measured in accordance with 507.09. Surface milling will be measured in accordance with 306.10. PCC base, PCC base patching, and widening with PCC base will be measured by the square yard of the thickness specified. The area of PCC will be the planned width of the base, patching, or widening multiplied by the measured length, or as directed in writing. The planned width of the base, patching and widening will be as shown on the typical cross-sections of the plans.

Rubblized PCCP will be measured by the square yard of rubblized pavement.

305.07 Basis of Payment

The accepted quantities of compacted aggregate will be paid for in accordance with 303.10, for the type specified, complete in place.

160 Retrofit load transfer will be paid for in accordance with 507.10. Surface milling will be paid for in accordance with 306.11.

PCC base, PCC base patching, and widening with PCC base will be paid for at the contract unit price by the square yard of the thickness specified.

Payment will be made under:

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Pay Item	Pay Unit Symbol
PCC Base, _____ in..... thickness	SYS
PCC Base Patching, _____ in..... thickness	SYS
Rubblizing PCCP	SYS
Widening with PCC Base, _____ in. thickness	SYS

180

The cost of excavation, disposal of existing materials, preparation of subgrade, and subbase required for the PCC base widening shall be included in the cost of widening with PCC base.

190

Replacement of pavement damaged by the Contractor's operations shall be without additional payment.

The cost of furnishing all labor, materials, and equipment necessary to rubblize, suppress dust, cut and remove exposed reinforcement, cut and remove joint fillers or similar materials, saw cutting of the pavement, severing existing joints, compacting and maintaining the compacted condition of the rubblized pavement shall be included in the cost of rubblized PCCP.

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The cost of furnishing, hauling, placing, leveling, and compacting the aggregate to fill depressions in the rubblized PCCP shall be included in the cost of coarse aggregate No. 53 or 73.

Furnishing and operating the 16 ft straightedge shall be included in the cost of other pay items within this section.

Furnishing and operating the 16 ft straightedge shall be included in the cost of other pay items within this section.

SECTION 306 – MILLING

306.01 Description

This work shall consist of the milling of asphalt and concrete pavements and the disposal of milled materials in accordance with 105.03.

CONSTRUCTION REQUIREMENTS

306.02 General

- 10 Milling operations shall be described in the QCP in accordance with ITM 803. Where the milling operation in a partial-day closure results in a longitudinal vertical or near vertical face exceeding 2 in. in height, the adjacent lane shall be milled during the same day, the milled lane resurfaced during the same day, or the vertical face tapered at a 45° angle or flatter. Where located within 3 in. of a curb, surface material that cannot be removed by the cold-milling machine shall be removed by other approved methods.

Transverse milled vertical faces greater than 1 in. that are exposed to traffic shall be transitioned in an approved manner.

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Castings located in milling areas that are not to be adjusted may remain in place during the milling or may be removed and replaced at the Contractor's option.

Localized weak areas uncovered by the milling process shall be patched in accordance with 304 or 305.

The milled material shall become the property of the Contractor, unless otherwise specified.

- 30 The roadway shall be cleaned before opening to traffic.

306.03 Equipment

Equipment for milling shall be in accordance with the following.

(a) Roadway Milling Machine

- 40 A milling machine shall be a power operated cold-milling machine, equipped with automatic control devices to establish profile grades by referencing from either the existing pavement or from independent grade control. The equipment shall have a positive means of controlling cross slope elevations, have an effective means for removing excess material from the surface, preventing airborne dust escaping from the operation, and producing a finished surface that provides a good bond to the new overlay.

Sufficient cutting teeth shall be on the coarse milling or fine milling cutting drum to produce cuttings such that 90% of the conglomerate particles pass a 2 in. sieve. A coarse milling cutting drum shall have 5/8 in. spacing between the cutting teeth and

be capable of producing a surface macrotexture ratio in accordance with ITM 812 equal to or greater than 1.8. A fine milling cutting drum shall have 5/16 in. or 3/8 in. spacing between the cutting teeth and be capable of producing a surface macrotexture ratio in accordance with ITM 812 equal to or greater than 5.0.

(b) Power Saw

Sawing equipment shall be capable of maintaining the specified alignment and depth of cut without damaging the pavement.

(c) Rotary Power Broom

A motorized, pneumatic tired unit with rotary bristle broom head.

(d) Straightedge

1. Straightedge – 16 ft

The straightedge shall be a walk behind, rigid beam device on two solid wheels on axles 16 ft apart with adjustable rods at the 1/4, 1/2, and 3/4 points. The adjustable rods shall be set to a 1/4 in clearance from the bottom of the rods to the bottom of the wheels when checked with a taut stringline running from wheel to wheel at each end of the straightedge. The straightedge shall be operated in the wheel path approximately 3 ft transversely from the edge line in the direction of traffic and parallel to the pavement centerline. The operator of the straightedge shall walk the equipment over the completed pavement surface while maintaining the alignment of the equipment in the presence of the Engineer.

2. Straightedge – 10 ft

A 10 ft straightedge is the same as a 16 ft straightedge except that the wheels are mounted 10 ft apart. A handheld rigid beam may be substituted.

306.04 Asphalt or PCCP Scarification Milling

Scarification milling shall consist of preparing a base for resurfacing by roughening the entire existing asphalt or PCCP surface. The milled pavement profile shall have a surface finish that does not vary longitudinally more than 1/4 in. from a 16 ft straightedge or as described in the QCP in accordance with 401.02.

A fine milling cutting drum in accordance with 306.03(a) shall be used when a single course overlay is specified with a lay rate as shown on the plans less than 165 lb/sq yd and the maximum scarification mill cut depth is expected to be less than 3/4 in. for asphalt or PCCP, otherwise, a coarse milling cutting drum in accordance with 306.03(a) shall be used.

The scarified milled surface shall have a macrotexture ratio in accordance with ITM 812 as follows:

- (a) equal to or greater than 5.0 when using a fine milling cutting drum for a single course overlay, or

(b) equal to or greater than 2.2 for a single course overlay, or

(c) equal to or greater than 1.8 for multiple course overlays.

Frequency of macrotexture testing shall be a minimum of once per day and shall be described in the QCP. The cross slope shall not vary more than 1/8 in. when measured with a 10 ft straightedge.

Milled traveled way areas left open to traffic for longer than five work days will be assessed \$1,600.00 per day per lane mile, or portion thereof, as liquidated damages, not as a penalty, but as damages sustained for each work day that the milled area remains open to traffic.

Milled non-traveled way areas such as auxiliary lanes and shoulders left open to traffic for longer than 10 work days will be assessed \$800.00 per day per lane mile, or portion thereof, as liquidated damages, not as a penalty, but as damages sustained for each work day that the milled area remains open to traffic.

306.05 Asphalt or PCCP Profile Milling to Correct Cross Slope

Profile milling shall consist of preparing a base for resurfacing by removing the existing asphalt or PCCP material to the specified cross slope as shown on the plans. The milled pavement profile shall have a surface finish that does not vary longitudinally more than 1/4 in. from a 16 ft straightedge or as described in the QCP in accordance with 401.02.

A fine milling cutting drum in accordance with 306.03(a) shall be used when a single course overlay is specified with a lay rate as shown on the plans less than 165 lb/sq yd and the maximum profile mill cut depth is expected to be less than or equal to 1 1/2 in. for asphalt or 3/4 in. for PCCP, otherwise, a coarse milling cutting drum in accordance with 306.03(a) shall be used.

The profile milled surface shall have a macrotexture ratio in accordance with ITM 812 as follows:

(a) equal to or greater than 5.0 when using a fine milling cutting drum for a single course overlay, or

(b) equal to or greater than 2.2 for a single course overlay, or

(c) equal to or greater than 1.8 for multiple course overlays.

Frequency of macrotexture testing shall be a minimum of once per day and shall be described in the QCP. The cross slope shall not vary more than 1/8 in. when measured with a 10 ft straightedge.

140 Milled traveled way areas left open to traffic for longer than five work days will be assessed \$1,600.00 per day per lane mile, or portion thereof, as liquidated damages, not as a penalty, but as damages sustained for each work day that the milled area remains open to traffic.

Milled non-traveled way areas such as auxiliary lanes and shoulders left open to traffic for longer than 10 work days will be assessed \$800.00 per day per lane mile, or portion thereof, as liquidated damages, not as a penalty, but as damages sustained for each work day that the milled area remains open to traffic.

306.06 Approach Milling

150 Approach milling shall consist of milling the surface and cutting a wedge at the driveways, commercial or public road approaches. The existing approach shall be milled a minimum depth of no less than 1/4 in. to accommodate the approach pavement. The approach milling shall be completed to provide a smooth transition from the traveled way pavement to the termini of the approach. The existing approach pavement shall be cut to provide a vertical face of 1 1/2 in. for the termini of surface.

Mailbox approaches to be resurfaced shall be milled to maintain the traveled way profile and cross slope.

160 Automatic control devices will not be required on surface milling equipment used for approach milling. Milling shall not damage any pavement that is to remain in place.

Approach milling shall not be performed at driveways unless it is required to meet a paved surface that continues beyond the construction limit. If the driveway is other than HMA or PCC beyond the construction limits, the approach milling is not required.

The transverse vertical cut face for commercial or public road approaches shall be transitioned at a rate of 24:1 or as directed.

170 306.07 Asphalt or PCCP Milling to a Specified Average Depth

Milling shall consist of preparing a base for resurfacing by removing the existing asphalt material or PCCP to the specified average depth as shown on the plans. The milled pavement shall have a surface finish that does not vary longitudinally more than 1/4 in. from a 16 ft straightedge or as described in the QCP in accordance with 401.02.

180 A fine milling cutting drum in accordance with 306.03(a) shall be used when a single course overlay is specified with a lay rate as shown on the plans less than 165 lb/sq yd and the average mill cut depth is less than or equal to 1 1/2 in. for asphalt or 3/4 in. for PCCP, otherwise, a coarse milling cutting drum in accordance with 306.03(a) shall be used.

The milled surface shall have a macrotexture ratio in accordance with ITM 812 as follows:

(a) equal to or greater than 5.0 when using a fine milling cutting drum for a single course overlay, or

(b) equal to or greater than 2.2 for a single course overlay, or

190 (c) equal to or greater than 1.8 for multiple course overlays.

Frequency of macrotexture testing shall be a minimum of once per day and shall be described in the QCP. The cross slope shall not vary more than 1/8 in. when measured with a 10 ft straightedge.

If shoulders or turn lanes are not milled and the overlay material is not placed in the milled areas within the same day, drainage slots shall be provided to eliminate ponding of water.

200 Milled traveled way areas left open to traffic for longer than five work days will be assessed \$1,600.00 per day per lane mile, or portion thereof, as liquidated damages, not as a penalty, but as damages sustained for each work day that the milled area remains open to traffic.

Milled non-traveled way areas such as auxiliary lanes and shoulders left open to traffic for longer than 10 work days will be assessed \$800.00 per day per lane mile, or portion thereof, as liquidated damages, not as a penalty, but as damages sustained for each work day that the milled area remains open to traffic.

210 The transverse vertical cut face shall be transitioned by HMA or prefabricated materials at a rate of 24:1 or as directed.

306.08 Asphalt Overlay Removal

Asphalt removal shall consist of complete removal of an asphalt overlay by milling from a portland cement concrete or brick base and the satisfactory disposal of the milled materials. Minor amounts of asphalt pavement material bonded to a concrete base at joints or cracks may remain in place. If this material becomes displaced during subsequent operations, it shall be removed. Minor amounts of asphalt pavement material bonded to a brick base may remain in place. Removal of minor areas of portland cement concrete or brick base during the milling operations is acceptable.

Milled areas shall be cleaned prior to reopening to traffic or before continuing construction operations.

The transverse vertical cut face shall be transitioned by HMA or prefabricated materials at a rate of 24:1 or as directed.

306.09 Transition Milling

230 Transition milling shall consist of cutting a wedge at the beginning and ending of

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Automatic control devices will not be required on surface milling equipment used for transitions cut off the traveled way. Cutting shall not damage any pavement that is to remain in place.

Approach milling, asphalt milling, asphalt removal, PCCP milling, scarification milling, profile milling, and transition milling will be measured by the square yard of the milled area.

Approach milling, asphalt milling, asphalt removal, PCCP milling, scarification milling, profile milling, and transition milling will be paid for at the contract unit price per square yard.

Payment will be made under:

The cost for castings removed and replaced at the Contractor's option in
270 accordance with 306.02 shall be included in the cost of the milling.

Any portion of the pavement that is damaged or removed outside the milling limits shall be replaced with no additional payment.

The cost of tapering of vertical faces and removal of milled material from the project site shall be included in the cost of milling.

The cost of cutting of the surface course shall be included in the milling.

- 280 Furnishing and operating the 16 ft straightedge shall be included in the cost of other pay items within this section.

SECTION 307 – CEMENT STABILIZED FULL DEPTH RECLAMATION, FDR

307.01 Description

This work shall consist of pulverizing and stabilizing an existing asphalt pavement along with existing base and subgrade materials to construct an RBC to the approved design properties in accordance with 105.03.

307.02 Just-in-Time Training

- 10 The Engineer and Contractor are required to attend a JITT course regarding FDR and both shall mutually agree on the course instructor, course content and training site. The training class shall be conducted at a project field location convenient for all project construction personnel responsible for FDR operations and inspection to attend.

The JITT course shall be held during normal working hours and be completed not more than 14 days prior to the start of FDR operations.

- 20 The Contractor shall provide a JITT instructor experienced in the construction methods, materials, and test methods associated with cement stabilized FDR. A copy of the course syllabus, handouts, and presentation materials shall be submitted to the Engineer at least five business days before the course is to be taught.

307.03 Quality Control

A QCP shall be submitted to the Engineer a minimum of five calendar days prior to the JITT.

The QCP shall include the following:

- 30 (a) the proposed FDR mix design,
- (b) a start to finish process description including discussion on corrective action measures,
- (c) a list of proposed equipment,
- (d) a list of proposed QC tests and testing frequencies,
- 40 (e) the curing methods applied to the cement stabilized RBC, and

- (f) the stabilization process applied to the RBC and subgrade after a failed proofroll.

All QC test results and responses to test results shall be maintained during the duration of the contract and made available to the Engineer upon request.

The following table provides the type and minimum frequency for tests.

QC TESTING	
Test	Frequency ^{1,2}
Depth of Pulverization	1 per 500 ft
Pulverized Material Gradation	1 per 0.5 day of production
In-place Moisture of Pulverized Material	1 per 0.5 day of production
Cement Application Rate	1 per 500 ft
Maximum Density and Moisture Content of Stabilized Material	1 per 0.5 day of production
Compacted In-Place Field Density ³	1 per 1,000 ft
Proofrolling	proofroll the entire RBC
1. The Contractor shall perform all QC tests within the first 500 ft after startup and after any change in the mix design. 2. Testing frequency is based upon linear feet of FDR laydown. 3. The density probe shall be no more than 2.0 in. above the bottom of the FDR treatment.	

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MATERIALS

307.04 Materials

RBC shall consist of a homogenous blend of RAP base, and subgrade materials that are combined with cement, water, and when required, recycling additives such as corrective aggregate. The cement may be dry powder or slurry with a minimum dry solids content of 60%. The actual materials used are dependent on the FDR mix design and project requirements.

Materials for use in RBC shall be in accordance with the following:

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Corrective aggregate to adjust gradation or supplement material volume:

- Coarse or Dense Graded Aggregate, Class C or Higher 904.03
- Fine Aggregate 904.02
- RAP shall be the product resulting from the cold milling or crushing of an existing asphalt pavement. The RAP coarse aggregate shall be processed so that 100% passes the 1 1/2 in. (37.5 mm) sieve.

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Portland Cement, Type I..... 901.01(b)
 Water 913.01

A Type D certification in accordance with 916 shall be provided for the RBC.

307.05 Mix Design

The FDR mix design shall be in accordance with ITM 595 and comprised of existing RAP, existing base and subgrade materials, cement, and if necessary, recycling additives.

Test	Procedure	Requirement
7-Day Unconfined Strength	ASTM D1633, Method A	350 psi minimum

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The mix design and all associated testing shall be performed using samples of the existing pavement, base, and subgrade material from the project site representing the reclaiming depth. Sampling, testing, and the mix design shall be performed by a design laboratory that is AASHTO re:source accredited for soil, aggregates, and concrete.

The sulfate content for the subgrade material shall be less than or equal to 1,000 ppm as determined in accordance with ITM 510.

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When significant in-place material changes occur, additional mix designs shall be performed to establish representative mixes for the entire job.

The Contractor shall obtain all samples required to develop the mix design. One sample per lane mile of planned RBC shall be the minimum sampling frequency for mix design preparation.

Mix designs shall be submitted for approval at least five calendar days prior to the JITT and shall include results of all tests performed.

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If new materials are added, a new mix design, including the updated test results, shall be submitted at least one day prior to implementation.

CONSTRUCTION REQUIREMENTS

307.06 Roadway Preparation

Snowplowable raised pavement markers shall be removed in accordance with 808.11(e) prior to FDR operations.

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Grass and other vegetation shall be removed from the edge of the existing pavement to prevent contamination of the RBC during milling operations.

Grade adjustments of existing structures shall be made in accordance with 720.04 except existing structures shall be lowered prior to FDR operations, properly covered and filled with material compatible with the FDR mix design to maintain traffic.

All areas of soft or yielding subgrade, as shown on the plans, shall be corrected prior to pulverization operations.

307.07 Equipment

120 The equipment shall be capable of pulverizing the existing asphalt pavement, base and subgrade materials. The equipment used for mixing the pulverized materials with cement, water, additives, and corrective aggregate, when required, shall be capable of producing a homogenous and uniformly blended RBC. The equipment used for placement of the RBC shall be capable of placement in accordance with 105.03.

The equipment shall consist of the following major components:

(a) Spreaders and Distributors

130 Spreaders or distributors used to apply dry powder additives shall be non-pressurized mechanical vane-feed, cyclone or screw type capable of providing a consistent, accurate and uniform distribution of material while minimizing dust during construction. Corrective aggregate, when required, may be placed by a mechanical spreader, a conventional paver, or by tailgating with end dump trucks and spread to a uniform thickness with a motor grader.

(b) Additive Slurry Storage and Supply Equipment

140 Slurry shall be produced using a batch or continuous-flow type stationary mixer equipped with calibrated metering and feeding devices that introduce the cement, water and additives into the mixer in the specified quantities. Additive slurry storage and supply equipment shall have agitators or similar equipment to keep the slurry in suspension when held in the slurry batch or storage tanks. Slurry shall be kept in suspension during transport using agitator equipment.

(c) Mixing and Reclaiming Equipment

150 Only self-propelled, high powered, minimum 500 hp rotary mixers or reclaimers capable of mixing in-place to the depth specified shall be used. The minimum cutting drum width shall be 7 ft and fitted with cutting teeth capable of trimming earth, aggregate, and HMA and be designed to allow the cutting teeth to be accurately adjusted vertically and held in-place. The machine shall have a minimum weight of 25,000 lb, and shall have the strength and rigidity to allow a center deflection of not more than 1/8 in.

160 The mixer or reclaimer shall be fitted with an integrated water injection system capable of introducing the water into the cutting drum during the mixing process. The metering device shall be capable of automatically adjusting the flow of material to compensate for any variation in the amount of reclaimed material introduced into the mixing chamber. The water shall be calculated on a volumetric basis tied to a speed gauge, ft/min, using a calibrated meter that is capable of accurately measuring the amount of material to within 0.5% of the rate required. Automatic digital readings shall be displayed for both the flow rate and total amount of reclaimed material in appropriate units of weight and time.

(d) Motor Grader

A motor grader for pre-shaping, aerating, spreading, and final shaping of the material shall be utilized. The motor grader shall have a cross slope indicator.

(e) Compaction Equipment

170 The RBC shall be compacted using self-propelled rollers. The number, weight, and types of rollers shall be as necessary to obtain the required compaction throughout the entire RBC thickness. The rollers may be used in any combination and may include a pneumatic tire roller, an 84 in. wide drum vibratory pad-foot roller equipped with a knockdown blade, or a 10 t minimum single or double drum vibratory steel roller.

(f) Water Trucks

A water truck shall be used for supplying water to the reclaimer or roadway for the addition of moisture during the reclaiming operation. The water truck shall be capable of providing a controlled and consistent spray without eroding or otherwise damaging the compacted RBC.

307.08 Weather Limitations

180 FDR operations shall be performed when the ambient temperature is 40°F or above. The FDR shall not be performed when the soil, aggregate, or subgrade is frozen or when freezing temperatures are anticipated within seven days of the end of RBC placement. The Engineer may restrict work when the heat index is greater than 100°F. The FDR shall not be performed before May 1 or after October 1.

307.09 Pulverization

190 The existing pavement shall be pulverized and stabilized in separate operations. Corrective aggregate, when required, shall be spread onto the existing surface in accordance with 307.07(a). The pre-determined full depth of asphalt pavement, base, and subgrade materials shall be pulverized, along with the corrective aggregate, to a homogenous mixture. The mixture may be brought to the desired moisture content during this process by means of surface application or through the mixing or reclaiming equipment's integrated fluid injection system for dust control. The base course shall not contain roots, sod, topsoil, weeds, wood, or any material deleterious to its reaction with the cement stabilizer.

For cement stabilized RBC, the pulverization shall produce a gradation that has 100% passing the 2 in. (50 mm) sieve and $\geq 55\%$ passing the No. 4 (4.75 mm) sieve.

200 When a paving fabric is encountered during the pulverization operation, the Contractor shall make the necessary changes in equipment or operations so that incorporation of shredded fabric into the RBC does not affect the performance parameters or inhibit placement or compaction of the RBC. The Contractor shall remove and properly dispose of oversized pieces of paving fabric. The Contractor shall make the necessary adjustments in equipment or operations so that the shredded fabric in the recycled material is no more than 5 sq in. No fabric piece shall have a dimension exceeding a length of 4 in.

210 Rubberized crack filler, durable pavement markings, loop wires, and other non-pavement materials shall be removed from the roadway during the pulverization process. Residual materials that cannot be completely removed may be incorporated into the mixture if the Contractor can demonstrate that those added materials will not adversely affect performance.

Any such materials retained in the mixture shall be appropriately sized and blended so as to not adversely affect the strength of the RBC.

307.10 Stabilization

220 The cement used to stabilize the RBC may be dry powder or slurry. The Contractor shall address the application methods and fugitive dust control procedures in the QCP when dry powder materials are used. The pulverized surface shall be scarified or knifed prior to applying materials in slurry form to prevent runoff or ponding. Any dry additives used shall be spread onto the pulverized surface using a mechanical spreader. The pulverized material shall be mixed with the stabilizer and additives, as required by the mix design, to create a homogeneous RBC.

The in-place moisture content of the material shall be within -1% to +2% of the design moisture content as determined by the mix design.

230 Cement stabilizing materials shall have an application tolerance determined by adding $\pm 0.5\%$ to the percent total cement content.

The cement shall be incorporated into the pulverized material at the initial rate shown in the approved mix design. Sampling and mix design may determine different levels of cement at various portions of the project.

The Contractor can request the cement percentage to exceed the upper tolerance provided the mix design requirements are satisfied at the requested percentage. The request will be subject to approval by the Engineer.

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307.11 Control Strip and Compaction

A minimum 500 ft long control strip shall be constructed on the first day of production to verify the construction process meets the requirements as specified. The control strip shall allow the Contractor to:

- (a) demonstrate that the equipment, materials and processes proposed can produce an RBC layer in accordance with specification requirements;
- 250 (b) determine the optimal rates for the cement, water, and any additives recommended for the reclaimed material;
- (c) determine the sequence and manner of rolling necessary to obtain strength requirements in one uniformly compacted layer.

The RBC density shall be achieved with the same equipment, materials, construction methods, and density requirements used on the accepted control strip. A new control strip shall be constructed if changes are made outside the tolerances of the original mix design, equipment, or construction methods.

260

The processed material shall be uniformly compacted in one layer to a minimum of 95% of the maximum density. Maximum density shall be determined in accordance with AASHTO T 180 at the required QC frequency from a representative sample collected after the cement has been added and mixed into the pulverized material but prior to compaction.

Compaction shall be monitored in accordance with AASHTO T 310 in the direct transmission mode and continue to reach a minimum of 95% of the established maximum density during the control strip and for the remainder of the compaction operation.

270

Compaction equipment shall be in accordance with 307.07(e). Initial compaction shall be within 500 ft of the reclaiming unit using either a vibratory pad-foot roller, a pneumatic tire roller or a combination of the two. The pass counts shall continue to increase until the cleat indentations from the pad-foot roller are no more than 3/16 in. in depth and light can be seen between the pad-foot and RBC interface or there are no wheel impressions from the pneumatic tire roller remaining in the RBC.

The cement stabilized material shall be bladed and shaped by a motor grader in accordance with 307.07(d) to remove any remaining roller marks or indentations then leveled in accordance with 301.07. The profile grade and cross-section of the RBC shall be finished within a tolerance of $\pm 1/2$ in. from the plan RBC elevation prior to profile milling.

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Intermediate and final compaction shall be applied to the bladed and shaped RBC using either a pneumatic tire roller, a single or double drum vibratory steel roller, or a combination of the two. Finish rolling shall not be performed in vibratory mode. The compaction operation shall be performed while the RBC remains in a workable condition and continued until roller marks no longer appear.

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Any type of rolling effort that causes cracking, displacement, or other type of pavement distress shall be discontinued until such time as the problem can be resolved as approved by the Engineer.

The QC technician shall be on site, observing all compaction efforts and approving areas as they reach minimum relative compaction. Care shall be taken to not over compact the mat.

All tests shall be conducted at the stated QC testing frequencies throughout FDR operations.

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307.12 Maintenance

The Contractor shall maintain the RBC until the surface course has been constructed.

Any damage to the completed recycled material shall be repaired by the Contractor prior to the placement of new HMA or final surface sealing. Patching shall be in accordance with 304. The excavated patch areas shall be filled and compacted with HMA or RBC material as directed by the Engineer. No payment will be made for damage or repair unless approved by the Engineer.

307.13 Curing

The planned method and duration of curing for cement stabilized RBC shall be in accordance with the QCP. The specified surface course shall be placed within two weeks of the RBC final cure, but no later than November 1.

Before placing the final surfacing, the cement stabilized RBC shall remain in-place for a minimum of three days.

Cement stabilized RBC shall be cured to minimize moisture loss from the surface for a time period that achieves the minimum required 7-day unconfined strength.

307.14 Proofrolling

The cement stabilized RBC shall be proofrolled in accordance with 203.26 using a tandem or tri-axle dump truck loaded to the legal limit. The Engineer will determine the corrective remediation limits for any area that has deflection or rutting greater than 1/2 in.

The Contractor shall rework the areas that fail in proofrolling by re-pulverizing and re-stabilizing the RBC in-place at no additional cost or by removing the RBC and stabilizing the subgrade with subgrade treatment Type IC in accordance with 207.

In locations of failing subgrade, the RBC shall be removed and subgrade treatment Type IC shall be placed in accordance with 207. HMA patching, Type B shall be placed in accordance with 304 in place of the RBC.

307.15 Milling

The entire surface of the cement stabilized RBC shall be scarified in accordance with 306.04 in preparation for the overlay. Liquidated damages will not apply. Construction engineering in accordance with 105.08(b) shall be provided.

307.16 Underdrain Installation

Underdrain installation in accordance with 718, when required, shall begin after proofrolling has been completed.

307.17 RBC Overlay

The overlay atop the RBC shall be as shown on the plans. The overlay shall be placed after proofrolling has been completed.

350 The RBC shall be swept of all loose material and standing water with a rotary power broom in accordance with 409 immediately prior to placing the surface. The RBC shall be swept lightly to avoid damage to the RBC.

A tack coat shall be required only for the HMA overlay and shall be applied to the RBC, in accordance with 406, immediately following sweeping operations.

Monuments shall be reestablished in accordance with 615.10.

307.18 Opening to Traffic

360 Opening to traffic shall occur after sufficient cure time in accordance with 307.13 has been applied to the RBC so traffic will not initiate raveling or permanent deformation. All loose particles that may develop on the pavement surface shall be removed by a rotary power broom in accordance with 409.

After opening to traffic, the surface of the RBC shall be maintained for the safe movement of traffic.

307.19 Method of Measurement

370 The RBC will be measured by the square yard, complete in place. Cement, used as stabilizing material, will be measured by the ton. Subgrade treatment will be measured in accordance with 207.05. Corrective aggregate to adjust the RBC gradation will be measured by the ton of material used. HMA patching, Type B will be measured in accordance with 304.06. Milling will be measured in accordance with 306.10. Re-established monuments will be measured in accordance with 615.13. Removal of snowplowable raised pavement markers will be measured in accordance with 808.12.

307.20 Basis of Payment

380 The RBC will be paid for as full depth reclamation at the contract unit price per square yard, complete in place. Cement, used as stabilizing material, will be paid for at the contract unit price per ton, complete in place. Subgrade treatment will be paid for in accordance with 207.06. Corrective aggregate used to adjust the RBC gradation will be paid for at the contract unit price per ton, complete in place. HMA patching, Type B will be paid for in accordance with 304.07, for the thickness shown on the plans. Milling will be paid for in accordance with 306.11. Re-established monuments will be paid for in accordance with 615.14. Removal of snowplowable raised pavement markers will be paid for in accordance with 808.13.

Payment will be made under:

390

Pay Item

Pay Unit Symbol

Corrective Aggregate, FDR.....	TON
Full Depth Reclamation.....	SYS
Stabilizing Material, Portland Cement	TON

The costs of the FDR mix design and QC testing shall be included in the cost of the full depth reclamation.

- 400 The costs associated with removal of grass and vegetation, rubberized crack filler, durable pavement markings, loop wires and other non-pavement materials shall be included in the cost of the full depth reclamation.

The costs associated with pulverizing, stabilizing, compacting, curing, and maintenance of the RBC shall be included in the cost of the full depth reclamation.

The cost associated with mixing water shall be included in the cost of the full depth reclamation.

- 410 The cost associated with aggregate, when used to supplement material volume, shall be included in the cost of the corrective aggregate pay item.

The cost associated with aggregate, when used to adjust the RBC gradation, shall be included in the cost of the corrective aggregate pay item.

In the locations of failing subgrade, removal of the RBC shall be included in the cost of subgrade treatment.

SECTION 308 – ASPHALT EMULSION STABILIZED FULL DEPTH RECLAMATION, FDR

308.01 Description

This work shall consist of pulverizing and stabilizing an existing asphalt pavement and base material, excluding subgrade, to construct an RBC to the approved design properties in accordance with 105.03.

308.02 Just-in-Time Training

- 10 The Engineer and Contractor are required to attend a JITT course regarding FDR and both shall mutually agree on the course instructor, course content, and training site.

The training class shall be conducted at a project field location convenient for all project construction personnel responsible for FDR operations and inspection to attend.

The JITT course shall be held during normal working hours and be completed not more than 14 days prior to the start of FDR operations.

20

The Contractor shall provide a JITT instructor experienced in the construction methods, materials and test methods associated with asphalt emulsion stabilized FDR.

A copy of the course syllabus, handouts and presentation materials shall be submitted to the Engineer at least five business days before the course is to be taught.

308.03 Quality Control

A quality control plan, QCP, shall be submitted to the Engineer a minimum of five calendar days prior to the JTT.

- 30 The QCP shall include the following:
- (a) the proposed FDR mix design,
 - (b) a start to finish process description including discussion on corrective action measures,
 - (c) a list of proposed equipment,
 - (d) a list of proposed QC tests and testing frequencies,
 - 40 (e) the curing methods applied to the asphalt emulsion stabilized RBC, and
 - (f) the stabilization process applied to the RBC and subgrade after a failed proofroll.

All QC test results and responses to test results shall be maintained during the duration of the contract and made available to the Engineer upon request.

- 50 The following table provides the type and minimum frequency for tests.

QC TESTING	
Test	Frequency ^{1,2}
Depth of Pulverization	1 per 500 ft
Pulverized Material Gradation	1 per 0.5 day of production
In-place Moisture of Pulverized Material	1 per 0.5 day of production
Asphalt Emulsion Content	1 per 500 ft
Maximum Density and Moisture Content of Injected Material	1 per 0.5 day of production
Compacted In-Place Field Density ³	1 per 1,000 ft
Field Moisture Content for Curing	1 per each day of production
Proofrolling	proofroll the entire RBC
1. The Contractor shall perform all QC tests within the first 500 ft after startup and after any change in the mix design. 2. Testing frequency is based upon linear feet of FDR laydown. 3. The density probe shall be no more than 2.0 in. above the bottom of the FDR treatment.	

MATERIALS

308.04 Materials

RBC shall consist of a homogenous blend of reclaimed asphalt pavement, RAP, and base materials that are combined with asphalt emulsion, water, and when required, recycling additives such as corrective aggregate or cement. Cement recycling additives used in asphalt emulsion stabilized RBC may be dry powder or slurry with a minimum
 60 dry solids content of 60%. The actual materials used are dependent on the FDR mix design and project requirements.

Materials for use in RBC shall be in accordance with the following:

	Asphalt Emulsion	902.01(b)3
	Corrective aggregate to adjust gradation or supplement material volume:	
	1. Coarse or Dense Graded Aggregate, Class C or Higher	904.03
70	2. Fine Aggregate	904.02
	3. RAP, shall be the product resulting from the cold milling or crushing of an existing asphalt pavement. The RAP coarse aggregate shall be processed so that 100% passes the 1 1/2 in. (37.5 mm) sieve.	
	Portland Cement, Type I.....	901.01(b)
	Water	913.01

80 A Type D certification in accordance with 916 shall be provided for the RBC.

308.05 Mix Design

The FDR mix design shall be in accordance with ITM 594 and comprised of existing RAP, existing base material, asphalt emulsion, and if necessary, recycling additives. The mix design and all associated testing shall be performed using samples of the existing pavement and base material from the project site representing the reclaiming depth. Sampling, testing, and the mix design shall be performed by a design laboratory that is AASHTO **re:source** accredited for soil, aggregates, HMA, and asphalt emulsion.

90 Additional mix designs shall be performed when the in-place material changes significantly in order to establish representative mixes for the entire job. The Contractor shall obtain all samples required to develop the mix design. One sample per lane mile of planned RBC shall be the minimum sampling frequency for mix design preparation.

Mix designs shall be submitted for approval at least five calendar days prior to the JITT and shall include **results of all tests** performed. If new materials are added, a new

mix design, including the updated test results, shall be submitted at least one day prior to implementation.

100

CONSTRUCTION REQUIREMENTS

308.06 Roadway Preparation

Snowplowable raised pavement markers shall be removed in accordance with 808.11(e) prior to FDR operations.

Grass and other vegetation shall be removed from the edge of the existing pavement to prevent contamination of the RBC during milling operation.

110 Grade adjustments of existing structures shall be made in accordance with 720.04 except existing structures shall be lowered prior to FDR operations, properly covered and filled with material compatible with the FDR mix design to maintain traffic.

All areas of soft or yielding subgrade, as shown on the plans or as directed, shall be corrected prior to pulverization operations.

308.07 Equipment

The equipment shall be capable of pulverizing the existing asphalt pavement and base materials. The equipment used for mixing the pulverized materials with asphalt emulsion, water, additives, and corrective aggregate, when required, shall be capable of producing a homogenous and uniformly blended RBC. The equipment used for placement of the RBC shall be capable of placement in accordance with 105.03.

120

Spreaders or distributors used to apply dry powder additives, additive slurry storage and supply equipment, motor grader, compaction equipment, and water tracks shall be in accordance with 307.07.

130

Mixing and reclaiming equipment shall be in accordance with 307.07(c), except that the mixer or reclaimer shall be fitted with an integrated water and asphalt emulsion injection system capable of introducing both materials into the cutting drum during the mixing process. The metering device shall be capable of automatically adjusting the flow of material to compensate for any variation in the amount of reclaimed material introduced into the mixing chamber.

The water or asphalt emulsion shall be calculated on a volumetric basis tied to a speed gauge, ft/min, using a calibrated meter that is capable of accurately measuring the amount of material to within 0.5% of the rate required. Automatic digital readings shall be displayed for both the flow rate and total amount of reclaimed material in appropriate units of weight and time.

140

308.08 Weather Limitations

FDR operations shall be performed when the ambient temperature is 50°F or above. The FDR shall not be performed when the soil, aggregate, or subgrade is frozen

or when freezing temperatures are anticipated within seven days of the end of RBC placement. The Engineer may restrict work when the heat index is greater than 100°F. The FDR shall not be performed before May 1 or after October 1.

308.09 Pulverization

The existing pavement shall be pulverized and stabilized in separate operations.
 150 Corrective aggregate, when required, shall be spread onto the existing surface in accordance with 307.07(a). The pre-determined full depth of asphalt pavement and base materials shall be pulverized, along with the corrective aggregate, to a homogenous mixture. The mixture may be brought to the desired moisture content during this process by means of surface application or through the mixing or reclaiming equipment's integrated fluid injection system for dust control. The base course shall not contain subgrade, roots, sod, topsoil, weeds, wood or any material deleterious to its reaction with the asphalt emulsion.

For asphalt emulsion stabilized RBC, the pulverization shall produce a gradation
 160 that has 100% passing the 2 in. (50 mm) sieve and $\geq 35\%$ passing the No.4 (4.75 mm) sieve.

When paving fabric is encountered during the pulverization operation, the Contractor shall make the necessary changes in equipment or operations so that incorporation of shredded fabric into the RBC does not affect the performance parameters or inhibit placement or compaction of the RBC. The Contractor shall be required to remove and properly dispose of oversized pieces of paving fabric. The Contractor shall make the necessary adjustments in equipment or operations so that the shredded fabric in the recycled material is no more than 5 sq in. No fabric piece
 170 shall have a dimension exceeding a length of 4 in.

Rubberized crack filler, durable pavement markings, loop wires, and other non-pavement materials shall be removed from the roadway during the pulverization process. Residual materials that cannot be completely removed may be incorporated into the mixture if the Contractor can demonstrate that those added materials will not adversely affect performance.

Any such materials retained in the mixture shall be appropriately sized and blended so as to not adversely affect the strength of the RBC.
 180

308.10 Injection

An additive used in asphalt emulsion stabilized RBC may be dry powder or slurry and the Contractor shall address the application methods and fugitive dust control procedures in the QCP when dry powder materials are used. The pulverized surface shall be scarified or knifed prior to applying materials in slurry form to prevent runoff or ponding. Any dry additives used shall be spread onto the pulverized surface using a mechanical spreader. The pulverized material shall be mixed with the stabilizer and additives as required by the mix design to create a homogeneous RBC.

- 190 The in-place moisture content of the material shall be within -1% to +2% of the design moisture content as determined by the mix design.

Asphalt stabilizing materials shall have an application tolerance determined by adding $\pm 0.25\%$ to the percent total asphalt emulsion content.

The asphalt emulsion shall be incorporated into the pulverized material at the initial rate shown in the approved mix design. Sampling and mix design may determine different levels of asphalt emulsion at various portions of the project.

- 200 The Contractor can request the asphalt emulsion percentage to exceed the upper tolerance provided the mix design requirements are satisfied at the requested percentage. The request will be subject to approval by the Engineer.

308.11 Control Strip and Compaction

A minimum 500 ft long control strip shall be constructed on the first day of production to verify the construction process meets the requirements as specified. The control strip shall allow the Contractor to:

- 210
- (a) demonstrate the equipment, materials and processes proposed can produce an RBC layer in accordance with specification requirements;
 - (b) determine the optimal rates for the asphalt emulsion, water and any additives recommended for the reclaimed material;
 - (c) determine the sequence and manner of rolling necessary to obtain specified density requirements in one uniformly compacted layer.

- 220 The RBC density shall be achieved with the same equipment, materials, construction methods and density requirements used on the accepted control strip. A new control strip shall be constructed if changes are made outside the tolerances of the original mix design, equipment or construction methods.

The processed material shall be uniformly compacted in one layer to a minimum of 95% of the maximum density. Maximum density shall be determined in accordance with AASHTO T 180 at the required QC frequency from a representative sample collected after injection but prior to compaction.

- 230 Compaction shall be monitored in accordance with AASHTO T 310 in the direct transmission mode and continue to reach a minimum of 95% of the established maximum density during the control strip and for the remainder of the compaction operation.

Compaction equipment shall be in accordance with 307.07(e). Initial compaction shall be within 500 ft of the reclaiming unit using either a vibratory pad-foot roller, a

pneumatic tire roller or a combination of the two. The pass counts shall continue to increase until the cleat indentations from the pad-foot roller are no more than 3/16 in. in depth and light can be seen between the pad-foot and RBC interface or there are no wheel impressions from the pneumatic tire roller remaining in the RBC.

240

The asphalt emulsion stabilized material shall be bladed and shaped by a motor grader in accordance with 307.07(d) to remove any remaining roller marks or indentations then leveled in accordance with 301.07. The profile grade and cross-section of the RBC shall be finished within a tolerance of $\pm 1/2$ in. from the plan RBC elevation prior to profile milling.

250

Intermediate and final compaction shall be applied to the bladed and shaped RBC using either a pneumatic tire roller, a single or double drum vibratory steel roller, or a combination of the two. Finish rolling shall not be performed in vibratory mode. The compaction operation shall be performed while the RBC remains in a workable condition and continued until roller marks no longer appear.

Any type of rolling effort that causes cracking, displacement or other type of pavement distress shall be discontinued until such time as the problem can be resolved and approved by the Engineer.

The QC technician shall be on site, observing all compaction efforts and approving areas as they reach minimum relative compaction. Care shall be taken to not over compact the mat.

260

All tests shall be conducted at the stated QC testing frequencies throughout FDR operations.

308.12 Maintenance

The Contractor shall maintain the RBC until the surface course has been constructed.

270

Any damage to the completed recycled material shall be repaired by the Contractor prior to the placement of new asphalt concrete or final surface sealing. Patching shall be in accordance with 304. The excavated patch areas shall be filled and compacted with HMA or RBC material as directed by the Engineer. No payment will be made for damage or repair unless approved by the Engineer.

308.13 Curing

Before placing the final surfacing, the asphalt emulsion stabilized RBC shall remain in-place for a minimum of three days and meet one of the following conditions:

280

- (a) there is less than 3.0% moisture remaining in the mixture, or
- (b) the in-place moisture contents have remained constant at 50% or less of the design optimum moisture content for a continuous time period of five days.

The planned method and duration of curing for asphalt emulsion stabilized RBC shall be in accordance with the QCP. The specified surface course shall be placed within two weeks of the RBC final cure, but no later than November 1.

308.14 Proofrolling

290 The asphalt emulsion stabilized RBC shall be proofrolled in accordance with 203.26 using a tandem or tri-axle dump truck loaded to the legal limit. The Engineer will determine the corrective remediation limits for any area that has deflection or rutting greater than 1/2 in.

The Contractor shall rework the areas **that fail** proofrolling by re-pulverizing and re-stabilizing the RBC in-place at no additional cost or by removing the RBC and stabilizing the subgrade with subgrade treatment Type IC in accordance with 207.

The reworked areas shall be proofrolled for final acceptance.

300 In locations of failing subgrade, the RBC shall be removed and subgrade treatment Type IC shall be placed in accordance with 207. HMA patching, Type B shall be placed in accordance with 304 in place of the RBC.

308.15 Milling

The entire surface of the asphalt emulsion stabilized RBC shall be scarified in accordance with 306.04 in preparation for the overlay. Liquidated damages will not apply. Construction engineering in accordance with 105.08(b) shall be provided.

308.16 Underdrain Installation

310 Underdrain installation in accordance with 718, when required, shall begin after proofrolling **has been completed**.

308.17 RBC Overlay

The overlay atop the RBC shall be as shown on the plans. The overlay shall be placed after proofrolling **has been completed**.

The RBC shall be swept of all loose material and standing water with a rotary power broom in accordance with 409 immediately prior to placing the surface. The RBC shall be swept lightly to avoid damage to the RBC.

320

A tack coat shall be required only for the HMA overlay and shall be applied to the RBC in accordance with 406 immediately following sweeping operations.

Monuments shall be reestablished in accordance with 615.10.

308.18 Opening to Traffic

Opening to traffic shall occur after sufficient cure time **in accordance with 308.13** has been applied to the RBC so traffic will not initiate raveling or permanent

330 deformation. All loose particles that may develop on the pavement surface shall be removed by a rotary power broom in accordance with 409.

After opening to traffic, the surface of the RBC shall be maintained for the safe movement of traffic.

308.19 Method of Measurement

The RBC will be measured by the square yard, complete in place. Asphalt emulsion will be measured by the ton. Subgrade treatment will be measured in accordance with 207.05.

340 Corrective aggregate used to adjust the RBC gradation will be measured by the ton of material used. HMA patching, Type B will be measured in accordance with 304.06.

Milling will be measured in accordance with 306.10. Re-established monuments will be measured in accordance with 615.13. Removal of snowplowable raised pavement markers will be measured in accordance with 808.12.

Portland cement will be measured by the ton.

350 308.20 Basis of Payment

The RBC will be paid for as full depth reclamation at the contract unit price per square yard, complete in place. Asphalt emulsion will be paid for at the contract unit price per ton, complete in place. Subgrade treatment will be paid for in accordance with 207.06.

Corrective aggregate used to adjust the RBC gradation will be paid for at the contract unit price per ton, complete in place. HMA patching, Type B will be paid for in accordance with 304.07, for the thickness shown on the plans.

360 Milling will be paid for in accordance with 306.11. Re-established monuments will be paid for in accordance with 615.14. Removal of snowplowable raised pavement markers will be paid for in accordance with 808.13.

Portland cement will be paid for in accordance with 104.03. The change order will include direct material costs, delivery costs, and shall not include any other markups.

Payment will be made under:

	Pay Item	Pay Unit Symbol
370	Corrective Aggregate, FDR.....	TON
	Full Depth Reclamation.....	SYS
	Stabilizing Material, Asphalt Emulsion.....	TON
	Stabilizing Material, Portland Cement	TON

The costs of the RBC mix design and QC testing shall be included in the cost of the full depth reclamation.

380 The costs associated with removal of grass and vegetation, rubberized crack filler, durable pavement markings, loop wires and other non-pavement materials shall be included in the cost of the full depth reclamation.

The costs associated with pulverizing, stabilizing, compacting, curing, and maintenance of the RBC shall be included in the cost of the full depth reclamation.

The cost associated with mixing water shall be included in the cost of the full depth reclamation.

390 The cost associated with aggregate, when used to supplement material volume, shall be included in the cost of the corrective aggregate pay item.

When portland cement is a required stabilizing material, costs associated with mixing, installation, compaction, curing, and maintenance shall be included in the cost of the full depth reclamation.

The cost associated with aggregate, when used to adjust the RBC gradation, shall be included in the cost of the corrective aggregate pay item.

400 In the locations of failing subgrade, removal of the RBC shall be included in the cost of the subgrade treatment.

DIVISION 400 – ASPHALT PAVEMENTS

SECTION 401 – QC/QA HMA PAVEMENT

401.01 Description

This work shall consist of one or more courses of QC/QA HMA base, intermediate, or surface mixtures constructed on prepared foundations in accordance with 105.03.

401.02 Quality Control

The HMA shall be produced from a certified HMA plant in accordance with ITM 583, Certified Hot Mix Asphalt Producer Program.

The HMA shall be transported and placed according to a QCP prepared and submitted by the Contractor in accordance with ITM 803, Contractor Quality Control Plans for Hot Mix Asphalt Pavements. The QCP shall be submitted to the Engineer at least 15 days prior to commencing HMA paving operations.

When a safety edge is required for a project, the QCP shall identify the devices in accordance with 409.03(c) to be used for constructing the safety edge.

20

MATERIALS

401.03 Materials

Materials shall be in accordance with the following:

Asphalt Materials

PG Binder 902.01(a)

Coarse Aggregates..... 904.03

Base Mixtures – Class D or Higher

Intermediate Mixtures – Class C or Higher

Surface Mixtures* – Class B or Higher

Fine Aggregates..... 904.02

Stabilizing Additives AASHTO M 325

* Surface aggregate requirements are listed in 904.03(d).

30

401.04 Design Mix Formula

A DMF shall be prepared in accordance with 401.05 and submitted in a format acceptable to the Engineer one week prior to use. The DMF shall be based on the ESAL category identified in the pay item and shall state the mixture designation and maximum particle size in the mixture. No mixture shall be used until the DMF has been assigned a mixture number by the DTE.

40

The DMF shall state the binder content, the ΔP_b as determined in accordance with ITM 591, and the MAF. The DMF shall state the source, type, and dosage rate of any stabilizing additives.

The ESAL category identified in the pay item correlates to the following ESAL ranges.

ESAL Category	ESAL
2*	< 3,000,000
3	3,000,000 to < 10,000,000
4*	\geq 10,000,000
* A category 2 mixture shall replace a category 1 mixture and a category 4 mixture shall replace a category 5 mixture.	

50

The plant discharge temperature for any mixture shall not be more than 315°F whenever PG 64-22 or PG 70-22 binders are used or not more than 325°F whenever PG 76-22 binder is used. QC/QA HMA may be produced using a water-injection foaming device. The DMF shall list the minimum and maximum plant discharge temperatures as applicable to the mixture.

401.05 Volumetric Mix Design

60 The DMF shall be determined for each mixture from a volumetric mix design by a design laboratory selected from the Department's list of Qualified Mix Design Laboratories. A volumetric mixture shall be designed in accordance with AASHTO R 35 and the respective AASHTO reference as listed below.

All loose mixtures shall be conditioned for 4 h in accordance with AASHTO R 30 prior to testing. Steel furnace slag coarse aggregate, when used in an intermediate or base mixture application, shall have a deleterious content less than 4.0% as determined in accordance with ITM 219.

70 Bulk Specific Gravity and Density of
Compacted Asphalt Mixtures using
Automatic Vacuum Sealing.....AASHTO T 331

The single percentage of aggregate passing each required sieve shall be within the limits of the following gradation tables:

Sieve Size	Dense Graded, Mixture Designation – Control Point (Percent Passing)				
	25.0 mm	19.0 mm	12.5 mm	9.5 mm	4.75 mm**
2 in. (50.0 mm)					
1 1/2 in. (37.5 mm)	100.0				
1 in. (25.0 mm)	90.0 - 100.0	100.0			
3/4 in. (19.0 mm)	< 90.0	90.0 - 100.0	100.0		
1/2 in. (12.5 mm)		< 90.0	90.0 - 100.0	100.0	100.0
3/8 in. (9.5 mm)			< 90.0	90.0 - 100.0	95.0 - 100.0
No. 4 (4.75 mm)				< 90.0	90.0 - 100.0
No. 8 (2.36 mm)	19.0 - 45.0	23.0 - 49.0	28.0 - 58.0	32.0 - 67.0*	
No. 16 (1.18 mm)					30.0 - 55.0
No. 30 (600 µm)					
No. 50 (300 µm)					
No. 200 (75 µm)	1.0 - 7.0	2.0 - 8.0	2.0 - 10.0	2.0 - 10.0	3.0 - 8.0
<p>* The mix design gradation shall be less than or equal to 58.0% passing the No. 8 (2.36 mm) sieve for all 9.5 mm surface mixtures. The mix design gradation can be greater than 58.0% passing the No. 8 (2.36 mm) sieve when used on non-Department maintained facilities.</p> <p>** The total blended aggregate gradation for the 4.75 mm mixture shall have a fineness modulus greater than or equal to 3.30 as determined in accordance with AASHTO T 27.</p>					

Primary Control Sieve, PCS, Control Point for Mixture Designation (Percent Passing)					
Mixture Designation	25.0 mm	19.0 mm	12.5 mm	9.5 mm	4.75 mm
PCS	4.75 mm	4.75 mm	2.36 mm	2.36 mm	n/a
PCS Control Point	40	47	39	47	n/a

Sieve Size	Open Graded, Mixture Designation – Control Point (Percent Passing)		
	OG9.5 mm	OG19.0 mm	OG25.0 mm
1 1/2 in. (37.5 mm)			100.0
1 in. (25.0 mm)		100.0	70.0 – 98.0
3/4 in. (19.0 mm)		70.0 – 98.0	50.0 – 85.0
1/2 in. (12.5 mm)	100.0	40.0 – 68.0	28.0 – 62.0
3/8 in. (9.5 mm)	75.0 – 100.0	20.0 – 52.0	15.0 – 50.0
No. 4 (4.75 mm)	10.0 – 35.0	10.0 – 30.0	6.0 – 30.0
No. 8 (2.36 mm)	0.0 – 20.0	7.0 – 23.0	7.0 – 23.0
No. 16 (1.18 mm)		2.0 – 18.0	2.0 – 18.0
No. 30 (600 µm)		1.0 – 13.0	1.0 – 13.0
No. 50 (300 µm)		0.0 – 10.0	0.0 – 10.0
No. 100 (150 µm)		0.0 – 9.0	0.0 – 9.0
No. 200 (75 µm)	0 – 6.0	0.0 – 8.0	0.0 – 8.0
% Binder	> 3.0	> 3.0	> 3.0

80

Dust/Calculated Effective Binder Ratio shall be 0.6 to 1.4. The Dust/Calculated Effective Binder Ratio for 4.75 mm mixtures shall be 1.0 to 2.0.

The optimum binder content shall produce a $\Delta P_b \leq 0.20$ as determined in accordance with ITM 591 and the following air voids at N_{des} :

AIR VOIDS AT OPTIMUM BINDER CONTENT								
	Dense Graded					Open Graded		
Mixture Designation	25.0 mm	19.0 mm	12.5 mm	9.5 mm	4.75 mm	25.0 mm	19.0 mm	9.5 mm
Air Voids	5.0%	5.0%	5.0%	5.0%	5.0%	15.0% - 20.0%	12.0%	17.0%

90 The design for dense graded mixtures shall have at least four points, including a minimum of two points above and one point below the optimum. A one point design may be used for open graded mixtures. The **MSG** shall be mass determined in water in accordance with AASHTO T 209. The **BSG** of the gyratory specimens shall be determined in accordance with AASHTO T 166, Method A or AASHTO T 331, if required, for dense graded and open graded mixtures.

100 The percent draindown of open graded mixtures shall not exceed 0.30% in accordance with AASHTO T 305. Open graded mixtures may incorporate recycled materials and fibers. The recycled materials shall be in accordance with 401.06. The fiber type and minimum dosage rate shall be in accordance with AASHTO M 325. The binder for open graded mixtures may have the upper temperature classification

reduced by 6°C from the specified binder grade if fibers are incorporated into the mixture or if 3.0% reclaimed asphalt shingles by weight of the total mixture is used.

110 The percent draindown of dense graded mixtures shall not exceed 0.30% in accordance with AASHTO T 305. Dense graded mixture shall be tested for moisture susceptibility in accordance with AASHTO T 283, except that the loose mixture curing shall be replaced by mixture conditioning for 4 h in accordance with AASHTO R 30. The minimum TSR shall be 80%. The 6 in. mixture specimens shall be compacted in accordance with AASHTO T 312. If anti-stripping additives are added to the mixture to be in accordance with the minimum TSR requirements, the dosage rate shall be submitted with the DMF.

A PG binder grade or source change will not require a new mix design. If the upper temperature classification of the PG binder is lower than the original PG grade, a new TSR value is required.

The MAF equals the Gmm from the mixture design divided by the following:

- 120 (a) 2.465 for 9.5 mm mixtures
- (b) 2.500 for 12.5 mm, 19.0 mm, and 25.0 mm mixtures.

If the MAF calculation results in a value where $0.980 \leq \text{MAF} \leq 1.020$, then the MAF shall be considered to be 1.000. If the MAF is greater than 1.020, the calculated MAF value shall have 0.020 subtracted from the value. If the MAF is less than 0.980, the calculated MAF value shall have 0.020 added to the value. The MAF does not apply to OG mixtures.

130 Changes in the source or types of aggregates shall require a new DMF.

The mixture design compaction temperature for the specimens shall be $300 \pm 9^\circ\text{F}$ for dense graded mixtures and 260°F for open graded mixtures.

Design criteria for each mixture shall be based on the ESAL shown in the contract documents and shall be as follows:

GYRATORY COMPACTION EFFORT					
ESAL	N _{ini} *	N _{des} *	N _{max} *	Max. %Gmm @ N _{ini}	Max. %Gmm @ N _{max}
Dense Graded 4.75 mm					
< 3,000,000	7	75	115	90.5	98.0
3,000,000 to < 10,000,000	8	100	160	89.0	98.0
≥ 10,000,000	8	100	160	89.0	98.0
Dense Graded 9.5 mm, 12.5 mm, 19.0 mm, and 25.0 mm					
< 3,000,000	5	30	40	91.5	97.0
3,000,000 to < 10,000,000	6	50	75	91.5	97.0
≥ 10,000,000	6	50	75	91.5	97.0
Open Graded					
All ESAL	n/a	20	n/a	n/a	n/a
* N _{ini} , N _{des} , N _{max} - definitions are included in AASHTO R 35.					

Voids in Mineral Aggregate, VMA, Criteria @ N _{des}	
Mixture Designation	Minimum VMA, %
4.75 mm	17.0
9.5 mm	16.0
12.5 mm	15.0
19.0 mm	14.0
25.0 mm	13.0
OG	n/a

140

Volume of Effective Binder, Vbe, Criteria @ N _{des}	
Mixture Designation	Minimum Vbe, %
4.75 mm	12.0
9.5 mm	11.0
12.5 mm	10.0
19.0 mm	9.0
25.0 mm	8.0
OG	n/a

Voids Filled with Asphalt, VFA, Criteria @ N _{des}	
ESAL	VFA, %
< 3,000,000	60 – 73
3,000,000 to < 10,000,000	60 – 70
≥ 10,000,000	60 – 70
Notes:	
1. For 4.75 mm mixtures, the specified VFA range shall be 67% to 79%.	
2. For 9.5 mm mixtures, the specified VFA range shall be 69% to 72% for design traffic levels ≥ 3,000,000 ESALs.	
3. For 25.0 mm mixtures, the specified lower limit of the VFA shall be 62% for design traffic levels < 300,000 ESALs.	
4. For OG mixtures, VFA is not applicable.	

401.06 Recycled Materials

Recycled materials may consist of RAP or RAS or a blend of both. RAP shall be the product resulting from the cold milling or crushing of an existing HMA pavement. Before entering the plant, RAP shall be processed so that 100% will pass the 2 in. (50 mm) sieve. Before entering the plant, RAS shall be processed so that 100% will pass the 3/8 in. (9.5 mm) sieve. The RAP coarse aggregate shall pass the maximum size sieve for the mixture being produced.

RAP for the ESAL category 3 and 4 surface mixtures shall be a fine RAP with 100% passing the 3/8 in. (9.5 mm) sieve and 95 to 100% passing the No. 4 (4.75 mm) sieve. The Contractor may request the use of coarse RAP in a category 4 surface mixture up to a maximum 20.0% by volume of material retained on the No. 4 (4.75 mm) sieve. The election to use coarse RAP in a category 4 surface mixture will void the allowed use of crushed stone and gravel coarse aggregate materials in accordance with 904.03(d). SMA RAP as defined in 410.06 shall not be used in any HMA mixture.

Recycled materials may be used as a substitute for a portion of the new materials required to produce HMA mixtures. The amount of total binder replaced by binder in the recycled material shall be computed as follows:

$$\text{Binder Replacement, \%} = \frac{(A \times B) + (C \times D)}{E}$$

where:

- A = RAP, % Binder Content by Mass of RAP
- B = RAP, % by Total Mass of Mixture
- C = RAS, % Binder Content by Mass of RAS
- D = RAS, % by Total Mass of Mixture
- E = Total, % Binder Content by Total Mass of Mixture.

RAS may be obtained from either pre-consumer or post-consumer asphalt shingles. The two RAS types shall not be blended together for use in HMA mixtures.

Post-consumer asphalt shingles shall be in accordance with the following:

- 180 (a) post-consumer asphalt shingles shall be essentially nail-free;
- (b) extraneous metallic materials retained on or above the No. 4 (4.75 mm) sieve shall not exceed 0.5% by mass;
- (c) extraneous non-metallic materials such as glass, rubber, soil, brick, paper, wood, and plastic retained on or above the No. 4 (4.75 mm) sieve shall not exceed 1.5% by mass, and
- 190 (d) post-consumer shingles shall be prepared by a processing company with an IDEM Legitimate Use Approval letter. The approval letter shall be submitted with the DMF to the Engineer.

The recycled material percentages shall be as specified on the DMF. HMA mixtures utilizing recycled materials shall be limited to the binder replacement percentages in the following table:

HMA mixtures utilizing RAP or RAS or a blend of RAP and RAS										
MAXIMUM BINDER REPLACEMENT, %										
Mixture Category	Base and Intermediate							Surface		
	Dense Graded				Open Graded			Dense Graded		
	25.0 mm	19.0 mm	12.5 mm	9.5 mm	25.0 mm	19.0 mm	9.5 mm	12.5 mm	9.5 mm	4.75 mm
2	25.0*				25.0*			25.0*		
3	25.0*				25.0*			25.0*		
4	25.0*				25.0*			25.0*		
* The contribution of RAS to any HMA mixture shall be ≤ 3.0% by total mass of mixture and ≤ 15.0% binder replacement.										

- 200 The combined aggregate properties shall be in accordance with 904. The combined aggregate bulk specific gravity shall be determined in accordance with ITM 584 and the combined aggregate gradation shall be in accordance with 401.05 for the HMA mixture specified.

401.07 Lots and Sublots

Lots will be defined as 5,000 t of base or intermediate mixtures or 3,000 t of surface mixture. Lots will be further sub-divided into sublots not to exceed 1,000 t of base or intermediate mixtures or 600 t of surface mixture. Partial sublots of 100 t or less will be added to the previous subplot. Partial sublots greater than 100 t constitute a full subplot. Partial lots of four sublots or less will be added to the previous lot to create an extended lot.

401.08 Blank

401.09 Acceptance of Mixtures

Acceptance of mixtures for V_{be} at N_{des} , and air voids at N_{des} for each lot will be based on tests performed by the Engineer for dense graded 9.5 mm, 12.5 mm, 19.0 mm and 25.0 mm mixtures with original contract pay item quantities greater than or equal to 300 t.

- 220 Acceptance of mixtures for binder content and air voids at N_{des} will be based on a Type D certification in accordance with 402.09 for dense graded mixtures with original contract pay item quantities less than 300 t. Acceptance of mixtures for binder content and air voids at N_{des} for each lot will be based on a Type D certification in accordance with 402.09 for dense graded 4.75 mm mixtures.

- 230 Acceptance of mixtures for binder content and air voids at N_{des} for each lot will be based on tests performed by the Engineer for open graded mixtures with original contract pay item quantities greater than or equal to 300 t. Acceptance of mixtures for binder content and air voids at N_{des} will be based on a Type D certification in accordance with 402.09 for open graded mixtures with original pay item quantities less than 300 t, except the air voids tolerance shall be $\pm 3.5\%$ from the DMF.

The Engineer will randomly select the location within each subplot for sampling in accordance with ITM 802. The first 300 t of the first subplot of the first lot for each mixture pay item will not be sampled. An acceptance sample will consist of plate samples obtained in accordance with ITM 802 and ITM 580. The Engineer will take immediate possession of the samples.

- 240 Acceptance samples will be reduced to the appropriate size for testing in accordance with ITM 587. The binder content and gradation will be determined in accordance with ITM 571. The maximum specific gravity will be mass determined in water in accordance with AASHTO T 209.

The effective specific gravity, G_{se} , of the mixture will be determined in each subplot and reported from the acceptance sample testing.

The total aggregate bulk specific gravity, G_{sb} , value will be determined in accordance with ITM 597.

- 250 The air voids will be determined in accordance with AASHTO R 35 based on the average bulk specific gravity from two gyratory specimens and the MSG for the subplot. The VMA will be determined in accordance with AASHTO R 35 based on the average bulk specific gravity from two gyratory specimens, the percent aggregate in the mixture from the subplot, and the BSG of the aggregate blend from the DMF as applicable. The gyratory specimens will be prepared in accordance with AASHTO T 312.

260 The dust/calculated effective binder ratio and the volume of effective binder in the mixture will be determined and reported from the acceptance sample testing conducted in each subplot. The volume of effective binder will be the difference between VMA and air voids. The Contractor shall take action in accordance with ITM 583 to address a dust/calculated effective binder ratio not in accordance with 401.05, a volume of effective binder in the mixture below design minimums, or a volume of effective binder in the mixture greater than 2.0% above design minimums.

270 The bulk specific gravity of gyratory specimens for dense graded mixtures will be determined in accordance with AASHTO T 166, Method A or AASHTO T 331, if required, except samples are not required to be dried overnight. The bulk specific gravity of gyratory specimens for open graded mixtures will be determined in accordance with AASHTO T 331.

A binder draindown test in accordance with AASHTO T 305 for open graded mixtures shall be completed once per lot in accordance with 401.07 and shall not exceed 0.50%.

The Contractor shall make available the subplot quality control results within seven calendar days from the date the acceptance sample was taken.

280 The Engineer will make available the subplot acceptance test results after receiving the subplot quality control results from the Contractor.

Air voids, binder content and Vbe values will be reported to the nearest 0.01%. Draindown test results will be rounded to the nearest 0.01%. Rounding will be in accordance with 109.01(a).

Pay factors for dense graded mixtures with original contract pay item quantities greater than or equal to one lot will be determined in accordance with 401.19(a). Partial lots of four sublots or less will have pay factors determined in accordance with 401.19(b) if the previous lot is not available.

290 Pay factors for dense graded mixtures with original contract pay item quantities greater than or equal to 300 t and less than one lot and open graded mixtures will be determined in accordance with 401.19(b).

The Contractor may request an appeal of the Engineer's test results in accordance with 401.20.

300 A Type C certification in accordance with 916 shall be provided for the stabilizing additives for each shipment. Stabilizing additives from different manufacturers and different types of stabilizing additives shall not be intermixed.

In the event that an acceptance sample is not available to represent a subplot, all test results of the previous subplot will be used for acceptance. If the previous subplot is not available, the subsequent subplot will be used for acceptance.

Samples shall not be obtained from the following areas:

- (a) Mixture placed on an approach, taper, gore area, crossover that is not placed simultaneously with the mainline.
- 310 (b) Mixture placed on a shoulder less than 8 ft in width that is not placed simultaneously with the mainline.
- (c) Within 25 ft of a transverse construction joint.
- (d) Areas placed with paving equipment in accordance with 409.03(c)2 or 409.03(c)3.

320 If a random location falls within this area, the Engineer will randomly select another location within the subplot for sampling. If an entire subplot falls within this area, test results from the previous subplot will be used for acceptance. If the previous subplot is not available, the subsequent subplot will be used for acceptance. If previous or subsequent subplot results for a mixture accepted by 401.19(a) will be replicated for an entire lot, each subplot in that lot will be accepted by 401.19(b).

CONSTRUCTION REQUIREMENTS

401.10 General

330 Equipment for HMA operations shall be in accordance with 409. The Contractor shall submit to the Engineer written documentation that includes the manufacturer's make, model, serial number, manufactured year, and the manufacturer's literature with pictures. The documentation shall be submitted prior to use and shall certify that the paving equipment proposed for the project is new and includes the modifications or has been modified in accordance with the following.

340 The paver shall be equipped with means of preventing the segregation of the coarse aggregate particles when moving the mixture from the paver hopper to the paver augers. The means and methods used shall be in accordance with the paver manufacturer's instructions and may consist of chain curtains, deflector plates, or other such devices, or any combination of these.

The following specific requirements shall also apply to identified HMA pavers:

1. Blaw-Knox HMA pavers shall be equipped with the Blaw-Knox Materials Management Kit, MMK.
2. Cedarapids HMA pavers shall be those that were manufactured in 1989 or later.

- 350 3. Barber-Green/Caterpillar HMA pavers shall be equipped with deflector plates as identified in the December 2000 Service Magazine entitled “New Asphalt Deflector Kit {6630-DFL, 6631-DFL, or 6640-DFL}”.

The Contractor shall demonstrate to the Engineer, prior to use, that the modifications to the paving equipment have been implemented on all pavers to be used on the project.

360 Fuel oil, kerosene, or solvents shall not be transported in open containers on equipment. Cleaning of equipment and small tools shall not be performed on the pavement or shoulder areas.

HMA mixtures shall not exhibit segregation, flushing, or bleeding. Corrective action shall immediately be taken to prevent continuation of these conditions. Segregated, flushed, or bleeding HMA mixtures will be referred to the Department’s Division of Materials and Tests for adjudication as a failed material in accordance with 105.03.

370 All mixtures that become loose and broken, mixed with dirt, or are defective in any way shall be removed and replaced in accordance with 105.03.

401.11 Preparation of Surfaces to be Overlaid

The subgrade, or subbase shall be shaped to the required grade and sections, free from all ruts, corrugations, or other irregularities, and uniformly compacted and approved in accordance with 207 and 302. Milling of an existing pavement surface shall be in accordance with 306. Surfaces on which a mixture is placed shall be free from objectionable or foreign materials at the time of placement.

380 Rubblized concrete pavements shall be primed in accordance with 405. PCCP, milled asphalt surfaces, and new and existing asphalt surfaces shall be tacked in accordance with 406. Contact surfaces of curbing, gutters, manholes, and other structures shall be tacked in accordance with 406.

All partially completed sections of roadway that are 8 in. or less in thickness shall be proofrolled prior to the placement of additional materials unless otherwise directed by the Engineer. Proofrolling shall be accomplished in accordance with 203.26. The contact pressure shall be 70 to 80 psi. Soft yielding areas shall be removed and replaced.

401.12 Process Control

390 The Engineer and Contractor will jointly review the operations to ensure compliance with the QCP. Continuous violations of compliance with the QCP will result in suspension of paving operations.

401.13 Weather Limitations

HMA courses of less than 138 lb/sq yd shall be placed when the ambient temperature and the temperature of the surface on which it is to be placed is 45°F or above. No mixture shall be placed on a frozen subgrade.

401.14 Spreading and Finishing

400 The mixture shall be placed upon an approved surface by means of laydown equipment in accordance with 409.03(c). Prior to paving, both the planned quantity and lay rate shall be adjusted by multiplying by the MAF. When mixture is produced from more than one DMF for a given pay item, the MAF will be applied to the applicable portion of the mixture for each. The temperature of each mixture at the time of spreading shall be less than 315°F whenever PG 64-22 or PG 70-22 binders are used or not more than 325°F whenever PG 76-22 binder is used. No mixture shall be placed on a previously paved course that has not cooled to below 175°F. For mixtures compacted in accordance with 402.15, the temperature of each mixture at the time of spreading shall not be less than 245°F.

410 Planned HMA courses greater than 220 lb/sq yd placed under traffic, shall be brought up even with each adjacent lane at the end of each work day. Planned HMA courses less than or equal to 220 lb/sq yd shall be brought forward concurrently, within practical limits, limiting the work in one lane to not more than one work day of production before moving back to bring forward the adjacent lane. Traffic shall not be allowed on open graded mixtures.

420 Hydraulic extensions on the paver will not be allowed for continuous paving operations. Fixed extensions or extendable screeds shall be used on courses greater than the nominal width of the paver except in areas where the paving width varies. Hydraulic extensions may be used in tapers and added lanes less than 250 ft in length.

Automatic slope and grade controls shall be used as outlined in the QCP.

HMA mainline and HMA shoulders which are 8 ft or more in width shall be placed with paving equipment in accordance with 409.03(c)1.

430 When laying mixtures with density not controlled by cores, the speed of the paver shall not exceed 50 ft per minute. Rollers shall be operated to avoid shoving of the HMA and at speeds not to exceed 3 mph. However, vibratory rollers will be limited to 2.5 mph.

The finished thickness of any course shall be at least two times but not more than five times the maximum particle size as shown on the DMF, except 4.75 mm mixtures shall be at least 1.5 times but not more than 3 times the maximum particle size shown on the DMF.

A safety edge shall be constructed at locations where a dense graded intermediate mixture or a surface mixture is constructed adjacent to an aggregate or earth shoulder.

440

Vibratory rollers in accordance with 409.03(d)4 shall not be operated in the vibratory mode at locations indicated on the plans. Oscillatory rollers in accordance with 409.03(d)5 will be allowed for use but the vertical impact force capability shall not be used. Density acceptance shall be in accordance with 401.16.

401.15 Joints

Longitudinal joints in the surface shall be at the lane lines of the pavement. Longitudinal joints below the surface shall be offset from previously constructed joints by approximately 6 in. and be located within 12 in. of the lane line.

450

Hot poured joint adhesive in accordance with 906 shall be applied to longitudinal joints constructed between two adjacent HMA courses in the top course of dense graded intermediate mixtures and all 4.75 mm, 9.5 mm, and 12.5 mm surface mixture courses. This includes joints within the traveled way as well as between any of the following:

- (a) traveled way and an auxiliary lane,
- (b) traveled way and a paved shoulder, and
- (c) auxiliary lane and a paved shoulder.

460

The material shall be heated in a jacketed, double boiler melting kettle. The kettle shall have an attached pressure feed wand system with applicator shoe.

The joint adhesive shall be applied to the face of the previously constructed edge at the joint using a wand applicator. Prior to application of the joint adhesive, the joint face shall be dry and free of loose material and foreign objects. The adhesive shall be applied on the joint face 1/8 in. thick at the temperature recommended by the manufacturer. Excess joint adhesive shall not be allowed to pool on the top of the previously constructed pavement course or the pavement to be overlaid. The application of the adhesive shall be made within the same day, but at least 30 minutes prior to construction of the longitudinal joint.

470

All 9.5 mm and 12.5 mm surface mixture longitudinal joints that have the joint adhesive applied shall be sealed using SS-1h, RPE, or AE-NT asphalt emulsion in accordance with 902.01(b). The sealing operation shall not begin until all density cores in accordance with 401.16 and 401.20 have been obtained and the installation of pavement corrugations, when specified in accordance with 606, has been completed.

480

The liquid asphalt sealant shall be a minimum width of 24 in., centered on the joint line, and shall be extended, when necessary, to provide coverage beyond the edge of the pavement corrugation. The sealant shall be applied onto a dry surface, free of any foreign or loose material, using a distributor in accordance with 409.03(a). The sealant temperature at the time of application shall be at least 135°F and shall not exceed 180°F. The ambient air and pavement temperatures at the time of application shall be greater than 32°F.

The application rate of the sealant shall be as follows:

Asphalt Emulsion	Application Rate* (gal./sq yd)
SS-1h or AE-NT	0.03 ±0.01**
RPE	0.15 ±0.01***
<p>* The asphalt material shall not be diluted.</p> <p>** Areas receiving greater than 0.04 gal./sq yd shall be lightly broomed to reduce the effects of excess sealant on the pavement surface.</p> <p>*** The application rate shall be reduced when sealing milled corrugations in accordance with 606. The application rate shall be 0.11 ±0.01 gal./sq yd.</p>	

490

Temporary pavement markings in accordance with 801.12 shall be offset a sufficient distance from the longitudinal joint so as not to obstruct the installation of the pavement corrugations or the application of the liquid asphalt sealant.

The SS-1h or AE-NT sealant shall be cured a minimum of five days prior to applying the permanent pavement traffic markings in accordance with 808. The RPE sealant shall be cured a minimum of 48 h prior to applying the permanent pavement traffic markings in accordance with 808. Where pavement markings are to be grooved in accordance with 808.07(b)1, the minimum cure for the sealant shall not apply.

500

Transverse joints shall be constructed by exposing a near vertical full depth face of the previous course. For areas inaccessible to rollers, other mechanical devices shall be used to achieve the required density.

If constructed under traffic, temporary transverse joints shall be feathered to provide a smooth transition to the driving surface.

401.16 Density

Acceptance will be based on lots and sublots in accordance with 401.07.

510

Density of the compacted dense graded mixture will be determined from cores except where:

- (a) the total planned lay rate to be placed over a shoulder existing prior to the contract award is less than 385 lb/sq yd, or
- (b) the first lift of material placed at less than 385 lb/sq yd over a shoulder existing prior to the contract award.

520

Density of any random core location in these areas will be assigned a value of 94.0% MSG and compaction shall be in accordance with 402.15.

Open graded mixtures shall be compacted with six passes of a static tandem roller and will be assigned a value of 84.0% MSG. Vibratory rollers shall not be used on open graded mixtures.

Compaction of 4.75 mm mixtures shall be in accordance with 402.15, except vibratory rollers shall be operated in static mode and the vertical impact force capability of oscillatory rollers shall not be used.

530

Compaction of mixtures with original contract pay item quantities less than 300 t shall be in accordance with 402.15.

Density acceptance by cores will be based on samples obtained from two random locations selected by the Engineer within each subplot in accordance with ITM 802. One core shall be cut at each random location in accordance with ITM 580. The transverse core location will be located so that the edge of the core will be no closer than 3 in. from a confined edge or 6 in. from a non-confined edge of the course being placed. The maximum specific gravity will be determined from the samples obtained in 401.09.

540

The Contractor shall obtain cores in the presence of the Engineer with a device that shall produce a uniform 6.00 ± 0.25 in. diameter pavement sample. Coring shall be completed prior to the random location being covered by the next course.

All core locations will be marked and shall be cored within two work days of placement. A damaged core shall be discarded and replaced with a core from a location selected by adding 1 ft to the longitudinal location of the damaged core using the same transverse offset.

550

The Contractor and the Engineer shall mark the core to define the course to be tested. If the core indicates a course thickness of less than two times the maximum particle size, the core will be discarded and a core from a new random location will be selected for testing.

Cores shall not be obtained from the following areas:

560

- (a) Mixture placed on an approach, taper, gore area, crossover that is not placed simultaneously with the mainline.
- (b) Mixture placed on a shoulder less than 8 ft in width that is not placed simultaneously with the mainline.
- (c) Within 25 ft of a transverse construction joint.
- (d) Within 25 ft of an acceptance sample taken in accordance with 401.09.

- 570 (e) Areas placed with paving equipment in accordance with 409.03(c)2
or 409.03(c)3.

If a random location falls within this area, the Engineer will randomly select another location within the subplot for coring. If an entire subplot falls within this area, test results from the previous subplot will be used for acceptance. If the previous subplot is not available, the subsequent subplot will be used for acceptance.

580 The Engineer will take immediate possession of the cores. If the Engineer's cores are subsequently damaged, additional coring will be the responsibility of the Department. Subsequent core locations will be determined by subtracting 1 ft from the random location using the same transverse offset.

The density for the mixture will be expressed as:

$$\text{Density, \%} = \frac{\text{BSG}}{\text{MSG}} \times 100$$

where:

BSG = average bulk specific gravity
MSG = maximum specific gravity

590 Samples for the bulk specific gravity and maximum specific gravity will be dried in accordance with ITM 572. The Engineer will determine the bulk specific gravity of the cores in accordance with AASHTO T 166, Method A or AASHTO T 331, if required. The maximum specific gravity will be mass determined in water in accordance with AASHTO T 209.

600 Within one work day of coring operations, the Contractor shall clean, dry, and refill the core holes with either HMA of similar or smaller size particles or bridge deck repair material from the QPL of Rapid Setting Patch Materials. The rapid setting patch material shall be mixed in a separate container and placed in the hole in accordance with the manufacturer's recommendations, consolidated by rodding, and struck-off flush with the adjacent pavement.

The Engineer's acceptance test results for each subplot will be available when the subplot testing is complete. Acceptance of the pavement for density, %MSG, will be reported to the nearest 0.01%. Rounding will be in accordance with 109.01(a).

401.17 Pavement Corrugations

Pavement corrugations shall be in accordance with 606.

401.18 Pavement Smoothness

610 Pavement smoothness will be accepted by means of an inertial profiler, a 16 ft straightedge, or a 10 ft straightedge as described below.

(a) Inertial Profiler with Smoothness Pay Adjustments

When a pay item for Inertial Profiler, HMA is included in the contract, the

Contractor shall furnish, calibrate, and operate an approved inertial profiler in accordance with ITM 917 for the acceptance of longitudinal smoothness on the mainline traveled way, including adjacent acceleration or deceleration lanes, where all of the following conditions are met:

1. The posted speed is greater than 45 mph.
2. The traveled way width and slope are constant and is at least 0.5 mi in length.
3. The HMA is placed on a milled surface and the planned lay rate for a single lift is 165 lb/sq yd or greater, or the total combined planned lay rate of surface, intermediate, and base courses is 385 lb/sq yd or greater.

The profiles and International Roughness Index, IRI, results including areas of localized roughness shall become the property of the Department. The inertial profiler shall remain the property of the Contractor.

The project area will be divided into individual smoothness sections measuring 0.1 mi in length for each lane. The paving exceptions and areas exempt from inertial profiler operation will be in accordance with ITM 917.

If the posted speed limit for an entire smoothness section is less than or equal to 45 mph, the section will be exempt from Inertial Profiler operation and the smoothness within the section will be accepted in accordance with 401.18(b).

If the posted speed limit is greater than 45 mph for a portion of a smoothness section and is less than or equal to 45 mph for the remainder, the section smoothness acceptance will be as follows:

1. By inertial profiler for the portion of the section with a posted speed limit greater than 45 mph.
2. In accordance with 401.18(b) for the portion of the section with a posted speed limit less than or equal to 45 mph.

At locations where the inertial profiler is required, it shall be used on the surface course and on any dense graded intermediate course immediately below the surface course.

(b) 16 ft Straightedge

The Contractor shall furnish and operate a 16 ft straightedge in accordance with 306.03(d) and as described below. The 16 ft straightedge shall be used to measure smoothness along the direction of mainline traffic.

Locations on the pavement surface scraped by the straightedge shall be marked. The pavement shall be corrected in accordance with 401.18(e) to meet the required tolerance. For existing utility and manhole castings that required no grade adjustment, the tolerance may be adjusted after being reviewed and approved by the Engineer.

For contracts which include the Inertial Profiler, HMA pay item, the 16 ft straightedge or the Inertial Profiler simulating the 16 ft straightedge shall be used to measure longitudinal smoothness on surface courses at the following locations:

- 670 1. All mainline traveled way lanes shorter than 0.5 mi.
2. All mainline traveled way lanes at locations exempted from inertial profiler operation in accordance with ITM 917.
3. All mainline traveled way lanes within smoothness sections with posted speed limits less than or equal to 45 mph throughout the entire section length.
- 680 4. All tapers.
5. All ramps.
6. All turn lanes, including bi-directional left turn lanes shorter than 0.5 mi.
7. All acceleration and deceleration lanes associated with ramps with posted speeds of 45 mph or less.
8. All shoulders.
- 690 9. All intersections with significant change in cross slope.

For contracts where the inertial profiler is not used for smoothness acceptance, the 16 ft straightedge shall be used to measure longitudinal smoothness on all surface courses, and on any dense graded intermediate course immediately below the surface course. Measurement with the 16 ft straightedge shall include the above locations, all mainline traveled way lanes and ramps with posted speeds greater than 45 mph, and on ramp acceleration or deceleration lanes.

700 **(c) 10 ft Straightedge**

The 10 ft straightedge will be in accordance with 306.03(d). The 10 ft straightedge will be used to check transverse slopes, across travel lanes and shoulders, approaches, and crossovers. When the 10 ft straightedge is used, the pavement variations shall be corrected to 1/8 in. or less.

(d) Areas of Localized Roughness, ALR

At locations where the inertial profiler is being used on an intermediate course,

all areas having a localized roughness in excess of 160 in./mi utilizing continuous IRI with a 25 ft window shall be corrected subject to approval by the Engineer.

710

At locations where the inertial profiler is being used on a surface course, all areas under category Type A, as defined in 401.19(c), having a localized roughness in excess of 160 in./mi or category Type B in excess of 170 in./mi utilizing continuous IRI with a 25 ft window shall be corrected subject to approval by the Engineer. After ALR's have been identified, a grinding simulation shall be performed to estimate whether the ALR can be corrected to an IRI value of less than 160 in./mi with no more than a 1/4 in. max grind depth at any spot. If such correction is not possible, then an ALR with an IRI value of less than 190 in./mi can remain uncorrected if approved by the Engineer, and an ALR with an IRI value greater than 190 in./mi shall require full depth removal and replacement of the surface course of sufficient area to meet specifications.

720

In addition, if there is only one ALR in any two lane mile section, then no smoothness correction will be required if the ALR does not exceed 190 in./mi and the overall smoothness in accordance with 401.18(d) of the two lane mile section does not require any corrective action. A two lane mile section will start one mile before the ALR and end one mile after the ALR in order that all two lane mile sections will have, at most, one ALR each.

(e) Smoothness Section Correction

730

The width of the corrected area may be partial or full lane width, depending on the respective wheel path profiles. Underlying courses that are exposed by corrective action shall be milled to a depth of 1 1/2 in. and replaced with surface course. After the corrective action is taken on a surface course, the inertial profiler shall be operated throughout the entire affected smoothness section to verify the adequacy of the corrective action.

At locations where the 16 ft straightedge is used, the pavement variations shall be corrected to 1/4 in. or less.

740

If grinding of an intermediate course is used for pavement smoothness corrections, the grinding shall not precede the surface placement by more than 30 calendar days if open to traffic.

401.19 Pay Factors

(a) Dense Graded Mixture \geq One Lot

Pay factors, PF, are calculated for the air voids at N_{des} , V_{be} at N_{des} and in-place density, %Gmm. The Percent Within Limits, PWL, for each lot will be determined in accordance with ITM 588.

750

The appropriate pay factor for each property is calculated as follows:

Estimated PWL greater than 90:

$$PF = ((0.50 \times PWL) + 55.00)/100$$

Estimated PWL greater than 70 and equal to or less than 90:

$$PF = ((0.40 \times PWL) + 64.00)/100$$

760

Estimated PWL greater than or equal to 50 and equal to or less than 70:

$$PF = ((0.85 \times PWL) + 32.5)/100$$

If the Lot PWL for any one of the properties is less than 50, a subplot has an air void content less than 1.0% or greater than 8.0%, or a subplot has a volume of effective binder greater than 3.0% above design minimums, the lot will be referred to the Department's Division of Materials and Tests for adjudication as a failed material in accordance with normal Department practice as listed in 105.03.

770

Air voids, Vbe, and in-place density, %Gmm, PF values will be reported to the nearest 0.01. Rounding will be in accordance with 109.01(a).

A composite pay factor for each lot based on test results for mixture properties and density is determined by a weighted formula as follows:

$$\text{Lot PF} = 0.30(PF_{\text{VOIDS}}) + 0.35(PF_{\text{Vbe}}) + 0.35(PF_{\text{DENSITY}})$$

where:

Lot PF = Lot Composite Pay Factor for Mixture and Density

PF_{VOIDS} = Lot Pay Factor for Air Voids at N_{des}

PF_{Vbe} = Lot Pay Factor for Vbe at N_{des}

PF_{DENSITY} = Lot Pay Factor for In-Place Density, % Gmm

780

The lot quality assurance adjustment for mixture properties and density is calculated as follows:

$$q = L \times U \times (\text{Lot PF} - 1.00)/MAF$$

where:

q = quality assurance adjustment for mixture properties and density of the lot

L = Lot quantity

U = Unit price for the material, \$/ton

Lot PF = Lot Pay Factor

Lot test results for the air voids at N_{des} , Vbe at N_{des} , and density will be used to determine the Lot Pay Factors.

790

The specification limits for the air voids at N_{des} , V_{be} at N_{des} , and density will be as follows:

SPECIFICATION LIMITS		
Mixture		
	LSL*	USL**
Air Voids at N_{des} , %	3.60	6.40
Volume of Effective Binder at N_{des} , %	Spec	Spec +2.50
Density		
	LSL*	USL**
Roadway Core Density (%Gmm), %	93.00	n/a
* LSL, Lower Specification Limit		
** USL, Upper Specification Limit		

(b) Dense Graded Mixture < One Lot and Open Graded Mixture

A composite pay factor for each subplot based on test results for mixture properties and density is determined in a weighted formula as follows:

800 Dense Graded Mixture:

$$SCPF = 0.30(PF_{VOIDS}) + 0.35(PF_{V_{be}}) + 0.35(PF_{DENSITY})$$

Open Graded Mixture:

$$SCPF = 0.20(PF_{BINDER}) + 0.35(PF_{VOIDS}) + 0.45$$

where:

SCPF = Sublot Composite Pay Factor for Mixture and Density

PF_{BINDER} = Sublot Pay Factor for Binder Content

PF_{VOIDS} = Sublot Pay Factor for Air Voids at N_{des}

$PF_{V_{be}}$ = Sublot Pay Factor for V_{be} at N_{des}

$PF_{DENSITY}$ = Sublot Pay Factor for Density

810

If the SCPF for an open graded subplot is less than 0.85 or the volume of effective binder is greater than 3.0% above design minimums, the subplot will be referred to the Division of Materials and Tests for adjudication as a failed material in accordance with 105.03.

The subplot quality assurance adjustment for mixture properties and density is calculated as follows:

$$q = L \times U \times (SCPF - 1.00)/MAF$$

820 where:

q = quality assurance adjustment for the subplot
 L = subplot quantity
 U = unit price for the material \$/ton
 SCPF = subplot composite pay factor

Sublot test results for mixture properties will be assigned pay factors in accordance with the following:

BINDER CONTENT	
Open Graded Deviation from DMF ($\pm\%$)	Pay Factor
≤ 0.2	1.05
0.3	1.04
0.4	1.02
0.5	1.00
0.6	0.90
0.7	0.80
0.8	0.60
0.9	0.30
1.0	0.00
>1.0	Submitted to the Division of Materials and Tests*
* Test results will be considered and adjudicated as a failed material in accordance with normal Department practice as listed in 105.03.	

VOLUME OF EFFECTIVE BINDER, Vbe	
Dense Graded Deviation from Spec Minimum	Pay Factors
$> +3.0$	Submitted to the Division of Materials and Tests*
$\geq +2.5$ and $\leq +3.0$	1.00 - 0.05 for each 0.1% above +2.5%
$\geq +2.0$ and $< +2.5$	1.05 - 0.01 for each 0.1% above +2.0%
$> +0.5$ and $< +2.0$	1.05
≥ 0.0 and $\leq +0.5$	1.05 - 0.01 for each 0.1% below +0.5%
≥ -0.5 and < 0.0	1.00 - 0.02 for each 0.1% below 0.0%
≥ -2.0 and < -0.5	0.90 - 0.06 for each 0.1% below -0.5%
< -2.0	Submitted to the Division of Materials and Tests*
* Test results will be considered and adjudicated as a failed material in accordance with normal Department practice as listed in 105.03.	

AIR VOIDS		
Dense Graded	Open Graded	Pay Factor
Deviation from Spec ($\pm\%$)	Deviation** ($\pm\%$)	
≤ 0.5	≤ 3.0	1.05
> 0.5 and ≤ 1.7	> 3.0 and ≤ 4.0	1.00
	4.1	0.98
1.8	4.2	0.96
	4.3	0.94
	4.4	0.92
1.9	4.5	0.90
2.0	4.6	0.84
	4.7	0.78
	4.8	0.72
	4.9	0.66
	5.0	0.60
> 2.0	> 5.0	Submitted to the Division of Materials and Tests*
* Test results will be considered and adjudicated as a failed material in accordance with normal Department practice as listed in 105.03. ** Deviation shall be from 17.5% for OG25.0 mm and OG19.0 mm mixtures and shall be from 14.5% for OG9.5 mm mixtures.		

830

For mixtures produced during a plant's adjustment period, pay factors based on the DMF with the above tolerances will be used to compute quality assurance adjustments.

Sublot test results for density will be assigned pay factors in accordance with the following:

DENSITY	
Percentages are based on %MSG	Pay Factors, %
Dense Graded	
≥ 98.0	Submitted to the Division of Materials and Tests*
97.0 - 97.9	1.00
96.6 - 96.9	1.05 - 0.01 for each 0.1% above 96.5
95.0 - 96.5	1.05
94.1 - 94.9	1.00 + 0.005 for each 0.1% above 94.0
93.0 - 94.0	1.00
92.0 - 92.9	1.00 - 0.005 for each 0.1% below 93.0
91.0 - 91.9	0.95 - 0.010 for each 0.1% below 92.0
90.0 - 90.9	0.85 - 0.030 for each 0.1% below 91.0
≤ 89.9	Submitted to the Division of Materials and Tests*
* Test results will be considered and adjudicated as a failed material in accordance with normal Department practice as listed in 105.03.	

The pay factors will be rounded to the nearest 0.01.

840

(c) Smoothness

Smoothness pay adjustments will only be applied when the smoothness is measured by an inertial profiler in accordance with 401.18(a).

The Mean Roughness Index, MRI, will be determined utilizing a fixed interval for each lane for each 0.1 mile section of paving. The MRI for a 0.1 mile section will be the average of the IRI of the two wheel paths. Categorized segments shall be as follows:

850

1. Type A. Pavement on a non-interstate with more than a single opportunity to achieve a smooth ride or asphalt pavement on an interstate with a single opportunity or more. The following operations, if performed on the contract, will be considered opportunities.

- a. A layer of HMA base, intermediate, and surface; each layer is an opportunity. Wedge and level will not be considered an opportunity.

860

- b. Profile milling to correct cross slope is considered an opportunity prior to placing base, intermediate, or surface HMA.

2. Type B. Pavement that is not included in the description above under Type A.

At locations where an inertial profiler is used to accept smoothness, a quality assurance adjustment will be determined for each lane. This adjustment will be applied to all QC/QA HMA pay items within the pavement section. The adjustment will be calculated using the following formula:

870

$$q_s = (PF_s - 1.00) \sum_{i=1}^n \left(A \times \frac{S}{T} \times U \right)$$

where:

q_s = quality assurance adjustment for smoothness for one section
 PF_s = pay factor for smoothness
 n = number of layers
 A = area of the section, sq yd
 S = planned spread rate for material, lb/sq yd
 T = conversion factor: 2,000 lb/ton
 U = unit price for the material, \$/ton.

The quality assurance adjustment for smoothness, Q_s , for the contract will be the total of the quality assurance adjustments for smoothness, q_s , on each section by the following formula:

$$Q_s = \sum q_s$$

880

When smoothness is measured by an inertial profiler, payment adjustments will be made for any 0.1 mile section based on initial MRI generated on the surface course only and in accordance with the following table. Smoothness correction, if required, shall be in accordance with 401.18(e). The MRI pay factors for smoothness will be determined prior to any required smoothness correction.

PAY FACTORS FOR SMOOTHNESS	
Posted Speed greater than 45 mph	
MRI, in./mi.	Pay Factor, PF
over 0 to 35	1.06
over 35 to 40	1.05
over 40 to 45	1.04
over 45 to 50	1.03
over 50 to 55	1.02
over 55 to 60	1.01
over 60 to 70	1.00
over 70 to 75	0.99
over 75 to 80	0.98
over 80 to 85	0.96
over 85 to 90	0.95
over 90	For Type A, PFs will be 0.95 and the section shall be corrected to 70 or less.
over 90 to 110	For Type B, PFs will be 0.95 and the section does not require correction.
over 110	For Type B, PFs will be 0.95 and the section shall be corrected to 90 or less.

401.20 Appeals

890

(a) Dense Graded Mixtures and Open Graded Mixtures

If the QC test results do not agree with the acceptance test results in a subplot, a request, along with a comparison of the QC and acceptance test results, may be made in writing for additional testing of that subplot. The appeal sample will be analyzed in

a lab different than the lab that analyzed the original sample at the discretion of the Engineer.

The Contractor may appeal an individual subplot for the binder content, the MSG, the BSG of the gyratory specimens, or the BSG of the density cores when the QC results are greater than one standard deviation from the acceptance test results as follows: 0.25 for binder content, 0.010 for the MSG and BSG of the gyratory specimens, and 0.020 for the BSG of the density cores.

Upon request from the Contractor, the BSG of the density core may be exempted from the individual subplot appeal if both the QC and QA results show a %MSG for the density greater than or equal to 93.0%.

A \$500.00 credit adjustment will be included in a quality adjustment pay item in accordance with 109.05.1(d) for each appealed subplot that did not result in an improvement to the SCPF or Lot PF.

A written request for an appeal shall be submitted within seven calendar days of receipt of the Department's written results for the lot accepted under 401.19(a) or the subplot accepted under 401.19(b). The conditions for an extended lot appeal are as follows:

(1) one appeal will be allowed for the entire extended lot if the Contractor informs the Department of the anticipated extended lot condition within seven calendar days of receipt of the lot results, or

(2) one appeal will be allowed only for the extended sublots if the Contractor did not inform the Department of the anticipated extended lot condition within seven calendar days of receipt of the lot results.

The backup sample will be tested in accordance with the applicable test method for the subplot requested for all tests exceeding the subplot standard deviation criteria.

1. MSG

The backup MSG will be dried in accordance with ITM 572 and mass determined in water in accordance with AASHTO T 209.

2. BSG of the Gyratory Specimen

New gyratory specimens will be prepared and tested in accordance with AASHTO T 312 from the backup sample.

3. Binder Content

The backup binder content sample will be prepared and tested in accordance with ITM 571.

4. BSG of the Density Core

Additional cores shall be taken within seven calendar days unless otherwise directed. Additional core locations will be determined by adding 1 ft longitudinally of the cores tested using the same transverse offset. The appeal density cores will be dried in accordance with ITM 572 and tested in accordance with AASHTO T 166, Method A or AASHTO T 331, if required.

The appeal results will replace all previous test result for acceptance of mixture in accordance with 401.09 and density in accordance with 401.16. The results will be
950 furnished to the Contractor.

(b) Smoothness

The Department will perform annual Quality Assurance reviews of a portion of each Contractor's MRI results in accordance with ITM 917. The Contractor's results will be compared to the Department's. The Department will notify the Contractor of unacceptable results in a timely manner. The Department will allow an appeal period of 14 days during which time the Contractor shall submit a written request and appeal results for Department review. If the Contractor's appeal results do not agree with the Department's results, the Contractor shall be required to perform a side-by-side
960 evaluation. The Department's results will be utilized for smoothness payment in place of the Contractor's results unless the Contractor's appeal results are determined to be acceptable for payment. Sections where corrective action has taken place prior to the Department's data collection will utilize the Contractor's initial results prior to corrective action for payment.

401.21 Method of Measurement

HMA mixtures will be measured by the ton of the type specified, in accordance with 109.01(b). The measured quantity will be divided by the MAF to determine the pay quantity.
970

Milled shoulder corrugations will be measured in accordance with 606.02.

Joint adhesive will be measured by the linear foot in accordance with 109.01(a). Liquid asphalt sealant will be measured by the linear foot.

401.22 Basis of Payment

The accepted quantities for this work will be paid for at the contract unit price per ton for QC/QA-HMA, of the type specified, complete in place.

980 Payment for furnishing, calibrating, operating the inertial profiler, and furnishing IRI profile information will be made at the contract lump sum price for Inertial Profiler, HMA.

Furnishing and operating the 16 ft straightedge shall be included in the cost of other pay items within this section.

Adjustments to the contract payment with respect to mixture, density, and smoothness for the mixture produced will be included in a quality adjustment pay item in accordance with 109.05.1.

990

Milled shoulder corrugations will be paid for in accordance with 606.03.

Joint adhesive will be paid for at the contract unit price per linear foot, complete in place. Liquid asphalt sealant will be paid for at the contract unit price per linear foot.

Payment will be made under:

	Pay Item	Pay Unit Symbol
1000	Inertial Profiler, HMA	LS
	Joint Adhesive, _____ course type	LFT
	Liquid Asphalt Sealant	LFT
	QC/QA-HMA, _____, _____, _____, _____ mm	TON
	(ESAL ⁽¹⁾) (PG ⁽²⁾) (Course ⁽³⁾) (Mix ⁽⁴⁾)	
	(1) ESAL Category as defined in 401.04	
	(2) Number represents the high temperature binder grade. Low temperature grades are - 22	
	(3) Surface, Intermediate, or Base	
1010	(4) Mixture Designation	

Preparation of surfaces to be overlaid shall be included in the cost of other pay items.

Coring and refilling of the core holes shall be included in the cost of other pay items within this section.

No payment will be made for additional anti-stripping additives, appeal coring, or traffic control expenditures related to coring operations.

1020

The cost of removing and replacing soft and yielding areas shall be included in the cost of other pay items in this section.

Corrections for pavement smoothness shall be included in the cost of other pay items within this section.

The price for Inertial Profiler, HMA will be full compensation regardless of how often the inertial profiler is used or how often the IRI is determined.

1030

If QC/QA-HMA 19.0 mm over QC/QA-HMA 25.0 mm mixtures are specified, QC/QA-HMA 19.0 mm mixture may be considered as a substitute for the QC/QA-HMA 19.0 mm and QC/QA-HMA 25.0 mm mixtures upon a written request by the Contractor. The request for the substitution shall be prepared in advance of the work.

A computation will be made in order to obtain a unit price for the QC/QA-HMA 19.0 mm mixture. The quantity and amount for QC/QA-HMA 19.0 mm mixture shall equal the sum of the contract quantities and amounts shown for QC/QA-HMA 19.0 mm and QC/QA-HMA 25.0 mm mixtures. The unit price for QC/QA-HMA 19.0 mm mixture shall be equal to the sum of contract amounts divided by the sum of contract quantities. Payment for the QC/QA-HMA 19.0 mm mixture will be made at the unit price per ton for QC/QA-HMA 19.0 mm mixture. No payment will be made for additional work or costs which may result due to this change.

SECTION 402 – HMA PAVEMENT

402.01 Description

This work shall consist of one or more courses of miscellaneous mixtures constructed in accordance with 105.03.

402.02 Quality Control

The HMA shall be supplied from a certified HMA plant in accordance with ITM 583; Certified Hot Mix Asphalt Producer Program. The HMA shall be transported and placed according to a QCP prepared and submitted by the Contractor in accordance with ITM 803; Contractor Quality Control Plans for Hot Mix Asphalt Pavements. The QCP shall be submitted to the Engineer at least 15 days prior to commencing HMA paving operations.

When a safety edge is required for a project, the QCP shall identify the devices in accordance with 409.03(c) to be used for constructing the safety edge.

MATERIALS

402.03 Materials

Materials shall be in accordance with the following:

Asphalt Materials	
PG Binder	902.01(a)
Coarse Aggregates.....	904
Base Mixtures – Class D or Higher	
Intermediate Mixtures – Class C or Higher	
Surface Mixtures* – Class B or Higher	
Fine Aggregates.....	904
* Surface aggregate requirements are listed in 904.03(d).	

402.04 Design Mix Formula

A DMF shall be prepared in accordance with 401.04 and submitted in a format acceptable to the Engineer one week prior to use.

The DMF will be based on the ESAL and mixture designation as follows:

Mixture Type	Type B*	Type C	Type D
Design ESAL	< 3,000,000	3,000,000 to < 10,000,000	≥ 10,000,000
Surface	4.75 mm	4.75 mm	4.75 mm
	9.5 mm	9.5 mm	9.5 mm
	12.5 mm	12.5 mm	12.5 mm
Surface – PG Binder	64-22	70-22	70-22
Intermediate	9.5 mm	9.5 mm	9.5 mm
	12.5 mm	12.5 mm	12.5 mm
	19.0 mm	19.0 mm	19.0 mm
	25.0 mm	25.0 mm	25.0 mm
Intermediate – PG Binder	64-22	64-22	70-22
Base	19.0 mm	19.0 mm	19.0 mm
	25.0 mm	25.0 mm	25.0 mm
Base – PG Binder	64-22	64-22	64-22
*A Type B mixture shall replace a Type A mixture.			

40

A Type C mixture may be used in lieu of a Type B mixture. A Type D mixture may be used in lieu of a Type C or a Type B mixture.

Surface 4.75 mm mixtures shall not be used when the required lay rate shown on the plans is greater than 100 lb/sq yd. Surface 12.5 mm mixtures shall not be used when the required lay rate shown on the plans is less than 195 lb/sq yd.

50 The plant discharge temperature for any mixture shall not be more than 315°F whenever PG 64-22 or PG 70-22 binders are used. HMA may be produced using a water-injection foaming device. The DMF shall list the minimum and maximum plant discharge temperatures as applicable to the mixture.

No mixture shall be used until the DMF has been assigned a mixture number by the DTE.

402.05 Volumetric Mix Design

The DMF shall be determined for each mixture from a volumetric mix design in accordance with 401.05.

60 A DMF developed for a QC/QA HMA mixture may be used and the source or grade of the binder may be changed. The high temperature grade shall meet the minimum requirements of 402.04.

The MAF equals the G_{mm} from the mixture design divided by the following:

- (a) 2.465 for 9.5 mm mixtures

(b) 2.500 for 12.5 mm, 19.0 mm, and 25.0 mm mixtures.

If the MAF calculation results in a value where $0.980 \leq \text{MAF} \leq 1.020$, then the MAF shall be considered to be 1.000. If the MAF is greater than 1.020, the calculated MAF value shall have 0.020 subtracted from the value. If the MAF is less than 0.980, the calculated MAF value shall have 0.020 added to the value.

402.06 Blank

402.07 Mix Criteria

(a) Composition Limits for HMA Transverse Rumble Strip Mixtures

Transverse rumble strip mixtures shall be Type B surface in accordance with 402.04. An MAF in accordance with 402.05 will not apply. Aggregate requirements of 904.03(d) do not apply.

(b) Composition Limits for HMA Wedge and Leveling Mixtures

The mixture shall consist of surface or intermediate mixtures in accordance with 402.04. Aggregate requirements of 904.03(d) do not apply when the wedge and leveling mixture is covered by a surface or intermediate mixture.

(c) Composition Limits for Temporary HMA Mixtures

Temporary HMA mixtures shall be the type specified in accordance with 402.04. An MAF in accordance with 402.05 will not apply.

(d) Composition Limits for HMA Curbing Mixes

The mixture shall be HMA surface Type B in accordance with 402.04, except 402.05 shall not apply and RAP shall not be used. The binder content shall be 7.0% and the gradations shall meet the following:

HMA CURBING GRADATIONS	
Sieve Size	Percent Passing
1/2 in. (12.5 mm)	100.0
3/8 in. (9.5 mm)	80.0 - 100.0
No. 4 (4.75 mm)	73.0 ±5.0
No. 30 (600 µm)	20.0 - 50.0
No. 200 (75 µm)	6.0 - 12.0

A DMF shall be prepared in accordance with the above table and submitted in a format acceptable to the Engineer one week prior to use. The DMF shall state the binder content.

402.08 Recycled Materials

Recycled materials shall be in accordance with 401.06, except Type B mixtures

shall correspond to category 2 mixtures, Type C mixtures shall correspond to category 3 mixtures, and Type D mixtures shall correspond to category 4 mixtures.

402.09 Acceptance of Mixtures

110 A Type D certification in accordance with 916 and the Frequency Manual shall be provided for the HMA pavement. The test results shown on the certification shall be the quality control tests representing the material supplied and include air voids and binder content. Air voids tolerance shall be $\pm 2.0\%$ and binder content tolerance shall be $\pm 0.7\%$ from DMF.

Single test values and averages will be reported to the nearest 0.1%. Rounding will be in accordance with 109.01(a).

Test results exceeding the tolerance limits will be considered as a failed material and adjudicated in accordance with 105.03.

120

CONSTRUCTION REQUIREMENTS

402.10 General

Equipment for HMA operations shall be in accordance with 409. The Contractor shall submit to the Engineer prior to use a written Certificate of Compliance that the proposed paving equipment has been modified in accordance with 401.10 or is new and includes the modifications.

130 Fuel oil, kerosene, or solvents shall not be transported in open containers on any equipment at any time. Cleaning of equipment and tools shall not be performed on the pavement or shoulder areas.

Segregation, flushing, or bleeding of HMA mixtures will not be allowed. Corrective action shall be taken to prevent continuation of these conditions. Areas of segregation, flushing, or bleeding shall be corrected, if directed. All areas showing an excess or deficiency of asphalt materials shall be removed and replaced.

All mixtures that become loose and broken, mixed with dirt, or defective in any way shall be removed and replaced.

140

Mixture shall not be dispatched from the plant that cannot be spread and compacted before sundown of that day, unless otherwise specified.

402.11 Preparation of Surfaces to be Overlaid

The subgrade, or subbase, shall be shaped to the required grade and sections, free from all ruts, corrugations, or other irregularities, and uniformly compacted and approved in accordance with 207 and 302. Milling of an existing surface shall be in accordance with 306. Surfaces on which a mixture is placed shall be free from objectionable or foreign materials at the time of placement.

150

Rubblized concrete pavements shall be primed in accordance with 405. PCCP, milled asphalt surfaces, and asphalt surfaces shall be tacked in accordance with 406. Contact surfaces of curbing, gutters, manholes, and other structures shall be tacked in accordance with 406.

402.12 Weather Limitations

HMA courses less than 110 lb/sq yd are to be placed when the ambient and surface temperatures are 60°F or above. HMA courses equal to or greater than 110 lb/sq yd but less than 220 lb/sq yd are to be placed when the ambient and surface temperatures are 45°F or above. HMA courses equal to or greater than 220 lb/sq yd and HMA curbing are to be placed when the ambient and surface temperatures are 32°F or above. Mixture shall not be placed on a frozen subgrade. However, HMA courses may be placed at lower temperatures, provided the density of the HMA course is in accordance with 402.16.

All partially completed sections of roadway that are 8 in. or less in thickness shall be proofrolled prior to the placement of additional materials unless otherwise directed by the Engineer. Proofrolling shall be accomplished in accordance with 203.26. The contact pressure shall be 70 to 80 psi. Soft yielding areas shall be removed and replaced.

402.13 Spreading and Finishing

The mixture shall be placed upon an approved surface by means of laydown equipment in accordance with 409.03(c). Prior to paving, both the planned quantity and lay rate shall be adjusted by multiplying by the MAF. When a mixture is produced from more than one DMF for a given pay item, the MAF will be applied to the applicable portion of the mixture for each. Mixtures in areas inaccessible to laydown equipment or mechanical devices may be placed by other methods.

The temperature of each mixture at the time of spreading shall be less than 315°F whenever PG 64-22 or PG 70-22 binders are used. The temperature of each mixture at the time of spreading shall not be less than 245°F. No mixture shall be placed on a previously paved course that has not cooled to less than 175°F.

Planned HMA courses greater than 220 lb/sq yd placed under traffic shall be brought up even with each adjacent lane at the end of each work day. Planned HMA courses less than or equal to 220 lb/sq yd shall be brought forward concurrently, within practical limits, limiting the work in one lane to not more than one work day of production before moving back to bring forward the adjacent lane. Traffic shall not be allowed on open graded mixtures.

Hydraulic extensions on the paver will not be allowed for continuous paving operations. Fixed extensions or extendable screeds shall be used on courses greater than the nominal width of the paver except in areas where the paving widths vary. Hydraulic extensions may be used on approaches, tapers, and added lanes less than 250 ft in length.

HMA shoulders which are 8 ft or more in width shall be placed with automatic paving equipment.

200

HMA mixtures in hauling equipment shall be protected by tarps from adverse weather conditions or foreign materials. Adverse weather conditions include, but will not be limited to, precipitation or temperatures below 45°F.

The speed of the paver shall not exceed 50 ft per minute when spreading mixtures.

Automatic slope and grade controls shall be required except when placing mixtures on roadway approaches which are less than 200 ft in length or on miscellaneous work. The use of automatic controls on other courses where use is impractical due to project conditions may be waived by the Engineer.

210

The finished thickness of each course shall be at least two times but not more than five times the maximum particle size as shown on the DMF. The finished thickness of wedge and level mixtures shall be at least 1 1/2 times but not more than six times the maximum particle size as shown on the DMF. Feathering may be less than the minimum thickness requirements.

Transverse rumble strips shall be placed to ensure uniformity of height, width, texture, and the required spacing between strips. A tack coat in accordance with 406 shall be applied on the pavement surface prior to placing the mixture. The tack coat may be applied with a paint brush or other approved methods.

220

A safety edge shall be constructed at locations where an intermediate mixture or a surface mixture is constructed adjacent to an aggregate or earth shoulder.

Vibratory rollers in accordance with 409.03(d)4 shall not be operated in vibratory mode at locations indicated on the plans. Oscillatory rollers in accordance with 409.03(d)5 will be allowed for use but the vertical impact force capability shall not be used. Density acceptance shall be in accordance with 402.15.

230

402.14 Joints

Longitudinal joints in the surface shall be at the lane lines of the pavement. Longitudinal joints below the surface shall be offset from previously constructed joints by approximately 6 in. and be located within 12 in. of the lane line.

Transverse joints shall be constructed by exposing a near vertical full depth face of the previous course.

If constructed under traffic, temporary transverse joints shall be feathered to provide a smooth transition to the driving surface.

240

402.15 Compaction

The HMA mixture shall be compacted with equipment in accordance with 409.03(d) immediately after the mixture has been spread and finished. Rollers shall not cause undue displacement, cracking, or shoving.

A roller application is defined as one pass of the roller over the entire mat. Compaction operations shall be completed in accordance with one of the following options.

250

NUMBER OF ROLLER APPLICATIONS							
Rollers	Courses						
	$\leq 440 \text{ lb/sq yd}$					$> 440 \text{ lb/sq yd}$	
	Option 1	Option 2	Option 3	Option 4	Option 5	Option 1	Option 2
Three Wheel	2		4			4	
Pneumatic Tire	2	4				4	
Tandem	2	2	2			4	
Vibratory				6			8
Oscillatory					6	-	-

A reduced number of applications on a course may be approved if detrimental results are being observed.

Compaction equipment shall be operated with the drive roll or wheels nearest the paver and at speeds not to exceed 3 mph. However, vibratory rollers will be limited to 2.5 mph. Rolling shall be continued until applications are completed and all roller marks are eliminated.

260 Compaction operations shall begin at the low side and proceed to the high side of the mat. The heaviest roller wheel shall overlap its previous pass by a minimum of 6 in.

Longitudinal joints shall be compacted in accordance with the following:

(a) For confined edges, the first pass adjacent to the confined edge, the compaction equipment shall be entirely on the hot mat 6 in. from the confined edge.

270 (b) For unconfined edges, the compaction equipment shall extend 6 in. beyond the edge of the hot mat.

All displacement of the HMA mixture shall be corrected at once using lutes or the addition of fresh mixture as required. The line and grade of the edges of the HMA mixture shall not be displaced during rolling.

The wheels of the compaction equipment shall be kept properly moistened with water or water with detergent to prevent adhesion of the materials to the wheels.

280 Areas inaccessible to rollers shall be compacted thoroughly with hand tampers or other mechanical devices in accordance with 409.03(d)7 to achieve the required compaction. A trench roller, in accordance with 409.03(d)6, may be used to obtain compaction in depressed areas.

The final two roller applications shall be completed at the highest temperature where the mixture does not exhibit any tenderness.

Vehicular traffic will not be allowed on a course until the mixture has cooled sufficiently to prevent distortions.

290

Transverse rumble strips shall be compacted with vibratory compacting equipment in accordance with 409.03(d)7 unless otherwise stated.

402.16 Low Temperature Compaction Requirements

Compaction for mixtures placed below the temperatures listed in 402.12 shall be controlled by density determined from MSG of the plate samples and cores cut from the compacted pavement placed during a low temperature period. Samples shall be obtained in accordance with ITM 580. Acceptance will be based on a plate sample and two cores. The Engineer will randomly select the locations in accordance with ITM 300 802. The transverse core location will be located so that the edge of the core will be no closer than 3 in. from a confined edge or 6 in. from a non-confined edge of the course being placed.

For compaction of HMA during low temperature periods with quantities less than 100 t per day, acceptance may be visual.

310 The Contractor shall obtain cores in the presence of the Engineer with a device that shall produce a uniform 6.00 ± 0.25 in. diameter pavement sample. Coring shall be completed prior to the random location being covered. The final HMA course shall be cored within one work day of placement. Damaged cores shall be discarded and replaced with a core from a location selected by adding 1 ft to the longitudinal location of the damaged core using the same transverse offset.

The Contractor and the Engineer shall mark the core to define the course to be tested. If the core indicates a course thickness of less than two times the maximum particle size, the core will be discarded and a core from a new random location will be selected for testing.

320 The Engineer will take immediate possession of the cores. If the Engineer's cores are subsequently damaged, additional coring within a specific section will be the responsibility of the Department. Subsequent core locations will be determined by subtracting 1 ft from the random location using the same transverse offset.

The density for the mixture shall be expressed as:

$$\text{Density, \%} = \frac{\text{BSG}}{\text{MSG}} \times 100$$

where:

BSG = average bulk specific gravity

MSG = maximum specific gravity

330

The Engineer will determine the bulk specific gravity of the cores in accordance with AASHTO T 166, Method A or AASHTO T 331, if required. The maximum specific gravity will be mass determined in water in accordance with AASHTO T 209. Density shall not be less than 93.0%.

The Contractor shall refill the core holes in accordance with 401.16.

402.17 Pavement Corrugations

Pavement corrugations shall be in accordance with 606.

340

402.18 Pavement Smoothness

Pavement smoothness will be in accordance with 401.18, except inertial profiler requirements will not apply.

402.19 Method of Measurement

HMA mixtures will be measured by the ton of the type specified in accordance with 109.01(b). The measured quantity will be divided by the MAF to determine the pay quantity.

350

HMA rumble strips will be measured by the linear foot of each transverse strip, complete in place.

Milled pavement corrugations will be measured in accordance with 606.02.

402.20 Basis of Payment

The accepted quantities for this work will be paid for at the contract unit price per ton for HMA, of the type specified, complete in place.

360 HMA transverse rumble strips will be paid for at the contract unit price per linear foot, complete in place.

Milled pavement corrugations will be paid for in accordance with 606.03.

Payment will be made under:

Pay Item

Pay Unit Symbol

HMA Transverse Rumble Strips	LFT
HMA for Temporary Pavement, Type ____*	TON

370 HMA Wedge and Level, Type ____*..... TON
 * Mixture type

Preparation of surfaces to be overlaid shall be included in the cost of other pay items in this section.

No payment will be made for additional anti-stripping additives.

The cost of removing and replacing soft yielding areas shall be included in the cost of other pay items in this section.

380

No payment will be made for coring operations and related traffic control expenditures required in 402.16.

Corrections for pavement smoothness including removal and replacement of pavement, shall be included in the cost of other pay items in this section.

The cost of removal of HMA for temporary pavement including the subgrade and subbase materials shall be included in the cost of HMA for temporary pavement.

390

SECTION 403 – BLANK

SECTION 404 – SEAL COAT

404.01 Description

This work shall consist of one or more applications of asphalt material, each followed by an application of cover aggregate in accordance with 105.03.

404.02 Quality Control

10 Seal coat, SC, shall be constructed according to a QCP prepared and submitted by the Contractor in accordance with ITM 803, Contractor Quality Control Plan for Seal Coat.

The QCP shall be submitted to the Engineer at least 15 days prior to commencing seal coat operations.

MATERIALS

404.03 Asphalt Material

The type and grade of asphalt material shall be in accordance with the following:

20 Asphalt Emulsion, RS-2, AE-90,
 AE-90S, or HFRS-2..... 902.01(b)

404.04 Cover Aggregate

Aggregate shall be in accordance with the following requirements. When slag is used as an alternate to natural aggregate, adjustments will be made in accordance with 904.01, to compensate for differences in specific gravity.

Coarse Aggregates*, Class B or Higher

Size No. 8, 9, 11, 12, SC 11, SC 12, or SC 16..... 904.03

30 Fine Aggregate, Size No. 23 or 24 904.02

* Coarse aggregate type required shall be in accordance with 904.03(d)1 for ESAL categories 2 or 3.

The types of seal coats shall be as follows:

Type (see Note 1)	Application	Cover Aggregate Size No. and Course	Rates of Application per sq yd	
			Aggregate, lb	Asphalt Material, Gal. at 60°F
1 or 1P (see Note 2)	Single	23, 24	12 - 15	0.12 - 0.16
2 or 2P	Single	12, SC 12	14 - 17	0.29 - 0.33
3 or 3P	Single	11, SC 11, SC 16	16 - 20	0.36 - 0.40
4 or 4P	Single	9	28 - 32	0.63 - 0.68
5 or 5P	Double	Top: 12, SC 12	16 - 19	0.41 - 0.46
		Bottom: 11, SC 11, SC 16	16 - 20	0.28 - 0.31
6 or 6P	Double	Top: 11, SC 11, SC 16	18 - 22	0.62 - 0.68
		Bottom: 9	28 - 32	0.42 - 0.46
7 or 7P	Double	Top: 11, SC 11, SC 16	18 - 22	0.62 - 0.68
		Bottom: 8	28 - 32	0.42 - 0.46
Note 1 – AE-90S and SC aggregates shall be used for Type P seal coats, except SC aggregate requirement will not apply to seal coat used on shoulders.				
Note 2 – HFRS-2 shall not be used with Type 1 seal coat.				

40 **SC** aggregates shall be 85% one face and 80% two face crushed. The Flakiness Index in accordance with ITM 224 shall be a maximum of 25%. Non SC aggregates shall have a minimum crushed particle percentage of 70%. Determination of crushed particles shall be made from the mass weight of material retained on the No. 4 (4.75 mm) sieve in accordance with ASTM D5821.

CONSTRUCTION REQUIREMENTS**404.05 Weather Limitations**

Asphalt material shall not be applied on a wet surface, or when other weather conditions would adversely affect the seal coat. Seal coat shall not be placed when the ambient or pavement temperature is below 60°F. Seal coat shall not be applied to travel

lanes or auxiliary lanes before May 1 or after October 1, but may be applied to
50 shoulders within the above temperature range.

404.06 Equipment

A distributor, rotary power broom, pneumatic tire roller, and aggregate spreader in accordance with 409.03 shall be used.

404.07 Preparation of Surface

Surfaces to be sealed shall be patched as shown on the plans or as directed, brought to proper section and grade, and compacted.

60 The surface shall be cleaned of all loose material prior to seal coat application. Sealing operations may not commence until the surface is approved.

All castings, detector housings, and snowplowable raised pavement markers shall be covered prior to applying the asphalt material to prevent coating with seal coat. These coverings shall be removed prior to opening to unrestricted traffic.

404.08 Applying Asphalt Material

Asphalt material shall be applied in a uniform continuous spread over the section to be treated. The quantity of asphalt material to be applied per square yard shall be in
70 accordance with the QCP. During application, minor adjustments to the application rate shall be made in accordance with the QCP.

The asphalt material shall not be spread over a greater area than can be covered with the cover aggregate within the trucks at the site.

The spread of the asphalt material shall be no wider than the width covered by the cover aggregate from the spreading device. Operations shall allow asphalt materials to chill, set up, dry, or otherwise impair retention of the cover coat.

80 404.09 Application of Cover Aggregate

Within 1 minute of the application of the asphalt material, cover aggregate shall be spread in quantities as required. Spreading shall be accomplished such that the tires of the trucks or aggregate spreader do not contact the uncovered and newly applied asphalt material.

404.10 Rolling Operation

The aggregate shall be seated with at least three roller applications. A roller application is defined as one pass of the roller over the width sealed. The first roller application shall be completed within 2 minutes of aggregate application, with the final
90 application completed within 30 minutes after the cover aggregate is applied. The rollers shall not be operated at speeds that will displace the cover aggregate from the asphalt material.

404.11 Sweeping Operation

Excess cover aggregate shall be removed from the pavement surface by brooming no later than the morning after placement of the seal coat. The brooming shall not displace the imbedded aggregate. A second brooming operation shall be performed prior to opening to unrestricted traffic in accordance with 101.36.

100 **404.12 Protection of Surface**

Traffic shall not be allowed on the freshly sealed surfaces until final rolling application is complete. The seal coat shall be protected by keeping traffic off the freshly sealed surface or by controlling traffic speed in accordance with the QCP. Traffic shall not displace the embedded aggregate.

Any areas with minor bleeding will be covered with fine aggregate or other approved blotting material.

404.13 Method of Measurement

110 Seal coat will be measured by the square yard of the seal coated surface.

Patching will be measured in accordance with 304.06.

404.14 Basis of Payment

Seal coat will be paid for at the contract unit price per square yard complete in place.

Patching will be paid for in accordance with 304.07.

120 Payment will be made under:

Pay Item	Pay Unit Symbol
Seal Coat, _____ type	SYS
Seal Coat, _____ P type	SYS

130 The cost of determination of asphalt material and cover aggregate application rates, sweeping and rolling operations, blotting material, and other incidentals shall be included in the cost of the pay items.

The Contractor shall adjust application rates as directed by the Engineer within the limits set out herein. No additional payment will be made for additional materials necessary to meet the required application rates within the specified limits.

SECTION 405 – PRIME COAT

405.01 Description

This work shall consist of preparing and treating a rubblized PCCP with asphalt material in accordance with 105.03.

MATERIALS

405.02 Asphalt Materials

10 The type and grade of asphalt material shall be in accordance with the following:

Asphalt Emulsion, AE-PL 902.01(b)

405.03 Cover Aggregate

Aggregate shall be in accordance with the following:

Coarse Aggregate, Class B or Higher, Size No. 12 904.03

Fine Aggregate, Size No. 23 or No. 24 904.02

20

CONSTRUCTION REQUIREMENTS

405.04 Weather Limitations

Asphalt material shall not be applied on a wet surface, when the ambient temperature is below 50°F, or when other unsuitable conditions exist, unless approved by the Engineer.

405.05 Equipment

A distributor and aggregate spreader in accordance with 409.03 shall be used.

30

405.06 Preparation of Surface

The existing surface to be treated shall be shaped to the required grade and section, free from all ruts, corrugations, or other irregularities, uniformly compacted, and approved.

405.07 Application of Asphalt Material

AE-PL shall be uniformly applied at the rate of 0.50 to 0.75 gal./sq yd placed in a single application. When placing material on a rubblized base, a carpet drag shall be utilized behind the distributor.

40

When traffic is to be maintained within the limits of the section, approximately one half of the width of the section shall be treated in one application. Complete coverage of the section shall be ensured. Treated areas shall not be opened to traffic until the asphalt material has been absorbed.

405.08 Cover Aggregate

If the asphalt material fails to penetrate and the primed surface must be used by traffic, cover aggregate shall be spread to provide a dry surface.

405.09 Method of Measurement

- 50 Asphalt for prime coat will be measured by the ton or by the square yard. Cover aggregate will be measured by the ton.

405.10 Basis of Payment

The accepted quantities of prime coat will be paid for at the contract unit price per ton or per square yard for asphalt for prime coat. The accepted quantities of cover aggregate will be paid for at the contract unit price per ton, complete in place.

Payment will be made under:

60	Pay Item	Pay Unit Symbol
	Asphalt for Prime Coat.....	TON
		SYS
	Cover Aggregate, Prime Coat.....	TON

SECTION 406 – TACK COAT**406.01 Description**

This work shall consist of preparing and treating an existing pavement or concrete surface with asphalt material in accordance with 105.03.

MATERIALS**406.02 Materials**

- 10 The type and grade of asphalt material shall be in accordance with the following:

Asphalt Emulsion, SS-1h, AE-NT.....	902.01(b)
PG Asphalt Binder, PG 64-22	902.01(a)

CONSTRUCTION REQUIREMENTS**406.03 Equipment**

A distributor in accordance with 409.03(a) shall be used.

- 20 **406.04 Preparation of Surface**

The existing surface to be treated shall be free of foreign materials deemed detrimental by the Engineer. The surface where the asphalt material is applied shall be free of standing water and shall be cleaned of dust, debris and any substances that will prevent adherence.

406.05 Application of Asphalt Material

The asphalt material shall be uniformly applied across the entire width of pavement to be overlaid and shall cover a minimum of 95% of the surface. The asphalt

- 30 material shall be given sufficient time to break and set to minimize tracking from hauling and laydown equipment. Areas of inadequate coverage that create streaking or areas of excessive coverage that create ponding shall be corrected to obtain an even distribution.

The asphalt material application rate shall be based on the existing surface type and shall be as follows:

Surface Type	Application Rate*(gal./sq yd)
New Asphalt	0.05 to 0.08
Existing Asphalt	0.06 to 0.11
Milled Asphalt	0.06 to 0.12
PCCP	0.05 to 0.08
* The asphalt material shall not be diluted.	

406.06 Method of Measurement

Asphalt for tack coat will be measured by the ton or by the square yard.

40

406.07 Basis of Payment

The accepted quantities of tack coat will be paid for at the contract unit price per ton or per square yard for asphalt for tack coat, complete in place.

Payment will be made under:

Pay Item

Pay Unit Symbol

Asphalt for Tack Coat TON
SYS

50

SECTION 407 – DUST PALLIATIVE

407.01 Description

This work shall consist of preparing and treating an existing aggregate surface with asphalt material in accordance with 105.03.

407.02 Asphalt Material

The type and grade of asphalt material shall be in accordance with the following:

- 10 Asphalt Emulsion, AE-PL 902.01(b)

407.03 Weather Limitations

Asphalt material shall not be applied on a wet surface, when the ambient temperature is below 50°F, or when other unsuitable conditions exist, unless approved by the Engineer.

407.04 Equipment

A distributor in accordance with 409.03(a) shall be used.

20 **407.05 Preparation of Surface**

The surface to be treated shall be shaped to the required section and be free from all ruts, corrugations, or other irregularities.

407.06 Application of Asphalt Material

The asphalt material shall be uniformly applied at the rate of 0.25 to 1 gal./sq yd in a uniform continuous spread over the section to be treated or as directed.

When traffic is to be maintained within the limits of the section, approximately one half of the full section width shall be treated in one application. Complete coverage
30 of the section shall be ensured.

Treated areas shall not be opened to traffic until the asphalt material has been absorbed.

407.07 Method of Measurement

Asphalt for dust palliative will be measured by the ton.

407.08 Basis of Payment

The accepted quantities of this work will be paid for at the contract unit price per
40 ton for asphalt for dust palliative, complete in place.

Payment will be under:

Pay Item	Pay Unit Symbol
Asphalt for Dust Palliative	TON

SECTION 408 – SEALING OR FILLING CRACKS AND JOINTS**408.01 Description**

This work shall consist of sealing or filling longitudinal and transverse cracks and joints in existing asphalt pavement in accordance with 105.03.

Full lane width transverse cracks and longitudinal joints shall be routed and sealed. All other cracks shall be filled.

10 **MATERIALS****408.02 Materials**

Materials shall be in accordance with the following:

Asphalt Binder, PG 64-22*902.01(a)

Asphalt Emulsion for Crack Filling, AE-90S.....	902.01(b)
Fine Aggregates, No. 23 or No. 24.....	904.02
Joint Sealing Materials	906.02(a)2

- 20 * A PG 64-22 asphalt binder shall be used to fill cracks on a surface that is milled in accordance with 306, and polypropylene fibers shall be used only in conjunction with warranted micro-surfacing.

CONSTRUCTION REQUIREMENTS

408.03 Equipment

- 30 A distributor in accordance with 409.03 shall be used when crack filling with asphalt emulsion or an indirect-heat double boiler kettle with mechanical agitator shall be used when filling with hot poured material. An indirect-heat double boiler kettle with mechanical agitator shall be used when routing and sealing. Air compressors shall be capable of producing a minimum air pressure of 100 psi.

408.04 Weather Limitations

Sealing or filling operations shall not be conducted on a wet surface, when the ambient temperature is below 40°F, or when other unsuitable conditions exist, unless approved by the Engineer.

408.05 Routing and Sealing Cracks and Joints

- 40 Cracks and joints, 1/2 in. or less in width, shall be routed with a routing machine capable of cutting a uniform shape to form a reservoir not exceeding 3/4 in. wide with a minimum depth of 3/4 in. Cracks and joints shall be cleaned by blowing with compressed air or by other suitable means. The operation shall be coordinated such that routed materials do not encroach on pavement lanes carrying traffic and all routed materials are disposed of in accordance with 104.07. Cracks and joints shall be sealed with hot poured joint sealant to within 1/4 in. below the surface in accordance with the manufacturer's recommendations.

408.06 Filling Cracks

- 50 Cracks shall be cleaned by blowing with compressed air or by other suitable means. Asphalt material shall be placed utilizing a "V" shaped wand tip, to allow the penetration of the materials into the cracks. The cracks shall be completely filled or overbanded not to exceed 5 in., or as required. All excess asphalt material shall be removed from the pavement. The filled cracks shall be covered with sufficient fine aggregate or other suitable material to prevent tracking of the asphalt materials. All excess cover material shall be removed from the pavement within 24 h, when directed.

- 60 Application of asphalt materials shall be completed without covering existing pavement markings. When traffic is to be maintained within the limits of the section, temporary traffic control measures in accordance with 801 shall be used. Treated areas shall not be opened to traffic until the asphalt material has been absorbed.

408.07 Method of Measurement

Sealing and filling of cracks and joints in asphalt pavements will be measured by the ton of material used. Routing of cracks and joints will not be measured.

Temporary traffic control measures will be measured in accordance with 801.17.

408.08 Basis of Payment

70 Sealing and filling of cracks and joints in asphalt pavements will be paid for by the ton of material used for the type specified.

Temporary traffic control measures will be paid for in accordance with 801.18.

Payment will be made under:

Pay Item**Pay Unit Symbol**

Cracks and Joints in Asphalt Pavement, Rout and Seal TON

Cracks in Asphalt Pavement, Fill TON

80

The cost of all materials, cover aggregate, cleaning, and all necessary incidentals shall be included in the cost of the pay items in this section.

SECTION 409 – EQUIPMENT**409.01 Production, Transportation, and Laydown of Asphalt Mixtures**

For production of asphalt mixtures, the Contractor shall provide all equipment necessary for the production, transportation, and laydown operations.

409.02 Mixing Plant

The mixing plant shall be certified in accordance with ITM 583 and shall be capable of producing a uniform mixture.

10

409.03 HMA Laydown Operations**(a) Distributor**

The distributor shall be equipped, maintained, and operated to provide uniform heating and application rates as specified. The distributor shall have a volume measuring device and a thermometer to monitor the asphalt material.

Distributors shall also be equipped with a power unit for the pump and a full circulation spray bar with vertical controls.

20

(b) Hauling Equipment

The mixtures shall be transported to the laydown operation in trucks that have tight, clean, and smooth beds.

Truck beds may be treated with anti-adhesive agents selected from the QPL. The truck beds shall be raised after application of non-foaming anti-adhesive agents to drain liquids from the bed prior to HMA being loaded into the truck. The Department will maintain a QPL of Anti-Adhesive Materials.

- 30 Hauling equipment shall be equipped with a watertight cover to protect the mixture.

(c) Laydown Equipment

1. Paver

The paver shall be self-propelled, and equipped with a material receiving system, and equipped with heated and vibrating screeds. The paver may also include automatic slope and grade controls, extendable screeds and extendable augers.

- 40 Automatic control devices shall be separated from the paver screeds, paver tracks or wheels and be capable of adjusting both sides of the screeds automatically to maintain a constant angle of attack in relation to the grade leveler device or grade line.

A grade leveling system may be used to activate the control devices on each HMA course, including matching lays. The leveling system shall be attached to the paver and operated parallel to the paver's line of travel.

- 50 Extendable screeds shall be rigid, heated, vibrating, and be capable of maintaining the cross slope and line and grade of the pavement to produce uniform placement of the materials.

Auger extensions shall be used when required to distribute the HMA uniformly in front of the screed.

When a dense graded intermediate or a surface mixture is placed adjacent to an aggregate or earth shoulder, the side of the paver adjacent to the aggregate or earth shoulder shall be equipped with a device capable of constructing a safety edge. The following devices are approved for this application:

- 60 (a) Advant-Edge™, Advant-Edge Paving Equipment LLC
- (b) Safety Edge End Gate, Carlson Paving Products, Inc.
- (c) TransTech Shoulder Wedge Maker™, TransTech Systems, Inc.
- (d) SafeTSlope Edge Smoother™, Troxler Electronic Laboratories, Inc.

2. Widener

- 70 A device capable of receiving, transferring, spreading, and striking off materials to the proper grade and slope.

3. Other Mechanical Devices

Inaccessible or short sections of HMA may be placed with specialty equipment approved by the Engineer.

(d) Compaction Equipment

80 Compaction equipment shall be self-propelled, steel wheel or pneumatic tire types, in good condition, and capable of reversing direction without backlashing. All roller wheels shall be equipped with scrapers to keep the wheels clean, have water spraying devices on the wheels, and steering devices capable of accurately guiding the roller.

1. Tandem Roller

A roller having two axles and a minimum weight of 10 t.

2. Three Wheel Roller

A roller having three wheels with a minimum bearing of 300 lb/in. on the rear wheels. The crown of the wheels shall not exceed 2.5 in. in 18 ft.

90 A tandem roller which has a drive wheel bearing of no less than 300 lb/in. may be used in lieu of the three wheel roller.

3. Pneumatic Tire Roller

A pneumatic tire roller shall have a minimum rolling width of 5.5 ft. The roller shall be equipped with compaction tires, minimum size 7:50 by 15, exerting an average contact pressure from 50 to 90 psi uniformly over the pavement.

100 The wheels on at least one axle shall be fully oscillating vertically and mounted to prevent scuffing of the pavements during rolling or turning operations. Charts or tabulations showing the contact areas and pressures for the full range of tire inflation pressures and for the full range of tire loadings for each compactor shall be furnished to the Engineer.

4. Vibratory Roller

A vibratory roller shall have both drums equipped for vertical impact forces, a variable amplitude system, a speed control device, and have a minimum vibration frequency of 2,000 vibrations per minute. A reed tachometer shall be provided for verifying the frequency of vibrations.

110 5. Oscillatory Roller

An oscillatory roller shall have both drums equipped for horizontal and vertical shear forces or one drum equipped for horizontal and vertical shear force and the other drum equipped for a vertical impact force.

6. Trench Roller

A trench roller shall have a compaction wheel bearing of no less than 300 lb/in.

7. Specialty Roller/Compactor

120 Inaccessible or short sections of HMA may be compacted with specialty equipment approved by the Engineer.

(e) Miscellaneous Equipment

1. Aggregate Spreader

A spreader shall be a self-propelled, pneumatic tired, motorized unit with a front loading hopper and a transportation system for distributing the aggregates uniformly across the pavement.

2. Rotary Power Broom

130 A motorized, pneumatic tired unit with rotary bristle broom head.

(f) Smoothness Equipment

The inertial profiler shall be in accordance with ITM 917.

SECTION 410 – QC/QA HMA – SMA PAVEMENT

410.01 Description

This work shall consist of one course of QC/QA HMA – SMA mixture constructed on prepared foundations in accordance with 105.03.

410.02 Quality Control

10 The SMA mixture shall be supplied from a certified HMA plant in accordance with ITM 583, Certified Hot Mix Asphalt Producer Program. The QCP shall be modified to include the requirements for the SMA mixtures. The SMA shall be transported and placed according to the QCP prepared and submitted by the Contractor in accordance with ITM 803, Contractor Quality Control Plans for Hot Mix Asphalt Pavements. The QCP shall be submitted to the Engineer at least 15 days prior to commencing SMA paving operations.

When a safety edge is required for a project, the QCP shall identify the device or devices in accordance with 409.03(c) to be used for constructing the safety edge.

MATERIALS

20

410.03 Materials

Materials shall be in accordance with the following:

Asphalt Materials

PG Binder, PG 76-22, PG 70-22	902.01(a)
Coarse Aggregates, Class AS	904.03
Fine Aggregates (sand, mineral filler)	904.02
Stabilizing Additives	AASHTO M 325

30 **410.04 Design Mix Formula**

A DMF shall be prepared in accordance with 410.05 and submitted in a format acceptable to the Engineer one week prior to use. The DMF shall state the maximum particle size in the mixture. The DMF shall state the calibration factor, test temperature and absorption factors to be used for the determination of binder content using the ignition oven in accordance with ITM 586, the binder content by extraction in accordance with ITM 571, ΔP_b , determined in accordance with ITM 591, the aggregate degradation loss value in accordance with ITM 220 and a Mixture Adjustment Factor, MAF. The DMF shall state the source, type dosage rate of any stabilizing additives. The DMF will be based on the ESAL and mixture designation.

- 40 No mixture shall be used until the DMF has been assigned a mixture number by the DTE.

The ESAL category identified in the pay item correlates to the following ESAL ranges:

ESAL Category	ESAL
2*	< 3,000,000
3	3,000,000 to < 10,000,000
4*	\geq 10,000,000
* A category 2 mixture shall replace a category 1 mixture and a category 4 mixture shall replace a category 5 mixture.	

- 50 The plant discharge temperature for any mixture shall not be more than 315°F whenever PG 70-22 binder is used or not more than 325°F whenever PG 76-22 binder is used. SMA may be produced using a water-injection foaming device. The DMF shall list the minimum and maximum plant discharge temperatures as applicable to the mixture.

410.05 SMA Mix Design

- 60 The DMF shall be determined for each mixture from a SMA mix design by a design laboratory selected from the Department's list of Qualified Mix Design Laboratories. A SMA mixture shall be designed in accordance with ITM 220, AASHTO M 325 and AASHTO R 46 except the design gyrations shall be 75 for all ESAL categories. All loose mixture shall be conditioned for 4 h in accordance with AASHTO R 30 prior to testing. Steel furnace slag coarse aggregate, when used in an intermediate mixture application, shall have a deleterious content less than 4.0% as determined in accordance with ITM 219.

The single percentage of aggregate passing each required sieve shall be within the limits of the following gradation table.

SMA GRADATION CONTROL LIMITS						
	Mixture Designation					
	9.5 mm		12.5 mm		19.0 mm	
Sieve Size	Lower	Upper	Lower	Upper	Lower	Upper
1 1/2 in. (37.5 mm)					100.0	100.0
1 in. (25.0 mm)			100.0	100.0	99.0*	100.0
3/4 in. (19.0 mm)	100.0	100.0	99.0*	100.0	90.0	99.0
1/2 in. (12.5 mm)	99.0*	100.0	90.0	99.0	50.0	88.0
3/8 in. (9.5 mm)	70.0	95.0	50.0	80.0	25.0	60.0
No. 4 (4.75 mm)	30.0	50.0	20.0	35.0	20.0	28.0
No. 8 (2.36 mm)	20.0	30.0	16.0	24.0	16.0	24.0
No. 16 (1.18 mm)	---	21.0	---	---	---	---
No. 30 (600 µm)	---	18.0	---	---	---	---
No. 50 (300 µm)	---	15.0	---	---	---	---
No. 200 (75 µm)	8.0	12.0	8.0	11.0	8.0	11.0
* The lower % passing gradation may be 98.0% when SMA RAP material in accordance with 410.06 is used in the SMA mixture.						

70 The optimum binder and aggregate gradation content shall produce a $\Delta P_b \leq 0.20$ as determined in accordance with ITM 591 and 4.0% air voids. The maximum specific gravity shall be mass determined in water in accordance with AASHTO T 209. The percent draindown for SMA mixture shall not exceed 0.30% in accordance with AASHTO T 305.

The MAF equals the Gmm from the mixture design divided by the following:

- (a) 2.465 for 9.5 mm mixtures
- (b) 2.500 for 12.5 mm and 19.0 mm mixtures.

80 If the MAF calculation results in a value where $0.980 \leq \text{MAF} \leq 1.020$, then the MAF shall be considered to be 1.000. If the MAF is greater than 1.020, the calculated MAF value shall have 0.020 subtracted from the value. If the MAF is less than 0.980, the calculated MAF value shall have 0.020 added to the value. The MAF does not apply to OG mixtures.

90 The mixture shall be tested for moisture susceptibility in accordance with AASHTO T 283 except that the loose mixture curing shall be replaced by mixture conditioning for 4 h in accordance with AASHTO R 30. The minimum tensile strength ratio, TSR, shall be 70%. The 6 in. mixture specimens shall be compacted to $6.0 \pm 1.0\%$ air voids in accordance with AASHTO T 312. Specimens shall be prepared using freeze-thaw preconditioning. If anti-stripping additives are added to the mixture to be in accordance with the minimum TSR requirements, the dosage rate shall be submitted with the DMF.

The fine aggregate portion of the aggregate blend shall be non-plastic as determined in accordance with AASHTO T 90.

A change in the source or types of aggregates or a change in source or type of stabilizing additives shall require a new DMF.

100 A PG binder grade or source change will not require a new mix design. If the upper temperature classification of the PG binder is lower than the original PG grade, a new TSR value is required.

The specific gravity of SF and the Gsb of the aggregate blend containing SF may be adjusted once per contract upon notification by the SF source and approval by the DTE. A new DMF is not required for this adjustment.

The mixture design compaction temperature for the specimens shall be $300 \pm 9^{\circ}\text{F}$.

Voids in Mineral Aggregate, VMA, Criteria	
Mixture Designation	Minimum VMA, %
19.0 mm	15.0
12.5 mm	16.0
9.5 mm	17.0

110 410.06 Recycled Materials

Recycled materials shall be in accordance with 401.06 for dense graded mixtures except non-SMA RAP material for use in the SMA mixture shall be 100% passing the 3/8 in. (9.5 mm) sieve and 95 to 100% passing the No. 4 (4.75 mm) sieve.

SMA RAP material shall be the product derived by exclusively milling an existing SMA mixture. The SMA RAP material shall pass the maximum size sieve for the mixture being produced as follows:

SMA RAP GRADATION, %						
Sieve Size	Mixture Designation					
	9.5 mm		12.5 mm		19.0 mm	
	Lower	Upper	Lower	Upper	Lower	Upper
1 1/2 in. (37.5 mm)					100.0	100.0
1 in. (25.0 mm)			100.0	100.0	95.0	100.0
3/4 in. (19.0 mm)	100.0	100.0	95.0	100.0	---	---
1/2 in. (12.5 mm)	95.0	100.0	---	---	---	---

120 The Contractor may request the use of SMA RAP material in the SMA mixture provided the material is stockpiled separately at the plant and the material properties were determined in accordance with ITM 584 during stockpile construction. The request shall include all QC test results describing the stockpile composition. The

Engineer will obtain a representative sample of the SMA RAP material in accordance with ITM 207 for testing in accordance with ITM 590 to verify the proposed design value.

410.07 Lots and Sublots

130 Lots will be defined as 4,000 t of SMA intermediate mixture or 2,400 t of SMA surface mixture. Lots will be further sub-divided into sublots not to exceed 1,000 t of SMA intermediate mixture or 600 t of SMA surface mixture. Partial sublots of 100 t or less will be added to the previous sublot. Partial sublots greater than 100 t constitute a full sublot.

410.08 Job Mix Formula

A **JMF** shall be developed by a certified HMA producer in accordance with ITM 583. A JMF used for SMA mixture in the current calendar year will be allowed.

140 The aggregate and recycled materials blend percentage and the amount passing all sieves on the DMF may be adjusted provided the gradation limits do not exceed the requirements of 410.05. Adjustments to the aggregate and recycled materials blend percentage, gradation and the new combined aggregate bulk specific gravity shall be included on the JMF.

The total binder content on the JMF may be determined by adjusting the DMF a maximum of $\pm 0.3\%$. The recycled materials binder content may be adjusted as part of the total binder content provided the binder replacement percentage is in accordance with 410.06.

150 The mixture compaction temperature shall be $300 \pm 9^\circ\text{F}$. The JMF shall list the minimum and maximum plant discharge temperatures as applicable to the mixture. The JMF for each mixture shall be submitted to the Engineer.

410.09 Acceptance of Mixtures

160 Acceptance of mixtures for binder content and gradation for each lot will be based on tests performed by the Engineer. The Engineer will randomly select the location within each sublot for sampling in accordance with ITM 802. An acceptance sample will consist of one plate sample at the random location. A backup sample will consist of one plate sample located 2 ft towards the center of the mat from the acceptance sample.

Samples from each location shall be obtained from each sublot from the pavement in accordance with ITM 580. The Engineer will take immediate possession of the samples.

A maximum specific gravity sample and a binder content and gradation sample will be obtained from the plate sample in accordance with ITM 587. The binder content will be determined in accordance with ITM 586 or ITM 571 as directed by the Engineer and the gradation will be determined in accordance with AASHTO T 30. The

- 170 maximum specific gravity will be mass determined in water in accordance with AASHTO T 209. The test results of the sublots will be averaged and shall meet the requirements for tolerances from the JMF for each sieve and binder content.

The Engineer will make the subplot acceptance test results available after receiving the subplot quality control results from the Contractor.

ACCEPTANCE TOLERANCE FOR MIXTURES (Percent Mass)									
Mixture	Number of Tests	Sieve Size							
		*25.0 mm	*19.0 mm	*12.5 mm	*9.5 mm	*4.75 mm	2.36 mm	600 µm	75 µm
Surface	1	---	---	---	---	---	8.0	4.0	2.5
	2	---	---	---	---	---	5.7	2.8	2.1
	3	---	---	---	---	---	4.6	2.3	1.8
	4	---	---	---	---	---	4.0	2.0	1.5
Intermediate	1	---	---	---	---	---	10.0	6.0	2.0
	2	---	---	---	---	---	7.0	4.2	1.4
	3	---	---	---	---	---	5.8	3.5	1.2
	4	---	---	---	---	---	5.0	3.0	1.0
* The acceptance tolerance for this sieve shall be the applicable composition limits specified in 410.05.									

ACCEPTANCE TOLERANCE FOR BINDER				
Binder Content	Number of Tests			
	1	2	3	4
% Binder	0.7	0.5	0.4	0.3

- 180 Acceptance of mixtures for range will be determined using the results of subplot tests performed by the Engineer from each lot. If the range is not in accordance with the requirements, adjustment points will be assessed in accordance with 410.19(a).

ACCEPTANCE TOLERANCE FOR RANGE (±Percent Mass)		
Sieve Size and Binder Content	Percentage Points	
	Surface	Intermediate
No. 8 (2.36 mm)	12.0	15.0
No. 30 (600 µm)	6.0	9.0
No. 200 (75 µm)	2.0	3.0
% Binder	1.0	1.0

Acceptance tolerances for binder content and gradation will be as set out above for the number of tests performed. The acceptance tolerance for range will be as set out above for lots of more than one subplot. The range of binder shall be the difference between the highest subplot binder content and the lowest subplot binder content in one

lot. The range of gradation shall be the difference between the highest subplot percent passing and the lowest subplot percent passing each required sieve in one lot.

190

Single test values and averages will be reported to the nearest 0.1%. Rounding will be in accordance with 109.01(a).

Lot adjustment points will be assessed in accordance with 410.19(a) when the average or range for binder content or gradation are not met.

The Contractor may request an appeal of the Engineer's test results in accordance with 410.20.

200

A binder draindown test in accordance with AASHTO T 305 shall be completed once per lot in accordance with 410.07 and shall not exceed 0.30%.

A Type C certification in accordance with 916 shall be provided for the stabilizing additives for each shipment. Stabilizing additives from different manufacturers and different types of additives shall not be intermixed.

In the event than an acceptance sample is not available to represent subplot, all test results of the previous subplot will be used for acceptance. If the previous subplot is not available, the subsequent subplot will be used for acceptance.

210

Samples shall not be obtained from areas placed with paving equipment in accordance with 409.03(c)2 or 409.03(c)3. If a random location falls within this area, the Engineer will randomly select another location within the subplot for sampling. If an entire subplot falls within this area, test results from the previous subplot will be used for acceptance. If the previous subplot is not available, the subsequent subplot will be used for acceptance.

CONSTRUCTION REQUIREMENTS

220

410.10 General

Equipment for SMA operations shall be in accordance with 409. The Contractor shall submit to the Engineer, prior to use, a written Certificate of Compliance that the proposed paving equipment has been modified in accordance with 401.10 or is new and includes the modifications.

Fuel oil, kerosene, or solvents shall not be transported in open containers on equipment. Cleaning of equipment and small tools shall not be performed on the pavement or shoulder areas.

230

SMA mixtures shall not exhibit segregation, flushing, or bleeding. Corrective action shall immediately be taken to prevent continuation of these conditions. Segregated, flushed, or bleeding of SMA mixtures will be referred to the Department's

Division of Materials and Tests for adjudication as a failed material in accordance with 105.03.

All mixtures that become loose and broken, mixed with dirt, or are in any way defective shall be removed and replaced in accordance with 105.03.

410.11 Preparation of Surfaces to be Overlaid

- 240 Milling of an existing pavement surface shall be in accordance with 306. Surfaces on which a mixture is placed shall be free from objectionable or foreign materials at the time of placement.

Milled asphalt surfaces and asphalt surfaces shall be tacked in accordance with 406. Contact surfaces of curbing, gutters, manholes, and other structures shall be tacked in accordance with 406.

410.12 Process Control

- 250 The Engineer and Contractor will jointly review the operations to ensure compliance with the QCP. Continuous violations of compliance with the QCP will result in suspension of paving operations.

410.13 Weather Limitations

SMA courses shall be placed when the ambient temperature and the temperature of the surface on which it is to be placed is 45°F or above.

410.14 Spreading and Finishing

- 260 The mixture shall be placed upon an approved surface by means of a paver or other mechanical devices in accordance with 409.03. Mixtures in areas inaccessible to mechanical devices may be placed by other methods. The temperature of mixture at the time of spreading shall be no more than 315°F whenever PG 70-22 binder is used or no more than 325°F whenever PG 76-22 binder is used. The temperature of each mixture shall not be less than 245°F at the time of spreading when placed with paving equipment in accordance with 409.03(c)2 or 409.03(c)3. No mixture shall be placed on a previously paved course that has not cooled to less than 175°F.

- 270 Prior to paving, both the planned quantity and lay rate shall be adjusted by multiplying by the MAF. When mixture is produced from more than one DMF or JMF for a given pay item, the MAF will be applied to the applicable portion of the mixture for each.

Planned SMA courses greater than 220 lb/sq yd placed under traffic, shall be brought up even with each adjacent lane at the end of each work day. Planned SMA courses less than or equal to 220 lb/sq yd shall be brought forward concurrently, within practical limits, limiting the work in one lane to not more than one work day of production before moving back to bring forward the adjacent lane.

Hydraulic extensions on the paver will not be allowed for continuous paving operations. Fixed extensions or extendable screeds shall be used on courses greater

280 than the nominal width of the paver except in areas where the paving widths vary. Hydraulic extensions may be used in tapers and added lanes less than 250 ft in length.

Automatic slope and grade controls will be required and shall be outlined in the QCP.

SMA mainline and SMA shoulders which are 8 ft or more in width shall be placed with automatic paving equipment.

290 The rollers shall be operated to avoid shoving of the SMA and at speeds not to exceed 3 mph. Rollers shall be in accordance with 409.03(d)1, 409.03(d)2, or 409.03(d)7. Vibratory rollers meeting the requirements of 409.03(d)4 may be used but shall not be operated in vibratory mode, except the vibratory mode may be used on the first pass to the paver. Oscillatory rollers in accordance with 409.03(d)5 will be allowed for use but the vertical impact force capability shall not be used, except the vertical impact force capability may be used on the first pass to the paver.

The finished thickness of any course shall be at least two times but not more than five times the maximum particle size as shown on the DMF.

300 A safety edge shall be constructed at locations where the surface mixture is constructed adjacent to an aggregate or earth shoulder.

410.15 Joints

Longitudinal joints in the surface shall be at the lane lines of the pavement.

Hot poured joint adhesive in accordance with 906 shall be applied to longitudinal joints constructed between two adjacent HMA courses in the top course of dense graded intermediate mixtures and all 9.5 mm and 12.5 mm SMA mixture courses. This includes joints within the traveled way as well as between any of the following:

310

- (a) traveled way and an auxiliary lane,
- (b) traveled way and a paved shoulder, and
- (c) auxiliary lane and a paved shoulder.

The material shall be heated in a jacketed, double boiler melting kettle. The kettle shall have an attached pressure feed wand system with applicator shoe.

320 The joint adhesive shall be applied to the face of the previously constructed edge at the joint using a wand applicator. Prior to application of the joint adhesive, the joint face shall be dry and free of loose material and foreign objects. The adhesive shall be applied on the joint face 1/8 in. thick at the temperature recommended by the manufacturer. Excess joint adhesive shall not be allowed to pool on the top of the previously constructed pavement course or the pavement to be overlaid. The application of the adhesive shall be made within the same day, but at least 30 minutes prior to construction of the longitudinal joint.

Transverse joints shall be constructed by exposing a near vertical full depth face of the previous course. For areas inaccessible to rollers, other mechanical devices shall be used to achieve the required density.

330

If constructed under traffic, temporary transverse joints shall be feathered to provide a smooth transition to the driving surface.

410.16 Density

Acceptance will be based on lots and sublots in accordance with 410.07.

The Engineer's acceptance test results for each sublot will be available after the sublot and testing are complete.

340

Sublot and lot density values will be reported to the nearest 0.1%. Rounding will be in accordance with 109.01(a).

Density acceptance for all SMA mixtures shall be based on cores cut from the compacted pavement and analysis of pavement samples obtained in accordance with ITM 580. Acceptance will be based on lots and sublots in accordance with 410.07. The Engineer will randomly select two locations in accordance with ITM 802, within each sublot for coring. The transverse core location will be located so that the edge of the core will be no closer than 3 in. from a confined edge or 6 in. from a non-confined edge of the course being placed. The maximum specific gravity will be determined from the sample obtained in 410.09.

350

The Contractor shall obtain cores in the presence of the Engineer with a device that shall produce a uniform 6.00 ± 0.25 in. diameter pavement sample. Surface courses shall be cored within one work day of placement. Damaged core shall be discarded and replaced with a core from a location selected by adding 1 ft to the longitudinal location of the damaged core using the same transverse offset.

The Contractor and the Engineer shall mark the core to define the course to be tested. If the core indicates a course thickness of less than two times the maximum particle size, the core will be discarded and a core from a new random location will be selected for testing.

360

Cores shall not be obtained from areas placed with paving equipment in accordance with 409.03(c)2 or 409.03(c)3. If a random location falls within this area, the Engineer will randomly select another location within the sublot for coring. If an entire sublot falls within this area, test results from the previous sublot will be used for acceptance. If the previous sublot is not available, the subsequent sublot will be used for acceptance.

370

The Engineer will take immediate possession of the cores. If the Engineer's cores are subsequently damaged, additional coring within a specific sublot or sublots will be the responsibility of the Department. Subsequent core locations will be determined by

subtracting 1 ft from the random location using the same transverse offset.

The density of the mixture will be expressed as:

$$\text{Density, \%} = \frac{\text{BSG}}{\text{MSG}} \times 100$$

where:

380

BSG = average bulk specific gravity
MSG = maximum specific gravity

Samples for the bulk specific gravity and maximum specific gravity will be dried in accordance with ITM 572. The Engineer will determine the bulk specific gravity of the cores in accordance with AASHTO T 166, Method A or AASHTO T 331, if required. The maximum specific gravity will be mass determined in water in accordance with AASHTO T 209. The target value for density of SMA mixtures of each subplot shall be 93.0%.

390 The densities of the sublots will be averaged to determine the density of the lot.

Within one work day of coring operations, the Contractor shall clean, dry, and refill the core holes with either SMA of similar or smaller size particles or bridge deck repair material from the QPL of Rapid Setting Patch Materials. The rapid setting patch material shall be mixed in a separate container and placed in the hole in accordance with the manufacturer's recommendations, consolidated by rodding, and struck-off flush with the adjacent pavement. The Contractor's plan for refilling core holes shall be outlined in the QCP.

400 **410.17 Pavement Corrugations**

Pavement corrugations shall be in accordance with 606.

410.18 Pavement Smoothness

The pavement smoothness will be evaluated and determined in accordance with 401.18.

410.19 Adjusted Points

410 When test results for mixture properties or density exceed the allowable tolerances, adjustment points will be assessed. The adjustment points will be used to calculate a quality assurance adjustment quantity, q, for the lot. Quality assurance adjustment points for smoothness will be in accordance with 401.19(c).

The adjustment for mixture properties and density are calculated as follows:

$$q = 1.00 \times (L \times U \times P/100)/MAF$$

where:

q = quality assurance adjustment quantity
L = lot quantity

U = unit price for the material, \$/ton

P = total adjustment points

The total quality assurance adjustments is to be calculated as follows:

$$Q = Q_s + \sum (q_m + q_d)$$

420 where:

Q = total quality assurance adjustment quantity

Q_s = quality assurance adjustment for smoothness as calculated in 401.19(c)

q_m = lot adjustments for mixtures

q_d = lot adjustments for density

If the total adjustment points for a lot are greater than 15, the pavement will be evaluated by the Division of Materials and Tests. If the Contractor is not required to remove the mixture, quality assurance adjustments of the lot will be assessed or other corrective actions as determined by the Division of Materials and Tests.

(a) Mixture

When test results for the mixture furnished exceeded the allowable tolerances, adjustment points will be assessed as follows:

430

ADJUSTMENT POINTS FOR GRADATION								
Adjustment Points	Sieve Size							
	25.0 mm	19.0 mm	12.5 mm	9.5 mm	4.75 mm	2.36 mm	600 µm	75 µm
For each 0.1% up to 1.0% out of tolerance	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.3
For each 0.1% above 1.0% out of tolerance	0.1	0.1	0.1	0.1	0.1	0.2	0.3	0.6

Gradation adjustment points for the lot shall be the sum of points calculated for up to 1% out of tolerance and the points calculated for greater than 1% out of tolerance in accordance with 410.09.

Binder content adjustment points for the lot shall be two points for each 0.1% above the tolerance or four points for each 0.1% below the tolerance in accordance with 410.09.

440

When test results for the mixture furnished exceed the allowable range in accordance with 410.09, adjustment points will be assessed as follows:

ADJUSTMENT POINTS FOR RANGE	
Sieve Size and Binder Content	Adjustment Points (For each 0.1% out of range)
No. 8 (2.36 mm)	0.1
No. 30 (600 µm)	0.1
No. 200 (75 µm)	0.1
% Binder	1.0

For mixtures produced during a certified HMA plant's adjustment period, adjustment points will not be assessed if the mixture produced is in accordance with the following:

1. The gradation complies with 410.05 with the allowable tolerance limits shown in 410.09.
2. The range for the binder content and gradation do not exceed the limits shown in 410.09.
3. The binder content is within the tolerance requirements of 410.09.

If the mixture is not in accordance with these requirements, adjustment points will be assessed in accordance with 410.09 for variations exceeding the requirements shown above.

(b) Density

When the density of the lot is outside the allowable tolerances, adjustment points will be assessed as follows:

DENSITY	
Percentages are based on %MSG	Pay Adjustments, %
> 97.0	Submitted to the Division of Materials and Tests*
93.0 – 97.0	0.00
92.0 – 92.9	0.20 points for each 0.10% below 93.0
91.0 – 91.9	2.00 + 0.40 points for each 0.10% below 92.0
89.0 – 90.9	6.00 + 1.00 points for each 0.10% below 91.0
≤ 89.0	Submitted to the Division of Materials and Tests*
* Test results will be considered and adjudicated as a failed material in accordance with normal Department practice as listed in 105.03.	

410.20 Appeals

If the QC test results do not agree with the acceptance test results, a request, along with the QC test results, may be made in writing for additional testing. Additional

470 testing may be requested for one or more of the following tests: binder content, gradation, or MSG of the mixture samples, and bulk specific gravity of the density cores. The request for the appeal for MSG, BSG of the density cores or binder content and gradation shall be submitted within seven calendar days of receipt of the Department's written results for that subplot. The subplot and specific tests shall be specified at the time of the appeal request. Only one appeal request per subplot is allowed. Once the appeal request has been granted, the Engineer will perform additional testing.

480 The appeal results will replace all previous test results for acceptance of mixture in accordance with 410.09 and density in accordance with 410.16. The results will be furnished to the Contractor. The backup mixture samples or density cores will be tested in accordance with the following:

(a) MSG

The backup MSG will be dried in accordance with ITM 572 and mass determined in water in accordance with AASHTO T 209.

(b) Binder Content and Gradation

490 The backup binder content and gradation sample will be prepared and tested in accordance with the test methods that were used for acceptance.

(c) BSG of the Density Core

Cores shall be taken within seven calendar days unless otherwise directed. Additional core locations will be determined by adding 1 ft longitudinally of the cores tested using the same transverse offset. The cores will be dried in accordance with ITM 572 and tested in accordance with AASHTO T 166, Method A or AASHTO T 331, if required. The Contractor shall clean, dry, and refill the core holes with SMA or HMA surface materials within one work day of the coring operations.

500 **410.21 Method of Measurement**

SMA mixtures will be measured by the ton of the type specified, in accordance with 109.01(b). The measured quantity will be divided by the MAF to determine the pay quantity.

Joint adhesive will be measured by the linear foot in accordance with 109.01(a).

410.22 Basis of Payment

The accepted quantities for this work will be paid for at the contract unit price per ton for QC/QA – HMA, of the type specified, – SMA, complete in place.

510 Payment for furnishing, calibrating, operating the inertial profiler, and furnishing IRI profile information will be made in accordance with 401.18.

Furnishing and operating the 16 ft straightedge shall be included in the cost of other pay items within this section.

Joint adhesive will be paid for by the linear foot, complete in place.

520 Adjustments to the contract payment with respect to mixture, density, and smoothness for mixture produced will be included in a quality assurance adjustment pay item. The unit price for this pay item will be \$1.00 and the quantity will be in units of dollars. The quantity is the total calculated in accordance with 410.19. A change order will be prepared to reflect contract adjustments in accordance with 109.05.

Payment will be made under:

	Pay Item	Pay Unit Symbol
530	Joint Adhesive, _____ course type	LFT
	QC/QA - HMA, _____, _____, _____, _____ mm, - SMA TON (ESAL ⁽¹⁾)(PG ⁽²⁾)(Course ⁽³⁾)(Mix ⁽⁴⁾)	
	Quality Assurance Adjustment.....	DOL
	⁽¹⁾ ESAL Category as defined in 410.04	
	⁽²⁾ Number represents the high temperature binder grade. Low temperature grades are - 22	
	⁽³⁾ Surface or Intermediate	
	⁽⁴⁾ Mixture Designation	

540 Preparation of surfaces to be overlaid shall be included in the cost of other pay items within this section.

Coring and refilling of the pavement holes shall be included in the cost of other pay items within this section.

No payment will be made for additional anti-stripping additives, appeal coring or related traffic control expenditures for coring operations.

550 Corrections for pavement smoothness shall be included in the cost of other pay items within this section.

The price for inertial profiler, HMA will be full compensation regardless of how often the inertial profiler is used or how often the IRI is determined.

SECTION 411 – WARRANTED MICRO-SURFACING

411.01 Description

This work shall consist of furnishing materials and the placement of warranted micro-surfacing in accordance with 105.03.

Multiple course micro-surfacing shall consist of a surface course over a rut fill or leveling course. Single course micro-surfacing shall consist of a surface course.

- 10 The Contractor shall be responsible for the warranted micro-surfacing in accordance with 411.09.

MATERIALS

411.02 Materials

Materials shall be in accordance with the following:

- 20 Asphalt Emulsion 902.01(b)1
 Coarse Aggregates – Class B or Higher* 904.03
 Fine Aggregates** 904.02
 Portland Cement, Type I..... 901.01(b)
 Water 913.01

* The coarse aggregate angularity shall be a minimum of 95% in accordance with ASTM D5821. The coarse aggregate for rut fill shall be limestone, dolomite, crushed gravel, sandstone, ACBF, or SF. The surface application aggregate type shall be based on the ESAL category in the Surface Aggregate Table below.

- 30 ** The fine aggregate for micro-surface shall be limestone, dolomite, crushed gravel, sandstone, ACBF, or SF. The fine aggregate angularity shall be a minimum of 45 in accordance with AASHTO T 304 Method A. The clay content of the blended aggregate material from the fine and coarse aggregates shall meet a minimum sand equivalency of 65 in accordance with AASHTO T 176. The surface leveling application aggregate type shall be based on the ESAL category as follows:

40

SURFACE AGGREGATE TABLE			
Coarse or Fine Aggregate Type	Traffic ESALs		
	< 3,000,000	< 10,000,000	≥ 10,000,000
Air-Cooled Blast Furnace Slag	Yes	Yes	Yes
Steel Furnace Slag	Yes	Yes	Yes
Sandstone	Yes	Yes	Yes
Crushed Dolomite	Yes	Yes	(Note 1)
Polish Resistant Aggregates	Yes	Yes	(Note 1)
Crushed Stone	No	No	No
Gravel	No	No	No
Note 1: Polish resistant aggregate or crushed dolomite may be used when blended with ACBF or sandstone but cannot exceed 50% of the coarse aggregate by weight, or cannot exceed 40% of the coarse aggregate by weight when blended with SF.			

411.03 Design Mix Formula

The Contractor shall submit a **DMF** for the specific materials to be used on the project to the **DTE** one week prior to use.

The DMF shall state the following, where the percentages shown are based on the dry weight of the aggregate:

- 50 (a) source of each individual material
- (b) the aggregation gradation shall be in accordance with the following:

Sieve Size	Surface/Leveling, %	Rut Fill, %*
3/8 in. (9.5 mm)	100	100
No. 4 (4.75 mm)	85 - 100	70 - 90
No. 8 (2.36 mm)	50 - 80	45 - 70
No. 16 (1.18 mm)	40 - 65	28 - 50
No. 30 (600 µm)	25 - 45	19 - 34
No. 50 (300 µm)	13 - 25	12 - 25
No. 100 (150 µm)	7 - 18	7 - 18
No. 200 (75 µm)	5 - 15	5 - 15
* If rut fill course is used as a surface application, the aggregates shall be in accordance with the Surface Aggregate Table above.		

- (c) percentage of aggregate
- (d) percentage of mineral filler, minimum and maximum
- 60 (e) percentage of water, minimum and maximum
- (f) percentage of mix set additives, if required
- (g) percentage of polymer modified CSS-1h emulsified asphalt
- (h) state the quantitative effects of moisture content on the unit weight of the aggregate
- (i) results for the tests in the following:

70

Characteristic	Test Method ISSA*	Requirement
Wet Cohesion 30 minutes, min. (set time) 60 minutes, min. (traffic)	TB-139**	12 kg-cm 20 kg-cm
Wet Stripping, min.	TB-114	> 90%
Compatibility Classification	TB-144	11 pts min.
Wet Track Abrasion Loss 60 minutes soak, max. 6 day soak, max.	TB-100	538 g/sq m 807 g/sq m
Mix Time @ 77°F (25°C)	TB-113**	controllable to 120 s
Mix Time @ 104°F (40°C)	TB-113**	controllable to 35 s
Excess Binder	TB-109	538 g/sq m
Deformation, max.	TB-147	5%
* International Slurry Surfacing Association. ** The TB-139 (set time) and TB-113 (mix time) tests shall be checked at the highest temperature expected during construction. For the TB-113 test at 104°F (40°C), all ingredients and containers shall be preheated.		

411.04 Equipment

The Contractor shall use self-contained, self-propelled, continuous loading units designed for micro-surfacing.

Truck-mounted batch type machines will be allowed on projects with quantities less than or equal to 50,000 sq yds. The Contractor shall provide a minimum of two truck-mounted units at all times.

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411.05 Pre-Paving Coordination

A pre-paving meeting will be held on-site prior to beginning work. The Contractor shall furnish as a minimum:

- (a) the Contractor's detailed work schedule
- (b) traffic control plan
- (c) calibration of equipment
- (d) DMF/JMF
- (e) inspection and evaluation of the condition and adequacy of equipment, including units for transport of materials
- (f) QCP in accordance with ITM 803.

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CONSTRUCTION REQUIREMENTS

411.06 Preparation of Surfaces

The Contractor shall be responsible for all surface preparation necessary to meet the performance requirements for warranted micro-surfacing. All castings and detector

housings shall be protected prior to the application of material in accordance with 404.07, except that raised pavement markers shall be removed.

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Any existing durable pavement markings shall be removed in accordance with 808.10 prior to placement of warranted micro-surfacing.

Cracks in the pavement in excess of 1/4 in. shall be filled in accordance with 408 prior to placement of warranted micro-surfacing.

The pavement surface shall have tack coat applied in accordance with 406 prior to placement of warranted micro-surfacing.

110 **411.07 Opening to Traffic**

The micro-surface shall be capable of being opened to traffic within 1 h after application. If the micro-surface is not stable under traffic loading within 1 h of placement, the Contractor shall immediately cease operations. Prior to resuming operations, the Contractor shall notify the Engineer of the cause and the corrective action to be taken.

The micro-surface shall be cured a minimum of five days prior to applying permanent pavement markings in accordance with 808.

120 **411.08 Finished Pavement Properties**

All finished surface irregularities in excess of 1/8 in. measured with a 10 ft straightedge shall be corrected.

The longitudinal construction joints and lane edges shall coincide with the proposed painted lane lines. Longitudinal joints shall be constructed with less than a 3 in. overlap on adjacent passes and no more than 1/4 in. overlap thickness measured with a 10 ft straightedge in accordance with 409.03(f). If applicable, overlapping passes shall be made to prevent ponding of water. Construct transverse joints with no more than a 1/8 in. difference in elevation across the joint as measured with a 10 ft straightedge. The lane edge shall have no more than 2 in. of horizontal variance in 100 ft.

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411.09 Warranty

A warranty bond is to insure completion of required warranty work, including payments for all labor, materials, equipment, and incidentals necessary or convenient to the successful completion of the project and the carrying out of the duties and obligations imposed by the contract used to remediate any warranted distresses.

The Contractor shall furnish a warranty bond at the pre-construction conference or prior to beginning any work on the contract. The warranty bond shall be equal to 100% of the contract total for the warranted micro-surfacing pay items, and shall be properly executed by a surety satisfactory to the Department, and shall be payable to

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the State of Indiana. The warranty bond shall be in effect for three years from the date of substantial completion.

Upon the final acceptance of the project, the contractual obligations of the Contractor are satisfied as long as the micro-surfacing continues to meet or exceed the warranted values as defined herein.

- 150 All warranty work shall be accomplished in accordance with 411.11. At the end of the warranty period, the Contractor will be released from further warranty work or responsibility, provided all previous warranty work has been satisfactorily completed and approved by the Department.

411.10 Conflict Resolution Team

The scope of work for the conflict resolution team includes all issues concerning the warranted pavement relative to the quality control plan, material selection, warranted pavement evaluations, distress indicators, remedial action, and remediation plans.

160

The team will consist of two Contractor representatives, two Department representatives, and an additional person mutually agreed upon by both the Department and the Contractor. All costs for the additional person will be equally shared by the Department and the Contractor.

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The team members will be identified in writing when needed and will be knowledgeable in the terms and conditions of this warranty and the methods used in the measurement and calculation of pavement distress. The team will render a final recommendation to the Chief Engineer by a majority vote. Each member has an equal vote.

411.11 Warranty Work

Elective work is performed by the Contractor at its discretion to meet the performance requirements of warranted micro-surfacing prior to direction from the Department for the Contractor to perform remedial work.

Remedial work is performed as a result of pavement distress surveys performed by the Department.

180

During the warranty period, elective work and remedial work shall be performed at no cost to the Department. Elective work shall be at the Contractor's option. The scope of all **elective or** remedial work to be performed **and all** materials to be used shall be proposed by the Contractor and shall be subject to approval by the Department. Prior to proceeding with any warranty work or monitoring, all necessary permits shall be obtained from the Department.

Elective work **performed** during the warranty period will not be assessed a lane closure fee. For remedial work, costs for closure periods will be as shown in the contract.

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During the warranty period, the Contractor may monitor the warranted micro-surfacing using non-destructive procedures.

Coring, milling, or other destructive procedures may not be performed by the Contractor without prior consent of the Department. The Contractor will not be responsible for damages to the pavement as a result of coring, milling, or other destructive procedures conducted by the Department.

200 The Contractor has the first option to perform the remedial work. If the problem requires immediate attention, as determined by the Engineer, for safety of the traveling public and the Contractor cannot perform the remedial work within 24 h of notification, the Department will perform the remedial work. The Contractor shall be responsible for all costs incurred by the Department for remedial work performed by the Department. Remedial work performed by the Department will not alter the requirements, responsibilities, or obligations of the warranty.

411.12 Pavement Distress Indicators, Thresholds, and Remedial Work

The Department will use the following pavement distress indicators throughout the warranty period:

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- (a) Rutting – transverse displacement of the micro-surfacing.
- (b) Delamination – physical separation of the micro-surfacing that exposes the underlying surface.
- (c) Raveling – wearing away of the micro-surfacing.
- (d) Skid Resistance – friction number as measured by ASTM E274 and ASTM E524.

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The pavement threshold values for the pavement distress indicators will be evaluated for the entire length of the project for each lane. The threshold values for the pavement distress indicators are listed below:

Distress	Single Location	Multiple Locations
Delamination or Raveling	1/2 sq yd	1 sq yd/mi
Rut Depth	1/4 in.	average 1/4 in./mi
Friction Number*	no less than 30	average 35
* Individual friction tests will be performed in each lane every 1/2 mi for the length of the project.		

The Department may evaluate the warranted micro-surfacing during the warranty period. A final condition survey will be made by the Department and the Contractor will be notified in writing of all sections exceeding the warranty threshold at least 90 days in advance of the expiration of the warranty period.

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If the Department determines that any **distress** threshold level has been met or exceeded and remedial work is required, the Contractor shall submit a work plan and schedule to the Engineer for approval. The Contractor shall perform the remedial work within 30 calendar days of notification of approval by the Engineer.

If **at** anytime during the warranty period, 30% or more of the project requires **or** has received remedial work, remedial work as determined by the Department shall be performed on the entire project.

240 If remedial or elective work performed by the Contractor necessitates repair or replacement of pavement markings, adjacent lanes or roadway shoulders, the required work shall be the responsibility of the Contractor.

Warranty requirements for elective and remedial work will be limited to the life of the original contract warranty.

411.13 Department Maintenance

250 The Department may perform routine maintenance operations during the warranty period including, but not limited to, plowing, applying de-icing chemicals, repairs to safety appurtenances, pavement markings, mowing, and sign maintenance. The Department will perform no routine pavement surface maintenance activities during the warranty period.

411.14 Method of Measurement

Warranted micro-surfacing, of the type specified, will be measured by the square yard of surface course.

Only the surface course will be measured for payment.

260 411.15 Basis of Payment

Warranted micro-surfacing, of the type specified, will be paid for at the contract unit price per square yard of micro-surface, warranted, of the type specified, complete in place.

Payment will be made under:

	Pay Item	Pay Unit Symbol
270	Micro-Surfacing, Warranted, for Approaches, Multiple Course	SYS
	Micro-Surfacing, Warranted, for Approaches, Single Course.....	SYS
	Micro-Surfacing, Warranted, Multiple Course.....	SYS
	Micro-Surfacing, Warranted, Single Course	SYS

The cost of all incidentals including, but not limited to, surface preparation, meeting smoothness requirements, and warranty bond shall be included in the cost of the pay items.

280 **411.16 Final Warranty Acceptance**

The Engineer will review the project in the field for any defects not addressed in the indicators and recommend a Final Warranty Acceptance. The Department will issue the Contractor a Final Warranty Acceptance letter upon completion of the warranty period and all remedial work.

SECTION 412 – FOG SEAL

412.01 Description

This work shall consist of applying asphalt emulsion to the pavement surface in accordance with 105.03.

MATERIALS

412.02 Materials

10 Materials shall be in accordance with the following:

Asphalt Emulsion, AE-F	902.01(b)
Fine Aggregate	904.02

CONSTRUCTION REQUIREMENTS

412.03 Equipment

A distributor in accordance with 409.03(a) shall be used.

20 **412.04 Weather Limitations**

Fog seal operations shall not be conducted on a wet pavement, when the ambient air or pavement temperature is below 60°F, or when other unsuitable conditions exist, unless approved by the Engineer. Fog seal shall not be applied to travel lanes or auxiliary lanes before May 1 or after October 1.

412.05 Preparation of Surface

Surfaces shall be clean and free of any foreign or loose material.

30 All castings, detector housings, and snowplowable raised pavement markers shall be covered to prevent coating with fog seal prior to application of the fog seal. These coverings shall be removed prior to opening to traffic.

412.06 Application of Asphalt Material

The asphalt material shall be applied uniformly at the rate of 0.10 ±0.02 gal./sq yd. Asphalt material shall be applied to ensure even and uniform coverage to the pavement surface.

412.07 Protection of Surface

- 40 Fine aggregate or other approved blotting material shall be applied to pedestrian crosswalks, driveways, or other areas as **directed**. Brooming of ponded areas shall be required prior to opening to traffic on treated surfaces, as directed.

Traffic shall not be allowed on the freshly sealed surface until the asphalt material has sufficiently cured to prevent tracking.

412.08 Application of Pavement Markings

The fog seal shall be cured a minimum of five days prior to applying permanent pavement markings in accordance with 808.

- 50 **412.09 Method of Measurement**

Fog seal will be measured by the square yard complete in place.

412.10 Basis of Payment

Fog seal will be paid for at the contract unit price per square yard.

Payment will be made under:

	Pay Item	Pay Unit Symbol
60	Fog Seal.....	SYS

The costs of all asphalt materials, fine aggregate, surface preparation, and all other necessary incidentals shall be included in the cost of the pay item.

SECTION 413 – BLANK**SECTION 414 - ULTRATHIN BONDED WEARING COURSE,
WARRANTED****414.01 Description**

This work shall consist of furnishing materials and the placement of warranted ultrathin bonded wearing course, UBWC, in accordance with 105.03. The UBWC shall consist of surface preparation, application of asphalt emulsion and asphalt mixture. Asphalt mixture shall be produced by a Certified Hot Mix Asphalt Producer.

- 10 The Contractor shall be responsible for the warranted UBWC in accordance with 414.14.

MATERIALS

414.02 Materials

Materials shall be in accordance with the following:

	Asphalt Emulsion	902.01(b)2
	Asphalt Materials	
20	PG Binder, PG 64-22, PG 76-22	902.01(a)
	PG Binder Grade	414.02(b)
	Coarse Aggregates, Class A or Higher	904.03 and 414.02(c)
	Fine Aggregates.....	904.02
	Mineral Filler.....	904.02(f)

(a) Blank

(b) Asphalt Materials

The PG binder grade shall be selected based on the following requirements:

30

PG Binder	ESAL
64-22	< 10,000,000
76-22	≥ 10,000,000

Additional requirements for the PG 76-22 binder as follows:

Characteristic	Test Method	Min.	Max.
Separation, % prepared by ASTM D 7173	AASHTO T 53		6°C
Elastic Recovery, @ 39°F (4°C), %	AASHTO T 301	60	

(c) Coarse Aggregates

Additional requirements for coarse aggregate shall also be as follows:

Characteristic	Method	Min.	Max.
Coarse Aggregate Angularity	ASTM D5821	95/85*	
Micro-Deval Abrasion, % loss	AASHTO T 327		18
* Denotes two faced crush requirements.			

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414.03 Design Mix Formula

The **DMF** shall be determined for each mixture prepared by a Qualified Mix Design Laboratory selected from the Department's list of Qualified Mix Design Laboratories. The Contractor shall submit a DMF for each mixture to the Engineer one week prior to use. The DMF shall state the maximum particle size in the mixture, the

mixture gradation, the total aggregate bulk specific gravity, the maximum and bulk specific gravity of the UBWC mixture and the application rate for any anti-stripping additives. No mixture shall be used until the DMF has been reviewed by the DTE.

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414.04 Mix Design

The binder content and the percentage of aggregate passing each sieve shall be in accordance with the following requirements:

MIXTURE DESIGNATION – CONTROL POINT (Percent Passing)			
Sieve Size	12.5 mm	9.5 mm	4.75 mm
3/4 in. (19.0 mm)	100.0		
1/2 in. (12.5 mm)	85.0 - 100.0	100.0	
3/8 in. (9.5 mm)	55.0 - 80.0	85.0 - 100.0	100.0
No. 4 (4.75 mm)	22.0 - 38.0	22.0 - 38.0	40.0 - 55.0
No. 8 (2.36 mm)	19.0 - 32.0	19.0 - 32.0	20.0 - 32.0
No. 16 (1.18 mm)	15.0 - 24.0	15.0 - 24.0	15.0 - 24.0
No. 30 (600 µm)	11.0 - 18.0	11.0 - 18.0	11.0 - 18.0
No. 50 (300 µm)	8.0 - 14.0	8.0 - 14.0	8.0 - 14.0
No. 100 (150 µm)	5.0 - 10.0	5.0 - 10.0	5.0 - 10.0
No. 200 (75 µm)	4.0 - 5.5	4.0 - 5.5	4.0 - 5.5
Binder Content, %	4.6 - 6.1	4.8 - 6.1	5.0 - 6.3
Plan Lay Rate (lb/sq yd)*	90	75	65
* Plan lay rates are based on 100 lb/sq yd/in. using a mixture with a specific gravity of 2.5. Mixtures with different specific gravity will require an adjusted equivalent lay rate.			

The binder film thickness shall be a minimum of 0.4 mil. The binder content of the mix shall be determined by calculating the binder film thickness in accordance with ITM 589.

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The maximum specific gravity of the UBWC mixture shall be mass determined in water in accordance with AASHTO T 209.

The bulk specific gravity of the UBWC mixture shall be determined in accordance with AASHTO T 331.

Draindown from the loose mixture shall not exceed 0.10% when tested in accordance with AASHTO T 305.

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The TSR shall meet or exceed 80% when tested in accordance with AASHTO T 283(1). Specimens for AASHTO T 283 shall be 6 in. in diameter by $3 \frac{3}{4} \pm 1/4$ in. height and compacted in accordance with AASHTO T 312, except the specimens shall be compacted to 100 gyrations and resultant air voids reported for information purposes only.

The compaction temperatures shall be $300 \pm 10^{\circ}\text{F}$.

(1) AASHTO T 283 shall be used with the following exceptions:

- 80 (a) Condition the mixture for 4 h in accordance with AASHTO R 30, Section 7.1.
- (b) Compact the Superpave Gyratory Compactor, SGC, specimens to 100 gyrations.
- (c) Extrude the samples as soon as possible without damage to the sample.
- (d) Use AASHTO T 269 to determine the void content.
- 90 (e) Record the void content of the specimens.
- (f) If less than 55% saturation is achieved, the procedure does not need to be repeated unless the difference in tensile strength between duplicate specimens is greater than 25 lb/sq in.

414.05 Use of Recycled Materials

Recycled materials shall be in accordance with 401.06 for dense graded surfaces, except RAP for use in the UBWC mixture shall be 100% passing the 3/8 in. (9.5 mm) sieve and 95 to 100% passing the No. 4 (4.75 mm) sieve.

414.06 Quality Control

The Contractor shall produce a mixture in compliance with the DMF within the limits of the quality control tolerances. The Contractor shall maintain all quality control documentation and make a copy available to the Engineer upon request or at completion of work.

The Contractor shall sample the mix a minimum once per day in accordance with ITM 580, section 8.6 Truck Samples, Dense Graded HMA Mixture. The sample shall be tested for binder content and gradation prior to the next day's production.

The Contractor shall take corrective action when the binder content exceeds $\pm 0.5\%$ from that stated in the DMF as tested in accordance with ITM 586.

The Contractor shall take corrective action when the aggregate gradation exceeds the following values from that stated in the DMF as tested in accordance with AASHTO T 30.

414.07

Sieve Size	Quality Control Tolerances (\pm), %		
	Mixture Designation - Tolerances		
	12.5 mm	9.5 mm	4.75 mm
3/4 in. (19.0 mm)			
1/2 in. (12.5 mm)	5.0		
3/8 in. (9.5 mm)		5.0	
No. 4 (4.75 mm)	4.0	4.0	5.0
No. 8 (2.36 mm)	4.0	4.0	4.0
No. 16 (1.18 mm)			4.0
No. 200 (75 μ m)	1.0	1.0	1.0

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CONSTRUCTION REQUIREMENTS

414.07 Equipment

The equipment shall be in accordance with 409.01, 409.02, 409.03(b), 409.03(d)1, and as follows:

The paver shall be self-priming, designed and built for applying the UBWC. The paver shall have:

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- (a) a receiving hopper,
- (b) feed system,
- (c) asphalt emulsion storage tank,
- (d) a calibrated metering system for measuring the emulsion volume applied,
- (e) a spray bar,
- (f) a heated, variable width, combination vibratory screed, or
- (g) a combination vibratory-tamping bar screed.

The paver shall be capable of spraying the asphalt emulsion, applying the asphalt mix and leveling the surface of the mat in one pass. The screed shall have the ability to crown the pavement at the center.

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414.08 Preparation of Surface

The Contractor shall be responsible for all surface preparation to meet the requirements for warranted UBWC. All castings and detector housings not identified on the plans as being reset shall be protected prior to the application of material in accordance with 404.07, except that raised pavement markers shall be removed.

414.09 Asphalt Emulsion

150 The asphalt emulsion shall be applied at a temperature recommended by the emulsion supplier. The asphalt emulsion shall be applied uniformly across the entire width of pavement to be overlaid. Equipment shall not operate on the applied asphalt emulsion before the asphalt mix is placed.

The recommended plan application rates of the asphalt emulsion are as shown in the table below. Determination of actual application rates shall be the responsibility of the Contractor.

Recommended Asphalt Emulsion Application Rate and Adjustment Factors for Surface Conditions			
Mixture Designation	12.5 mm	9.5 mm	4.75 mm
General application rate, gal./sq yd	0.20	0.17	0.14
Existing Surface Condition	Recommended adjustment to application rate, gal./sq yd		
PCCP, smooth or polished	-0.03	-0.03	-0.03
PCCP, broomed or textured	0	0	0
Flushed asphalt concrete surface	-0.02	-0.03	-0.03
Dense, unaged asphalt concrete surface	0	0	0
Open textured, dry, aged or oxidized asphalt concrete surface	+0.02	+0.01	+0.01
Milled asphalt concrete surface	+0.02	+0.01	+0.01

414.10 Pre-Paving Meeting

160 A pre-paving meeting between the Engineer and Contractor will be held on-site prior to beginning work. The following shall be reviewed:

- (a) work schedule
- (b) traffic control plan
- (c) equipment calibrations and adjustments
- (d) inspection and evaluation of the condition and adequacy of equipment, including units for transport of materials
- (e) JMF
- (f) Contractor's proposed emulsion and mix application rates
- 170 (g) QCP in accordance with ITM 803
- (h) Contractor's authorized representative.

414.11 Mixture Placement

The UBWC shall be prepared and placed at temperatures recommended by the binder supplier. Fracturing of aggregates shall be avoided.

414.12 Mixture Finishing

180 Three passes of rollers capable of exerting at least 150 lb/in. and in conformance with 409.03(d)1 shall be applied to the UBWC before the material has cooled below 185°F. A release agent may be added to the water system of the rollers to prevent adhesion of the material to the roller drum. Rollers shall not operate in vibratory mode.

414.13 Smoothness

Pavement smoothness shall be controlled by the Contractor with a 16 ft straightedge longitudinally and will be controlled by the Department with a 10 ft straightedge transversely. The 16 ft straightedge shall be in accordance with 306.03(d). The 10 ft straightedge will be in accordance with 306.03(d). Smoothness correction shall be in accordance with 401.18(e).

- 190 The lane edge shall have no more than 2 in. of horizontal variance in 100 ft.

414.14 Warranty

A warranty bond is to insure completion of required warranty work, including payments for all labor, materials, equipment, and incidentals necessary or convenient to the successful completion of the project and the carrying out of the duties and obligations imposed by the contract used to remediate any warranted distresses.

- 200 The Contractor shall furnish to the Engineer a warranty bond at the pre-construction conference or prior to beginning any work on the contract. The warranty bond shall be equal to 100% of the contract total for the warranted UBWC pay items, and shall be properly executed by a surety satisfactory to the Department, and shall be payable to the State of Indiana. The warranty bond shall be in effect for three years from the date of substantial completion.

Upon the final acceptance of the project, the contractual obligations of the Contractor are satisfied as long as the UBWC continues to meet or exceed the warranted values as defined herein.

- 210 All warranty work shall be accomplished in accordance with 414.16. At the end of the warranty period, the Contractor will be released from further warranty work or responsibility, provided all previous warranty work has been satisfactorily completed and approved by the Department.

414.15 Conflict Resolution Team

The scope of work for the conflict resolution team includes all issues concerning the warranted pavement relative to the quality control plan, material selection, warranted pavement evaluations, distress indicators, remedial action, and remediation plans.

- 220 The team will consist of two Contractor representatives, two Department representatives, and an additional person mutually agreed upon by both the Department and the Contractor. All costs for the additional person will be equally shared by the Department and the Contractor.

The team members will be identified in writing when needed and will be knowledgeable in the terms and conditions of this warranty and the methods used in the measurement and calculation of pavement distress. The team will render a final recommendation to the Chief Engineer by a majority vote. Each member has an equal vote.

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414.16 Warranty Work

Elective work is performed by the Contractor at its discretion to meet the performance requirements of warranted UBWC prior to direction from the Department for the Contractor to perform remedial work.

Remedial work is performed as a result of pavement distress surveys performed by the Department.

240 During the warranty period, elective work and remedial work shall be performed at no cost to the Department. Elective work shall be at the Contractor's option. The scope of all elective work or remedial work to be performed as well as materials to be used shall be proposed by the Contractor and shall be subject to approval by the Department. Prior to proceeding with any warranty work or monitoring, all necessary permits shall be obtained from the Department.

Elective work during the warranty period will not be assessed a lane closure fee. For remedial work, costs for closure periods will be as shown in the contract.

250 During the warranty period, the Contractor may monitor the warranted UBWC using non-destructive procedures.

Coring, milling, or other destructive procedures may not be performed by the Contractor without prior consent of the Department. The Contractor will not be responsible for damages to the pavement as a result of coring, milling, or other destructive procedures conducted by the Department.

260 The Contractor has the first option to perform the remedial work. If the problem requires immediate attention, as determined by the Engineer, for safety of the traveling public and the Contractor cannot perform the remedial work within 24 h of notification, the Department will perform the remedial work. The Contractor shall be responsible for all costs incurred by the Department for remedial work performed by the Department. Remedial work performed by the Department will not alter the requirements, responsibilities, or obligations of the warranty.

414.17 Pavement Distress Indicators, Thresholds, and Remedial Action

The Department will use the following pavement distress indicators throughout the warranty period:

- 270
- (a) Delamination - physical separation of the UBWC that exposes the underlying surface.
 - (b) Rutting - transverse displacement of the UBWC.
 - (c) Raveling - wearing away of the UBWC.
 - (d) Skid Resistance - friction number as measured by ASTM E274 and ASTM E524.

The pavement threshold values for the pavement distress indicators will be evaluated for the entire length of the project for each lane. The threshold values for the pavement distress indicators are listed below:

Distress	Single Location	Multiple Locations
Delamination/Raveling	1/2 sq yd	1 sq yd/mi
Rut Depth	1/4 in.	average 1/4 in./mi
Friction Number*	no less than 30	average 35
* Individual friction tests will be performed in each lane every 1/2 mi for the length of the project.		

280

The Department may evaluate the warranted UBWC during the warranty period. A final condition survey will be made by the Department and the Contractor will be notified in writing of all sections exceeding the warranty threshold at least 90 days in advance of the expiration of the warranty period.

If the Department determines that any threshold level has been met or exceeded and remedial work is required, the Contractor shall submit a work plan and schedule to the Engineer for approval. The Contractor shall perform the remedial work within 30 calendar days of notification of approval by the Engineer.

If, anytime during the warranty period, 30% or more of the project requires, or has received remedial work, remedial work as determined by the Department shall be performed on the entire project.

If remedial or elective work performed by the Contractor necessitates repair or replacement of pavement markings, adjacent lanes or roadway shoulders, the required work shall be the responsibility of the Contractor.

Warranty requirements for all elective and remedial work will be limited to the life of the original contract warranty.

414.18 Department Maintenance

The Department may perform routine maintenance operations during the warranty period including, but not limited to, plowing, applying de-icing chemicals, repairs to safety appurtenances, pavement markings, mowing, and sign maintenance.

The Department will perform no routine pavement surface maintenance activities during the warranty period.

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414.19 Method of Measurement

Ultrathin bonded wearing course, of the type specified, will be measured by the square yard in accordance with 109.01.

414.20 Basis of Payment

Ultrathin bonded wearing course, of the type specified, will be paid for at the contract unit price per square yard.

Payment will be made under:

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Pay Item**Pay Unit Symbol**

Ultrathin Bonded Wearing Course for Approaches, _____ SYS
size

Ultrathin Bonded Wearing Course, _____ SYS
size

330 The cost of all incidentals including, but not limited to, surface preparation, asphalt emulsion, meeting smoothness requirements, and warranty bond shall be included in the cost of the pay items.

414.21 Final Warranty Acceptance

The Engineer will review the project in the field for any general defects not addressed in the indicators and recommend a Final Warranty Acceptance. The Department will issue the Contractor a Final Warranty Acceptance letter upon completion of the warranty period and all required remedial work.

SECTION 415 – BLANK**SECTION 416 - COLD IN-PLACE RECYCLING, CIR****416.01 Description**

This work shall consist of milling and pulverizing a portion of the existing asphalt pavement to specified depth and maximum size, mixing asphalt emulsion, water and additives to produce a recycled asphalt layer. This material shall then be placed and compacted to the approved design properties in accordance with 105.03.

416.02 Just-in-Time Training, JITT

10 The Engineer and the Contractor are required to attend a JITT course regarding CIR and both shall mutually agree on the course instructor, course content and training site. The training class shall be conducted at a project field location convenient for all project construction personnel responsible for CIR operations and inspection to attend.

The JITT course shall be held during normal working hours and be completed not more than 14 days prior to the start of CIR operations.

The Contractor shall provide a JITT instructor experienced in the construction methods, materials and test methods associated with asphalt emulsion stabilized CIR.

- 20 A copy of the course syllabus, handouts and presentation materials shall be submitted to the Engineer at least five business days before the course is to be taught.

416.03 Quality Control

- A QCP shall be submitted to the Engineer a minimum of five calendar days prior to the JITT. The QCP shall include the proposed CIR mix design, a start to finish process description to include discussion on corrective action measures, a list of proposed equipment, a list of proposed QC tests and testing frequencies, and the curing methods applied to the CIR. All QC test results and responses to test results shall be maintained during the duration of the contract and made available to the Engineer upon request.
- 30

The following table provides the type and minimum frequency for tests.

QC TESTING	
Test	Frequency ^{1,2}
Depth of Pulverization	1 per 500 ft
Pulverized Material Gradation	1 per 0.5 day of processing
Asphalt Emulsion Content	1 per 500 ft
Water Content	1 per 500 ft
Compacted In-Place Field Density	1 per 1,000 ft
Field Moisture Content for Curing	1 per each day of production
Optimum Field Density	1 per 2 days of production
1. The Contractor shall perform all QC tests within the first 500 ft after startup and after any change in the mix design. 2. Testing frequency is based upon linear feet of CIR processing.	

MATERIALS

416.04 Materials

- CIR shall consist of a homogenous blend of RAP combined with asphalt emulsion, water, and when required, recycling additives such as corrective aggregate or cement. Cement recycling additives used in asphalt emulsion stabilized CIR may be dry powder or slurry with a minimum dry solids content of 60%. The actual materials used are dependent on the CIR mix design and project requirements.
- 40

Materials for use in CIR shall be in accordance with the following:

- Asphalt Emulsion902.01(b)3
- Corrective aggregate to adjust gradation or supplement material volume:
- 50 1. Coarse or Dense Graded Aggregate, Class C or Higher904.03

2. Fine Aggregate 904.02

3. RAP shall be the product resulting from the cold milling or crushing of an existing asphalt pavement. The RAP coarse aggregate shall be processed so that 100% passes the 1 1/2 in. (37.5 mm) sieve.

Portland Cement, Type I..... 901.01(b)

Water 913.01

60

A Type D certification in accordance with 916 and the Frequency Manual shall be provided for the CIR.

416.05 Mix Design

The CIR mix design shall be in accordance with ITM 592 and shall be comprised of existing RAP, asphalt emulsion, and if necessary, recycling additives. The mix design and all associated testing shall be performed, using samples of the existing pavement material from the project site representing the recycling depth, by a design laboratory that is AASHTO re:source accredited in HMA and asphalt emulsion.

70 Additional mix designs shall be developed when the in-place material changes significantly to establish representative mixes for the entire job. The Contractor shall be responsible for obtaining all samples required to develop the mix design. One sample per lane mile of planned CIR shall be the minimum sampling frequency for mix design preparation.

The mix design, or designs, shall be submitted to the Engineer for approval at least five calendar days prior to the JITT and shall include results of all tests performed. If new materials are added, a new mix design shall be submitted at least one day prior to implementation. New mix designs shall include the updated test results.

80

CONSTRUCTION REQUIREMENTS

416.06 Roadway Preparation

Snowplowable raised pavement markers shall be removed in accordance with 808.11(e) prior to CIR operations.

Grass and other vegetation shall be removed from the edge of the existing pavement to prevent contamination of the pulverized material during milling operation.

90

Grade adjustments of existing structures shall be made in accordance with 720.04 prior to CIR operations, except existing structures shall be lowered, properly covered, and filled with material compatible with the CIR mix design to maintain traffic.

All areas of soft or yielding subgrade, as shown on the plans, shall be corrected prior to CIR operations.

416.07 Equipment

100 The recycling equipment shall be capable of milling the existing asphalt pavement, sizing the resulting RAP, and mixing the RAP with the materials stipulated in the mix design. The recycling equipment shall be capable of meeting the specified sizing requirement with either the milling process or with additional sizing equipment. The recycling equipment shall be capable of producing a homogenous and uniformly coated CIR mixture by mixing the RAP with the asphalt emulsion, water and any other additives, either in the cold planer housing or in an additional mixing chamber. The equipment used for placement of the CIR mixture shall be capable of the placement in accordance with 105.03.

110 The CIR equipment shall consist of the following major components:

(a) Cold In-Place Recycler Equipment

The cold in-place recycling equipment will include either a single unit recycler or a multi-unit recycler.

1. Single Unit Recycler

120 The single-unit recycler shall be a self-propelled cold milling/cold recycling machine with a down cutting cutter head capable of pulverizing and recycling the existing HMA pavement to the depth specified, incorporate the asphalt emulsion and water, and combine the materials to produce a homogenous mixture. The machine shall have two systems for adding asphalt emulsion and water. Each system having a full width spray bar with a positive displacement pump interlocked to the machine's ground speed to ensure that the amount of asphalt emulsion and water being added is automatically adjusted with changes to the machine's ground speed. Each additive system shall have its own spray bar equipped with two nozzles per foot of spray bar and be capable of incorporating up to 7 gal./sq yd of asphalt emulsion or water. Individual valves on the spray bar shall be capable of being turned off as necessary to minimize asphalt emulsion and water overlap on subsequent passes.

2. Multi-Unit Recycler

130 A multi-unit recycler may be utilized instead of a single unit recycler. The multi-unit recycler shall contain the following:

- 140 a. A self-propelled cold milling machine capable of pulverizing the existing asphalt material in a single pass to the depth shown on the plans and to a minimum width of not less than 12 1/2 ft. The machine shall have automatic depth controls to maintain the cutting depth to within $\pm 1/4$ in. of that shown on the plans and shall have a positive means for controlling cross slope elevations. The use of a heating device to soften the pavement will not be allowed.

- 150 b. A material-sizing unit having screening and crushing capabilities to reduce the cold pulverized material to the appropriate size. The screening and crushing unit shall have a closed-circuit system capable of continuously returning oversized material to the crusher. All pulverized material shall be processed to the maximum size requirements specified.
- 160 c. A mixing unit equipped with a belt scale for the continuous weighing of the pulverized and sized asphalt material and a coupled/interlocked computer controlled liquid metering device. The mixing unit shall be an on-board completely self-contained pugmill. The liquid metering device shall deliver the amount of asphalt emulsion to within $\pm 0.25\%$ of the required amount by weight of the pulverized asphalt material. The asphalt emulsion pump shall be of sufficient capacity to allow emulsion contents up to 4.0% by weight of pulverized material. Also, automatic digital readings shall be displayed for both the flow rate and total amount of pulverized asphalt material and asphalt emulsion in appropriate units of weight and time.

(b) Spreaders for Dry Cement

170 Spreaders used to apply dry cement recycling additives shall be non-pressurized mechanical vane-feed, cyclone or screw type capable of providing a consistent, accurate and uniform distribution of material while minimizing dust during construction.

(c) Additive Slurry Storage and Supply Equipment

180 Slurry shall be produced using a batch or continuous-flow type stationary mixer equipped with calibrated metering and feeding devices that introduce the cement, water, and additives into the mixer in the specified quantities. Additive slurry storage and supply equipment shall have agitators or similar equipment to keep the slurry in suspension when held in the slurry batch or storage tanks. Slurry shall be kept in suspension during transport using agitator equipment.

(d) Spreading of Corrective Aggregate

 Corrective aggregate, when required, shall be placed with a mechanical spreader or a conventional paver.

(e) Water Truck

190 A water truck for supplying water to the milling equipment during CIR operation shall be provided. The water truck system shall be able to supply the mixing chamber, if necessary, to provide an independent source of water to properly disperse the asphalt emulsion.

(f) Laydown Equipment

The processed CIR mixture shall be spread uniformly across the recycling width using either a self-propelled paver in accordance with 409.03(c) or screed integral to the recycling equipment.

The screed shall be controlled by electronic grade and cross slope control. The equipment shall be of sufficient size and power to spread the recycled material in one continuous pass, without segregation, in accordance with 105.03. Heating of the screed will not be allowed.

200

In utilizing a self-propelled paver, material shall either be loaded directly into the paver hopper from the recycling equipment or loaded by a pickup device from a windrow.

If utilizing a pickup device, it shall be capable of removing and transferring the entire windrow of recycled mix in a single pass. The pick-up machine shall be within 150 ft of the mixing unit throughout the treatment process.

(g) Compaction Equipment

210

Compaction equipment shall be in accordance with 409.03(d). The number, weight, and types of rollers shall be as necessary to obtain required compaction. At a minimum, the following rollers shall be used:

1. At least one pneumatic tired roller in accordance with 409.03(d)3 with a minimum weight of not less than 20 t.
2. At least one double drum vibratory roller in accordance with 409.03(d)4 with a minimum weight of not less than 10 t.

220

416.08 Weather Limitations

CIR operations shall be performed when the RAP temperature, or pavement surface temperature, is above 50°F with ambient temperatures above 35°F for seven days. The Engineer may restrict work when the heat index is greater than 100°F. The CIR shall not be performed before May 1 or after October 1.

416.09 Processing and Mixing Operation

For CIR mixtures, the pulverization shall produce a gradation that has 100% passing the 1 1/2 in. (37.5 mm) sieve.

230

Corrective aggregate, when required, shall be spread onto the existing surface using a mechanical spreader or a conventional paver.

An additive used in asphalt emulsion stabilized CIR may be dry powder or slurry and the Contractor shall address the application methods and fugitive dust control procedures in the QCP when dry powder materials are used.

240 The pulverized material shall be processed through a mixing unit capable of combining the pulverized material, asphalt emulsion, and any additives to produce a homogenous recycled mixture. The asphalt emulsion shall be injected into the pulverized asphalt material at the initial rate determined by the mix design and approved by the Engineer. Sampling and mix design may determine different levels of asphalt emulsion at various portions of the project.

250 When a paving fabric is encountered during the pulverization operation, the Contractor shall make necessary changes in equipment or operations so incorporation of shredded fabric into the CIR does not affect the performance parameters or inhibit placement or compaction of the CIR. The Contractor shall be required to remove and properly dispose of oversized pieces of paving fabric. The Contractor shall make the necessary adjustments in equipment or operations so that the shredded fabric in the recycled material is no more than 5 sq in. No fabric piece shall have a dimension exceeding a length of 4 in.

Rubberized crack filler, durable pavement markings, loop wires, and other non-pavement materials shall be removed, as observed, from the roadway during the CIR process. Residual materials that cannot be completely removed may be incorporated into the mixture if the Contractor can demonstrate that those added materials will not adversely affect performance.

260 Any such materials retained in the mixture shall be appropriately sized and blended so as to not adversely affect the strength of the CIR.

Asphalt emulsion shall have an application tolerance determined by adding $\pm 0.25\%$ to the percent total asphalt emulsion content recommended by the mix design.

The Contractor can request the asphalt emulsion percentage to exceed the upper tolerance provided the mix design requirements are satisfied at the requested percentage. The request will be subject to approval by the Engineer.

416.10 Control Strip and Compaction

270 A minimum 500 ft long control strip shall be conducted on the first day of production to verify the construction process meets the requirements as specified. The control strip shall allow the Contractor to:

- (a) demonstrate the proposed equipment, materials, and processes can produce a CIR layer in accordance with specification requirements,
 - (b) determine the optimal rates for the asphalt emulsion, water, and any additives recommended for the reclaimed material, and
 - (c) determine the sequence and manner of rolling necessary to obtain specified density requirements.
- 280

The CIR density shall be achieved with the same equipment, materials, construction methods, and density requirements used on the accepted control strip. A new control strip shall be constructed if changes are made outside of the tolerances of the original mix design, equipment, or construction methods.

290 A rolling pattern that produces the maximum obtainable density, or optimum field density, shall be determined during the control strip using a roller in accordance with 409.03(d)4. The Contractor shall provide a sequence and manner of rolling by establishing a roller pass versus density chart showing the progress of densification from initial lay down through optimum field density using a properly calibrated nuclear gauge in accordance with AASHTO T 310. Production may continue after approval of the control strip.

300 The Contractor shall perform compaction testing in accordance with AASHTO T 310 during production to ensure compaction is between 97% and 102% of the optimum field density established during the control strip. If two successive tests indicate compaction is over 102% or below 97% of the optimum field density, a new rolling pattern and roller pass versus density chart shall be established.

The QC technician shall be on site, observing all compaction efforts, and approving areas as they reach minimum relative compaction. Care shall be taken not to over compact the mat.

310 Any type of rolling effort that causes cracking, displacement, or other type of pavement distress shall be discontinued until such time as the problem can be resolved as approved by the Engineer.

Rollers shall not be started or stopped on recycled material except when changing direction during the compaction process.

All tests shall be conducted at the stated QC testing frequencies throughout CIR operations.

416.11 Opening to Traffic

320 Opening to traffic shall occur after sufficient cure time has been applied to the CIR so traffic will not initiate raveling or permanent deformation. All loose particles that may develop on the pavement surface shall be removed by a rotary power broom in accordance with 409.

After opening to traffic, the surface of the recycled pavement shall be maintained in a condition suitable for the safe movement of traffic.

416.12 Maintenance

The Contractor shall maintain the recycled pavement in a manner satisfactory to the Engineer until the surface course has been constructed.

330 Any damage to the completed recycled material shall be repaired by the Contractor prior to the placement of new asphalt concrete or final surface sealing. Patching shall be in accordance with 304. The excavated patch areas shall be filled and compacted with HMA or CIR material as directed by the Engineer. No direct payment will be made for damage or repair unless approved by the Engineer.

416.13 Curing

Before placing the final surfacing, the recycled surface shall remain in-place for a minimum of three days and meet one of the following conditions:

- 340 (a) there is less than 3.0% moisture remaining in the mixture, or
- (b) the material has cured for a minimum of 10 consecutive days without rainfall.

The planned method and duration of curing for CIR shall be in accordance with the QCP. The specified surface course shall be placed within two weeks of the CIR final cure, but no later than November 1.

416.14 Milling

350 The entire surface of the CIR shall be scarified in accordance with 306.04 in preparation for the overlay, except liquidated damages will not apply. Construction engineering shall be provided in accordance with 105.08(b).

416.15 CIR Surface Course

The surface course atop the CIR shall be as shown on the plans.

The CIR shall be swept of all loose material and standing water with a rotary power broom in accordance with 409 immediately prior to placing the surface. The CIR shall be swept lightly to avoid damage to the CIR.

360

A tack coat shall be required only for the HMA overlay and shall be applied to the CIR in accordance with 406 immediately following sweeping operations.

Monuments shall be reestablished in accordance with 615.10.

416.16 Method of Measurement

370 The CIR will be measured by the square yard, complete in place. Asphalt emulsion will be measured by the ton. Aggregate used to adjust the CIR gradation will be measured by the ton. HMA patching will be measured in accordance with 304.06. Milling will be measured in accordance with 306.10. Re-established monuments will be measured in accordance with 615.13. Grade adjustment of existing structures will be measured in accordance with 720.06. Removal of snowplowable raised pavement markers will be measured in accordance with 808.12. Portland cement will be measured by the ton.

416.17 Basis of Payment

The CIR will be paid for at the contract unit price per square yard, complete in place. Asphalt emulsion will be paid for at the contract unit price per ton, complete in place. Aggregate used to adjust the CIR gradation will be paid for at the contract unit price per ton, complete in place. HMA patching will be paid for in accordance with 304.07 for the thickness shown on the plans. Milling will be paid for in accordance with 306.11. Re-established monuments will be paid for in accordance with 615.14. Grade adjustment of existing structures will be paid for in accordance with 720.07. Removal of snowplowable raised pavement markers will be paid for in accordance with 808.13.

Portland cement will be paid for in accordance with 104.03. The change order will include direct material costs, delivery costs, and shall not include any other markups.

Payment will be made under:

Pay Item	Pay Unit Symbol
Cold In-Place Recycling.....	SYS
Corrective Aggregate, CIR.....	TON
Stabilizing Material, Asphalt Emulsion.....	TON
Stabilizing Material, Portland Cement	TON

The costs of the CIR mix design and QC testing shall be included in the cost of the CIR.

The costs associated with removal of grass and vegetation, rubberized crack filler, durable pavement markings, loop wires and other non-pavement materials shall be included in the cost of the CIR.

The costs associated with stabilizing, compacting, curing and maintenance of the CIR not related to failing subgrade shall be included in the cost of the CIR.

The cost associated with mixing water shall be included in the cost of the CIR.

The cost associated with aggregate when used to supplement material volume shall be included in the cost of the corrective aggregate pay item.

When portland cement is a required stabilizing material, costs associated with mixing, installation, compaction, curing, and maintenance shall be included in the cost of the CIR.

The cost associated with aggregate when used to adjust the CIR gradation shall be included in the cost of the corrective aggregate pay item.

The cost of milling the asphalt emulsion stabilized CIR to maintain profile shall be included in the cost of the milling.

In the locations of failing subgrade, removal of the CIR shall be included in the cost of subgrade treatment.

SECTION 417 - COLD CENTRAL PLANT RECYCLING, CCPR

417.01 Description

This work shall consist of a mixture of sized **RAP** millings from existing asphalt pavement or existing stockpiles, asphalt emulsion, water, and other additives. The mixture shall be produced at a nearby location, then placed and compacted to produce a recycled asphalt layer to the approved design properties in accordance with 105.03.

417.02 Just-in-Time Training

- 10 The Engineer and the Contractor are required to attend a **JITT** course regarding CCPR and both shall mutually agree on the course instructor, course content, and training site. The training class shall be conducted at a project field location convenient for all project construction personnel responsible for CCPR operations and inspection to attend.

The JITT course shall be held during normal working hours and be completed not more than 14 days prior to the start of CCPR operations.

- 20 The Contractor shall provide a JITT instructor experienced in the construction methods, materials, and test methods associated with asphalt emulsion stabilized CCPR. A copy of the course syllabus, handouts, and presentation materials shall be submitted to the Engineer at least five business days before the course is to be taught.

417.03 Quality Control

A **QCP** shall be submitted to the Engineer a minimum of five calendar days prior to the JITT. The QCP shall include the proposed CCPR mix design, a start to finish process description to include discussion on corrective action measures, a list of proposed equipment, a list of proposed QC tests and testing frequencies, and the curing methods and procedures applied to the CCPR.

30

All QC test results and response to test results shall be maintained during the duration of the contract and made available to the Engineer upon request.

The following table provides the type and minimum frequency for tests:

QC TESTING	
Test	Frequency ^{1,2}
Depth of Laydown	1 per 500 ft
Pulverized Material Gradation	1 per 1,000 tons of production
Pulverized Material Moisture Content	1 per 500 tons of production
Asphalt Emulsion Content ³	1 per 500 tons of production
Water Content ³	1 per 500 tons of production
Compacted In-Place Field Density	1 per 1,000 ft
Field Moisture Content for Curing	1 per each day of production
Optimum Field Density	1 per 2 days of production
1. The Contractor shall perform all QC tests within the first 500 ft after startup and after any change in the mix design. 2. Testing frequency is based upon either linear feet of CCPR laydown or tons of CCPR mixture processing. 3. Asphalt emulsion content and water content shall be taken from the readings of the control settings of the mixing unit.	

MATERIALS

417.04 Materials

- 40 CCPR shall consist of a homogenous blend of RAP combined with asphalt emulsion, water, and when required, recycling additives such as corrective aggregate or cement. Cement recycling additives used in asphalt emulsion stabilized CCPR may be dry powder or slurry with a minimum dry solids content of 60%. The actual materials used are dependent on the CCPR mix design and project requirements.

Materials for use in CCPR shall be in accordance with the following:

- Asphalt Emulsion 902.01(b)3
- Corrective Aggregate to adjust gradation or
 50 supplement material volume:
1. Coarse or Dense Graded Aggregate,
 Class C or Higher 904.03
 2. Fine Aggregate 904.02
 3. RAP shall be the product resulting from the cold milling or crushing of existing asphalt pavement and processed so that 100% passes the 1 1/2 in. (37.5 mm) sieve.
- Portland Cement, Type I 901.01(b)
- Water 913.01

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A Type D certification in accordance with 916 and the Frequency Manual shall be provided for the CCPR.

417.05 Mix Design

CCPR mix designs shall be in accordance with ITM 592 and shall be comprised of existing RAP, asphalt emulsion, and recycling additives, if necessary. The mix design and all associated testing shall be performed using samples of each proposed material. RAP samples shall either be collected from the existing pavement at the project site representing the milling depth or from the RAP stockpile to be used during construction. The mix design shall be completed by a design laboratory that is AASHTO re:source accredited in HMA and asphalt emulsion. Additional mix designs shall be developed when the proposed material changes significantly to establish representative mixes for the entire job. The Contractor shall be responsible for obtaining all samples required to develop the mix design. One sample per lane mile of planned CCPR shall be the minimum sampling frequency for mix design preparation.

The mix design, or designs, shall be submitted to the Engineer for approval at least five calendar days prior to the JITT and shall include results of all tests performed. If new materials are added, a new mix design, including the updated test results, shall be submitted at least one day prior to implementation.

CONSTRUCTION REQUIREMENTS

417.06 Roadway Preparation

Snowplowable raised pavement markers shall be removed in accordance with 808.11(e) prior to CCPR operations.

Grass and other vegetation shall be removed from the edge of the existing pavement to prevent contamination of the pulverized asphalt material during milling operation.

All areas of soft or yielding subgrade shall be corrected prior to CCPR operations.

If the CCPR mix is to be placed on a prepared subgrade or aggregate base, the Contractor shall ensure the subgrade soils and base have been properly prepared, moisture treated, and compacted to the minimum density as specified, immediately prior to placement of the CCPR mix to create an evenly graded, unyielding surface.

417.07 Pavement Removal

The existing asphalt pavement shall be milled in accordance with 306 to the length, depth, and width as specified. The RAP shall be free of contamination of dirt, base, concrete or other deleterious materials such as silt and clay.

When paving fabric is encountered during the pulverization operation, the Contractor shall make necessary changes in equipment or operations so incorporation of shredded fabric into the CCPR does not affect the performance parameters or inhibit placement or compaction of the CCPR. The Contractor shall remove and properly dispose of oversized pieces of paving fabric. The Contractor shall make the necessary adjustments in equipment or operations so that the shredded fabric in the recycled

- 110 material is no more than 5 sq in. No fabric piece shall have a dimension exceeding a length of 4 in.

Rubberized crack filler, durable pavement markings, loop wires, and other non-pavement materials shall be removed as observed from the roadway. Residual materials that cannot be completely removed may be incorporated into the mixture if the Contractor can demonstrate that those added materials will not adversely affect performance.

- 120 Any such materials retained in the mix shall be appropriately sized and blended so as not to adversely affect the strength of the recycled pavement.

417.08 Equipment

The equipment shall consist of the following major components:

(a) Milling Machine/Pavement Cold Planer

- 130 Milling equipment shall be in accordance with 306.03(a). The equipment shall be capable of pulverizing the existing asphalt material in a single pass to the depth shown on the plans. The machine shall have automatic depth controls to maintain the cutting depth to within $\pm 1/4$ in. of that shown on the plans. The milling operation shall not disturb or damage the underlying material. The use of a heating device to soften the pavement will not be allowed.

(b) Additive Slurry Storage and Supply Equipment

- 140 Slurry shall be produced using a batch or continuous-flow type stationary mixer equipped with calibrated metering and feeding devices that introduce the cement, water and additives into the mixer in the specified quantities. Additive slurry storage and supply equipment shall have agitators or similar equipment to keep the slurry in suspension when held in the slurry batch or storage tanks. Slurry shall be kept in suspension during transport using agitator equipment.

(c) Sizing Equipment

A material-sizing unit shall be capable of sizing using a scalping screen or crushing capabilities to reduce RAP to a maximum size of 1 1/2 in. (37.5 mm) or to the maximum size requirements specified prior to mixing with the asphalt emulsion.

(d) Mixing and Proportioning Equipment

- 150 The equipment shall be capable of processing sized RAP, asphalt emulsion, water, and any additives stipulated in the mix design into a homogenous and uniformly coated CCPR mixture. The CCPR mixing unit shall be a twin shaft pugmill or other approved mixer, including the drum type capable of producing a consistent uniform mixture. The outlet of the mixer shall be such that it prevents segregation of the material when discharged. The equipment shall display automatic digital readings for the flow rate of both the RAP and asphalt emulsion in appropriate units of weight and time.

The mixing apparatus shall have cold feed hopper equipped with vibrators on the

hopper walls to assist the free flow of materials to a variable speed belt conveyor. Control of the RAP shall be by mechanically adjustable gate valves at the point of discharge or a RAP belt scale for the continuous weighing of the RAP. The variable speed belt conveyor or RAP belt scale shall be interlocked to the asphalt emulsion metering device.

The asphalt emulsion metering device shall be capable of automatically adjusting the flow of asphalt emulsion to compensate for any variation in the amount of RAP introduced into the mixing apparatus. Asphalt emulsion shall be metered by weight of RAP using a calibrated meter that will accurately measure the amount of asphalt emulsion to within a tolerance of $\pm 2.0\%$ of the specified rate.

(e) Hauling Equipment

Hauling equipment shall be in accordance with 409.03(b).

(f) Laydown Equipment

Laydown equipment shall be in accordance with 409.03(c).

The paver screed shall be controlled by electronic grade and cross slope control. Heating of the screed shall not be allowed.

CCPR material shall either be loaded directly into the paver hopper from transport trucks or loaded by a pickup device. If utilizing a pickup device, it shall be capable of removing and transferring the entire windrow of recycled mix in a single pass.

The equipment used for placement of the CCPR mixture shall be capable of the placement in accordance with 105.03.

(g) Compaction Equipment

Compaction equipment shall be in accordance with 409.03(d). The number, weight, and types of rollers shall be as necessary to obtain required compaction. At a minimum, the following rollers shall be used:

1. At least one pneumatic tired roller in accordance with 409.03(d)3 with a minimum weight of not less than 20 t.
2. At least one double drum vibratory roller in accordance with 409.03(d)4 with a minimum weight of not less than 10 t.

417.09 Weather Limitations

CCPR operations shall be performed when the RAP temperature, or pavement surface temperature, is above 50°F with ambient temperatures above 35°F for seven days. The Engineer may restrict work when the heat index is greater than 100°F. The CCPR shall not be performed before May 1 or after October 1.

417.10 Material Sizing and Stockpiling

The gradation of the RAP shall have 100% passing the 1 1/2 in. (37.5 mm) sieve, or be sized to meet specific contract requirements.

RAP that has been crushed and screened shall be stockpiled and maintained to prevent reconsolidation. Water may be added to RAP as it is screened and crushed to abate dust and mitigate reconsolidation.

- 210 Corrective aggregate, if required, shall either be mixed with RAP to produce a homogenous mixture during stockpiling or fed into the mixing apparatus at the rate determined by the mix design.

417.11 Processing and Mixing Operation

The sized RAP shall be processed through a mixing unit capable of combining the sized RAP, asphalt emulsion, and any additives to produce a homogenous recycled mixture.

- 220 An additive used in asphalt emulsion stabilized CCPR may be dry powder or slurry. The Contractor shall address the application methods and fugitive dust control procedures in the QCP when dry powder materials are used.

The asphalt emulsion shall be injected into the CCPR materials at the initial rate determined by the mix design and approved by the Engineer. Sampling and mix design may determine different levels of asphalt emulsion at various portions of the project.

The asphalt emulsion shall have an application tolerance determined by adding $\pm 0.25\%$ to the percent total asphalt emulsion content.

- 230 The Contractor can request the asphalt emulsion percentage to exceed the upper tolerance provided the mix design requirements are satisfied at the requested percentage. The request will be subject to approval by the Engineer.

417.12 Placement

The depth of CCPR shall be as indicated on the plans.

The hauling equipment shall deliver the blended CCPR material into the paver within one hour of mixing or before the asphalt emulsion begins to break and set.

- 240 CCPR single lift thickness shall be a minimum compacted depth of 3 in. and shall not exceed a maximum compacted depth of 5.5 in. Tack coat in accordance with 406 shall be applied between the lifts.

417.13 Control Strip and Compaction

A minimum 500 ft long control strip shall be conducted on the first day of production to verify the construction process meets the requirements as specified. The control strip shall allow the Contractor to:

- 250 (a) demonstrate the equipment, materials, and processes proposed to produce a CCPR layer in accordance with specification requirements,
- (b) determine the optimal rates for the asphalt emulsion, water and any additives recommended for the material, and
- (c) determine the sequence and manner of rolling necessary to obtain specified density requirements in one uniformly compacted layer.

260 The CCPR density shall be achieved with the same equipment, materials, construction methods, and density requirements used on the accepted control strip. A new control strip shall be constructed if changes are made outside of the tolerances of the original mix design, equipment, or construction methods.

A rolling pattern that produces the maximum obtainable density, or optimum field density, shall be determined during the control strip using a roller in accordance with 409.03(d)4. The Contractor shall provide a sequence and manner of rolling by establishing a roller pass versus density chart that shows the progress of densification from initial lay down through optimum field density using a properly calibrated nuclear gauge in accordance with AASHTO T 310. Production may continue after approval of the control strip.

The Contractor shall perform compaction testing in accordance with AASHTO T 310 during production to ensure compaction is between 97% and 102% of the optimum field density established during the control strip. If two successive tests indicate compaction is over 102% or below 97% of the optimum field density, a new rolling pattern and roller pass versus density chart shall be established.

280 The QC technician shall be on site, observing all compaction efforts, and approving areas as they reach minimum relative compaction. Care shall be taken not to over compact the mat.

Any type of rolling effort that causes cracking, displacement, or other type of pavement distress shall be discontinued until such time as the problem can be resolved as approved by the Engineer.

Rollers shall not be started or stopped on recycled material unless when changing direction during the compaction process.

290 All tests shall be conducted at the stated QC testing frequencies throughout CCPR operations.

417.14 Opening to Traffic

Opening to traffic shall occur after sufficient cure time has been applied to the CCPR so traffic will not initiate raveling or permanent deformation. All loose particles that may develop on the pavement surface shall be removed by a rotary power broom in accordance with 409.

After opening to traffic, the surface of the recycled pavement shall be maintained in a condition suitable for the safe movement of traffic.

300

417.15 Maintenance

The Contractor shall maintain the recycled pavement in a manner satisfactory to the Engineer until the surface course has been constructed.

Any damage to the completed recycled material shall be repaired by the Contractor prior to the placement of new asphalt concrete or final surface sealing. Patching shall be in accordance with 304. The excavated patch areas shall be filled and compacted with HMA or CCPR material as directed by the Engineer. No direct payment will be made for damage repair unless approved by the Engineer.

310

417.16 Curing

Before placing the final surfacing, the recycled surface shall remain in-place for a minimum of three days and meet one of the following conditions:

- (a) there is less than 3.0% moisture remaining in the mixture, or
- (b) the material has cured for a minimum of 10 consecutive days without rainfall.

320 The planned method and duration of curing for CCPR shall be in accordance with the QCP. The specified surface course shall be placed within two weeks of the CCPR final cure, but no later than November 1.

417.17 Milling and Pavement Smoothness

When the CCPR material is placed in a single lift, the entire surface of the CCPR shall be scarified in accordance with 306.04 in preparation for the overlay, except liquidated damages will not apply. Construction engineering in accordance with 105.08(b) shall be provided.

330 Pavement smoothness of the cured CCPR mat shall meet the requirements of 401.18(b) The Contractor shall correct humps or depressions exceeding the tolerances in accordance with 401.18(c).

417.18 CCPR Surface Course

The CCPR shall be swept of all loose material and standing water with a rotary power broom in accordance with 409 immediately prior to placing the tack coat. A tack coat shall be required and shall be applied to the CCPR in accordance with 406.

340 Monuments shall be reestablished in accordance with 615.10 after the surface course is placed.

417.19 Method of Measurement

The CCPR will be measured by the square yard, complete in place. Asphalt emulsion will be measured by the ton. Aggregate **used** to adjust the CCPR gradation will be measured by the **ton**. HMA Patching will be measured in accordance with 304.06. Re-established monuments will be measured in accordance with 615.13. Grade adjustment of existing structures will be measured in accordance with 720.06. Removal of snowplowable raised pavement markers will be measured in accordance with 808.12. Portland cement will be measured by the ton.

350

417.20 Basis of Payment

The CCPR will be paid for at the contract unit price per square yard, complete in place. Asphalt emulsion will be paid for at the contract unit price per ton, complete in place. Aggregate used to adjust the CCPR gradation will be paid for at the contract unit price per ton, complete in place. HMA patching will be paid for in accordance with 304.07 **for** the thickness **shown** on the plans. Re-established monuments will be paid for in accordance with 615.14. Grade adjustment of existing structures will be paid for in accordance with 720.07. Removal of snowplowable raised pavement markers will be paid for in accordance with 808.13.

360

Portland cement will be paid for in accordance with 104.03. The change order will include direct material costs, delivery costs, and shall not include any other markups.

Payment will be made under:

	Pay Item	Pay Unit Symbol
	Cold Central Plant Recycling	SYS
	Corrective Aggregate, CCPR	TON
370	Stabilizing Material, Asphalt Emulsion.....	TON
	Stabilizing Material, Portland Cement	TON

The costs associated with the CCPR mix design and quality control testing shall be included in the cost of the cold central plant recycling.

The costs associated with the removal of grass and vegetation, rubberized crack filler, durable pavement markings, loop wires and other non-pavement materials shall be included in the cost of the **CCPR**.

380 The costs associated with pulverizing, stabilizing, compacting, curing and maintenance of the CCPR not related to failing subgrade shall be included in the cost of the **CCPR**.

The cost associated with mixing water for cold central plant material shall be included in the cost of the cold central plant recycling.

The cost associated with aggregate **used** to supplement material volume shall be included in the cost of the corrective aggregate pay item.

- 390 When portland cement is a required stabilizing material, costs associated with mixing, installation, compaction, curing, and maintenance shall be included in the cost of the **CCPR**.

The cost associated with aggregate **used** to adjust the CCPR gradation shall be included in the cost of the corrective aggregate pay item.

The costs of the asphalt emulsion stabilizing material shall be included in the cost of the stabilizing material pay item.

- 400 In the locations of failing subgrade, removal of the CCPR shall be included in the cost of subgrade treatment.

400-R-780 MSCR BINDER SPECIFICATIONS

(Revised 05-17-24)

The Standard Specifications are revised as follows:

SECTION 401, BEGIN LINE 36, DELETE AND INSERT AS FOLLOWS:

401.04 Design Mix Formula

A DMF shall be prepared in accordance with 401.05 and submitted in a format acceptable to the Engineer one week prior to use. The DMF shall be based on the ESAL category identified in the pay item and shall state the mixture designation and maximum particle size in the mixture. No mixture shall be used until the DMF has been assigned a mixture number by the DTE. *The mixture number will be assigned for each calendar year. Assigning of a mixture number shall not in any way be construed as acceptance in conjunction with 401.19.*

The DMF shall state the binder content, the ΔP_b as determined in accordance with ITM 591, and the MAF. The DMF shall state the source, type, and dosage rate of any stabilizing additives.

The ESAL category identified in the pay item correlates to the following ESAL ranges.

ESAL Category	ESAL
2 *	< 3,000,000
3	3,000,000 to < 10,000,000
4 *	\geq 10,000,000
* A category 2 mixture shall replace a category 1 mixture and a category 4 mixture shall replace a category 5 mixture.	

A category 4 mixture meeting all the requirements of a category 3 mixture may be used in lieu of a category 3 mixture.

The plant discharge temperature for any mixture shall not be more than 315°F whenever PG ~~64-2258S-28~~ or PG ~~70-2258H-28~~ binders are used or not more than 325°F whenever PG ~~76-2258E-28~~ binder is used. QC/QA HMA may be produced using a water-injection foaming device. The DMF shall list the minimum and maximum plant discharge temperatures as applicable to the mixture.

401.05 Volumetric Mix Design

The DMF shall be determined for each mixture from a volumetric mix design by a design laboratory selected from the Department's list of ~~Qualified~~ *QPL of HMA Mix Design Laboratories. A laboratory will be considered for inclusion on the QPL by following the procedure in ITM 574.* A volumetric mixture shall be designed in accordance with AASHTO R 35 and the respective AASHTO reference as listed below.

All loose mixtures shall be conditioned ~~for 4 h~~ in accordance with AASHTO R 30 prior to testing, *except as follows:*

(a) *Mixtures shall be conditioned for 4 hours.*

(b) *Dense graded mixtures shall be conditioned at $300 \pm 5^{\circ}\text{F}$ and open graded mixtures shall be conditioned at $260 \pm 5^{\circ}\text{F}$.*

Steel furnace slag coarse aggregate, when used in an intermediate or base mixture application, shall have a deleterious content less than 4.0% as determined in accordance with ITM 219.

SECTION 401, BEGIN LINE 82, INSERT AS FOLLOWS:

Dust/Calculated Effective Binder Ratio *for dense graded mixtures* shall be 0.6 to 1.4. The Dust/Calculated Effective Binder Ratio for 4.75 mm mixtures shall be 1.0 to 2.0.

SECTION 401, BEGIN LINE 97, DELETE AND INSERT AS FOLLOWS:

The percent draindown of open graded mixtures shall not exceed 0.30% in accordance with AASHTO T 305. Open graded mixtures may incorporate recycled materials and fibers. The recycled materials shall be in accordance with 401.06. The fiber type and minimum dosage rate shall be in accordance with AASHTO M 325. The binder for open graded mixtures may have ~~the upper temperature classification reduced by 6°C from the specified binder grade~~ *a traffic loading designation of H* if fibers are incorporated into the mixture or if 3.0% ~~reclaimed asphalt shingles~~ *RAS* by weight of the total mixture is used.

SECTION 401, BEGIN LINE 114, DELETE AND INSERT AS FOLLOWS:

A PG binder grade or source change will not require a new mix design. If the ~~upper temperature classification~~ *traffic loading designation* of the PG binder is lower than the original PG grade, a new TSR value is required.

SECTION 401, AFTER LINE 173, INSERT AS FOLLOWS:

If a pay item is designated as PG 58S-28 and a surface mixture, the binder grade used shall be PG 58H-28 when the Binder Replacement is less than or equal to 15.0%.

SECTION 401, BEGIN LINE 232, DELETE AND INSERT AS FOLLOWS:

The Engineer will randomly select the location within each subplot for sampling in accordance with ITM 802. The first 300 t of the first subplot of the first lot for each ~~mixture~~ *original contract* pay item in a calendar year will not be sampled. An acceptance sample will consist of plate samples obtained in accordance with ITM 802 and ITM 580. The Engineer will take immediate possession of the samples.

SECTION 401, BEGIN LINE 404, DELETE AND INSERT AS FOLLOWS:

applicable portion of the mixture for each. The temperature of each mixture at the time of spreading shall be less than 315°F whenever PG ~~64-225~~ *58S-28* or PG ~~70-225~~ *58H-28* binders are used or not more than 325°F whenever PG ~~76-225~~ *58E-28* binder is used. No mixture shall be placed on a previously paved course that has not cooled to below 175°F . For mixtures compacted in accordance with 402.15, the temperature of each mixture at the time of spreading shall not be less than 245°F .

SECTION 401, BEGIN LINE 1004, DELETE AND INSERT AS FOLLOWS:

QC/QA-HMA, 58, mm.... TON
(ESAL⁽¹⁾) (PG⁽²⁾) (Course⁽³⁾) (Mix⁽⁴⁾)

- (1) ESAL Category as defined in 401.04
 (2) Number represents the high temperature binder grade. *Letter represents traffic loading designation.* Low temperature grades are - ~~22~~28
 (3) Surface, Intermediate, or Base
 (4) Mixture Designation

SECTION 402, BEGIN LINE 36, DELETE AND INSERT AS FOLLOWS:

The DMF will be based on the ESAL and mixture designation as follows:

Mixture Type	Type B*	Type C	Type D
Design ESAL	< 3,000,000	3,000,000 to < 10,000,000	≥ 10,000,000
Surface	4.75 mm	4.75 mm	4.75 mm
	9.5 mm	9.5 mm	9.5 mm
	12.5 mm	12.5 mm	12.5 mm
Surface – PG Binder	64-2258S-28	70-2258H-28	70-2258E-28
Intermediate	9.5 mm	9.5 mm	9.5 mm
	12.5 mm	12.5 mm	12.5 mm
	19.0 mm	19.0 mm	19.0 mm
	25.0 mm	25.0 mm	25.0 mm
Intermediate – PG Binder	64-2258S-28	64-2258H-28	70-2258E-28
Base	19.0 mm	19.0 mm	19.0 mm
	25.0 mm	25.0 mm	25.0 mm
Base – PG Binder	64-2258S-28	64-2258S-28	64-2258S-28
*A Type B mixture shall replace a Type A mixture.			

A Type C mixture may be used in lieu of a Type B mixture. A Type D mixture may be used in lieu of a Type C or a Type B mixture.

Surface 4.75 mm mixtures shall not be used when the required lay rate shown on the plans is greater than 100 lb/sq yd. Surface 12.5 mm mixtures shall not be used when the required lay rate shown on the plans is less than 195 lb/sq yd.

The plant discharge temperature for any mixture shall not be more than 315°F whenever PG ~~64-2258S-28~~ or PG ~~70-2258H-28~~ binders are used *or not more than 325°F whenever 58E-28 binder is used.* HMA may be produced using a water-injection foaming device. The DMF shall list the minimum and maximum plant discharge temperatures as applicable to the mixture.

SECTION 402, BEGIN LINE 180, DELETE AND INSERT AS FOLLOWS:

The temperature of each mixture at the time of spreading shall be less than 315°F whenever ~~64-2258S-28~~ or PG ~~70-2258H-28~~ binders are used *or not more than 325°F whenever 58E-28 binder is used.* The temperature of each mixture at the time of spreading shall not be less than 245°F. No mixture shall be placed on a previously paved course that has not cooled to less than 175°F.

SECTION 406, BEGIN LINE 9, DELETE AND INSERT AS FOLLOWS:

406.02 Materials

The type and grade of asphalt material shall be in accordance with the following:

Asphalt Emulsion, SS-1h, AE-NT902.01(b)
 PG Asphalt Binder, PG ~~64-2258S-28~~.....902.01(a)

SECTION 408, BEGIN LINE 12, DELETE AND INSERT AS FOLLOWS:

408.02 Materials

Materials shall be in accordance with the following:

Asphalt Binder, PG ~~64-2258S-28~~* 902.01(a)
 Asphalt Emulsion for Crack Filling, AE-90S 902.01(b)
 Fine Aggregates, No. 23 or No. 24 904.02
 Joint Sealing Materials 906.02(a)2

* A PG ~~64-2258S-28~~ asphalt binder shall be used to fill cracks on a surface that is milled in accordance with 306, and polypropylene fibers shall be used only in conjunction with warranted micro-surfacing.

SECTION 902, BEGIN LINE 3, DELETE AND INSERT AS FOLLOWS:

902.01 Asphalt

Asphalt is defined as a cementitious material obtained from petroleum processes. Asphalts shall be sampled and tested in accordance with the applicable requirements of 902.02.

(a) Performance Graded Asphalt Binders

~~Performance graded asphalt~~PG binders shall be from a supplier on the QPL of Performance-Graded Asphalt Binder Suppliers. A PG binder will be considered for inclusion on the QPL by following ITM 581.

~~Performance graded, PG asphalt binders shall be in accordance with the following:~~

GRADE	58-28	64-22	64-28	70-22	70-28	76-22
ORIGINAL BINDER						
Flash Point, minimum, °C	230					
Viscosity, maximum, 3 Pa·s, Test Temp, °C	135					
DSR, G*/sin δ (delta), minimum, 1.00 kPa, Test Temp. @ 10 rad/s, °C	58	64	64	70	70	76
ROLLING THIN FILM OVEN RESIDUE						
Mass Loss, maximum, %	1.00					
DSR, G*/sin δ (delta), minimum, 2.20 kPa, Test Temp. @ 10 rad/s, °C	58	64	64	70	70	76
PRESSURE AGING VESSEL (PAV) RESIDUE						
PAV Aging Temperature, °C	100 (Note 1)					
DSR, G*/sin δ (delta), maximum, 5,000 kPa, Test Temp. @ 10 rad/s, °C (Note 3)	19	25	22	28	25	31
Physical Hardening	Report (Note 2)					
Creep Stiffness, S, maximum, 300 MPa, m-value, minimum, 0.300, Test Temp. @ 60 s, °C	-18	-12	-18	-12	-18	-12
Notes: 1. Oven temperature tolerance shall be ±0.5°C. 2. Physical Hardening is performed on a set of asphalt beams according to AASHTO T 313, Section 12.1,						

except the conditioning time is extended to 24 h \pm 10 minutes at 10°C above the minimum performance temperature. The 24 h stiffness and m value are reported for information purposes only.

3. Binders that have a $G^*\sin \delta$ (delta) of 5,001 to 6,000 Kpa will be considered acceptable if the phase angle is 42 degrees or greater.

A PG 58-28 or PG 64-22 binder may be modified by in-line blending with styrene butadiene rubber, SBR, polymer latex at the HMA plant in accordance with ITM 581. A PG 58-28 may be modified to a PG 64-28 and a PG 64-22 may be modified to a PG 70-22. A Type A certification in accordance with 916 shall be provided for SBR polymer latex. The results of the following shall be shown on the certification.

Property	Requirements
Total Polymer Solids, % by weight	60 — 72
Butadiene, % by weight, min.	68
Residual Styrene, % by weight, max.	0.1
Ash, % of total polymer solids by weight, max.	3.5
pH	9 — 11
Viscosity, Brookfield model RVF, Spindle No. 2 @ 20 rpm @ 25°C, max.	2,000

The minimum SBR polymer latex content shall be 2.5 %. The SBR polymer latex content may be reduced below the minimum content provided, if the following requirements are met:

1. An AASHTO accredited laboratory shall blend the PG binder and SBR polymer latex at the proposed SBR polymer latex content and test and grade the modified PG binder in accordance with AASHTO M 320.
2. The laboratory test results verifying the blend and compliance with 902.01(a) shall be submitted to the Engineer for approval.
3. The source of the PG Binder or SBR polymer latex shall not be changed.

PG binders shall be in accordance with AASHTO M 332 and in accordance with the elastic response requirements in AASHTO R 92.

1. Sampling

An acceptance sample and backup sample shall be taken from the asphalt delivery system at the HMA plant. A copy of a load ticket identifying the binder source shall be submitted with the samples. The Engineer will take immediate possession of the samples.

2. PG Binder Testing

The Department will perform complete testing in accordance with AASHTO M 320/332. Complete PG binder testing will consist of RTFO DSR and PAV BBR testing. *Elastic response in accordance with AASHTO R 92 will also be reported.* Rotational viscosity and flashpoint tests are not required. If the material is not in accordance with the

specifications, the material will represent one week of HMA production and be adjudicated as a failed material in accordance with 105.03.

3. Appeals

~~If the Contractor does not agree with the acceptance test results, a request may be made in writing for additional testing. The appeal shall be submitted within 15 calendar days of receipt of the Department's written results. The basis of the appeal shall include complete AASHTO M 320 test results.~~

SECTION 054000 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Division 13 Metal Building Systems.

1.2 SUMMARY

- A. Section Includes:
 - 1. Non-Load-bearing wall framing.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of cold-formed steel framing product and accessory.
- B. Shop Drawings:
 - 1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
 - 2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
- C. Delegated-Design Submittal: For cold-formed steel framing.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer licensed in the state where the project is located to design cold-formed steel framing.

- B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.
 - 1. Design Loads: design by pre-engineered building manufacturer, except for hangar door by hydraulic door manufacturer.
 - 2. Design framing systems to provide for movement of framing members located outside the insulation building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
 - 3. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
 - a. Upward and downward movement of 1/2 inch.
- C. Cold-Formed Steel Framing Design Standards:
 - 1. Wall Studs: AISI S211.
 - 2. Headers: AISI S212.
 - 3. Lateral Design: AISI S213.
- D. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S200.
- E. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.3 COLD-FORMED STEEL FRAMING, GENERAL

- A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
 - 1. Grade: As required by structural performance.
 - 2. Coating: G60, A60, AZ50, or GF30.

2.4 NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: 0.0329 inch.
 - 2. Flange Width: 2 inches.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:

1. Minimum Base-Metal Thickness: Matching steel studs.
 2. Flange Width: 1-1/4 inches.
- C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, unpunched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 0.0966 inch.
 2. Flange Width: 1-3/8 inches.

2.5 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated as follows:
1. Supplementary framing.
 2. Bracing, bridging, and solid blocking.
 3. Web stiffeners.
 4. Anchor clips.
 5. End clips.
 6. Foundation clips.
 7. Gusset plates.

2.6 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.
- B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.
- C. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steeldrill screws.
1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
- D. Welding Electrodes: Comply with AWS standards.

2.7 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: ASTM A 780.
- B. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from

manufacturer's standard widths to match width of bottom track or rim track members.

2.8 FABRICATION

- A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
 - 1. Fabricate framing assemblies using jigs or templates.
 - 2. Cut framing members by sawing or shearing; do not torch cut.
 - 3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by no fewer than three exposed screw threads.
 - 4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
- C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
 - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 - 2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Install load bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.
- B. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel framing according to AISI S200 and to manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
 - 1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.
- D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
 - 1. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.
- E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.
- H. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.
- I. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to

a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 NON-LOAD-BEARING WALL INSTALLATION

- A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:
 1. Anchor Spacing: As shown on Shop Drawings.
- B. Squarely seat studs against top and bottom tracks with gap not exceeding of 1/8 inch between the end of wall framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:
 1. Stud Spacing: 16 inches unless noted otherwise.
- C. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar configurations.
- D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.
- E. Align floor and roof framing over studs according to AISI S200, Section C1. Where framing cannot be aligned, continuously reinforce track to transfer loads.
- F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.
- G. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.
 1. Frame wall openings with not less than a double stud at each jamb of frame as indicate on Shop Drawings. Fasten jamb members together to uniformly distribute loads.
 2. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.
- H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.
 1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.

- I. Install horizontal bridging in stud system, spaced vertically 48 inches. Fasten at each stud intersection.
 - 1. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to studflanges and secure solid blocking to stud webs or flanges.
- J. Install steel sheet diagonal bracing straps to both stud flanges, terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.
- K. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000

SECTION 074116 - INSULATED METAL ROOF PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes insulated metal roof panels.

1.2 RELATED DOCUMENTS

- A. Preinstallation Conference: Refer to Division 1 Specifications
- B. Division 13 Metal Building Systems

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
- C. Samples: For each type of metal panel indicated.

1.4 INFORMATIONAL SUBMITTALS

- A. Product test reports.
- B. Warranties: Samples of special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 2 years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Energy Performance: Provide roof panels that are listed on the EPA/DOE's ENERGY STAR "Roof Product List" for low-slope roof products.
- B. Energy Performance: Provide roof panels according to one of the following when tested according to CRRC-1:
 - 1. Three-year, aged solar reflectance of not less than 0.55 and emissivity of not less than 0.75.
 - 2. Three-year, aged Solar Reflectance Index of not less than 64 when calculated according to ASTM E 1980.
- C. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 72:
 - 1. Wind Loads: As indicated on Drawings.
 - 2. Other Design Loads: to be designed by pre-engineered building manufacturer
 - 3. Deflection Limits: For wind loads, no greater than 1/240 of the span.
- D. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E 1680 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 1.57 lbf/sq. ft. (75 Pa).
- E. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 1646[or ASTM E 331] at the following test-pressure difference:
 - 1. Test-Pressure Difference: 2.86 lbf/sq. ft. (137 Pa).
- F. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.

1. Uplift Rating: UL 90.
 - G. FM Global Listing: Provide metal roof panels and component materials that comply with requirements in FM Global 4471 as part of a panel roofing system and that are listed in FM Global's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.
 1. Fire/Windstorm Classification: Class 1A-90
 2. Hail Resistance: MH
 - H. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- 2.2 FOAMED-INSULATION-CORE METAL ROOF PANELS
- A. General: Provide factory-formed and -assembled metal roof panels fabricated from two sheets of metal with insulation core foamed in place during fabrication with joints between panels designed to form weathertight seals. Include accessories required for weathertight installation.
 1. Panel Performance:
 - a. Flatwise Tensile Strength: 30 psi (200 kPa) when tested according to ASTM C 297/C 297M.
 - b. Humid Aging: Volume increase not greater than 6.0 percent and no delamination or metal corrosion when tested for seven days at 140 deg F (60 deg C) and 100 percent relative humidity according to ASTM D 2126.
 - c. Heat Aging: Volume increase not greater than 2.0 percent and no delamination, surface blistering, or permanent bowing when tested for seven days at 200 deg F (93 deg C) according to ASTM D 2126.
 - d. Cold Aging: Volume decrease not more than 1.0 percent and no delamination, surface blistering, or permanent bowing when tested for seven days at minus 20 deg F (29 deg C) according to ASTM D 2126.
 - e. Fatigue: No evidence of delamination, core cracking, or permanent bowing when tested to a 20-lbf/sq. ft. (958-kPa) positive and negative wind load and with deflection of L/180 for 2 million cycles.
 - f. Autoclave: No delamination when exposed to 2-psi (13.8-kPa) pressure at a temperature of 212 deg F (100 deg C) for 2-1/2 hours.
 - g. Fire-Test-Response Characteristics: Class A according to ASTM E 108.
 2. Insulation Core: Modified isocyanurate or polyurethane foam using a non-CFC blowing agent, with maximum flame-spread and smoke-developed indexes of 25 and 450, respectively.
 - a. Closed-Cell Content: 90 percent when tested according to ASTM D 6226.

- b. Density: 2.0 to 2.6 lb/cu. ft. (32 to 42 kg/cu. m) when tested according to ASTM D 1622.
 - c. Compressive Strength: Minimum 20 psi (140 kPa) when tested according to ASTM D 1621.
 - d. Shear Strength: 26 psi (179 kPa) when tested according to ASTM C 273.
- B. Standing-Seam-Profile, Foamed-Insulation-Core Metal Roof Panels: Formed with vertical tongue-and-groove ribs at panel edges and between ribs; designed for sequential installation by interlocking tongue-and-groove panel edges and mechanically attaching panels to supports using concealed clips located between panels and engaging edges of adjacent panels, and mechanically seaming panels together.
 - 1. Basis of Design: Nucor Building Systems, SR2 Insulated Standing Seam
 - 2. Metallic-Coated Steel Sheet: Facings of zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation; structural quality. Pre-painted by the coil-coating process to comply with ASTM A 755/A 755M.
 - 3.
 - a. Exterior Finish: PVDF
 - 1) Color: As indicated on drawings
 - b. Interior Finish: Siliconized polyester
 - 1) Color: Manufacturer's standard colors
 - 4. Joint Type: As standard with manufacturer.
 - 5. Panel Coverage: 40 inches
 - 6. Panel Thickness: 3.25 inches
 - 7. Thermal-Resistance Value (R-Value): R-26 according to ASTM C 1363.

2.3 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.
- B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
 - 1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.
 - 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.

3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or pre-molded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- C. Flashing and Trim: Provide flashing and trim formed from same material as exterior facings of metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.
- D. Roof Curbs: Fabricated from same material, finish, and color as exterior facings of roof panels, 0.048-inch (1.2-mm) nominal thickness; with bottom of skirt profiled to match roof panel profiles and with welded top box and integral full-length cricket. Fabricate curb subframing of 0.060-inch- (1.52-mm-) nominal thickness, angle-, C-, or Z-shaped steel sheet. Fabricate curb and subframing to withstand indicated loads of size and height indicated. Finish roof curbs to match metal roof panels.
- E. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM, PVC, or neoprene sealing washers for exposed fasteners. Verify that fasteners used are compatible with insulated metal panel manufacturer's recommendations or requirements.
- F. Panel Sealants: Provide sealant types recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, non-sag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
 2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.4 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- C. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

- D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

2.5 FINISHES

A. Exterior Facings and Accessories:

1. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
2. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
3. Siliconized Polyester: Epoxy primer and silicone-modified, polyester-enamel topcoat; with a dry film thickness of not less than 0.2 mil (0.005 mm) for primer and 0.8 mil (0.02 mm) for topcoat.

B. Interior Facings:

1. Siliconized Polyester: Epoxy primer and silicone-modified, polyester-enamel topcoat; with a dry film thickness of not less than 0.2 mil (0.005 mm) for primer and 0.8 mil (0.02 mm) for topcoat.
2. Acrylic or Polyester Finish: Manufacturer's standard white or light-colored acrylic or polyester finish.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.2 METAL PANEL INSTALLATION

- A. Lap-Seam, Foamed-Insulation-Core Metal Roof Panels: Fasten insulated metal roof panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.
 1. Lap ribbed or fluted sheets one full-rib corrugation. Apply panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or applications not true to line.
 2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of insulated metal roof panels.

3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
 4. Provide sealant tape at lapped joints of insulated metal roof panels and between panels and protruding equipment, vents, and accessories.
 5. Apply a continuous ribbon of sealant tape to panel side laps and elsewhere as needed to weatherproof panels.
 6. Apply snap-on battens to seams of insulated metal roof panels to conceal fasteners.
- B. Standing-Seam, Foamed-Insulation-Core Metal Roof Panels: Fasten insulated metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.
1. Install clips to supports with self-tapping fasteners.
 2. Seamed Joint: Crimp standing seams with manufacturer-approved, motorized seamer tool so cleat, insulated metal roof panel, and factory-applied side-lap sealant are completely engaged.
- C. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
- D. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible and set units true to line and level. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

3.3 CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

END OF SECTION 074116

SECTION 074213 - INSULATED METAL WALL PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Division 13 Metal Building Systems

1.2 SUMMARY

- A. Section Includes:
 - 1. Foamed-insulation-core metal wall panels.
 - 2. Laminated-insulation-core metal wall panels.

1.3 PRE-INSTALLATION CONFERENCE

- A. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
- C. Samples: For each type of metal panel indicated.

1.5 INFORMATIONAL SUBMITTALS

- A. Product test reports.
- B. Warranties: Samples of special warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 2 years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 72:
 - 1. Wind Loads: Designed by pre-engineered building manufacturer
 - 2. Other Design Loads: Designed by pre-engineered building manufacturer
 - 3. Deflection Limits: Designed by pre-engineered building manufacturer
 - 4. Loads from hydraulic door by hydraulic door manufacturer
- B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E 283 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 1.57 lbf/sq. ft. (75 Pa)
- C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 2.86 lbf/sq. ft. (137 Pa)
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces
- E. Fire-Test-Response Characteristics: Provide metal wall panels and system components with the following fire-test-response characteristics, as determined by testing identical panels and system components per test method indicated below by UL or another testing and inspecting agency

acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.

1. Fire-Resistance Characteristics: Provide materials and construction tested for fire resistance per ASTM E 119.
2. Intermediate-Scale Multistory Fire Test: Tested mockup, representative of completed multistory wall assembly of which wall panel is a part, complies with NFPA 285 for test method and required fire-test-response characteristics of exterior non-load-bearing wall panel assemblies.
3. Radiant Heat Exposure: No ignition when tested according to NFPA 268.
4. Potential Heat: Acceptable level when tested according to NFPA 259.
5. Surface-Burning Characteristics: Provide wall panels with a flame-spread index of 25 or less and a smoke-developed index of 450 or less, per ASTM E 84.

2.2 FOAMED-INSULATION-CORE METAL WALL PANELS

- A. General: Provide factory-formed and -assembled metal wall panels fabricated from two metal facing sheets and insulation core foamed in place during fabrication, and with joints between panels designed to form weathertight seals. Include accessories required for weathertight installation.

1. Insulation Core: Modified isocyanurate or polyurethane foam using a non-CFC blowing agent, with maximum flame-spread and smoke-developed indexes of 25 and 450, respectively.
 - a. Closed-Cell Content: 90 percent when tested according to ASTM D 6226.
 - b. Density: 2.0 to 2.6 lb/cu. ft. (32 to 42 kg/cu. m) when tested according to ASTM D 1622.
 - c. Compressive Strength: Minimum 20 psi (140 kPa) when tested according to ASTM D 1621.
 - d. Shear Strength: 26 psi (179 kPa) when tested according to ASTM C 273/C 273M.

- B. Concealed-Fastener, Foamed-Insulation-Core Metal Wall Panels: Formed with tongue-and-groove panel edges; designed for sequential installation by interlocking panel edges and mechanically attaching panels to supports using concealed clips or fasteners.

1. Basis of Design: Nucor Building Systems, Insulated Wall Panel DM40
2. Metallic-Coated Steel Sheet: Facings of zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation; structural quality. Pre-painted by the coil-coating process to comply with ASTM A 755/A 755M.
3.
 - a. Exterior Finish: PVDF
 - 1) Color: Owner to select from manufacturer's stand colors
 - b. Interior Finish: Siliconized polyester

1) Color: Owner to select from manufacturer's standard colors

4. Backer Board: On back side of exterior facing.
5. Snap-on Batten: Same material, finish, and color as exterior facings of wall panels.
6. Panel Coverage: 40 inches (1016 mm) nominal.
7. Panel Thickness: 3.0 inches (76 mm)
8. Thermal-Resistance Value (R-Value): R-24 according to ASTM C 1363.

2.3 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, Class AZ50 (Class AZM150) aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.
- B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
 1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal panels.
 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or pre-molded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- C. Backer Board: Hardboard complying with ANSI A135.4, Class 1 tempered, 1/4 inch (6 mm) thick unless otherwise indicated.
- D. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.
- E. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.
- F. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing; 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
 2. Joint Sealant: ASTM C 920; as recommended in writing by metal panel manufacturer.

3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.4 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- C. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

2.5 FINISHES

- A. Panels and Accessories:
 1. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 2. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 3. Siliconized Polyester: Epoxy primer and silicone-modified, polyester-enamel topcoat; with a dry film thickness of not less than 0.2 mil (0.005 mm) for primer and 0.8 mil (0.02 mm) for topcoat.
 4. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

PART 3 - EXECUTION

3.1 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.2 INSULATED METAL WALL PANEL INSTALLATION

- A. General: Apply continuous ribbon of sealant to panel joint on concealed side of insulated metal wall panels as vapor seal; apply sealant to panel joint on exposed side of panels for weather seal.
 - 1. Fasten foamed-insulation-core metal wall panels to supports with fasteners at each lapped joint at location and spacing and with fasteners recommended by manufacturer.
 - 2. Apply panels and associated items true to line for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
 - 3. Provide metal-backed washers under heads of exposed fasteners on weather side of insulated metal wall panels.
 - 4. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
 - 5. Provide sealant tape at lapped joints of insulated metal wall panels and between panels and protruding equipment, vents, and accessories.
 - 6. Apply a continuous ribbon of sealant tape to panel side laps and elsewhere as needed to make panels weathertight.
 - 7. Apply snap-on battens to exposed-fastener, insulated-core metal wall panel seams to conceal fasteners.
- B. Foamed-Insulation-Core Metal Wall Panels: Fasten metal wall panels to supports with concealed clips at each joint at location and spacing and with fasteners recommended by manufacturer. Fully engage tongue and groove of adjacent panels.
 - 1. Install clips to supports with self-tapping fasteners.
- C. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
- D. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible and set units true to line and level. Install work with laps, joints, and seams that are permanently watertight.

3.3 CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

END OF SECTION 074213.19

SECTION 074293 - SOFFIT PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes metal soffit panels.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
- C. Samples: For each type of metal panel indicated.

1.3 PRE-INSTALLATION CONFERENCE

- A. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.4 INFORMATIONAL SUBMITTALS

- A. Product test reports.
- B. Warranties: Samples of special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 2 years from date of Substantial Completion.

- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:
1. Wind Loads: designed by pre-engineered building manufacturer
 2. Other Design Loads: designed by pre-engineered building manufacturer
 3. Deflection Limits: designed by pre-engineered building manufacturer
- B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E 283 at the following test-pressure difference:
1. Test-Pressure Difference: 1.57 lbf/sq. ft. (75 Pa)
- C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:
1. Test-Pressure Difference: 2.86 lbf/sq. ft. (137 Pa)
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces

2.2 METAL SOFFIT PANELS

- A. General: Provide metal soffit panels designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps. Include accessories required for weathertight installation.
- B. Metal Soffit Panels: Match profile and material of metal wall panels.
1. Basis of design: Nucor Building Systems standard soffit panel
 2. Color: Match color of wall panels
 3. Sealant: Factory applied within interlocking joint.

2.3 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, Class AZ50 (Class AZM150) aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.
- B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
 - 1. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or pre-molded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Finish flashing and trim with same finish system as adjacent metal panels.
- D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.
- E. Panel Sealants: Provide sealant types recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
 - 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing; 1/8 inch (3 mm) thick.
 - 2. Joint Sealant: ASTM C 920; as recommended in writing by metal panel manufacturer.
 - 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.4 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.
- C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

- D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

2.5 FINISHES

A. Panels and Accessories:

- 1. Two-Coat Fluoropolymer: AAMA 621 or AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
- 2. Three-Coat Fluoropolymer: AAMA 621 or AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
- 3. Siliconized Polyester: Epoxy primer and silicone-modified, polyester-enamel topcoat; with a dry film thickness of not less than 0.2 mil (0.005 mm) for primer and 0.8 mil (0.02 mm) for topcoat.
- 4. Concealed Finish: White or light-colored acrylic or polyester backer finish.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.
 - 1. Soffit Framing: Wire tie or clip furring channels to supports, as required to comply with requirements for assemblies indicated.

3.2 METAL PANEL INSTALLATION

- A. Metal Soffit Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.
 - 1. Apply panels and associated items true to line for neat and weathertight enclosure.
 - 2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.

3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.

B. Watertight Installation:

1. Apply a continuous ribbon of sealant or tape to seal lapped joints of metal panels, using sealant or tape as recommend by manufacturer on side laps of nesting-type panels and elsewhere as needed to make panels watertight.
2. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
3. At panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with sealant and fastened together by interlocking clamping plates.

C. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.

D. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.

3.3 CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

END OF SECTION 074293

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Sheet Metal Flashing/Counterflashing.
- B. Related Sections:
 - 1. Division 13 Metal Building Systems

1.3 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.
- B. Samples for Initial Selection: For each type of sheet metal flashing, trim, and accessory indicated with factory-applied color finishes involving color selection.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

- B. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.

PART 2 – PRODUCTS

2.1 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.
- B. Metallic-Coated Steel Sheet: Restricted flatness steel sheet, metallic coated by the hot-dip process and pre-painted by the coil-coating process to comply with ASTM A 755/A 755M.
 - 1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation; structural quality.
 - 2. Surface: Smooth, flat.
 - 3. Exposed Coil-Coated Finish:
 - a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 4. Color: As selected by Architect from manufacturer's full range.
 - 5. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

2.2 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and

recommended by manufacturer of primary sheet metal or manufactured item.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating.
 - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
3. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329 or Series 300 stainless steel.
- C. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, non-sag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
- D. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- F. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.
- G. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.3 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.
 1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
 2. Obtain field measurements for accurate fit before shop fabrication.
 3. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
 4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.
- B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated

and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

- C. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."
- D. Sealed Joints: Form non-expansion but movable joints in metal to accommodate elastomeric sealant.
- E. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.
- F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- G. Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" for application, but not less than thickness of metal being secured.
- H. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.
- I. Do not use graphite pencils to mark metal surfaces.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.
 - 1. Verify compliance with requirements for installation tolerances of substrates.
 - 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
 2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 3. Space cleats not more than 12 inches (300 mm) apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
 4. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
 5. Install sealant tape where indicated.
 6. Torch cutting of sheet metal flashing and trim is not permitted.
 7. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.
1. Coat back side of uncoated aluminum sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (600 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.
- D. Fastener Sizes: Use fasteners of sizes that will penetrate wood sheathing not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for wood screws, metal decking not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- E. Seal joints as shown and as required for watertight construction.
1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).
 2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."
- F. Rivets: Rivet joints in uncoated aluminum where indicated and where necessary for strength.

3.3 FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and

level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

- B. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches (100 mm) over base flashing. Lap counterflashing joints a minimum of 4 inches (100 mm) and bed with sealant. Secure in a waterproof manner by means of snap-in installation and sealant or lead wedges and sealant, interlocking folded seam or blind rivets and sealant.

3.4 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.5 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean off excess sealants.
- C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of installation, remove unused materials and clean finished surfaces. Maintain in a clean condition during construction.
- D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 076200

SECTION 078413 - PENETRATION

FIRESTOPPING PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items.
- B. Related Sections include the following:
 - 1. Division 07 Section "Fire-Resistive Joint Systems."
 - 2. Division 22 and 23 Sections specifying duct and piping penetrations.
 - 3. Division 26, 27, and 28 Sections specifying cable and conduit penetrations.

1.3 PERFORMANCE REQUIREMENTS

- A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.
- B. Rated Systems: Provide through-penetration firestop systems with the following ratings determined per ASTM E 814:
 - 1. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.
 - 2. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floorareas:
- C. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.
 - 1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture resistant through-penetration firestop systems.

2. For floor penetrations with annular spaces exceeding 4 inches (100 mm) in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.
 3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.
- D. For through-penetration firestop systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For each through-penetration firestop system, show each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item. Include firestop design designation of qualified testing and inspecting agency that evidences compliance with requirements for each condition indicated.
1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.
 2. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular through-penetration firestop condition, submit illustration, with modifications marked, approved by through-penetration firestop system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.
- C. Through-Penetration Firestop System Schedule: Indicate locations of each through-penetration firestop system, along with the following information:
1. Types of penetrating items.
 2. Types of constructions penetrated, including fire-resistance ratings and, where applicable, thicknesses of construction penetrated.
 3. Through-penetration firestop systems for each location identified by firestop design designation of qualified testing and inspecting agency.
- D. Qualification Data: For Installer.
- E. Product Certificates: For through-penetration firestop system products, signed by product manufacturer.
- F. Product Test Reports: From a qualified testing agency indicating through-penetration firestop system complies with requirements, based on comprehensive testing of current products.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A firm experienced in installing through-penetration firestop

systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance.

- B. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, through one source from a single manufacturer.
- C. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:
 - 1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
 - 2. Through-penetration firestop systems are identical to those tested per testing standard referenced in "Part 1 Performance Requirements" Article. Provide rated systems complying with the following requirements:
 - a. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by the following:
 - 1) UL in its "Fire Resistance Directory."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life if applicable, qualified testing and inspecting agency's classification marking applicable to Project, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.
- C. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined by Architect and building inspector, if required by authorities having jurisdiction.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the through-penetration firestop systems.
 - 1. A/D Fire Protection Systems Inc.
 - 2. Hilti, Inc.
 - 3. RectorSeal Corporation (The).
 - 4. Specified Technologies Inc.
 - 5. 3M; Fire Protection Products Division.
 - 6. Tremco; Sealant/Weatherproofing Division.
 - 7. USG Corporation.

2.2 FIRESTOPPING, GENERAL

- A. Compatibility: Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.
- B. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated. Accessories include, but are not limited to, the following items:
 - 1. Permanent forming/damming/backing materials, including the following:
 - a. Slag-/rock-wool-fiber insulation.
 - b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
 - c. Fire-rated form board.
 - d. Fillers for sealants.
 - 2. Temporary forming materials.
 - 3. Substrate primers.
 - 4. Collars.
 - 5. Steel sleeves.

2.3 FILL MATERIALS

- A. General: Provide through-penetration firestop systems containing the types of fill materials indicated in the Through-Penetration Firestop System Schedule at the end of Part 3 by referencing the types of materials described in this Article. Fill materials are those referred to in directories of referenced testing and inspecting agencies as "fill," "void," or "cavity" materials.
- B. Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.
- C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized steel sheet.
- E. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
- F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a non-shrinking, homogeneous mortar.
- H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives.
- I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, non-shrinking foam.
- J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
 - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and non-sag formulation for openings in vertical and other surfaces requiring a nonslumping, gunnable sealant, unless indicated firestop system limits use to non-sag grade for both opening conditions.
 - 2. Grade for Horizontal Surfaces: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces.
 - 3. Grade for Vertical Surfaces: Non-sag formulation for openings in vertical and other surfaces.

2.4 MIXING

- A. For those products requiring mixing before application, comply with through-penetration firestop system manufacturer's written instructions for accurate proportioning of materials,

water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of work.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with firestop system manufacturer's written instructions and with the following requirements:
 - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.
 - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.3 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

- A. General: Install through-penetration firestop systems to comply with Part 1 "Performance Requirements" Article and with firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.
- C. Install fill materials for firestop systems by proven techniques to produce the following results:
1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Identify through-penetration firestop systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of edge of the firestop systems so that labels will be visible to anyone seeking to remove penetrating items or firestop systems. Use mechanical fasteners for metal labels. For plastic labels, use self-adhering type with adhesives capable of permanently bonding labels to surfaces on which labels are placed and, in combination with label material, will result in partial destruction of label if removal is attempted.

3.5 CLEANING AND PROTECTING

- A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce systems complying with specified requirements.

END OF SECTION 078413

SECTION 079200 - JOINT SEALANTS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes joint sealants for the following applications, including those specified by reference to this Section:

- 1. Exterior joints in the following vertical surfaces and horizontal nontraffic surfaces:
 - a. Control and expansion joints in unit masonry.
 - b. Perimeter joints between materials listed above and frames of doors, windows, and louvers.
 - c. Other joints as indicated.
- 2. Exterior joints in the following horizontal traffic surfaces:
 - a. Isolation and contraction joints in cast-in-place concrete slabs.
 - b. Other joints as indicated.
- 3. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:
 - a. Perimeter joints of exterior openings where indicated.
 - b. Vertical joints on exposed surfaces of walls and partitions.
 - c. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
 - d. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - e. Other joints as indicated.
- 4. Interior joints in the following horizontal traffic surfaces:
 - a. Control and expansion joints in flooring.
 - b. Other joints as indicated.

- B. Related Sections include the following:

- 1. Division 08 Section "Glazing" for glazing sealants.
- 2. Division 09 Section "Gypsum Board" for sealing perimeter joints of gypsum board partitions to reduce sound transmission.

1.3 PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
- B. Provide joint sealants for interior applications that establish and maintain airtight and water resistant continuous joint seals without staining or deteriorating joint substrates.

1.4 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Samples for Verification: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- D. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.
- E. Qualification Data: For Installer.
- F. Preconstruction Field Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on preconstruction testing specified in "Quality Assurance" Article.
- G. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- H. Field Test Report Log: For each elastomeric sealant application.
- I. Product Test Reports: Based on comprehensive testing of product formulations performed by a qualified testing agency, indicating that sealants comply with requirements.
- J. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of elastomeric sealants required for this Project.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

- C. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
 - 1. Use manufacturer's standard test method to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
 - 2. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 - 3. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
- D. Product Testing: Obtain test results for "Product Test Reports" Paragraph in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period preceding the commencement of the Work.
 - 1. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.
- E. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to Project joint substrates as follows:
 - 1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
 - 2. Conduct field tests for each application indicated below:
 - a. Each type of elastomeric sealant and joint substrate indicated.
 - 3. Notify Architect seven days in advance of dates and times when test joints will be erected.
 - 4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.
 - a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193.
 - 1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
 - 5. Report whether sealant in joint connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
 - 6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.
- F. Mockups: Build mockups incorporating sealant joints, as follows, to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution:
 - 1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this Section.

- G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.6 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 40 deg F (5 deg C).
 - 2. When joint substrates are wet.
 - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 - 4. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY

- A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.
- C. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:
 - 1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
 - 2. Disintegration of joint substrates from natural causes exceeding design specifications.
 - 3. Mechanical damage caused by individuals, tools, or other outside agents.
 - 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.

2.2 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.
- B. VOC Content of Interior Sealants: Provide interior sealants and sealant primers that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1. Sealants: 250 g/L.
 - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 - 3. Sealant Primers for Porous Substrates: 775 g/L.
- C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.3 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- C. Single-Component Mildew-Resistant Acid-Curing Silicone Sealant:
 - 1. Products:
 - a. Dow Corning Corporation; 786 Mildew Resistant.
 - b. GE Silicones; Sanitary SCS1700.
 - c. Tremco; Tremsil 200.
 - 2. Type and Grade: S (single component) and NS (nonsag).
 - 3. Class: 25.
 - 4. Use Related to Exposure: NT (nontraffic).
- D. Multicomponent Nonsag Urethane Sealant:
 - 1. Products:
 - a. Sika Corporation, Inc.; Sikaflex - 2c NS TG.
 - b. Sonneborn, Division of ChemRex Inc.; NP 2.
 - c. Tremco; Vulkem 227.
 - d. Tremco; Vulkem 322 DS.
 - e. Pecora Corporation; Dynatrol II.
 - f. Tremco; Dymeric.
 - 2. Type and Grade: M (multicomponent) and NS (nonsag).

3. Uses Related to Exposure: T (traffic) and NT (nontraffic).

E. Multicomponent Pourable Urethane Sealant:

1. Products:
 - a. Meadows, W. R., Inc.; POURTHANE.
 - b. Pecora Corporation; Urexpan NR-200.
 - c. Tremco; THC-901.
 - d. Tremco; THC-900.
 - e. Tremco; Vulkem 245.
 - f. Pecora Corporation; Urexpan NR 300.
2. Type and Grade: M (multicomponent) and P (pourable).
3. Class: 25.
4. Use Related to Exposure: T (traffic).

2.4 LATEX JOINT SEALANTS

- A. Latex Sealant: Comply with ASTM C 834, Type P, Grade NF.

B. Products:

1. Bostik Findley; Chem-Calk 600.
2. Pecora Corporation; AC-20+.
3. Schnee-Morehead, Inc.; SM 8200.
4. Sonneborn, Division of ChemRex Inc.; Sonolac.
5. Tremco; Tremflex 834.

2.5 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following:

1. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
2. Products:
 - a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
 - b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.

- B. Acoustical Sealant for Concealed Joints: Manufacturer's standard, nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.

1. Products:
 - a. Pecora Corporation; BA-98.
 - b. Tremco; Tremco Acoustical Sealant.

2.6 PAVEMENT EXPANSION JOINTS

- A. Provide approved foam, bituminous, and/or fiber expansion joint fillers.
- B. Expansion Joint Cap: Provide removable joint filler cover as provided by Greenstreak or W.R. Meadows, Inc. (Sealtight Snap Cap) or equal on all concrete flatwork expansion joints to facilitate sealant installation.

2.7 JOINT-SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.8 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 LOCATION OF JOINT SEALANTS

- A. Carefully study the drawings and furnish and install the proper materials at each point where called for on the drawings and herein, plus at all other points where sealant is essential in maintaining the continued integrity of the watertight barrier. The following listings are included as a guide only.
- B. Location of joints filled with sealants:
 - 1. All joints so noted in stone masonry and concrete pavement site improvements and joints between stone masonry and dissimilar materials.
 - 2. Any other exterior joints between dissimilar materials where the joining of the two surfaces leaves a gap between the meeting materials or components as may be dictated by the various methods of construction –to make watertight.

3.3 JOINT DESIGN

- A. All sealant joints shall conform to the following criteria:
 - 1. No joint less than $\frac{1}{4}$ " in width or depth.
 - 2. Joints up to $\frac{1}{2}$ " in width shall have equal depth.
 - 3. Joints over $\frac{1}{2}$ " in width shall have depth equal to $\frac{1}{2}$ the width.

3.4 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
 - a. Concrete.
 - b. Masonry.
 - c. Unglazed surfaces of ceramic tile.
 - 3. Remove laitance and form-release agents from concrete.
 - 4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Metal.
 - b. Glass.

- B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.5 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Acoustical Sealant Application Standard: Comply with recommendations in ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.
- D. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- E. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- F. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- G. Tooling of Non-sag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.

3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

- a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.6 FIELD QUALITY CONTROL

- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed exterior elastomeric sealant joints as follows:
 - a. Perform 1 test for each 500 feet of joint length.
2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab in Appendix X1 in ASTM C 1193, as appropriate for type of joint-sealant application indicated.
 - a. For joints with dissimilar substrates, verify adhesion to each substrate separately; do this by extending cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
3. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field-adhesion-test log.
4. Inspect tested joints and report on the following:
 - a. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
 - b. Whether sealants filled joint cavities and are free of voids.
 - c. Whether sealant dimensions and configurations comply with specified requirements.
5. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
6. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

- B. Evaluation of Field Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.7 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.8 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.9 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior joints in brick veneer.
 - 1. Joint Sealant: Multicomponent non-sag urethane sealant.
 - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.
- B. Joint-Sealant Application: Exterior perimeter joints between frames of doors, windows, and louvers.
 - 1. Joint Sealant: Multicomponent non-sag urethane sealant.
 - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.
- C. Joint-Sealant Application: Interior perimeter joints of exterior openings.
 - 1. Joint Sealant: Latex sealant.
 - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.
- D. Joint-Sealant Application: Interior joints between plumbing fixtures and adjoining walls, floors, and counters.
 - 1. Joint Sealant: Single-component mildew-resistant silicone sealant
- E. Joint-Sealant Application: Perimeter joints between interior wall surfaces and frames of interior doors and windows.
 - 1. Joint Sealant: Latex sealant.
 - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

END OF SECTION 079200

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Standard hollow metal doors and frames

- B. Related Sections:

- 1. Division 09 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.
 - 2. Division 13 Metal Building Systems

1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings.

- B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDIA250.8.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, and finishes.

- B. Shop Drawings: Include the following:

- 1. Elevations of each door design.
 - 2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
 - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 4. Locations of reinforcement and preparations for hardware.
 - 5. Details of each different wall opening condition.
 - 6. Details of anchorages, joints, field splices, and connections.
 - 7. Details of accessories.
 - 8. Details of moldings, removable stops, and glazing.

- C. Other Action Submittals:

1. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch- (102-mm-) high wood blocking. Do not store in a manner that traps excess humidity.
 1. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

1.7 COORDINATION

- A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following (or equal):
 1. Amweld Building Products, LLC.
 2. Benchmark; a division of Therma-Tru Corporation.
 3. Ceco Door Products; an Assa Abloy Group company.
 4. Curries Company; an Assa Abloy Group company.
 5. Deansteel Manufacturing Company, Inc.
 6. Firedoor Corporation.
 7. Mesker Door Inc.
 8. Pioneer Industries, Inc.
 9. Steelcraft; an Ingersoll-Rand company.

Note: Exterior doors are to be included in the Pre-Engineered Metal Building (PEMB) package

and will be manufactured by the selected PEMB manufacturer.

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.
- D. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z (12G) coating designation; mill phosphatized.
 - 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- F. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.
- G. Grout: ASTM C 476, except with a maximum slump of 4 inches (102 mm), as measured according to ASTM C 143/C 143M.
- H. Glazing: Comply with requirements in Division 08 Section "Glazing."
- I. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4- mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.3 STANDARD HOLLOW METAL DOORS

- A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.
 - 1. Design: Refer to A-601 in drawings
 - 2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core.
 - a. Thermal-Rated (Insulated) Doors: Where indicated, provide doors fabricated with thermal-resistance value (R-value) of not less than 6.0 deg F x h x sq.

ft./Btu (1.057 K x sq. m/W) when tested according to ASTM C 1363.

- 1) Locations: Exterior doors.
 3. Vertical Edges for Single-Acting Doors: Manufacturer's standard.
 4. Vertical Edges for Double-Acting Doors: Round vertical edges with 2-1/8-inch (54-mm) radius.
 5. Top and Bottom Edges: Closed with flush or inverted 0.042-inch- (1.0-mm-) thick, end closures or channels of same material as face sheets.
 6. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
- B. Exterior Doors: Face sheets fabricated from galvanized steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
1. Level 3 and Physical Performance Level A (Maximum Duty), Model 1 (Full Flush) .
- C. Interior Doors: Face sheets fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 1 (Full Flush) .
- D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.
- E. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.4 STANDARD HOLLOW METAL FRAMES

- A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
- B. Exterior Frames: Fabricated from metallic-coated steel sheet.
1. Fabricate frames with mitered or coped corners.
 2. Fabricate frames as full profile welded unless otherwise indicated.
 3. Frames for Level 3 Steel Doors: 0.067-inch- (1.7-mm-) thick steel sheet. Frames less than 4'-0" wide can be fabricated of .053 inch thick steel sheet.
- C. Interior Frames: Fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated.
1. Fabricate frames with mitered or coped corners.
 2. Fabricate frames as full profile welded unless otherwise indicated.
 3. Frames for Level 3 Steel Doors: 0.067-inch- (1.7-mm-) thick steel sheet. Frames of

less than 4'-0" wide can be fabricated of 0.53 inch thick steel sheet.

4. Frames for Borrowed Lights: Same as adjacent door frame.

- D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

- A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch (1.0 mm) thick, with corrugated or perforated straps not less than 2 inches (50 mm) wide by 10 inches (250 mm) long; or wire anchors not less than 0.177 inch (4.5 mm) thick.
2. Post-installed Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch- (9.5- mm-) diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

- B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch (1.0 mm) thick, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch (50-mm) height adjustment. Terminate bottom of frames at finish floor surface.

2.6 STOPS AND MOLDINGS

- A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch (0.8 mm) thick, fabricated from same material as door face sheet in which they are installed.
- B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated.
- C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch (0.8 mm) thick, fabricated from same material as frames in which they are installed.

2.7 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- B. Grout Guards: Formed from same material as frames, not less than 0.016 inch (0.4 mm) thick.

2.8 FABRICATION

- A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.
- C. Hollow Metal Doors:
 - 1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
 - 2. Glazed Lites: Factory cut openings in doors.
 - 3. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch (19 mm) beyond edge of door on which astragal is mounted.
- D. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
 - 1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible. Galvanized frames must be factory welded.
 - 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 - 3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
 - 4. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
 - 5. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:
 - 1) Two anchors per jamb up to 60 inches (1524 mm) high.
 - 2) Three anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
 - 3) Four anchors per jamb from 90 to 120 inches (2286 to 3048 mm) high.
 - 4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 120 inches (3048 mm) high.
 - b. Post-installed Expansion Type: Locate anchors not more than 6 inches (152 mm) from top and bottom of frame. Space anchors not more than 26 inches (660 mm) o.c.
 - 6. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.

- a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.
- F. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished on sheet A-601
 - 1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
 - 2. Reinforce doors and frames to receive non-templated, mortised and surface-mounted door hardware.
 - 3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
- G. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
 - 1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
 - 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
 - 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
 - 4. Provide loose stops and moldings on inside of hollow metal work.
 - 5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

2.9 STEEL FINISHES

- A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
 - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:
 - 1. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - 2. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
 - 3. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - 4. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a perpendicular line from head to floor.
- C. Drill and tap doors and frames to receive non-templated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.
 - 1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - b. Install frames with removable glazing stops located on secure side of opening.
 - c. Install door silencers in frames before grouting.
 - d. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - e. Check plumbness, squareness, and twist of frames as walls are constructed.

- Shim as necessary to comply with installation tolerances.
 - f. Field apply bituminous coating to backs of frames that are filled with grout containing anti-freezing agents.
 - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
 - a. Floor anchors may be set with powder-actuated fasteners instead of post-installed expansion anchors if so indicated and approved on Shop Drawings.
 - 3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
 - 4. Concrete Walls: Solidly fill space between frames and concrete with grout. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.
 - 5. In-Place Concrete or Masonry Construction: Secure frames in place with post-installed expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 - 6. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.
 - C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
 - 1. Non-Fire-Rated Standard Steel Doors:
 - a. Jambs and Head: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm).
 - b. Between Edges of Pairs of Doors: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm).
 - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch (9.5 mm).
 - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch (19 mm).
 - D. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.
 - 1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (50 mm) o.c. from each corner.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- D. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 081113

SECTION 083430 - VERTICALLY BI-FOLD HANGER DOOR

PART 1 – GENERAL

1.1 QUANTITY

- A. Doors for this project will consist of (3) bi-fold doors as part of the base bid and (3) bi-fold doors as part of alternate #1

1.2 SIZE OF DOOR - Clear Open Width & Height

- A. Hanger door with door in up position, shall have an opening width of (60'-0") as shown in the plans and a **CLEAR** height of (20'-0") above finished floor elevation.

1.3 PLACEMENT of the Bi-Fold Door unto the building

- A. Door shall be mounted flush with exterior walls of building.

1.4 GENERAL / CONTRACTORS REQUIREMENTS: - DESIGN CRITERIA

- A. The bi-fold hangar doors shall be designed to the same loading requirements for live, dead and wind loads as the hangar building.
- B. The doors shall be engineered to resist all anticipated loads without sagging, bowing or conflicting with its smooth and efficient operation.
- C. The design shall be furnished, approved and sealed by a professional engineer registered in the state where the project is located.
- D. The building header shall be designed to accommodate horizontal and vertical building deflections to support the bi-fold door in all positions (with the proper lateral bracing).
- E. The building's door columns shall be framed of the proper design and size to reinforce the opening (with lateral bracing) and to carry all loads and vibrations imposed thereon.
- F. The Bifold should have solid footing with sill directly underneath the door frame and extending outward from the door to provide a base for the door's weather seal. This also prevents flow of water into, or under, the door installation.
- G. The finished floor of the building should be designed to prevent flow of water under the door installation. Sills shall have a slight slope outward of the bi-fold door to prevent water flow under the door installation.

1.5 GENERAL / ELECTRICAL REQUIREMENTS:

- A. The building contractor shall furnish and install a prewired electrical door operating mechanism to control each bi-fold door.
- B. The contractor is responsible and required to completely install the prewired electrical door operating mechanism, push button controls, devices and electrical conduit and wiring to the door operating controls.
- C. The electrical door mechanism and control shall be field wired by the contractor (Not The Door Manufacturer)

- D. Control panel shall have an up/down/off switch pre-wired to motor, and over-ride controls with the required number of adequately sized insulated electrical conductors.

1.6 GENERAL / Electric Power Operator: For the Bi-Fold Doors

- A. All electrical controls and devices shall conform to the requirements of the current National Electrical Code 513, NEMA, and be UL approved.
- B. Provide UL Listed Electric Operator, size and type as recommended by the manufacturer.
- C. The operator is furnished complete and consists of a motor and factory-wired control panels consisting of main fused disconnect switch, magnetic reversing starters, limit switches and push button controls, control circuit transformers, relays, timing devices, and warning devices.

1.7 SUBMITTALS

- A. Product Data: Submit manufacturer's Spec Sheets for each Bi-fold Door, plus product data and installation instructions. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes. Provide roughing-in diagrams. Include the following:
 - A. Summary of forces and loads on walls and jambs.
 - B. Setting drawings, templates, and installation instructions for built-in or embedded anchor devices.
- B. Shop Drawings: Submit shop drawings for approval prior to fabrication. Include detailed plans, elevations, details of framing members, required clearance, anchors and accessories. Include relationship with adjacent materials. The make and type of door, operators and controls shall be clearly shown. Door weight, method of suspension, operation, and all fastenings shall be indicated.
- C. Submit (3) copies each of the following manufacturer's Manuals / Diagrams
 - A. Bi-Fold Door Literature
 - B. Installation Manual
 - C. Operating Instructions
 - D. Maintenance data/manual.
 - E. Safety Decal Placement Guide Manual / Warning Labels
 - F. Electrical System Manual for the bi-fold door system
 - 1) Electrical Schematics
 - 2) Electrical Wiring Diagram
 - G. Diagram's of potentially hazardous locations related to the operation of the door.
 - H. Shop drawings for approval.
- D. Submit shop drawings specific for this project.
NOTE: Generalized project drawings not specific to this project will not be acceptable

1.8 QUALITY ASSURANCE

- A. Source Limitations: Obtain Bi-Fold doors through one source from a single manufacturer.

- B. Manufacturer Qualifications: Engage a firm experienced in manufacturing Bi-Fold doors similar to those indicated for this Project and with a record of successful in-service performance.
- C. Installer Qualifications: Engage an experienced installer who is an authorized representative of the door manufacturer for both installation and maintenance of units required for this Project.
- D. Product Options: Drawings indicate size, profiles, and dimensional requirements of Bi-Fold doors and accessories. Other manufacturers' systems with equal performance and dimensional characteristics may be considered. Refer to OPTIONAL UPGRADE EQUIPMENT.
- E. Pre-Installation Conference: Schedule a pre-installation conference prior to commencement of field operations that might affect installation of bi-fold doors to establish procedures for maintaining optimum working conditions, and to coordinate this work with related and adjacent work.
- F. The contractor shall touch up all scratches, abrasions or other slight painting defects with the same type and color of paint as originally applied.

1.9 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials and products in manufacturer's labeled protective packages. Store and handle in strict compliance with manufacturer's written instructions and recommendations. Protect from damage from weather, excessive temperatures and constructions operations.
- B. Inspect vertical bi-fold doors upon delivery for damage. Minor damages may be repaired provided refinished items are equal in all respects to new work and acceptable to Architect. Other wise, remove and replace damaged items as directed.
- C. Place bi-fold door frame units on minimum 4" high wood blocking. Store doors components & Packages at building site under cover. Avoid use of non vented plastic or canvas shelters which could create humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately.
- D. The contractor shall store the sheet, panels, components and other manufactured items so that they will not be damaged or deformed. Store metal sheets or panels so that water accumulations will drain freely. Do not store sheets or panels in contact with other materials which might cause staining.

PART 2 – MATERIALS

2.1 APPROVED MANUFACTURERS

- A. The bi-fold doors supplied by a manufacturer who is regularly engaged in the manufacture of aircraft hangar doors for a minimum of ten years, and upon request from the owner provide a list of completed projects. Bi-fold door shall be as manufactured by Schweiss Bi-Fold Doors, Box 220, Fairfax, MN 55332, phone 507-426-8273 or equal.
 - a. Schweiss Bi-Fold Doors
P.O. Box 220
Fairfax, MN. 55332 Phone 507-426-8273 Fax 507-426-7408

- B. Other manufacturer's seeking approval of their products must comply with requirements of the Instructions to Bidders.

2.2 BI-FOLD DOOR FRAMEWORK- FABRICATION / CONSTRUCTION REQUIREMENTS

- A. Hangar doors shall be of the electrically operated bi-fold canopy type and shall be integral with the hangar building design.
- B. When in the open position the doors shall have a slight slope to direct drainage away from the building.
- C. Door shall be hinged horizontally at the top and center and be arranged to open by moving frame out & up.
- D. Door frames shall have pre-located top hinges to align with the building truss members.
- E. Door shall be self contained with only the top hinges, bottom door rollers and column followers/ wind rails.
- F. The door framework shall consist of jig welded steel tube sections engineered by the door manufacturer to resist all anticipated loads without sagging, bowing or conflicting with its smooth operation.
- G. Structural steel door framing members shall be ASTM A500 Grade B square structural welded steel tubing.
- H. All labor, materials, accessories, equipment and services necessary to furnish a complete installation of a bi-fold hangar door as indicated by the manufacturer. Including frame, sections, brackets, guides tracks, hardware , operators and installation instructions.
- I. Shop connections shall be welded.
- J. Field connections shall be bolted.
- K. Must have locking mechanism where if locking mechanism is engaged, the motor for opening the door CANNOT be engaged.

2.3 DRIVESHAFT / LIFT DRUMS

- A. The solid steel driveshaft with lift drums mounted on bottom cord of door runs continuously along entire door width providing an even lift of the door at all times.
- B. The drive shaft shall be attached to the door frame with (grease-able) bearing mounts wherever there is a cable drum installed, to minimize stress on the shaft.
- C. Solid Driveshaft and lift drums shall be in sufficient amount to give 5:1 safety factor.

2.4 LIFTING METHODS

- A. LIFT STRAPS
 - a. The door power unit shall be operated by a system of lifting straps, lifting drums and drive shafts
 - b. Lift Straps attached to a retainer on the upper door frame passing through a strap guide attached at the top chord of the door frame, thereby transmitting forces directly to header of building & relieving door of unnecessary stresses.
 - c. The Lift Straps shall have adjustable slack take-up device to keep proper tension on each Lift Strap.
 - d. The lift drums must be properly shielded to avoid any potential hazards to people.

- e. Lift Straps and Lift Drums shall be manufacturer's standard adequately sized in sufficient amount to give 5:1 safety factor.

2.5 HEAVY DUTY HINGES

- A. Heavy Duty Steel Hinges furnished complete. Each Hinge set shall be 10.50" wide, pins shall be 11/16" diameter minimum.

2.6 DOOR TRUSS'S

- A. INTERNAL TRUSS - STANDARD
 - a. An extra heavy duty center truss shall be installed in the center of the interior side.
 - b. There will be a truss at the base of the door to provide extra strength

2.7 HEAVY DUTY SIDE ROLLERS

- A. The bi-fold hangar doors shall include 3" Heavy Duty minimum guide rollers with sealed bearings on bottom of door at jamb location.

2.8 COLUMN FOLLOWERS / WIND RAILS

- A. System provided by the door manufacture to hold the base of the door securely against the building when the door is in the closed position.
 - a. Solid square columns secure only in the closed position = Wind Rails.

2.9 WIND PINS

- A. Automatic Wind Pins
 - a. Center wind pins 1" diameter minimum - provide a sturdy installation - Must automatically engage/disengage.

2.10 MANUAL LATCHING SYSTEM'S

- A. Standard Manual Latch - STANDARD
 - a. The latching system shall be provided on both sides of the doors.
 - b. A manually latching system will be furnished so that the door is manually unlocked before the door can be opened and manually relocked after the door is in the closed position.

2.11 PAINT

- A. The door frame members and parts shall be factory primer finished with gray primer.

2.12 TOP & BOTTOM RUBBER SEALS

- A. Provide manufacturer's standard seal continuous at top, bottom of each door.
- B. The door shall be equipped with neoprene weather stripping at heads and jambs to prevent flow of moisture into the door installation. Sills shall have a special fabric reinforced high grade rubber astragal. The entire door perimeter shall be weather tight.
- C. Note: That existing bituminous surface varies and seals shall be placed accordingly.

2.13 WEATHER SEAL KIT

- A. The sides and center of each bifold must be sealed off with a special weather stripping. The center of the door must have a self-sticking foam cushion seal. The entire door perimeter must be weather tight.

2.14 BI-FOLD DOOR ELECTRIC POWER OPERATOR --- BOTTOM DRIVE

- A. Location of Power Operator
 - a. Motor shall be located on bottom chord of door frame (verify location with owner prior to installation).
- B. Electrical Controls
 - a. All electrical controls and devices shall be designed to meet National Electrical Code Section 513.
 - b. All controls are pre-wired, and factory tested.

2.15 ELECTRIC MOTOR / VOLTAGE / PHASE

- A. ELECTRIC MOTOR / VOLTAGE / PHASE - STANDARD
 - a. Service: 240 VAC, single phase, 3 wire service.
 - b. Single Phase Motor's shall be totally enclosed capacitor start.
 - c. Single phase, 240-volt electric motor with overload protection direct mounted to a gear reduction box and winding drum.
 - d. The size of the motor shall be as recommended by the manufacturer.
 - e. Door operator shall be pre-wired at factory complete with 24 V.A.C. control system.

2.16 GEAR MOTOR

- A. The gear motor is equipped with an electric brake, which will stop and hold door in any position of door travel.
- B. Provide high starting torque, reversible, continuous duty, class A insulated, electric motors complying with NEMA MG 1, with overload protection, sized to start, accelerate, and operate door in either direction, from any position.
- C. A magnetic starter, with 24v control unit for reliability is standard.
- D. Design operator so motor may be removed without disturbing limit switch adjustment and without affecting emergency auxiliary operator.

2.17 CONTROL STATION'S

- A. 2 Button Constant Hold Control Station - for opening & closing your Bi-fold door.

- a. 2-button constant contact dead man switch, prevents operator from leaving control panel while door is in motion, either up or down.
- b. When the operator takes his hand off the up /down button, the door immediately stops regardless of its opening / closing position.
- c. The motor automatically stops when the door reaches either the fully open or closed position.

2.18 LIMIT SWITCHES

- A. Heavy duty limit switch box shall be weatherproof.
- B. Heavy duty limit switch box shall provide adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.
- C. Note: Safety edges shall not be used as limit switches.

2.19 ELECTRICAL DISCONNECT

- A. Provide Electrical Disconnect to completely disable the door, for service, maintenance, emergency backup operations.
- B. Mount disconnect so it is accessible from floor level.

PART 3 – EXECUTION

3.1 EXECUTION

- A. Examination
 - a. Examine wall and overhead areas, including opening framing and blocking, with Installer present, for compliance with requirements for installation tolerances, clearances, and other conditions affecting performance of Work of this section.
 - b. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General:
 - a. Door manufacturer is required to coordinate with the metal building manufacturer in the development of the exact installation details and provide weights and door loadings to building manufacturer.
 - b. Install door, track, and operating equipment complete with necessary hardware, jamb and head mold strips, anchors, inserts, hangers, and equipment supports according to Shop Drawing, manufacturer's written instructions, and as specified.
 - c. Fasten vertical track assembly to framing at not less than 24 inches o.c. Hang horizontal track, hinges from structural overhead framing with angle or channel hangers welded and/or bolt fastened in place. Provide sway bracing, diagonal bracing, and reinforcement as required for rigid installation of track, hinges and door-operating equipment.
- B. Top and Bottom Limits Settings

- a. Each bi-fold door has a recommended clear opening setting, specified by the manufacture. Do not over travel the door beyond the recommended setting.
- C. Exterior wall panels
 - a. Metal building erector to install the same exterior wall panels that are on the building, use the same type on the bi-fold doors. Install the proper trims that are recommended by the manufacturer.
- D. Apply Proper Safety Markings
 - a. Apply proper markings for any potentially hazardous locations related to the operation of the door.
 - b. Follow the pictorial diagram included in the door installation manual.
- E. Installing Warning Labels
 - a. Furnish warning labels for any potentially hazardous locations related to the operation of the door.
 - b. Fasten warning labels to the bi-fold door frame and by the operator's station in accordance with manufacturer's instructions, NO EXCEPTIONS.
- F. Installer Certificates: Signed by manufacturer certifying that installers comply w/ specified requirements.

3.3 ELECTRICAL WORK - Contractor is responsible for:

- A. The contractor is responsible and required to completely install the prewired electrical door operating mechanism, push button controls, devices and electrical conduit & wiring to the door operating controls.
- B. Detail wiring for power, signal, and control systems.
 - a. Differentiate between manufacturer-installed and field installed wiring & between components pro-vided by door manufacturer and those provided by others.
- C. Install bi-fold doors in accordance with manufacturer's instructions.

3.4 Adjust & Clean

- A. Lubricate, test adjust doors - to operate easily, free from warp, twist, or distortion and fitting weathertight for entire perimeter.
- B. Prime Coat Touch Up:
 - A. Immediately after erection, sand and smooth any rusted or damaged areas of prime coat.
 - B. Touch-up damaged coating and finishes and repair minor damage.
 - C. Clean exposed surfaces using non-abrasive materials and methods recommended by manufacturer of material or product being cleaned and apply touch up of compatible air-drying primer.
- C. Final Adjustments:
 - a. Lubricate bearings and moving parts, adjust open and closed limits & doors to operate easily, free from warp, twist, or distortion and fitting weather-tight for the entire perimeter.
 - b. Check and readjust operating finish hardware items, leaving vertical bi-fold doors undamaged and in complete and proper operating condition.

3.5 DEMONSTRATION

- A. Startup Services: Engage a qualified -authorized service representative to perform startup services and to train Owner's maintenance personnel as specified below:
 - a. Test and adjust controls and safeties. Replace damaged and malfunctioning controls & equipment.
 - b. Train Owner's maintenance personnel on procedures and schedules related to startup and shut down, operating, troubleshooting, servicing, and preventative maintenance.
 - c. Review data in the installation & maintenance manuals.
 - d. Schedule training with Owner at least 7 days advance notice.

3.6 WARRANTY

- A. The Contractor shall warrant the door to be free of defects in accordance with the General Conditions, except the warranty shall be extended by manufacturer's 2 - year written warranty against defects in materials and workmanship, against problems which arise through normal anticipated usage of the door during the warranty period. The warranty shall be signed by the manufacturer.
- B. Additional Warranty on The Straps
In addition to the warranty specified above, the door manufacturer shall warrant the original lift straps for a period of five years, against defects in material.

3.7 OPTIONAL UPGRADE EQUIPMENT

- A. Top Override Safety Switches
Upper override switch that disconnects power to door if upper limit fails or if limits are overridden.
This safety feature is designed to prevent the door from traveling beyond its recommended clear opening height. If the door passes its full clear opening height, it will activate the override and stop the door automatically.
- B. Side Latch Safety Switches
Side Latch Safety Switches eliminate possible damage if door is opened while in locked position.
These switches are designed to prevent the door from operating while the side latches are locked in the closed position.
- C. Warning Lights and Horn
Warning Lights and Horn, which alerts persons in the area that door is opening or closing.

3.8 ACCESSORIES

- A. LOCATION AND QUANTITIY OF WALK IN DOOR
 - a. As indicated on drawings
- C. WALK IN DOOR WITH WINDOW

West Quad 6 Unit Box Hangar
Terre Haute Regional Airport
Terre Haute, Indiana

- a. An insulated walk-in door with minimum dimensions of 36 inches x 80 inches shall be provided in each bifold.
 - b. The window within the walk door shall be 24" x 30"
- E. WALK IN DOOR COLOR
 - a. Standard color specified / provided by the door mfg
 - b. As indicated on sheet A-601 of the drawings
- F. WALK IN DOOR CYLINDER LOCK
 - a. The walk-in door shall be equipped with a cylindrical lock and shall be master keyed, manufactured by Schlage, or approved equal.
 - b. Each unit shall be keyed differently, however doors securing entry to the same room shall be keyed alike. Two individual keys shall be furnished for each hangar unit together with three master keys. Verify keying with owner prior to installation.
 - c. Each walk-in door will be pre-painted by the contractor, color indicated on sheet A-601 of drawings.
 - d. Each Locking System may vary.
 - e. For electrically operated bi-fold doors, equip man door with safety interlock switch which will prevent electric operation of bi-fold door when the man door is open or ajar.

END OF SECTION

SECTION 083613 - SECTIONAL OVERHEAD DOORS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following types of electronically operated sectional overhead doors:
 - 1. Electrically operated steel sectional overhead doors with steel-framed
 - 2. Tracks configured for the following lift types:
 - a. Vertical, Hi-lift
 - 3. Sectional Door operating hardware, controls, and supports
- B. Related Sections include the following:
 - 1. Division 13 Metal Building Systems
 - 2. Division 8 Hollow Metal Doors and Frames
 - 3. Division 28 Connection to power supply and control devices

1.3 DEFINITIONS

- A. Operation Cycle: One complete cycle of a door begins with the door in the closed position. The door is then moved to the open position and back to the closed position.

1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide sectional overhead doors capable of withstanding the effects of gravity loads and the following loads and stresses without evidencing permanent deformation of door components:
 - 1. Wind Load: Uniform pressure (velocity pressure) of 20 lbf/sq. ft. (960 Pa), acting inward and outward.
- B. Electric operation-cycle requirements: Design sectional overhead door components and operator to operate for not less than 10,000 cycles.
- C. Installed R-Value: Minimum R-Value = 24
- D. Track and operating hardware: high lift

1.5 SUBMITTALS

- A. Product Data: For each type and size of sectional overhead door and accessory. Include details of construction relative to materials, dimensions of individual components, profiles, operating characteristics, electrical characteristics, furnished accessories and finishes. Provide roughing- in diagrams, operating instructions, and maintenance information. Include the following:
 - 1. Setting drawings, templates, and installation instructions for built-in or embedded anchor devices.
 - 2. Summary of forces and loads on walls and jambs.
 - 3. Motors: Show nameplate data and ratings; characteristics; mounting arrangements; size and location of winding termination lugs, conduit entry, and grounding lug; and coatings.
- B. Shop Drawings: For special components and installations not dimensioned or detailed in manufacturer's data sheets.
 - 1. Wiring Diagrams: Detail wiring for power, signal, and control systems. Differentiate between manufacturer-installed and field-installed wiring and between components provided by door manufacturer and those provided by others.
 - 2. Include plans, elevations, sections and mounting details.
 - 3. Include details of equipment assemblies. Indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
- C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for units with factory-applied finishes.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For sectional doors to include in maintenance manuals.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by CHI Overhead Doors, Model 3236 or an approved equal product by one of the following :
 - 1. Steel Doors with insulated steel panels:
 - a. Overhead Door Corporation
 - b. CHI Overhead Doors
 - c. Approved equal

2.2 STEEL SECTIONS

- A. Construct door sections from galvanized, structural-quality carbon-steel sheets complying with ASTM A 653 (ASTM A 653M), commercial quality, with a minimum yield strength of 33,000 psi (225 MPa) and a minimum G60 (Z180) zinc coating.
 - 1. Steel Sheet Thickness: 26 gauge exterior min
 - 2. Exterior Section Face: Grooved, ribbed or fluted.
- B. Fabricate door panels from a single sheet to provide sections not more than 24 inches (600 mm) high and nominally 2 inches (50 mm) deep. Roll horizontal meeting edges to a continuous, interlocking, keyed, rabbeted, shiplap, or tongue-in-groove weathertight seal, with a reinforcing flange return.
- C. Reinforce sections with continuous horizontal and diagonal reinforcement, as required to stiffen door and for wind loading. Provide galvanized steel bars, struts, trusses or strip steel, formed to depth and bolted or welded in place.
- D. Provide reinforcement for hardware attachment.
- E. Insulation: Manufacturer's standard polyurethane-foam-type thermal insulation, foamed in place to completely fill inner core of section, pressure bonded to face sheets to prevent delamination under wind load and with maximum flame-spread and smoke-developed indices of 75 and 450, respectively, according to ASTM E 84. Enclose insulation completely, with no exposed insulation material evident.
 - 1. Steel Sheet Inside Face: 27 gauge min.
- F. Fabricate sections so finished door assembly is rigid and aligned, with tight hairline joints, and free of warp, twist, and deformation.
- G. Finish galvanized steel door sections as follows:
 - 1. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 2. Factory Prime Finish: Manufacturer's standard primer, compatible with field-applied finish. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.
 - 3. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.
 - a. Color and Gloss: As selected by Owner from manufacturer's full range.

2.3 TRACKS, SUPPORTS, AND ACCESSORIES

- A. Tracks: Provide manufacturer's standard, galvanized steel track system, sized for door size

and weight, designed for lift type indicated and clearances shown, and complying with ASTM A 653 (ASTM A 653M), for minimum G60 (Z180) zinc coating. Provide complete track assembly including brackets, bracing, and reinforcement for rigid support of ball-bearing roller guides for required door type and size. Slot vertical sections of track at 2 inches o.c. for door-drop safety device. Slope tracks at proper angle from vertical or otherwise design to ensure tight closure at jambs when door unit is closed. Weld or bolt to track supports.

- B. Track Reinforcement and Supports: Provide galvanized steel track reinforcement and support members, complying with ASTM A 36 (ASTM A 36M) and ASTM A 123. Secure, reinforce, and support tracks as required for door size and weight to provide strength and rigidity without sag, sway, and vibration during opening and closing of doors.
- C. Support and attach tracks to opening jambs with continuous angle welded to tracks and attached to wall. Support vertical tracks with continuous angle welded to track and supported by laterally braced attachments to structural members.
- D. Weatherseals: Provide replaceable, adjustable, continuous, compressible weather-stripping gaskets of flexible vinyl, rubber, or neoprene fitted to bottom and at top of overhead door.
 - 1. Provide motor-operated doors with combination bottom weatherseal.
 - 2. In addition, provide continuous flexible seals at door jambs for a weathertight install.

2.4 HARDWARE

- A. General: Provide heavy-duty, corrosion-resistant hardware, with hot-dip galvanized, stainless- steel, or other corrosion-resistant fasteners, to suit door type.
- B. Hinges: Provide heavy-duty galvanized steel hinges, of not less than 0.0747-inch- (1.9-mm-) thick uncoated steel, at each end stile and at each intermediate stile, per manufacturer's written recommendations for door size. Attach hinges to door sections through stiles and rails with bolts and lock nuts or lock washers and nuts. Use rivets or self-tapping fasteners where access to nuts is not possible. Provide double-end hinges, where required, for doors exceeding 16 feet (4.87 m) in width, unless otherwise recommended by door manufacturer.
- C. Rollers: Provide heavy-duty rollers, with steel ball bearings in case-hardened steel races, mounted with varying projections to suit slope of track. Extend roller shaft through both hinges where double hinges are required. Provide 3-inch- (75-mm-) diameter roller tires for 3-inch (75- mm) track, and as follows:
 - 1. Case-hardened steel tires.
- D. Slide Bolt: Fabricate with side locking bolts to engage through slots in tracks for locking by padlock, located on single-jamb side, operable from inside only.
- E. Where door unit is power operated, provide safety interlock switch to disengage power supply when door is locked.

2.5 COUNTERBALANCING MECHANISM

- A. Torsion Spring: Operation by torsion-spring counterbalance mechanism consisting of adjustable tension torsion springs, fabricated from oil-tempered-steel wire complying with ASTM A 229 (ASTM A 229M), Class II, mounted on a cross-header tube or steel shaft. Connect to door with galvanized aircraft-type lift cables with cable safety factor of at least 5 to 1. Provide springs calibrated for 10,000 cycles minimum.
 - 1. Lift cables are to be concealed. Lift cables exposed to the exterior are not acceptable.
- B. Bracket: Provide anchor support bracket, as required to connect stationary end of spring to the wall, to level shaft and prevent sag.

2.6 ELECTRIC DOOR OPERATORS

- A. General: Provide heavy duty electric door operator assembly by Liftmaster GH (gear hoist) model at ½ HP or approved equal of size and capacity recommended and provided by door manufacturer for door and operational life specified, complete with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
- B. Comply with NFPA 70.
- C. Disconnect Device: Provide hand-operated disconnect or mechanism for automatically engaging sprocket-chain operator and releasing brake for emergency manual operation while disconnecting motor, without affecting timing of limit switch. Mount disconnect and operator so they are accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
- D. Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency auxiliary operator.
- E. Provide control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V, ac or dc.
- F. Door-Operator Type: Unit consisting of electrical motor and the following:
 - 1. Trolley or draw bar type, with V-belt primary drive, chain and sprocket secondary drive and quick release for manual operation.
- G. Electric Motors: Provide high-starting torque, reversible, continuous-duty, Class A insulated, electric motors, complying with NEMA MG 1, with overload protection, sized to start, accelerate, and operate door in either direction, from any position, at not less than 2/3 fps (0.2 m/s) and not more than 1 fps (0.3 m/s), without exceeding nameplate ratings or considering service factor. 120 volt, single phase, 3/4 horsepower.

1. Coordinate wiring requirements and electrical characteristics of motors with building electrical system.
 2. Provide open drip proof-type motor, and controller with NEMA ICS 6, Type 1 enclosure.
- H. Remote-Control Station: Provide momentary-contact, 3-button control station with push-button controls labeled "Open," "Close," and "Stop."
1. Provide interior units, full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
- I. Obstruction Detection Device: Photo eyes.
- J. Limit Switches: Provide adjustable switches, interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.
- K. Emergency Manual Operation: Equip electrically powered door with chain hoist lifting capability for Emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf (111N).
- L. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
- M. Provide operators with a 2-year limited warranty on motor and parts.
- N. Remote controls: (2) remote controls to be provided per overhead door

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine wall and overhead areas, including opening framing and blocking, with Installer present, for compliance with requirements for installation tolerances, clearances, and other conditions affecting performance of Work of this Section.
1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install door, track, and operating equipment complete with necessary hardware, jamb and head mold strips, anchors, inserts, hangers, and equipment supports according to Shop Drawings, manufacturer's written instructions, and as specified.
- B. Fasten vertical track assembly to framing at not less than 24 inches (600 mm) o.c. Provide sway bracing, diagonal bracing, and reinforcement as required for rigid installation of track and door operating equipment.

West Quad 6 Unit Box Hangar
Terre Haute Regional Airport
Terre Haute, Indiana

- C. Accessibility: Install sectional doors, switches and controls along accessible routes in compliance with regulatory requirements for accessibility.

3.3 ADJUSTING

- A. Lubricate bearings and sliding parts; adjust doors to operate easily, free from warp, twist, or distortion and fitting weathertight for entire perimeter.
- B. Adjust belt-driven motors as follows:
 - 1. Use adjustable motor-mounting bases for belt-driven motors.
 - 2. Align pulleys and install belts.
 - 3. Tension belt according to manufacturer's written instructions.

END OF SECTION 083613

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:

- 1. Commercial door hardware for the following:

- a. Swinging doors.
- b. Other doors to the extent indicated.

- 2. Cylinders for doors specified in other Sections.

- B. Related Sections include the following:

- 1. Division 08 Section "Hollow Metal Doors and Frames" for door silencers provided as part of hollow-metal frames.

- C. Products furnished, but not installed, under this Section include the following. Coordinating, purchasing, delivering, and scheduling remain requirements of this Section.

- 1. Cylinders for locks specified in other Sections.

1.3 SUBMITTALS

- A. Product Data: Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.

- B. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for locks, latches and closers.

- C. Maintenance Data: For each type of door hardware to include in maintenance manuals. Include final hardware and keying schedule.

- D. Other Action Submittals:

- 1. Keying Schedule: Prepared by or under the supervision of Architectural Hardware Consultant, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by lock manufacturer.
 - 1. Installer's responsibilities include supplying and installing door hardware and providing a qualified Architectural Hardware Consultant available during the Work to consult with Contractor, Architect, and Owner about door hardware and keying.
 - 2. Installer shall have warehousing facilities in Project's vicinity.
 - 3. Scheduling Responsibility: Preparation of door hardware and keying schedules.
- B. Architectural Hardware Consultant Qualifications: A person who is currently certified by DHI as an Architectural Hardware Consultant and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.
- C. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.
- D. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252, UBS Standard 7-2.
- E. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
- F. Means of Egress Doors: Latches do not require more than 15 lbf (67 N) to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
- G. Accessibility Requirements: For door hardware on doors in an accessible route, comply with ICC/ANSI A117.1.
 - 1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22.2 N).
 - 2. Comply with the following maximum opening-force requirements:
 - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
 - b. Sliding or Folding Doors: 5 lbf (22.2 N) applied parallel to door at latch.
 - c. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
 - 3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than ½ inch (13 mm) high.
 - 4. Adjust door closer sweep periods so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches (75 mm) from the latch, measured to the leading edge of the door.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered

to Project site.

- B. Tag each item or package separately with identification related to the final door hardware sets, and include basic installation instructions, templates, and necessary fasteners with each item or package.

1.6 COORDINATION

- A. Templates: Distribute door hardware templates for doors, frames, and other work specified to be factory prepared for installing door hardware, including hardware items specified in other sections. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- B. Electrical System Rough-in: Coordinate layout and installation of electrified door hardware with provider of access control system.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including excessive deflection, cracking, or breakage.
 - b. Faulty operation of doors and door hardware.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
 - 2. Warranty Period: Three years from date of Substantial Completion, unless otherwise indicated.
 - a. Exit Devices: Two years from date of Substantial Completion.
 - b. Manual Closers: 10 years from date of Substantial Completion.

1.8 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.
- B. Maintenance Service: Beginning at Substantial Completion, provide **six** months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door and door hardware operation. Provide parts and supplies that are the same as those used in the manufacture and installation of original products.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in this Section and door hardware sets indicated in Part 3 "Door Hardware Sets" Article.
- B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 "Door Hardware Sets" Article. Products are identified by using door hardware designations, as follows:
 - 1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in Part 3 "Door Hardware Sets" Article.
 - 2. An asterisk (*) indicates manufacturer of product indicated in schedule.
- C. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 HINGES, GENERAL

- A. Quantity: Provide the following, unless otherwise indicated:
 - 1. Two Hinges: For doors with heights up to 60 inches (1524 mm).
 - 2. Three Hinges: For doors with heights 61 to 90 inches (1549 to 2286 mm).
 - 3. Four Hinges: For doors with heights 91 to 120 inches (2311 to 3048 mm).
 - 4. For doors with heights more than 120 inches (3048 mm), provide 4 hinges, plus 1 hinge for every 30 inches (750 mm) of door height greater than 120 inches (3048 mm).
- B. Template Requirements: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.
- C. Hinge Base Metal: Unless otherwise indicated, provide the following:
 - 1. Exterior Hinges: Stainless steel, with stainless-steel pin.
 - 2. Interior Hinges: Steel with steel pin.
- D. Hinge Options: Where indicated in door hardware sets or on Drawings:
 - 1. Nonremovable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for out swinging exterior doors.
- E. Fasteners: Comply with the following:

1. Machine Screws: For metal doors and frames. Install into drilled and tapped holes.
2. Wood Screws: For wood doors and frames.
3. Screws: Phillips flat head; machine screws (drilled and tapped holes) for metal doors, wood screws for wood doors and frames. Finish screw heads to match surface of hinges.

2.3 HINGES

A. Manufacturers:

1. *Ives; an Allegion company (IVE).
2. Hager Companies (HAG).
3. McKinney Products Company; an ASSA ABLOY Group company (MCK).
4. Stanley Commercial Hardware; Div. of The Stanley Works (STH).

2.4 CONTINUOUS HINGES

A. Standard: HMA A 156.26.

1. Listed under Category N in BHMA's "Certified Product Directory".

B. General: Minimum 0.120 inch (3.0 mm) thick, hinge leaves with minimum overall width of 4 inches (102 mm); fabricated to full height of door and frame and to template screw locations; with components finished after milling and drilling area complete.

C. Continuous, Gear-Type Hinges: Extruded-aluminum, pinless, geared hinge leaves; joined by a continuous extruded-aluminum channel cap; with concealed, self-lubricating thrust bearings.

1. Available Manufacturers:

- a. Ives; an Allegion company (IVE).
- b. Hager Companies (HAG).
- c. McKinney Products Company; an ASSA ABLOY Group Company (MCK).
- d. Steel Products Limited (SPL).

2.5 LOCKS AND LATCHES, GENERAL

A. Accessibility Requirements: Where indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."

1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22 N).

B. Latches and Locks for Means of Egress Doors: Comply with NFPA 101. Latches shall not require more than 15 lbf (67 N) to release the latch. Locks shall not require use of a key,

tool, or special knowledge for operation.

C. Electrified Locking Devices: BHMA A156.25

D. Lock Trim:

1. Levers:

a. Extra Heavy Duty Commercial Duty Cylindrical Locks: Schlage
“ND” Series design with Sparta lever.

2. Escutcheons (Roses): Cast.

E. Backset: 2-3/4”, unless otherwise indicated.

F. Strikes: Manufacturer's standard strike with strike box for each latch bolt or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, and as follows:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.

2. Strikes for Bored Locks and Latches: BHMA A156.2.

2.6 MECHANICAL LOCKS AND LATCHES

A. Lock Functions: Function numbers and descriptions indicated in door hardware sets.

B. Bored Locks: BHMA A156.2, Grade 1; Series 4000.

1. Available Manufacturers:

a. *Schlage ND series; an Allegion company. (SCH). No substitution.

2.7 DOOR BOLTS

A. Bolt Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:

1. Mortise Flush Bolts: Minimum 3/4-inch (19-mm) throw.

B. Constant Latching Flush Bolts: designed for mortising into door edge.

1. Manufacturers:

a. Hager Companies (HAG).

b. *Ives; an Allegion company (IVE).

c. Trimco (TBM).

2.8 EXIT DEVICES

- A. Exit Devices for Means of Egress Doors: Comply with NFPA 101. Exit devices shall not require more than 15 lbf (67 N) to release the latch. Locks shall not require use of a key tool, or special knowledge for operation.
- B. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.
- C. Fire Exit Devices: Devices complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252.
- D. Manufacturers:
 - 1. *Von Duprin 99/33A series, an Allegion company (VON). No substitution.

2.9 LOCK CYLINDERS

- A. Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:
 - 1. Small Format Interchangeable Cores: Core insert, removable by use of a special key. Supplied by Owner.
- B. Construction Keying: Comply with the following:
 - 1. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.
 - a. Replace construction cores with permanent cores as directed by Owner.
- C. Manufacturers:
 - 1. *Schlage Everest 29; an Allegion company (SCH). No substitution.

2.10 AUXILIARY LOCKS:

- A. Deadlocks:
 - 1. Provide armor faceplate to suit door edge.
 - 2. Backset shall be 1 1/2" unless door stile width requires narrower backset.
 - 3. Provide a box non-lipped strike.
 - 4. Manufactures:
 - a. Adams Rite; an ASSA Abloy Company, MS1850S series, (ADA).

2.11 OPERATING TRIM

- A. Materials: Fabricate from stainless steel, unless otherwise indicated.
- B. Manufacturers:
 - 1. *Ives; an Allegion company (IVE).
 - 2. Hager Companies (HAG).
 - 3. Rockwood Manufacturing Company (RM).
 - 4. Trimco (TBM).

2.12 CLOSERS

- A. Accessibility Requirements: Where handles, pulls, latches, locks, and other operating devices are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."
 - 1. Comply with the following maximum opening-force requirements:
 - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
 - b. Fire Doors: Minimum opening force allowed by authorities having jurisdiction.
- B. Door Closers for Means of Egress Doors: Comply with NFPA 101. Door closers shall not require more than 30 lbf (133 N) to set door in motion and not more than 15 lbf (67 N) to open door to minimum required width.
- C. Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.
- D. Surface Closers: Provide type of arm required for closer to be located on non-public side of door, unless otherwise indicated.
 - 1. Manufacturers:
 - a. *LCN Closers; an Allegion company, 4040XP series. No substitutions.

2.13 PROTECTIVE TRIM UNITS

- A. Size: 1-1/2 inches (38 mm) less than door width on push side and 1 inch (13 mm) less than door width on pull side, by height specified in door hardware sets.
- B. Fasteners: Manufacturer's standard machine or self-tapping screws.
- C. Metal Protective Trim Units: BHMA A156.6; beveled top and 2 sides; fabricated from

material indicated in door hardware sets. the following material:

1. Material: 0.050-inch- (1.3-mm-) thick stainless steel.
2. Manufacturers:
 - a. *Ives; an Allegion company, (IVE).
 - b. Hager Companies (HAG).
 - c. Rockwood Manufacturing Company (RM).
 - d. Trimco (TBM).

2.14 DOOR GASKETING

- A. General: Provide continuous weather-strip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated or scheduled. Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.
 1. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
 2. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
 3. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.
- B. Air Leakage: Not to exceed 0.50 cfm per foot (0.000774 cu. m/s per m) of crack length for gasketing other than for smoke control, as tested according to ASTM E 283.
- C. Smoke-Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke-control ratings indicated, based on testing according to UL 1784.
 1. Provide smoke-labeled gasketing on 20-minute-rated doors and on smoke- labeled doors.
- D. Fire-Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252, UBC Standard 7-2.
- E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- F. Gasketing Materials: ASTM D 2000 and AAMA 701/702.
- G. Manufacturers:
 1. Hager Companies (HAG).
 2. National Guard Products (NGP).
 3. Pemko Manufacturing Co. (PEM).
 4. Reese Enterprises (RE).
 5. *Zero International (ZRO).

2.15 STOPS AND HOLDERS

- A. Stops and Bumpers: BHMA A156.16, Grade 1 unless Grade 2 is indicated.
 - 1. Provide floor stops for doors unless wall or other type stops are scheduled or indicated. Do not mount floor stops where they will impede traffic. Where floor or wall stops are not appropriate, provide overhead holders.
- B. Combination Overhead Stops and Holders: BHMA A156.8, Grade 1 unless Grade 2 is indicated.
- C. Manufacturers:
 - 1. *Glynn-Johnson; an Ingersoll-Rand Company (GJ)
 - 2. Hager Companies (HAG)
 - 3. *IVES Hardware; an Ingersoll-Rand Company (IVS)
 - 4. Rockwood Manufacturing Company (RM)
 - 5. SARGENT Manufacturing Company; an SSA ABLOY Group company (SGT).

2.16 POWER TRANSFERS:

- A. Transfer power from door frame to edge of door, UL listed R4504.
- B. Power transfer to be concealed when door is closed.
- C. Manufacturers:
 - 1. Von Duprin; an Allegion company, EPT series (VON). No substitution.

2.17 MAGNETIC LOCKS:

- A. Provide magnetic locks conforming to ANSI/BHMA A156.23 classification criteria including minimum holding force of 1500 LBF.
- B. Provide fasteners, mounting brackets, and spacer bars required for mounting and details.
- C. Provide power supply recommended and approved by manufacturer of magnetic locks.
- D. Where magnetic locks are scheduled, provide complete assemblies of controls, switches, power supplies, relays, and parts/material recommended and approved by manufacturer of magnetic locks for each individual leaf. Switches control both doors simultaneously at pairs. Locate controls as directed by Architect.
- E. Manufacturers:
 - 1. Schlage; an Allegion Company, M490P series (SCE).
 - 2. Securitron; an ASSA Abloy Company, M series (SEC).
 - 3. Dorma, EM series (DOR).

2.18 Pushbutton Release Devices:

- A. 1-5/8" mushroom heavy duty button, delayed action setting from 0-60 seconds, glow in the dark.
- B. Manufacturers:
 - 1. Schlage, 623 series.
 - 2. Equal be Securitron.

2.19 THRESHOLDS

- A. Accessibility Requirements: Where thresholds are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)." ANSI A117.1.
 - 1. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch (13 mm) high.
- B. Thresholds for Means of Egress Doors: Comply with NFPA 101. Maximum 1/2 inch (13 mm) high.
- C. Manufacturers:
 - 1. Hager Companies (HAG).
 - 2. National Guard Products (NGP).
 - 3. Pemko Manufacturing Co. (PEM).
 - 4. Reese Enterprises (RE).
 - 5. *Zero International (ZRO).

2.20 FABRICATION

- A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rated labels and as otherwise approved by Architect.
 - 1. Manufacturer's identification is permitted on rim of lock cylinders only.
- B. Base Metals: Produce door hardware units of base metal, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18. Do not furnish manufacturer's standard materials or forming methods if different from specified standard.
- C. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to commercially recognized industry standards for application intended, except aluminum

fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.

1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
2. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
3. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended Fasteners for Wood Doors."

2.21 FINISHES

- A. Standard: BHMA A156.18, as indicated in door hardware sets.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified hardware installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Steel Doors and Frames: Comply with DHI A115 Series.
 1. Surface-Applied Door Hardware: Drill and tap doors and frames according to ANSI A250.6.
- B. Wood Doors: Comply with DHI A115-W Series.

3.3 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights indicated as follows unless otherwise indicated or required to comply with governing regulations.
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 09 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
 - 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 - 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- C. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

3.4 FIELD QUALITY CONTROL

3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
 - 1. Door Closers: Unless otherwise required by authorities having jurisdiction, adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches (75 mm) from the latch, measured to the leading edge of the door.
- B. Occupancy Adjustment: Approximately six months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust, including adjusting operating forces, each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.6 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.

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- C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Refer to Division 01 Section "Demonstration and Training."

3.8 DOOR HARDWARE SCHEDULE

- A. Refer to drawing A-601 for hardware schedule and door schedule

END OF SECTION 087100

SECTION 088000 – GLAZING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 01, and Division 8 Hollow Metal Doors and Frames Specification Sections, apply to this section

1.2 SUMMARY

- A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
 - 1. Doors
 - 2. Glazed entrances.

1.3 DEFINITIONS

- A. Manufacturers of Glass Products: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.
- D. Deterioration of Insulating Glass: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions.

Provide glass lites in the thickness designations indicated for various size openings, but not less than

thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:

1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
 - a. Specified Design Wind Loads: As indicated, but not less than wind loads applicable to Project as required by ASCE 7 "Minimum Design Loads for Buildings and Other Structures": Section 6.0 "Wind Loads."
 - b. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.
 - 1) Load Duration: 60 seconds or less.
 - c. Maximum Lateral Deflection: For the following types of glass supported on all 4 edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 1 inch (25 mm), whichever is less.
 - 1) For monolithic glass lites heat treated to resist wind loads.
 - 2) For insulating glass.
 - d. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.
 - e. Thickness of Tinted and Heat-Absorbing Glass: Provide the same thickness for each tint color indicated throughout Project.
- C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:
 1. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
 2. Center-of-Glass Values: Based on using LBL-44789 WINDOW 5.0 computer program for the following methodologies:
 - a. U-Factors: NFRC 100 expressed as Btu/ sq. ft. x h x deg F (W/sq. m x K).
 - b. Solar Heat Gain Coefficient: NFRC 200.
 - c. Solar Optical Properties: NFRC 300.

1.5 SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Samples: For the following products, in the form of 12-inch- (300-mm-) square Samples for glass.
 - 1. Tinted glass.
 - 2. Insulating glass for each designation indicated.
- C. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.
- D. Qualification Data: For installers.
- E. Product Test Reports: For each of the following types of glazing products:
 - 1. Tinted float glass.
 - 2. Insulating glass.
 - 3. Glazing gaskets.
- F. Warranties: Special warranties specified in this Section.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
- B. Source Limitations for Glazing Accessories: Obtain glazing accessories through one source from a single manufacturer for each product and installation method indicated.
- C. Glass Product Testing: Obtain glass test results for product test reports in "Submittals" Article from a qualified testing agency based on testing glass products.
 - 1. Glass Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
- D. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201.
 - 1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council or another certification agency or manufacturer acceptable to authorities having jurisdiction.
 - 2. Where glazing units, including Kind FT glass and laminated glass, are specified in

Part 2 articles for glazing lites more than 9 sq. ft. (0.84 sq. m) in exposed surface area of one side, provide glazing products that comply with Category II materials, for lites 9 sq. ft. (0.84 sq. m) or less in exposed surface area of one side, provide glazing products that comply with Category I or II materials, except for hazardous locations where Category II materials are required by 16 CFR 1201 and regulations of authorities having jurisdiction.

- E. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: GANA's "Glazing Manual."
2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."

- F. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the following testing and inspecting agency:

1. Insulating Glass Certification Council.

- G. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, whether glazing is for use in fire doors or other openings, whether or not glazing passes hose-stream test, whether or not glazing has a temperature rise rating of 450 deg. F (250 deg. C), and the fire-resistance rating in minutes.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1.9 WARRANTY

- A. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form, made out to Owner and signed by insulating-glass manufacturer agreeing to replace insulating-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Basis of Design Product: The design for each glazing product is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers listed.

2.2 GLASS PRODUCTS

- A. Annealed Float Glass: ASTM C 1036, Type I (transparent flat glass), Quality-Q3; of class indicated.
- B. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; of class, kind, and condition indicated.
 - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
 - 2. Provide Kind HS (heat-strengthened) float glass in place of annealed float glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
 - 3. For uncoated glass, comply with requirements for Condition A.
 - 4. For coated vision glass, comply with requirements for Condition C (other uncoated glass).
 - 5. Provide Kind FT (fully tempered) float glass in place of annealed or Kind HS (heat strengthened) float glass where safety glass is indicated.
- C. Insulating-Glass Units, General: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article and in Part 2 "Insulating-Glass Units" Article.
 - 1. Provide Kind HS (heat-strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
 - 2. Provide Kind FT (fully tempered) glass lites where safety glass is indicated.
 - 3. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated for insulating glass units are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.
 - 4. Sealing System: Dual seal, with primary and secondary sealants as follows:
 - a. Manufacturer's standard sealants.
 - 5. Spacer Specifications: Manufacturer's standard spacer material and construction.

- a. Corner Construction: Manufacturer's standard corner construction.

2.3 GLAZING GASKETS

- A. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned gaskets of material indicated below; complying with ASTM C 509, Type II, black; and of profile and hardness required to maintain watertight seal:
 1. Neoprene.
 2. EPDM.
 3. Silicone.
 4. Thermoplastic polyolefin rubber.
 5. Any material indicated above.

2.4 MISCELLANEOUS GLAZING MATERIALS

- A. Annealed Float Glass: ASTM C 1036, Type I (transparent flat glass), Quality-Q3; of class indicated.
- B. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; of class, kind, and condition indicated.
 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
 2. Provide Kind HS (heat-strengthened) float glass in place of annealed float glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
 3. For uncoated glass, comply with requirements for Condition A.
 4. For coated vision glass, comply with requirements for Condition C (other uncoated glass).
 5. Provide Kind FT (fully tempered) float glass in place of annealed or Kind HS (heat strengthened) float glass where safety glass is indicated.
- C. Insulating-Glass Units, General: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article and in Part 2 "Insulating-Glass Units" Article.
 1. Provide Kind HS (heat-strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
 2. Provide Kind FT (fully tempered) glass lites where safety glass is indicated.
 3. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated for insulating glass units are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.
 4. Sealing System: Dual seal, with primary and secondary sealants as follows:

- a. Manufacturer's standard sealants.
- 5. Spacer Specifications: Manufacturer's standard spacer material and construction.
 - a. Corner Construction: Manufacturer's standard corner construction.

2.5 GLAZING GASKETS

- A. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned gaskets of material indicated below; complying with ASTM C 509, Type II, black; and of profile and hardness required to maintain watertight seal:
 - 1. Neoprene.
 - 2. EPDM.
 - 3. Silicone.
 - 4. Thermoplastic polyolefin rubber.
 - 5. Any material indicated above.

2.6 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

2.7 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

2.8 INSULATING-GLASS UNITS

- A. Insulating-Glass Units:
 - 1. Basis of Design Product:

- a. PPG Solarban 60 Solar Control Low E Glass, clear or a comparable product by one of the following :
 - 1) AFG Glass
 - 2) Viracon
 - 3) Guardian
 - 4) Approved equal
2. Overall Unit Thickness and Thickness of Each Lite: Comply with wood door manufacturer standards.
3. Interspace Content: Air.
4. Outdoor Lite: Class 2 float glass.
 - a. Color: Selected by owner from manufacturer's standard tint colors
 - b. Annealed, Kind HS (heat strengthened), Kind FT (fully tempered).
5. Visible Light Transmittance: 70 percent minimum.
6. Winter Nighttime NFRC U-Value: .29
7. Shading Coefficient: 0.45
8. Solar Heat Gain Coefficient: 0.39
9. Light to Solar Gain Ratio: 1.79

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine framing glazing, with Installer present, for compliance with the following:
 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 2. Presence and functioning of weep system.
 3. Minimum required face or edge clearances.
 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm) as follows:
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- I. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- J. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 GASKET GLAZING (DRY)

- A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Install gaskets so they protrude past face of glazing stops.

3.5 CLEANING AND PROTECTION

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- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.
- E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 088000

SECTION 092900 - GYPSUM BOARD

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Interior gypsum board.
- B. Related Sections include the following:
 - 1. Division 05 Section "Cold-Formed Metal Framing" for load-bearing steel framing.
 - 2. Division 07 Section "Thermal Insulation" for insulation and vapor retarders installed in assemblies that incorporate gypsum board.
 - 3. Division 09 Section "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For the following products:
 - 1. Trim Accessories: Full-size Sample in 12-inch- (300-mm-) long length for each trim accessory indicated.

1.4 QUALITY ASSURANCE

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

1.5 STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install interior products until installation areas are enclosed.
- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged. Replace installed panels that become wet, or moisture damaged during construction.
 - 1. Indications that panels are wet, or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 – PRODUCTS

2.1 PANELS, GENERAL

- A. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.2 INTERIOR GYPSUM BOARD

- A. General: Complying with ASTM C 36/C 36M or ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Gypsum Co.
 - b. G-P Gypsum.
 - c. National Gypsum Company.
 - d. USG Corporation.
- B. Type X:
 - 1. Thickness: 5/8 inch (15.9 mm).
 - 2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.
- C. Abuse-Resistant Gypsum Board: ASTM C 1629/C 1629M, Level 1.
 - 1. Core: 5/8 inch (15.9 mm), type X.
 - 2. Long Edges: Tapered.
 - 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D3274.

2.3 TILE BACKING PANELS

- A. Water-Resistant Gypsum Backing Board: ASTM C 630/C 630M or ASTM C 1396/C 1396M.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. G-P Gypsum.
 - b. National Gypsum Company.
 - c. USG Corporation.
 2. Core: 5/8 inch (15.9 mm), Type X.
- B. Cementitious Backer Units: ANSI A 118.9 and ASTM C 1288 or 1325, with manufacturer's standard edges.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. C-Cure; C-Cure Board 990.
 - b. CertainTeed Corporation; Fiber Cement Backer Board
 - c. National Gypsum Company, Permabase Cement Board.
 - d. USG Corporation; DUROCK Cement Board.
 2. Thickness: 5/8 inch (15.9 mm).
 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D3274.

2.4 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
 2. Shapes:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - c. L-Bead: L-shaped; exposed long flange receives joint compound.
 - d. Expansion (control) joint.
 - e. Curved-Edge Cornerbead: With notched or flexible flanges.

2.5 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
1. Interior Gypsum Wallboard: Paper.
 2. Exterior Gypsum Soffit Board: Paper.
- C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.

- a. Use setting-type compound for installing paper-faced metal trim accessories.
 - 3. Fill Coat: For second coat, use drying-type, all-purpose compound.
 - 4. Finish Coat: For third coat, use drying-type, all-purpose compound.
 - 5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.
- D. Joint Compound for Tile Backing Panels:
- 1. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting type, sandable topping compound.
 - 2. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.6 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
- C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
- D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 - 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
- E. Acoustical Sealant: As specified in Division 07 Section "Joint Sealants."
- F. Thermal Insulation: As specified in Division 07 Section "Thermal Insulation."
- G. Vapor Retarder: As specified in Division 07 Section "Thermal Insulation."

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Refer to partition type on drawings.
- B. Single-Layer Application:
 - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
 - 2. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

- a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.
 3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- C. Multilayer Application:
1. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
 2. Fastening Methods: Fasten base layers and face layers separately to supports with screws.
- D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.
- E. Curved Surfaces:
1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12-inch- (300-mm-) long straight sections at ends of curves and tangent to them.
 2. For double-layer construction, fasten base layer to studs with screws 16 inches (400 mm) o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches (300 mm) o.c.

3.4 APPLYING TILE BACKING PANELS

- A. Water-Resistant Gypsum Backing Board: Install at bathroom walls not subject to wetting. Install with 1/4-inch (6.4-mm) gap where panels abut other construction or penetrations.
- B. Cementitious Backer Units: ANSI A 108.11 at showers, tubs and where indicated.

3.5 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints at locations indicated on Drawings.
- C. Interior Trim: Install in the following locations:
 1. Cornerbead: Use at outside corners, unless otherwise indicated.
 2. LC-Bead: Use at exposed panel edges
 3. L-Bead: Use where indicated

4. Curved-Edge Cornerbead: Use at curved openings.

3.6 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 2. Level 2: Panels that are substrate for tile, Panels that are substrate for acoustical tile.
 3. Level 4: At panel surfaces that will be exposed to view, unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in other Division 09 Sections.
 4. Level 5: Where indicated on Drawings.
 - a. Primer and its application to surfaces are specified in other Division 09 Sections.

3.7 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 1. Indications that panels are wet, or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or blotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 099123 - PAINTING

PART 1 - General

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes surface preparation and the application of paint systems on the following interior substrates:
 - 1. Gypsum Board.
 - 2. Steel.
 - 3. Hollow metal doors and frames
- B. Related Sections include the following:
 - 1. Division 05 Sections for shop priming of metal substrates with primers specified in this Section.
 - 2. Division 8 Hollow Metal doors and frames
 - 3. Division 9 Gypsum Board

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of topcoat product indicated.
- C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat indicated.
 - 1. Submit Samples on rigid backing, 8 inches (200 mm) square.
 - 2. Step coats on Samples to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- D. Product List: For each product indicated, include the following:
 - 1. Cross-reference to paint system and locations of application areas. Use same Designations indicated on Drawings and in schedules.
 - 2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

1.4 QUALITY ASSURANCE

A. MPI Standards:

1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.

1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Benjamin Moore & Co.
2. ICI Paints.
3. Porter Paints.
4. PPG Architectural Finishes, Inc.
5. Sherwin-Williams Company (The).

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another, and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. Colors: As selected by Owner from manufacturer's full range.

2.3 PRIMERS/SEALERS

A. Interior Latex Primer/Sealer: MPI #50.

2.4 METAL PRIMERS

A. Alkyd Anticorrosive Metal Primer: MPI #79.

B. Quick-Drying Alkyd Metal Primer: MPI #76.

2.5 LATEX PAINTS

A. Institutional Low-Odor/VOC Latex (Flat): MPI #143 (Gloss Level 1).

B. Institutional Low-Odor/VOC Latex (Low Sheen): MPI #144 (Gloss Level 2).

C. Institutional Low-Odor/VOC Latex (Eggshell): MPI #145 (Gloss Level 3).

D. Institutional Low-Odor/VOC Latex (Semigloss): MPI #147 (Gloss Level 5).

2.6 EPOXY PAINTS

A. Water Based Epoxy (Interior and Exterior) MPI #115.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Gypsum Board: 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility with

existing finishes and primers.

- D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

- 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

- B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

- 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
 - 2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

- C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.

- 1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.

- D. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.

- E. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions.

- 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

- B. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

- C. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush

marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 INTERIOR PAINTING SCHEDULE

A. Steel Substrates:

- 1. Institutional Low-Odor/VOC Latex System: MPI INT 5.1S.
 - a. Prime Coat: Rust-inhibitive primer (water based).
 - b. Intermediate Coat: Institutional low-odor/VOC interior latex matching topcoat.
 - c. Topcoat: Institutional low-odor/VOC interior latex (semigloss).

B. Galvanized-Metal Substrates:

- 1. Institutional Low-Odor/VOC Latex System: MPI INT 5.3N.
 - a. Prime Coat: Waterborne galvanized-metal primer.
 - b. Intermediate Coat: Institutional low-odor/VOC interior latex matching topcoat.
 - c. Topcoat: Institutional low-odor/VOC interior latex (semigloss).

C. Gypsum Board Substrates:

- 1. Latex System: MPI INT 9.2A.
 - a. Prime Coat: Interior latex primer/sealer.
 - b. Intermediate coat: Interior latex matching topcoat.
 - c. Topcoat: Interior latex (low sheen).
- 2. Water Based Epoxy:
 - a. Prime Coat: Latex primer.
 - b. Intermediate and Topcoat: Water Based Epoxy.

West Quad 6 Unit Box Hangar
Terre Haute Regional Airport
Terre Haute, Indiana

END OF SECTION 099123

SECTION 220000 - GENERAL PLUMBING

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Plumbing Contractor shall provide:

- a. Potable water distribution, including cold-and-hot-water supply piping, sanitary piping and fittings, insulation, valves, hangers and supports, plumbing fixtures and equipment, specialties, accessories and plumbing appurtenances.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract.
- B. See also 231123 Natural Gas Piping.

1.3 DESCRIPTION OF WORK

- B. Work complete in all details (Labor and Materials) including possible engineering of the plumbing, support systems, fixtures, and equipment as hereinafter specified with all appurtenances common to various systems generally consisting of piping, valves, hangers and supports, insulation, covering, structures, cleaning, testing and such other material and work as is necessary, specified or required to form a complete and properly operating system as herein specified or indicated.
- C. The following items are included in work required and are described hereinafter in detail:
 - 1. Domestic water service, hot & cold water distribution system & sanitary piping system.
 - 2. Plumbing Fixtures, hot water generating equipment and accessories.
 - 3. Pipe Insulation and identification.
 - 4. Natural Gas piping system.
- D. Furnish labor and install materials required for a complete system functioning as described, whether or not specially called for or indicated.

1.4 SUMMARY

A. Plumbing Contractor shall provide:

- 1. Potable water distribution, including cold-and-hot-water supply piping, sanitary piping and fittings, insulation, valves, hangers and supports, plumbing fixtures and equipment, specialties, accessories and plumbing appurtenances.

E. The following items are included in work required and are described hereinafter in

detail:

1. Modifications to the domestic water service, hot & cold water distribution system, DWV piping system piping system.
 2. Plumbing Fixtures, hot water generating equipment and accessories.
 3. Pipe Insulation and identification.
 4. Natural Gas piping system.
 5. Piping specialties, valves, devices, and trim.
- F. Furnish labor and install materials required for a complete system functioning as described, whether or not specially called for or indicated.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; for fixtures for people with disabilities.
- B. Regulatory Requirements: Comply with provisions of the following:
1. Indiana Plumbing Code (Current ed.)
 2. Americans With Disabilities Act Guidelines (Current ed.)
 3. National Fuel Gas Code (NFPA 54) (Current ed.)
 4. National Electrical Code (NFPA 70) (Current ed.)
 5. NFPA 70: National Electrical Code
 6. NFPA 54: National Fuel Gas Code
 7. ASHRAE 90 A: "Energy Conservation in New Building Design"
 8. Electrical Component Standard: Provide components complying with NFPA 70 "National Electrical Code."
 9. ASME Code Compliance: Provide water heaters and safety relief valves that comply with ASME Boiler and Pressure Vessel Code and that bear the appropriate code symbols.
 10. ASHRAE Standards: Provide water heaters with performance efficiencies not less than prescribed in ASHRAE 90A, "Energy Conservation in New Building Design".
 11. Public Law 102-486, "Energy Policy Act" (water flow and consumption rates).
 12. NSF 61, "Drinking Water System Components—Health Effects."
 13. "Reduction of Lead in Drinking Water Act."
 14. Listing and Labeling: Provide water heaters that are listed and labeled.
 - a. The terms "listed" and "labeled" shall be as defined in the National Electrical Code, Article 100.
 15. Local codes and the local authority having jurisdiction.
- B. The above code requirements and regulations represent the minimum standards to which this project will be constructed. Where contract drawings and specifications exceed the above codes the drawings and specifications shall govern.

1.6 GENERAL PROJECT CONDITIONS AND DESIGN CRITERIA

- A. General:

1. The specifications are intended to convey the scope of work to indicate the general requirements of equipment and devices. This Contractor shall familiarize himself with the documents and existing site conditions and shall investigate and include all pertinent items within his work to produce complete and operational systems.
- B. Contract Drawings:
1. Drawings are not intended to show in detail exact locations and connections of existing conditions. Connections and locations shall be determined in the field by the Contractor.
- C. Permits and Fees:
1. The Contractor shall obtain and pay for all permits and licenses and shall give notice, pay all taxes, and comply with all laws, rules and regulation bearing on the work.
- D. Coordination:
1. Contractor shall coordinate plumbing work with that of other trades to avoid conflict and install this work in accordance with the Contractor's construction schedule.
 2. Contractor shall thoroughly study all plans, specifications and site conditions for this project and notify Owner in writing of any conflict between plumbing work and that of other trades.
 3. Contractor shall coordinate with site utility installation prior to and during construction to avoid conflicts between new and existing utilities and potential loss of services due to phasing of installations.
 4. Lay out work in advance and establish locations of chases, inserts, and sleeves. Provide inserts, sleeves, and supports as specified hereinafter. Coordinate locations and installation with other contractors.
 5. Before any building construction is started the Contractor shall determine the elevation and flow conditions of the sewer connections available.
 6. Provide water and waste systems in compliance with all applicable codes and standards as previously noted.

1.7 SUBMITTALS

- A. Submit product data including rated capacities of selected models and weights. Indicate materials, finishes, dimensions, required clearances, and methods of assembly of components; and piping and wiring connections for the following plumbing specialty products:
1. Plumbing Fixtures and trim.
 2. Plumbing Specialties.
 3. Cleanouts, cover plates, and access panels.
 4. Floor Drains
 5. Mechanical Sleeve Seals.
 6. Wall Hydrants.
 7. Water Heater and Accessories.
 8. Thermostatic Mixing Valves.
 9. Water Hammer Arrestors.
 10. Pipe Insulation.
 11. Pipe Labels.

- B. Prior to final payment as a condition of acceptance of the work, deliver to the Owner through the Architect one copy of each of the following manuals:
 - 1. Complete set(s) of approved shop drawings and maintenance data. As outlined in front-end documents.
- C. Record Drawings:
 - 1. During progress of the Work, maintain an accurate record of the plumbing installation; locating each pipe, valve, fixture, and all other plumbing items.
- D. Operation and Maintenance Data: For plumbing fixtures to include in operation and maintenance manuals.

1.8 WARRANTIES

- A. The Contractor, for this work, shall guarantee all workmanship and materials furnished by him for a period of one (1) year from the date of final acceptance of the installation; and, he shall repair and make good, at his own expense, any and all defects which may develop in said workmanship or materials during the warranty period.

1.9 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing piping systems with the following minimum working pressure ratings, except where indicated otherwise:
 - 1. Water Distribution Systems, Above Ground: 125 psig.
 - 2. Soil, Waste, and Vent Systems: 10-feet head of water.
 - 3. Natural Gas Systems: The Greater of 100 psig or 1.5 times the operational pressure.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products as specified within and in drawing schedules/details.

2.2 PLUMBING FIXTURES, GENERAL

- A. The application of the following products and materials, as required for the installation of the Plumbing systems, can be found in the Part 3 Articles, and in the Drawing Schedules and notations.
- B. Provide plumbing equipment, fixtures and trim, fittings, other components, and supports as specified within and in Plumbing Schedules on drawings.

2.3 FIXTURES AND EQUIPMENT

- A. Provide plumbing equipment, fixtures and trim, fittings, other components and supports as scheduled within and on drawings.
- B. Fittings General: Unless otherwise specified, provide fittings fabricated of brass, with a polished chrome plated finish.
- C. Supply and Drain Fittings not Listed: As required by code.

2.4 PIPE, FITTINGS, AND JOINING MATERIALS

- A. General: The application of the following pipe, tube, and fitting materials and joining methods required for plumbing piping systems are indicated in Part 3 Article "Pipe and Fittings Applications."
- B. Hard Copper Tube: ASTM B 88, Types K and L, (ASTM B 88M, Types A, B, and C,) water tube, drawn temper.
- C. Soft Copper Tube: ASTM B 88, Types K and L, (ASTM B 88M, Types A and B,) water tube, annealed temper.
- D. Copper Drainage Tube: ASTM B 306, Type DWV, drawn temper.
- E. Hubless, Cast-Iron Soil Pipe and Fittings: CISPI 301 and ASTM A 74.
- F. Wrought-Copper, Solder-Joint Pressure Fittings: ASME B16.22.
- G. Poly(Vinyl Chloride) (PVC) Plastic, Solid Core, DWV Pipe: ASTM D 2665, Schedule 40, plain ends.
- H. Poly(Vinyl Chloride) (PVC) Plastic, DWV Pipe Fittings: ASTM D 2665, made to ASTM D 3311; socket-type; drain, waste, and vent pipe patterns.
- I. Schedule 40 black steel, screwed fittings: ASTM A 120.
- J. Solder Filler Metal: ASTM B 32.
 - 1. Alloy Sn95 or Alloy Sn94: Tin (approximately 95 percent) and silver (approximately 5 percent), having 0.10-percent lead content.
 - 2. Alloy E: Tin (approximately 95 percent) and copper (approximately 5 percent), having 0.10-percent maximum lead content.
- K. Brazing Filler Metals: AWS A5.8.
 - 1. BCuP Series: Copper-phosphorus alloys.
 - 2. BAg1: Silver alloy.
- L. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- M. Solvent Cements: Manufacturer's standard solvents complying with the following:
 - 1. Poly(Vinyl Chloride) (PVC): ASTM D 2564.

- N. Hubless, Cast-Iron, Soil-Piping Couplings: CISPI 310, ASTM C 1277 assembly of Type 304 stainless-steel housing or shield and stainless-steel clamps., and ASTM C 564 rubber sleeve or gasket with integral, center pipe stop. Include the following:

- 1. Clamp Width: 3 inches wide with 4 clamps, for piping 1-1/2- to 4-inch NPS.
- 2. Clamp Width: 4 inches wide with 6 clamps, for piping 5- to 10-inches NPS.

2.5 VALVE FEATURES, GENERAL

- A. Valve Design: Bronze Body, Full Port with Lever Operating Handle.
- B. Pressure and Temperature Ratings: As scheduled and required to suit system pressures and temperatures.
- C. Sizes: Same size as upstream pipe, unless otherwise indicated.
- D. End Connections: As indicated below.
 - 1. Solder-Joint: Comply with ANSI B16.18.

2.6 BALL VALVES

- A. Ball Valves, 2-1/2 Inch and Smaller: Rated for 400 psi WOG pressure; two-piece construction; with bronze body conforming to ASTM B 62, Full Port, chrome-plated brass ball, replaceable "Teflon" or "TFE" seats and seals, blowout-proof stem, and vinyl-covered steel handle. Provide solder ends for domestic hot and cold water service.

2.7 FLOOR DRAINS

- A. General: Size outlets as indicated.
- B. Floor drains: ASME A112.21.1M, cast-iron body, with seepage flange and clamping device. Floor drains for installation in floors not having membrane waterproofing may have seepage flange without clamping device. Floor drains for use as area drains in exterior slab on grade may be furnished with anchor flange instead of seepage flange and clamping device.
- C. Finished and Non-Finished Area Floor Drain (FD): Cast-iron body, flashing collar, nickel-bronze adjustable strainer head with secured slotted or square hole grate, with the following features:
 - 1. Round heel-proof strainer head.
 - 2. Deep-seal trap.
 - 3. Trap seal protection device.

2.8 TRAP SEAL PROTECTION DEVICE

- A. Sewer gas and sewage backup protection floor drain insert in compliance with ASSE 1072 and NSF/ANSI 14.
- B. Description:

1. Material: Smooth, soft flexible, elastomeric PVC material molded into shape of duck's bill, open on top with curl closure at bottom or rubber diaphragm with sealing gaskets and pressure relief piston or shall be elastomer bellows type.
2. Device shall allow wastewater to open and adequately discharge floor drain through its interior and then close and returns to original molded shape after wastewater discharge is complete, creating an air tight seal.
3. Sizes as scheduled on Drawings.

2.9 CLEANOUTS

- A. General: Size cleanouts as indicated on drawings, or as required by Code, same size as connected drainage piping.
- B. Cleanouts: ASME A112.36.2M, cast-iron body with straight threads and gasket seal or taper threads for plug, flashing flange and clamping ring, and a brass closure plug. Cleanouts for installation in floors not having membrane waterproofing may be furnished without clamping ring.
- C. Floor Cleanouts: Cast-iron body and frame, with cleanout plug and adjustable round top as follows:
 1. Cleanout Top: Manufacturer's standard cast unit with nickel-bronze or stainless steel, non-slip scored or abrasive finish.

2.10 WATER HEATERS

- A. General:
 1. Provide safety relief valves that comply with ASME Boiler and Pressure Vessel Code and that bear the appropriate code symbols.
 2. Electrical Connections: Power wiring and disconnect switches are specified in Division 16.
 - a. Grounding: Connect unit components to ground in accordance with the National Electrical Code.
- B. Point-of-Use Tankless Thermostatic Electric Water Heaters
 1. Description: ANSI Z358.1 Compliant, Automatic, electric, wall-mounting, tankless type; with integral thermostatic controls.
 2. Insulation: Manufacturer's standard.
 3. Jacket: Aluminum or steel with baked-on enamel finish, or plastic.
 4. Heating Element: Resistance heating. (one or more heating modules as scheduled)
 5. Controls: Flow control fitting in inlet piping.
 6. Safety Controls: Automatic, high-temperature-limit cutoff, thermostatic control.
 7. Performance:
 - a. Temperature Rise: 52 deg F @ 1.5 gpm.
 - b. Electric Input: 13 kW.
 - c. Electrical Characteristics: 240 VAC, 1 Phase, 60 Hz.
 - d. See Drawing Schedule for additional Information.
- C. Storage-Type Gas Water Heaters

1. Description: Automatic, light-duty commercial, floor-mounted; gas; with vertical, ASME labeled where gas input exceeds 199 MBH, 150-psig-rated storage tank, integral controls, drain valve, and T & P relief valve.
2. Insulation: Fiberglass or polyurethane foam, surrounding tank.
3. Jacket: Steel, with baked-on enamel finish
4. Tank: Phenolic or glass-lined steel with anode rods and drain valve.
5. Controls: Adjustable thermostat temperature control.
6. Safety Controls: Automatic, high-temperature-limit cutoff. FVIR rated.
7. Temperature and Pressure Relief Valve: ASME rated and labeled, 3/4-inch size.
8. Vacuum Relief Valve: ANSI Z21.22, 3/4-inch size.
9. Performance (GWH-C):
 - a. Storage: 50 gallons
 - b. See Drawing Schedule.
10. Liquid thermometer on outlet piping.
11. Water Heater Mounting Assembly: Manufacturer factory-fabricated, steel floor mount stand and restraint system, capable of seismically supporting water heater and water.
12. Drain Pans: Corrosion-resistant metal or polyethylene plastic with raised edge. Include dimensions not less than base of water heater and include drain outlet and drain line not less than NPS 3/4-inch route to nearest floor drain.

2.11 HANGERS AND SUPPORTS

- A. Hangers, Supports, and Components: Factory-fabricated according to MSS SP-58.
1. Components include galvanized coatings where installed for piping and equipment that will not have a field-applied finish.
 2. Pipe attachments include nonmetallic coating for electrolytic protection where attachments are in direct contact with copper tubing.
 3. See drawings for hanger detail requirements.

2.12 INSULATION

- A. General: Conform to the following characteristics for insulation including facings, cements, and adhesives, when tested according to ASTM E 84, by UL or other testing or inspecting organization acceptable to the authority having jurisdiction. Label insulation with appropriate markings of testing laboratory.
1. Interior Insulation: Flame spread rating of 25 or less and a smoke developed rating of 50 or less.
 2. Exterior Insulation; Flame spread rating of 75 or less and a smoke developed rating of 150 or less.
- B. Glass-Fiber Insulation: Glass fibers bonded with thermosetting resin complying with the following:
1. Preformed Pipe Insulation, with Jacket: Comply with ASTM C 547, Type I, factory applied, all purpose, vapor-retarder jacket.
 2. Fire-Resistant Adhesive: Comply with MIL-A-3316C in the following classes and grades:

- a. Class 1, Grade A for bonding glass cloth and tape to unfaced glass-fiber insulation, for sealing edges of glass-fiber insulation, and for bonding lagging cloth to unfaced glass fiber insulation.
 - b. Class 2, Grade A for bonding glass-fiber insulation to metal surfaces.
 - 2. Vapor-Retarder Mastics: Fire- and water-resistant, vapor-retarder mastic for indoor applications. Comply with MIL-C-19565C, Type II, compatible with insulation and jacket.
 - 3. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. 4" wide, woven glass-fiber fabrics, plain weave, presized a minimum of 8 oz./sq. yd.
 - 4. Prefabricated Thermal Insulating Fitting Covers: Ultraviolet-resistant PVC, 20 mils thick, complying with ASTM C 450 for dimensions used in performing insulation to cover valves, elbows, tees, and flanges.
- C. Material: Flexible Nitrile, expanded closed-cell structure with smooth skin on both sides.
- 1. Tubular Materials: ASTM C 534, Type I.
 - 2. Sheet Materials: ASTM C 534, Type II.
- D. Thermal Conductivity: 0.30 average maximum at 75 deg F.
- E. Flexible Elastomeric Cellular Insulation Adhesive: Solvent-based, contact adhesive recommended by insulation manufacturer.
- F. Thickness: 1" for potable cold and hot water piping.

2.13 IDENTIFYING DEVICES AND LABELS

- A. General: Manufacturer's standard products of categories and types required for each application as detailed on Drawings.

2.14 FIRE STOPPING PENETRATION SYSTEMS

- A. Description: UL 1479, through-penetration firestop assembly.

2.15 MECHANICAL SLEEVE SEALS

- A. Description: Modular design, with interlocking rubber links shaped to continuously fill annular space between pipe and sleeve. Include connecting bolts and pressure plates.

2.16 WALL HYDRANTS

- A. Wall Hydrants (WHB): ASME A112.21. 3M or ASSE 1052 and ASSE 1019, non-freeze, automatic draining, field testable anti-backflow type, key operation, with 3/4 inch threaded or solder-joint inlet, wall plate, and ASME B1.20.7 garden-hose threads and non-removable hose connection vacuum breaker on outlet. Provide 1 operating key per each location.

2.17 PIPING SPECIALTIES

- A. Escutcheons: Manufactured wall, ceiling, and floor plates; deep-pattern type, where required to conceal protruding fittings and sleeves.
 - 1. Inside Diameter: Closely fit around pipe, tube, and insulation of insulated piping.
 - 2. Outside Diameter: Completely cover opening.
 - 3. Cast Brass: Split casting, with concealed hinge and set-screw.
 - a. Finish: Polished chrome plate.
 - 4. Stamped Steel: One-piece, spring clips, and chrome plated finish.
- B. Dielectric Fittings: Assembly or fitting having insulating material isolating joined dissimilar metals, to prevent galvanic action and stop corrosion.
 - 1. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld neck end types and matching piping system materials.
 - 2. Insulating Material: Suitable for system fluid, pressure, and temperature.
 - 3. Dielectric Unions: Factory-fabricated, union assembly, for 250 psig minimum
- C. Water Hammer Arresters: ASME A112.26.1M, ASSE 1010, or PDI WH-201, bellows or piston type with pressurized cushioning chamber. Sizes are based on water-supply fixture units, ASME A112.26.1M size "A" – "D".
- D. Thermal Expansion Absorber: Pressurized; diaphragm type expansion tank, with a total acceptance volume of 4.5 gallons at 40 psi (precharge) when using 140 degrees F water.
 - 1. See Drawing Schedules for additional information.
- E. Thermostatic Mixing Valves: ASSE 1016/1017, manually adjustable, thermostatic water mixing valve with bronze body. Include check stop and union on hot- and cold-water supply inlets, adjustable temperature settings.
 - 1. See Drawing Schedules for additional information.

2.18 FIXTURES

- A. Provide fixtures and accessories, including toilets, sinks, lavatories, urinals, water coolers, and etc.; complete with all rough-ins, fittings, trimmings, and supports, as required and indicated on Contract Drawings and within. Fixture requirements shall include:
 - 1. Utility sink shall be floor mounted unit complete with faucet, thermostatic mixing valve and accessories.
 - a. FIAT or approved equal.

2.19 OTHER MATERIALS

- A. Materials, not specifically described but required for a complete and operating plumbing installation, shall be new, first quality of their respective kinds, and as selected by the Contractor subject to the approval of the Architect/Engineer.

2.20 FLASHING MATERIALS

- A. Lead: ASTM B 749, Type L51121, copper-bearing sheet, at least 4 psf (0.0625-inch thick) for general use, and at least 6 psf (0.0937-inch thick) for burning (welding), except as otherwise indicated.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions under which the work is to be installed. Do not proceed until conditions are satisfactory, commencing work constitutes acceptance of prior work.
- B. Verify that plumbing is installed in strict accordance with the latest edition of the regulatory codes.

3.2 DISCREPANCIES

- A. In the event of discrepancy, immediately notify the Architect/Engineer. Do not proceed in areas of discrepancy until all such discrepancies have been fully resolved.

3.3 PLUMBING SYSTEM LAYOUT

- A. Contractor shall lay out the plumbing system, determining proper elevations for all components of the system and using only the minimum number of bends to produce a satisfactory functioning system. Follow the general layout shown on the drawings in all cases except where other work may interfere. Lay out all pipes to fall within partition, wall, or ceiling cavities and to not require furring other than as shown on the Drawings.

3.4 PIPE AND FITTINGS APPLICATIONS

- A. General: Use pipe, tube, fittings, and joining methods for piping systems according to the following applications.
- B. Water Distribution Piping Below Ground: Use the following:
 - 1. 2-1/2 Inches and Smaller: Soft copper tube, Type K (Type A).
- C. Water Distribution Piping Above Ground: Use the following:
 - 1. 2-1/2 Inches and Smaller: Hard copper tube, Type L (Type B); wrought-copper and bronze, grooved-end fittings; couplings for grooved-end copper tube and grooved-end copper fittings; grooved copper tube and grooved tube fitting joints; and soldered joints.
- D. Soil, Waste, and Vent, use the following:
 - 1. 1-1/2" and Larger: Poly(vinyl chloride) (PVC) plastic DWV pipe; PVC socket-type drain, waste, and vent pipe pattern fittings; and solvent-cemented joints.

3.5 VALVE APPLICATIONS

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
1. Shutoff Duty: Use ball valves.

3.6 INSTALLATION

- A. Piping - General:
1. This Contractor shall excavate for all underground work that requires excavation with respect to his portion of the work. He shall backfill to established grades using 3/8" clean limestone chip and shall remove all excavated surplus materials from the premises.
 2. This contractor shall coordinate the water service, gas service, sanitary sewer and service with the city systems.
 3. Lay out the plumbing system determining proper elevations for all components of the system and using only the minimum number of bends to produce a satisfactory functioning system. Follow the general layout shown on the drawings in all cases except where other work may interface. Lay out all pipes to fall within partition, wall, or ceiling cavities and to not require furring other than as shown on the Drawings.
 4. Clean all fabricated assemblies, in accordance with the provision of the Pipe Fabrication Institute Standard ES5 prior to shipping to the jobsite.
 5. Pipe sleeves shall be provided for piping through concrete or masonry construction and unless noted shall be cut flush with the finished surface. All sleeves shall be properly caulked or sealed to prevent leakage through these openings. Coordinate all required openings in walls and floors.
 6. Install all other pipes and fittings in accordance with recognized industry practice which will achieve permanently leak-proof piping systems, capable of performing each indicated service without piping failure. Each piece of pipe, tubing, fittings, and equipment shall be inspected for defects and obstructions. Promptly remove all defective materials from site.
 7. Install each run with a minimum of joints and couplings, but with adequate and accessible unions for disassembly and maintenance or replacement of valves and equipment.
 8. In finished and occupied spaces, conceal piping from view by locating in column enclosures, in hollow wall construction or above suspended ceilings. Do not encase horizontal runs in solid partitions except as indicated.
 9. Locate piping runs. Except as otherwise indicated, vertically and horizontally (uniformly pitched to drain) and avoid diagonal runs wherever possible.
 10. Provide all necessary supports, brackets, or foundations for properly installed piping systems. Firmly anchor all pipes in position. Provide for the expansion and contraction of his piping system so that the joints will not develop leaks and equipment connections will remain in place. Install isolators to prevent transmission of vibration.
 11. Hold piping close to walls, overhead construction, columns and other structural and permanent enclosure elements of the building. Limit clearance to 0.5 inch when furring is shown for enclosure or concealment of piping but allow for insulation thickness if any
 12. Piping and appurtenances shall be coordinated with other trades and building components to assure adequate space for electrical and mechanical installations above ceiling and in chases.

13. Install pipes to clear beams and obstructions, do not cut into or reduce the size of any load-carrying members without the prior approval of the Architect.
14. The Contractor shall not route wet plumbing piping directly above or within 3'-6" of electric equipment.
15. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions and ceilings.
16. Provide pipe labels on each plumbing systems. All piping systems shall be clearly identified for service type and direction of flow.
17. After completion of all work, the Contractor shall have the installation inspected by the local inspection authority. Any rework necessary to obtain approval shall be at the expense of this Contractor.
18. Pipe sleeves shall be provided for piping through concrete or masonry construction and unless noted shall be cut flush with the finished surface.
19. Orient horizontal runs parallel with walls and column lines.
20. In finished and occupied spaces, conceal piping from view by locating in column enclosures, in hollow wall construction or above suspended ceilings. Do not encase horizontal runs in solid partitions except as indicated.
21. All piping systems shall be clearly identified for service type and direction of flow.

B. Piping - Potable Water:

1. The Contractor shall coordinate the water service system piping with the City system.
2. Install main water service, and distribution rough-in piping and specialties for installation of water meter according to utility company requirements.
3. Furnish all valves of one (1) manufacturer and type throughout the entire installation of the work, unless otherwise specified. Install valves as required by code and as noted below.
4. Ball valves shall be installed on each main, each branch off the mains, and at each piece of equipment, and each fixture group. All units requiring waters supplies shall be separately valved. All valves shall be located so as to easily accessible.
5. The piping shall be free of water hammer. Install air chambers at each fixture location. Shock absorbers may be used in place of air chambers. Provide shock absorbers at all quick closing valves (i.e., ice machines, washers, solenoid valves, sensor operated devices, etc.) Air chambers will not be accepted for this application.
6. Provide complete isolation of all dissimilar metals.
7. Install hot- and cold-water supply piping runouts of sizes indicated, but not smaller than required by plumbing code to fixtures.
8. The Contractor shall provide for the expansion and contraction of his piping system so that the joints will not develop leaks and equipment connections will remain in place.

C. Piping – Drain Waste and Vent:

1. Install soil pipe and soil pipe fittings according to CISPI 1990 revised and edited edition of "Cast Iron Soil Pipe and Fittings Handbook, Volume I" and ASTM D 2665, ASTM D 2661, and ASTM D2665.
2. Schedule 40 PVC piping with DWV socket type drain, waste and vent pattern fittings shall be solvent-cemented joints, in accordance with ASTM D2665.
3. Provide drainage and vent piping runouts, with approved trap, of sizes indicated, but not smaller than required by plumbing code, to plumbing fixtures and drains.
4. Locate drainage piping runouts as close as possible to bottom of floor slab supporting fixtures or drains.
5. Provide a complete gravity type sanitary and vent piping system for all plumbing fixtures, floor drains, and equipment located throughout the facility. Refer to the

contract drawings for the location and quantity of commercial fixtures and equipment as well as additional requirements.

6. The Contractor shall coordinate the storm & sanitary system piping outlets with the City system.
7. Vents extending through the roof shall be a minimum of 15'-0" from any supply fan or fresh air intake. If necessary the vent shall be offset to meet this requirement. Coordinate the locations of air intakes vs. vents thru roof, prior to installation of vents.
8. PVC piping shall not be routed through return air spaces or spaces open to a return air plenum.

D. Piping – Natural Gas:

1. All gas piping shall be installed per the regulations of the local authority having jurisdiction.
2. Install gas piping at a uniform grade of 0.1 percent slope upward toward risers.
3. Gas piping shall utilize eccentric reducer fittings to make reductions in pipe sizes. Install gas fittings with level side down.
4. Connect gas branch piping from top of horizontal piping. Provide drip and sediment traps where condensate may collect.
5. All equipment connections shall be made with unions or flanges. Provide dielectric-type unions where copper piping is connected to ferrous materials.

3.7 JOINTS, FITTINGS, AND CONNECTIONS

A. Preparations:

1. Properly ream all cut pipe.
2. Cut all threads straight and true.
3. Apply best quality teflon tape to all male pipe threads but not to inside the fitting.
4. Use graphite on all cleanout plugs.

B. Domestic Water Pipe Joints to be Soldered:

1. Construct joints according to AWS "Soldering Manual." Chapter 22 "The Soldering of Pipe and Tube."

3.8 VALVE INSTALLATIONS

- A. General Application: Use ball valves for shut-off duty.
- B. Examine valve interior and actuate through open/close cycle. Replace defective valves with new valves.
- C. Locate valves for easy access and provide separate support where necessary.
- D. Install valves in horizontal piping with stem at or above the center of the pipe.
- E. Install valves in a position to allow full actuator movement.
- F. Install check valves and backflow preventers where indicated, for proper direction of flow.
- G. Install sectional valves close to main on each branch and riser serving 2 or more plumbing

fixtures or equipment connections and where indicated.

- H. Install shut-off valves on inlet to each plumbing equipment item, on each supply to each plumbing fixture not having stops on supplies and elsewhere as indicated.

3.9 HANGER AND SUPPORT INSTALLATION

- A. General: Comply with MSS SP-69 and SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Install building attachments within concrete or to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping.
- C. Install powder-actuated drive-pin fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual. Do not use in lightweight concrete slabs or in concrete slabs less than 4 inches (100 mm) thick.
- D. Install mechanical-anchor fasteners in concrete after concrete is placed and completely cured. Install according to fastener manufacturer's written instructions. Do not use in lightweight concrete slabs or in concrete slabs less than 4 inches (100 mm) thick.
- E. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- F. Install hangers for horizontal piping with following maximum spacing and minimum rod sizes:

<u>Nom. Pipe Size (Inches)</u>	<u>Steel Pipe Max. Span (Feet)</u>	<u>Copper Tube Max. Span (Feet)</u>	<u>Min. Rod Diameter (Inches)</u>
Up to 3/4	7	5	3/8
1	7	6	3/8
1-1/4	7	7	3/8
1-1/2	9	7	3/8
2	10	8	3/8
2-1/2	11	9	1/2
3	12	10	1/2
3-1/2	13	11	1/2
4	14	12	5/8, 1/2 for copper

1. Support vertical steel pipe and copper tube at each floor.

- G. Conform to table below for maximum spacing of supports for Polyvinyl Chloride (PVC) Pipe and Cast-Iron Pipe:

<u>Pipe Material</u>	<u>Horizontal In Feet</u>	<u>Vertical In Feet</u>
PVC Plastic Pipe	4	4
Cast-Iron Pipe	5	15

1. Support vertical cast iron and PVC pipe at each floor.
2. Cast iron supports and hangers shall be provided within 18" of each hub or joint.
3. See 3.9F for rod diameter requirements.

3.10 INSULATION

- A. Apply insulation material, accessories, and finishes according to the manufacturer's printed instructions.
- B. Install insulation with smooth, straight, and even surfaces.
- C. Apply insulation with a minimum number of joints.
- D. Apply insulation continuously through hangers and around anchor attachments to guard against crushing insulation.
- E. Fabricate sleeve fitting covers from flexible elastomeric cellular insulation for screwed valves, fittings, and specialties. Miter cut materials. Overlap adjoining pipe insulation.
- F. Slip insulation on the pipe before making connections wherever possible. Seal joints with adhesive. Where the slip-on technique is not possible, cut one side longitudinally and apply to the pipe or use pre-slit/pre-glued product. Seal seams and joints with adhesive.
- G. Tightly butt longitudinal seams and end joints. Bond with adhesive.
- H. Insulate all domestic, hot and cold water piping with 1" (minimum) insulation as specified in Part 2.12.

3.11 INSTALLATION OF PLUMBING FIXTURES

- A. Examine roughing-in for potable cold water and hot water supplies and soil, waste, and vent piping systems to verify actual locations of piping connections prior to installing fixtures.
- B. Install and fasten plumbing fixtures level and plumb, in accordance with fixture manufacturers' written installation instructions, roughing-in drawings, and referenced standards. See project schedules for additional information.
- C. Secure supplies behind wall or within wall pipe space, providing rigid installation.
- D. Install stop valve in an accessible location in each water supply to fixture.
- E. Install trap on fixture outlet except for fixtures having integral trap.
- F. Install escutcheons at each wall, floor, and ceiling penetration in exposed finished locations and within cabinets and millwork. Use deep pattern escutcheons where required to conceal protruding pipe fittings.
- G. Seal fixtures to walls, floors, and counters using a sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color, use clear for stainless steel.

3.12 WATER HEATER INSTALLATION

- A. Install water heaters on concrete bases. Set and connect units in accordance with manufacturer's written installation instructions and to NSF, ANSI/NFPA 54, UL and per Plumbing Code requirements.
- B. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances. Orient so controls and devices needing servicing are accessible. Electrical Contractor shall provide conduit, wiring and appurtenances as required to power water heaters and accessories.
- C. Coordinate with plumbing piping and related electrical work to achieve operating system.
- D. Install gas piping according to NFPA 54. Provide gas shutoff valve, union and dirt leg on gas supply to gas water heater.
- E. Install dielectric unions and shutoff valve on both hot- and cold-water lines to/from water heater.
- F. Install thermometer on water heater outlet piping (when not integral to the water heater).
- G. Adjust stored hot water temperature to 140 deg F. (Coordinate the setting of thermostatic mixing valves after the water heater temperature set point has been completed).
- H. Adjust operation and correction deficiencies found during commissioning.
- I. Install vacuum relief valve and thermal expansion absorber on cold water side of water heater connection.
- J. Install seismic restraints and supports per manufacturer's recommendations.

3.13 FLOOR DRAIN INSTALLATION

- A. Install drains according to manufacturer's written instructions, in locations indicated.
- B. Install drains at low points of surface areas to be drained, or as indicated. Set tops of drains flush with finished floor.
- C. Trap drains connected to Sanitary Building Drain system.
- D. Install drain flashing collar or flange so that no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes, where penetrated.

3.14 CLEANOUT INSTALLATION

- A. Install cleanouts in above-ground piping and building drain piping as indicated, and where not indicated, according to the following:
 - 1. Size same as drainage piping up to 4-inch size. Use 4-inch size for larger drainage piping except where larger size cleanout is indicated.
 - 2. Locate at each change in direction of piping greater than 45 degrees.

3. Locate at intervals of 50 feet maximum (including the developed length of cleanout pipe) for piping 4 inches and smaller and 100 feet for larger piping.
 4. Locate at base of each vertical storm and soil or waste stack.
- B. Install cleanout deck plates (covers), of types indicated, with top flush with finished floor, for floor cleanouts for piping below floors.
- C. Yard cleanouts at grade shall be installed with extension from sewer pipe to cleanout at grade as indicated. Set cleanout frame and cover in concrete block 24 by 24 by 6 inches deep, except where location is in concrete paving. Set top of cleanout 1 inch above surrounding earth grade or flush with surface when installed in paving.

3.15 INSTALLATION OF PIPING SPECIALTIES

- A. Install specialties of type and size, as required at each water supply connection to mechanical equipment and systems, and to other equipment and systems as indicated. Comply with plumbing code and authority having jurisdiction. Locate in same room as equipment being connected. Install air-gap fitting on units having atmospheric vent connection and pipe relief outlet drain to nearest floor drain.
- B. Install specialties according to manufacturer's written instructions.
- C. Install pipe labels on each system. Labels shall be spaced at a maximum of 30-foot intervals along each run. Reduce intervals to 15 feet in areas of congested piping and equipment.

3.16 CUTTING AND PATCHING

- A. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.
- B. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.
- C. Patch finished surfaces and building components using new materials specified for the original installation.

3.17 TESTING

- A. Test water distribution piping according to procedures of the Indiana Plumbing Code; the authority having jurisdiction or, in absence of published procedure, or as follows:
1. Test for leaks and defects in parts of existing systems that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of system tested.
 2. Leave uncovered and unconcealed in new, altered, extended, or replaced water distribution piping until it has been tested and approved. Expose work that has been covered or concealed before it has been tested and approved for testing.
 3. Cap and subject the piping system to a static water pressure of 50 psig above the operating pressure without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for 4 hours. Leaks and loss in test pressure constitute defects that must be repaired.

4. Repair leaks and defects with new materials and retest system or portion thereof until satisfactory results are obtained.
- B. Test drainage and vent systems according to procedures of the Indiana Plumbing Code; the authority having jurisdiction or, in absence of published procedure, or as follows:
 1. Test for leaks and defects in new drainage and vent piping systems. If testing is performed in segments, submit a separate report for each test, complete with a diagram of the portion of the system tested.
 2. Leave uncovered and unconcealed in new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose for testing work that has been covered or concealed before it has been tested and approved.
 3. Rough Plumbing Test Procedure: Except for outside leaders and perforated or open-jointed drain tile, test piping of plumbing drainage and venting systems on completion of roughing-in piping installation. Tightly close all openings in piping system and fill with water to point of overflow, but not less than 10 feet head of water. Water level shall not drop during the period from 15 minutes before inspection starts through completion of inspection. Inspect joints for leaks.
 4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and their traps filled with water, test connections and prove gastight and watertight. Plug stack openings on roof and building drain where it leaves the building and introduce air into the system equal to pressure of 1 inch water column (250 Pa). Use a U tube or manometer inserted in the trap of a water closet to measure this pressure. Air pressure shall remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
 5. Repair leaks and defects using new materials and retest system or portion thereof until satisfactory results are obtained.
- C. Test fixtures to demonstrate proper operation upon completion of installation and after units are water pressurized. Replace malfunctioning fixtures and components, then retest. Repeat procedure until all units operate properly.
- D. Tests: After piping systems have been tested and put into service, but before final adjusting and balancing, inspect valves for leaks. Adjust or replace packing to stop leaks; replace valves if leak persists.
- E. Do not cover up or enclose work until it has been properly and completely inspected and approved.
- F. Should any of the work be covered up or enclosed prior to all required inspections and approvals, uncover the work as required and, after it has been completely inspected and approved, make repairs and replacements with such materials and workmanship as are necessary to the approval of the Architect and at no additional cost to the Owner.

3.18 FIELD QUALITY CONTROL

- A. Inspect water distribution piping as follows:
 1. Do not enclose, cover, or put into operation water distribution piping system until it has been inspected and approved by the authority having jurisdiction.
 2. During progress of the installation, notify the plumbing official having jurisdiction at least 24 hours prior to time inspection must be made. Perform tests specified below in presence of the plumbing official.

- a. Roughing-In Inspection: Arrange for inspection of piping system before concealed or closed-in after system roughing-in and prior to setting fixtures.
 - b. Final Inspection: Arrange for final inspection by plumbing official to observe tests specified below and to ensure compliance with requirements of Plumbing Code.
3. Reinspections: When a plumbing official finds that piping system will not pass test or inspection, make required corrections and arrange for reinspection by the plumbing official.

3.19 ADJUSTING AND CLEANING

- A. Clean and disinfect water distribution piping as follows:
1. Purge new potable water distribution piping systems and parts of existing potable water systems that have been altered, extended, or repaired prior to use.
 2. Use purging and disinfecting procedure prescribed by authority having jurisdiction or, if a method is not prescribed by that authority, the procedure described in either AWWA C651 or AWWA C652 or as described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Fill system or part thereof with water/chlorine solution containing at least 50 parts per million of chlorine. Isolate (valve off) and allow to stand for 24 hours.
 - c. Drain system or part thereof of previous solution and refill with water/chlorine solution containing at least 200 parts per million of chlorine. Isolate and allow to stand for 3 hours.
 - d. Flush system with clean, potable water until chlorine does not remain in water coming from system following allowed standing time.
 - e. Submit water samples in sterile bottles to authority having jurisdiction. Repeat procedure if biological examination made by the authority shows evidence of contamination.
- B. Prepare and submit reports for purging and disinfecting activities.
- C. Clean interior of piping system.
- D. Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- E. Clean mill scale, grease, and protective coatings from exterior of valves and prepare valves to receive finish painting or insulation.
- F. Clean fixtures, fittings, and drain strainers with manufacturer's recommended cleaning methods and materials.
- G. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
- H. Adjust water pressure at faucets having controls, to provide proper flow and stream.
- I. Replace washers of leaking and dripping faucets and stops.
- J. Adjust operation and correct deficiencies discovered.

- K. Clean and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metals.
- L. Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.20 DEFECTIVE WORK

- A. If inspections or tests show defects, such defective work or material shall be replaced or repaired by the Contractor without additional expense and the tests shall be repeated until the work is satisfactory.

3.21 TRAINING

- A. The Contractor shall demonstrate to the Owner and his designed representative, the proper use, operation, and maintenance of all equipment furnished and installed under this section.

END OF SECTION 220000

SECTION 230513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes general requirements for single-phase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on alternating-current power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.3 COORDINATION

- A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
 - 1. Motor controllers.
 - 2. Torque, speed, and horsepower requirements of the load.
 - 3. Ratings and characteristics of supply circuit and required control sequence.
 - 4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

- A. Comply with NEMA MG 1 unless otherwise indicated.
- B. Comply with IEEE 841 for severe-duty motors.

2.2 MOTOR CHARACTERISTICS

- A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet (1000 m) above sea level.
- B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 SINGLE-PHASE MOTORS

- A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
 - 1. Permanent-split capacitor.
 - 2. Split phase.
 - 3. Capacitor start, inductor run.
 - 4. Capacitor start, capacitor run.
- B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
- C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
- D. Motors 1/20 HP and Smaller: Shaded-pole type.
- E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 230513

SECTION 231123 - FACILITY NATURAL-GAS PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Pipes, tubes, and fittings.
 - 2. Piping specialties.
 - 3. Piping and tubing joining materials.
 - 4. Valves.
 - 5. Pressure regulators.
 - 6. Service meters.
 - 7. Mechanical sleeve seals.
 - 8. Grout.
 - 9. Concrete bases.

1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

1.4 PERFORMANCE REQUIREMENTS

- A. Minimum Operating-Pressure Ratings:
 - 1. Piping and Valves: 100 psig (690 kPa) minimum unless otherwise indicated.
- B. Natural-Gas System Pressure within Buildings: More than 0.5 psig (3.45 kPa) but not more than 2 psig (13.8 kPa).

- C. Delegated Design: Design restraints and anchors for natural-gas piping and equipment, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

1.5 SUBMITTALS

- A. Product Data: For each type of the following:
 - 1. Piping specialties.
 - 2. Corrugated, stainless-steel tubing with associated components.
 - 3. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
 - 4. Pressure regulators. Indicate pressure ratings and capacities.
 - 5. Dielectric fittings.
 - 6. Mechanical sleeve seals.
 - 7. Escutcheons.
- B. Delegated-Design Submittal: For natural-gas piping and equipment indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 1. Detail fabrication and assembly of seismic restraints.
 - 2. Design Calculations: Calculate requirements for selecting seismic restraints.
- C. Coordination Drawings: Plans and details, drawn to scale, on which natural-gas piping is shown and coordinated with other installations, using input from installers of the items involved.
- D. Qualification Data: For qualified professional engineer.
- E. Welding certificates.
- F. Field quality-control reports.
- G. Operation and Maintenance Data: For motorized gas valves and pressure regulators to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Handling Flammable Liquids: Remove and dispose of liquids from existing natural-gas piping according to requirements of authorities having jurisdiction.
- B. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- C. Store and handle pipes and tubes having factory-applied protective coatings to avoid damaging coating, and protect from direct sunlight.
- D. Protect stored PE pipes and valves from direct sunlight.

1.8 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided.
- B. Coordinate requirements for access panels and doors for valves installed concealed behind finished surfaces. Comply with requirements in Division 08 Section "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
 - 1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
 - 2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
 - 3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
 - 4. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, minimum Class 150, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
 - a. Material Group: 1.1.
 - b. End Connections: Threaded or butt welding to match pipe.
 - c. Lapped Face: Not permitted underground.
 - d. Gasket Materials: ASME B16.20, metallic, flat, asbestos free, aluminum o-rings, and spiral-wound metal gaskets.

- e. Bolts and Nuts: ASME B18.2.1, carbon steel aboveground and stainless steel underground.
 - 5. Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and PE.
 - a. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.
- B. Corrugated, Stainless-Steel Tubing: Comply with ANSI/IAS LC 1.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. OmegaFlex, Inc.
 - b. Parker Hannifin Corporation; Parflex Division.
 - c. Titeflex.
 - d. Tru-Flex Metal Hose Corp.
 - 2. Tubing: ASTM A 240/A 240M, corrugated, Series 300 stainless steel.
 - 3. Coating: PE with flame retardant.
 - a. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1) Flame-Spread Index: 25 or less.
 - 2) Smoke-Developed Index: 50 or less.
 - 4. Fittings: Copper-alloy mechanical fittings with ends made to fit and listed for use with corrugated stainless-steel tubing and capable of metal-to-metal seal without gaskets. Include brazing socket or threaded ends complying with ASME B1.20.1.
 - 5. Striker Plates: Steel, designed to protect tubing from penetrations.
 - 6. Manifolds: Malleable iron or steel with factory-applied protective coating. Threaded connections shall comply with ASME B1.20.1 for pipe inlet and corrugated tubing outlets.
 - 7. Operating-Pressure Rating: 5 psig (34.5 kPa).
- C. Drawn-Temper Copper Tube: Comply with ASTM B 88, Type K (ASTM B 88M, Type A).
 - 1. Copper Fittings: ASME B16.22, wrought copper, and streamlined pattern.
 - 2. Bronze Flanges and Flanged Fittings: ASME B16.24, Class 150.
 - a. Gasket Material: ASME B16.20, metallic, flat, asbestos free, aluminum o-rings, and spiral-wound metal gaskets.
 - b. Bolts and Nuts: ASME B18.2.1, carbon steel or stainless steel.

3. Protective Coating for Underground Tubing: Factory-applied, extruded PE a minimum of 0.022 inch (0.56 mm) thick.
- D. Annealed-Temper Copper Tube: Comply with ASTM B 88, Type K (ASTM B 88M, Type A).
1. Copper Fittings: ASME B16.22, wrought copper, and streamlined pattern.
 2. Flare Fittings: Comply with ASME B16.26 and SAE J513.
 - a. Copper fittings with long nuts.
 - b. Metal-to-metal compression seal without gasket.
 - c. Dryseal threads complying with ASME B1.20.3.
 3. Protective Coating for Underground Tubing: Factory-applied, extruded PE a minimum of 0.022 inch (0.56 mm) thick.

2.2 PIPING SPECIALTIES

- A. Appliance Flexible Connectors:
1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
 2. Indoor, Movable-Appliance Flexible Connectors: Comply with ANSI Z21.69.
 3. Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.
 4. Corrugated stainless-steel tubing with polymer coating.
 5. Operating-Pressure Rating: 0.5 psig (3.45 kPa).
 6. End Fittings: Zinc-coated steel.
 7. Threaded Ends: Comply with ASME B1.20.1.
 8. Maximum Length: 72 inches (1830 mm).
- B. Quick-Disconnect Devices: Comply with ANSI Z21.41.
1. Copper-alloy convenience outlet and matching plug connector.
 2. Nitrile seals.
 3. Hand operated with automatic shutoff when disconnected.
 4. For indoor or outdoor applications.
 5. Adjustable, retractable restraining cable.
- C. Y-Pattern Strainers:
1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
 2. End Connections: Threaded ends for NPS 2 (DN 50) and smaller; flanged ends for NPS 2-1/2 (DN 65) and larger.
 3. Strainer Screen: 40-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
 4. CWP Rating: 125 psig (862 kPa).

- D. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

2.3 JOINING MATERIALS

- A. Joint Compound and Tape: Suitable for natural gas.
- B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- C. Brazing Filler Metals: Alloy with melting point greater than 1000 deg F (540 deg C) complying with AWS A5.8/A5.8M. Brazing alloys containing more than 0.05 percent phosphorus are prohibited.

2.4 MANUAL GAS SHUTOFF VALVES

- A. General Requirements for Metallic Valves, NPS 2 (DN 50) and Smaller: Comply with ASME B16.33.
 - 1. CWP Rating: 125 psig (862 kPa).
 - 2. Threaded Ends: Comply with ASME B1.20.1.
 - 3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
 - 4. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch (25 mm) and smaller.
 - 5. Service Mark: Valves 1-1/4 inches (32 mm) to NPS 2 (DN 50) shall have initials "WOG" permanently marked on valve body.
- B. General Requirements for Metallic Valves, NPS 2-1/2 (DN 65) and Larger: Comply with ASME B16.38.
 - 1. CWP Rating: 125 psig (862 kPa).
 - 2. Flanged Ends: Comply with ASME B16.5 for steel flanges.
 - 3. Service Mark: Initials "WOG" shall be permanently marked on valve body.
- C. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim, NPS 2 and Larger:: MSS SP-110.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BrassCraft Manufacturing Company; a Masco company.
 - b. Conbraco Industries, Inc.; Apollo Div.
 - c. Lyall, R. W. & Company, Inc.
 - d. McDonald, A. Y. Mfg. Co.
 - e. Perfection Corporation; a subsidiary of American Meter Company.

2. Body: Bronze, complying with ASTM B 584.
3. Ball: Chrome-plated bronze.
4. Stem: Bronze; blowout proof.
5. Seats: Reinforced TFE; blowout proof.
6. Packing: Threaded-body packnut design with adjustable-stem packing.
7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
8. CWP Rating: 600 psig (4140 kPa).
9. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

D. Bronze Plug Valves: MSS SP-78.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Lee Brass Company.
 - b. McDonald, A. Y. Mfg. Co.
 - c. Halliburton
2. Body: Bronze, complying with ASTM B 584.
3. Plug: Bronze.
4. Ends: Threaded, socket, or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Operator: Square head or lug type with tamperproof feature where indicated.
6. Pressure Class: 125 psig (862 kPa).
7. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
8. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

E. Cast-Iron, Lubricated Plug Valves: MSS SP-78.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Flowserve.
 - b. Homestead Valve; a division of Olson Technologies, Inc.
 - c. McDonald, A. Y. Mfg. Co.
 - d. Milliken Valve Company.
 - e. Mueller Co.; Gas Products Div.
 - f. R&M Energy Systems, A Unit of Robbins & Myers, Inc.
2. Body: Cast iron, complying with ASTM A 126, Class B.
3. Plug: Bronze or nickel-plated cast iron.
4. Seat: Coated with thermoplastic.

5. Stem Seal: Compatible with natural gas.
6. Ends: Threaded or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
7. Operator: Square head or lug type with tamperproof feature where indicated.
8. Pressure Class: 125 psig (862 kPa).
9. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

2.5 EARTHQUAKE VALVES

A. Earthquake Valves: Comply with ASCE 25.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Vanguard Valves, Inc.
2. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction.
3. Maximum Operating Pressure: 5 psig (34.5 kPa).
4. Cast-aluminum body with nickel-plated chrome steel internal parts.
5. Nitrile-rubber valve washer.
6. Sight windows for visual indication of valve position.
7. Threaded end connections complying with ASME B1.20.1.
8. Wall mounting bracket with bubble level indicator.

B. Earthquake Valves: Comply with ASCE 25.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Pacific Seismic Products, Inc.
2. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction.
3. Maximum Operating Pressure: 7 psig.
4. Cast-aluminum body with stainless-steel internal parts.
5. Nitrile-rubber, reset-stem o-ring seal.
6. Valve position, open or closed, indicator.
7. Composition valve seat with clapper held by spring or magnet locking mechanism.
8. Level indicator.
9. End Connections: Threaded for valves NPS 2 (DN 50) and smaller; flanged for valves NPS 2-1/2 (DN 65) and larger.

2.6 PRESSURE REGULATORS

A. General Requirements:

1. Single stage and suitable for natural gas.
2. Steel jacket and corrosion-resistant components.
3. Elevation compensator.
4. End Connections: Threaded for regulators NPS 2 (DN 50) and smaller; flanged for regulators NPS 2-1/2 (DN 65) and larger.

B. Line Pressure Regulators: Comply with ANSI Z21.80.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Actaris.
 - b. American Meter Company.
 - c. Eclipse Combustion, Inc.
 - d. Fisher Control Valves and Regulators; Division of Emerson Process Management.
 - e. Invensys.
 - f. Maxitrol Company.
 - g. Richards Industries; Jordan Valve Div.
2. Body and Diaphragm Case: Cast iron or die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
6. Orifice: Aluminum; interchangeable.
7. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
8. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
9. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.
10. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
11. Maximum Inlet Pressure: 2 psig.

C. Appliance Pressure Regulators: Comply with ANSI Z21.18.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Canadian Meter Company Inc.
 - b. Eaton Corporation; Controls Div.
 - c. Harper Wyman Co.

- d. Maxitrol Company.
 - e. SCP, Inc.
- 2. Body and Diaphragm Case: Die-cast aluminum.
 - 3. Springs: Zinc-plated steel; interchangeable.
 - 4. Diaphragm Plate: Zinc-plated steel.
 - 5. Seat Disc: Nitrile rubber.
 - 6. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
 - 7. Factory-Applied Finish: Minimum three-layer polyester and polyurethane paint finish.
 - 8. Regulator may include vent limiting device, instead of vent connection, if approved by authorities having jurisdiction.
 - 9. Maximum Inlet Pressure: 2 psig.

2.7 DIELECTRIC FITTINGS

A. Dielectric Unions:

- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Capitol Manufacturing Company.
 - b. Central Plastics Company.
 - c. Hart Industries International, Inc.
 - d. McDonald, A. Y. Mfg. Co.
 - e. Watts Regulator Co.; Division of Watts Water Technologies, Inc.
 - f. Wilkins; Zurn Plumbing Products Group.
- 2. Minimum Operating-Pressure Rating: 150 psig (1034 kPa).
- 3. Combination fitting of copper alloy and ferrous materials.
- 4. Insulating materials suitable for natural gas.
- 5. Combination fitting of copper alloy and ferrous materials with threaded, brazed-joint, plain, or welded end connections that match piping system materials.

B. Dielectric Flanges:

- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Capitol Manufacturing Company.
 - b. Central Plastics Company.
 - c. Watts Regulator Co.; Division of Watts Water Technologies, Inc.
 - d. Wilkins; Zurn Plumbing Products Group.
- 2. Minimum Operating-Pressure Rating: 150 psig (1034 kPa).
- 3. Combination fitting of copper alloy and ferrous materials.
- 4. Insulating materials suitable for natural gas.

5. Combination fitting of copper alloy and ferrous materials with threaded, brazed-joint, plain, or welded end connections that match piping system materials.

C. Dielectric-Flange Kits:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Advance Products & Systems, Inc.
 - b. Calpico Inc.
 - c. Central Plastics Company.
 - d. Pipeline Seal and Insulator, Inc.
2. Minimum Operating-Pressure Rating: 150 psig (1034 kPa)
3. Companion-flange assembly for field assembly.
4. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or PE bolt sleeves, phenolic washers, and steel backing washers.
5. Insulating materials suitable for natural gas.
6. Combination fitting of copper alloy and ferrous materials with threaded, brazed-joint, plain, or welded end connections that match piping system materials.

2.8 SLEEVES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

2.9 MECHANICAL SLEEVE SEALS

- A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Advance Products & Systems, Inc.
 - b. Calpico Inc.
 - c. Metraflex Company (The).
 - d. Pipeline Seal and Insulator, Inc.
 2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe and sleeve.
 3. Pressure Plates: Stainless steel.

4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one nut and bolt for each sealing element.

2.10 ESCUTCHEONS

- A. General Requirements for Escutcheons: Manufactured wall and ceiling escutcheons and floor plates, with ID to fit around pipe or tube, and OD that completely covers opening.
- B. One-Piece, Deep-Pattern Escutcheons: Deep-drawn, box-shaped brass with polished chrome-plated finish.
- C. One-Piece, Cast-Brass Escutcheons: With set screw.
 1. Finish: Polished chrome-plated or rough brass.
- D. Split-Casting, Cast-Brass Escutcheons: With concealed hinge and set screw.
 1. Finish: Polished chrome-plated or rough brass.
- E. One-Piece, Stamped-Steel Escutcheons: With set screw or spring clips and chrome-plated finish.
- F. Split-Plate, Stamped-Steel Escutcheons: With concealed hinge, set screw or spring clips, and chrome-plated finish.
- G. One-Piece, Floor-Plate Escutcheons: Cast-iron floor plate.
- H. Split-Casting, Floor-Plate Escutcheons: Cast brass with concealed hinge and set screw.

2.11 GROUT

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
 1. Characteristics: Post-hardening, volume adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
 2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
 3. Packaging: Premixed and factory packaged.

2.12 LABELING AND IDENTIFYING

- A. Detectable Warning Tape: Acid- and alkali-resistant, PE film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection,

detectable by metal detector when tape is buried up to 30 inches (750 mm) deep; colored yellow.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for natural-gas piping system to verify actual locations of piping connections before equipment installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Close equipment shutoff valves before turning off natural gas to premises or piping section.
- B. Inspect natural-gas piping according to the International Fuel Gas Code to determine that natural-gas utilization devices are turned off in piping section affected.
- C. Comply with the International Fuel Gas Code requirements for prevention of accidental ignition.

3.3 OUTDOOR PIPING INSTALLATION

- A. Comply with the International Fuel Gas Code for installation and purging of natural-gas piping.
- B. Install underground, natural-gas piping buried at least 36 inches (900 mm)] below finished grade. Comply with requirements in Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.
 - 1. If natural-gas piping is installed less than 36 inches (900 mm) below finished grade, install it in containment conduit.
- C. Steel Piping with Protective Coating:
 - 1. Apply joint cover kits to pipe after joining to cover, seal, and protect joints.
 - 2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.
- D. Copper Tubing with Protective Coating:
 - 1. Apply joint cover kits over tubing to cover, seal, and protect joints.
 - 2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.

- E. Install fittings for changes in direction and branch connections.
- F. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
 - 1. Install steel pipe for sleeves smaller than 6 inches (150 mm) in diameter.
 - 2. Install cast-iron "wall pipes" for sleeves 6 inches (150 mm) and larger in diameter.
- G. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- H. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 INDOOR PIPING INSTALLATION

- A. Comply with the International Fuel Gas Code for installation and purging of natural-gas piping.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.
- D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- G. Locate valves for easy access.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.

- J. Install escutcheons at penetrations of interior walls, ceilings, and floors.
 - 1. New Piping:
 - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
 - b. Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
 - c. Piping at Ceiling Penetrations in Finished Spaces: One-piece or split-casting, cast-brass type with polished chrome-plated finish.
 - d. Piping in Unfinished Service Spaces: One-piece, stamped-steel type with set screw or spring clips.
 - e. Piping in Equipment Rooms: One-piece, stamped-steel type with set screw or spring clips.
 - f. Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.
- K. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."
- L. Verify final equipment locations for roughing-in.
- M. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.
- N. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.
 - 1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches (75 mm) long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.
- O. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.
- P. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.
- Q. Concealed Location Installations: Except as specified below, install concealed natural-gas piping and piping installed under the building in containment conduit constructed of steel pipe with welded joints as described in Part 2. Install a vent pipe from containment conduit to outdoors and terminate with weatherproof vent cap.
 - 1. Above Accessible Ceilings: Natural-gas piping, fittings, valves, and regulators may be installed in accessible spaces without containment conduit.
 - 2. Below Grade Underneath Buildings: Natural-gas piping, fittings, and valves shall be installed in a containment conduit per NFPA 54.

3. In Floors: Install natural-gas piping with welded or brazed joints and protective coating in cast-in-place concrete floors. Cover piping to be cast in concrete slabs with minimum of 1-1/2 inches (38 mm) of concrete. Piping may not be in physical contact with other metallic structures such as reinforcing rods or electrically neutral conductors. Do not embed piping in concrete slabs containing quick-set additives or cinder aggregate.
 4. In Floor Channels: Install natural-gas piping in floor channels. Channels must have cover and be open to space above cover for ventilation.
 5. In Walls or Partitions: Protect tubing installed inside partitions or hollow walls from physical damage using steel striker barriers at rigid supports.
 - a. Exception: Tubing passing through partitions or walls does not require striker barriers.
 6. Prohibited Locations:
 - a. Do not install natural-gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
 - b. Do not install natural-gas piping in solid walls or partitions.
- R. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.
- S. Connect branch piping from top or side of horizontal piping.
- T. Install unions in pipes NPS 2 (DN 50) and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.
- U. Do not use natural-gas piping as grounding electrode.
- V. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.

3.5 VALVE INSTALLATION

- A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.
- B. Install underground valves with valve boxes.
- C. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.
- D. Install earthquake valves aboveground outside buildings according to listing.
- E. Install anode for metallic valves in underground PE piping.

3.6 PIPING JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Threaded Joints:
 - 1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
 - 2. Cut threads full and clean using sharp dies.
 - 3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
 - 4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
 - 5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- D. Welded Joints:
 - 1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
 - 2. Bevel plain ends of steel pipe.
 - 3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.
- F. Flanged Joints: Install gasket material, size, type, and thickness appropriate for natural-gas service. Install gasket concentrically positioned.
- G. Flared Joints: Cut tubing with roll cutting tool. Flare tube end with tool to result in flare dimensions complying with SAE J513. Tighten finger tight, then use wrench. Do not overtighten.
- H. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
 - 1. Plain-End Pipe and Fittings: Use butt fusion.
 - 2. Plain-End Pipe and Socket Fittings: Use socket fusion.

3.7 HANGER AND SUPPORT INSTALLATION

- A. Install seismic restraints on piping.
- B. Comply with requirements for pipe hangers and supports specified in Division 22 and on the drawings.

3.8 CONNECTIONS

- A. Install natural-gas piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.
- B. Install piping adjacent to appliances to allow service and maintenance of appliances.
- C. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches (1800 mm) of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.
- D. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.9 LABELING AND IDENTIFYING

- A. Comply with requirements in Division 22 and on the drawings.
- B. Install detectable warning tape directly above gas piping, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.

3.10 PAINTING

- A. Comply with requirements in Division 09 painting Sections for painting interior and exterior natural-gas piping.
- B. Paint exposed, exterior metal piping, valves, service regulators, service meters and meter bars, earthquake valves, and piping specialties, except components, with factory-applied paint or protective coating.
 - 1. Alkyd System: MPI EXT 5.1D.
 - a. Prime Coat: Alkyd anticorrosive metal primer.
 - b. Topcoat: Exterior alkyd enamel (gloss).
- C. Paint exposed, interior metal piping, valves, service regulators, service meters and meter bars, earthquake valves, and piping specialties, except components, with factory-applied paint or protective coating.
 - 1. Latex Over Alkyd Primer System: MPI INT 5.1Q.
 - a. Prime Coat: Alkyd anticorrosive metal primer.
 - b. Topcoat: Interior latex (semigloss).
 - c. Color: To be Determined by pipe schedule on drawings or Architect.
- D. Damage and Touchup: Repair marred and damaged factory-applied finishes with materials and by procedures to match original factory finish.

3.11 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Test, inspect, and purge natural gas according to the International Fuel Gas Code and authorities having jurisdiction.
- C. Natural-gas piping will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

3.12 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain earthquake valves.

3.13 APPLICATION

- A. Refer to pipe schedule on the drawings for application of pipe.

END OF SECTION 231123

SECTION 235123 - GAS VENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Listed double-wall vents.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for product.
- B. Shop Drawings: For vents.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Detail fabrication and assembly of hangers and seismic restraints.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Sample Warranty: For special warranty.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
 - 2. AWS D9.1/D9.1M, "Sheet Metal Welding Code," for shop and field welding of joints and seams in vents.

- B. Certified Sizing Calculations: Manufacturer shall certify venting system sizing calculations.

PART 2 - PRODUCTS

2.1 LISTED TYPE B VENTS

- A. Description: Double-wall metal vents tested according to UL 441 and rated for 480 deg F (248 deg C) continuously for Type B; with neutral or negative flue pressure complying with NFPA 211.
- B. Construction: Inner shell and outer jacket separated by at least a 1/4-inch (6-mm) airspace.
- C. Inner Shell: ASTM B 209 (ASTM B 209M), Type 1100 aluminum.
- D. Outer Jacket: G-90 Galvanized steel.
- E. Accessories: Tees, elbows, increasers, draft-hood connectors, terminations, adjustable roof flashings, storm collars, support assemblies, thimbles, firestop spacers, and fasteners; fabricated from similar materials and designs as vent-pipe straight sections; all listed for same assembly.
 - 1. Termination: Stack cap designed to exclude minimum 90 percent of rainfall.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATION

- A. Listed Type B Vents: Vents for certified gas appliances.

3.3 INSTALLATION OF LISTED VENTS

- A. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Section 074213 "Insulated Metal Wall Panels," and Section 078358 "Sheet Metal Flashing and Trim."
- B. Comply with minimum clearances from combustibles and minimum termination heights according to product listing or NFPA 211, whichever is most stringent.

- C. Seal between sections of positive-pressure vents according to manufacturer's written installation instructions, using sealants recommended by manufacturer.
- D. Support vents at intervals recommended by manufacturer to support weight of vents and all accessories, without exceeding appliance loading.
- E. Lap joints in direction of flow.

3.4 CLEANING

- A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris, and repair damaged finishes.

END OF SECTION 235123

SECTION 235533.16 - GAS-FIRED UNIT HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes gas-fired unit heaters.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of gas-fired unit heater.
 - 1. Include rated capacities, operating characteristics, and accessories.
- B. Shop Drawings: For gas-fired unit heaters. Include plans, elevations, sections, and attachment details.
 - 1. Prepare by or under the supervision of a qualified professional engineer detailing fabrication and assembly of gas-fired unit heaters, as well as procedures and diagrams.
 - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans, elevations, and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Structural members to which equipment will be attached.
 - 2. Items penetrating roof and the following:
 - a. Vent and gas piping rough-ins and connections.
- B. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For gas-fired unit heaters to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

- A. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace heat exchanger of gas-fired unit heater that fails in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide products by one of the following:
 - 1. Reznor
 - 2. Trane
 - 3. Modine

2.2 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Capacities and Characteristics: See drawings.

2.3 MANUFACTURED UNITS

- A. Description: Factory assembled, piped, and wired, and complying with ANSI Z83.8/CSA 2.6.
- B. Gas Type: Design burner for natural gas having characteristics same as those of gas available at Project site.
- C. Type of Venting: Indoor, separated combustion, power vented.
- D. Housing: Steel, with integral draft hood and inserts for suspension mounting rods.

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1. External Casings and Cabinets: Baked enamel or Powder coating over corrosion-resistant-treated surface.
 2. Discharge Louvers: Independently adjustable, horizontal blades.
- E. Accessories:
1. Four-point suspension kit.
 2. Concentric, Terminal Vent Assembly: Combined combustion-air inlet and power-vent outlet with wall or roof caps. Include adapter assembly for connection to inlet and outlet pipes, and flashing for wall or roof penetration.
 3. Downturn nozzle kit as indicated on plans.
- F. Heat Exchanger: Aluminized steel.
- G. Burner Material: Aluminized steel with stainless-steel inserts.
- H. Propeller Unit Fan:
1. Formed-steel propeller blades riveted to heavy-gage steel spider bolted to cast-iron hub, dynamically balanced, and resiliently mounted.
 2. Fan-Blade Guard: Galvanized steel, complying with OSHA specifications, removable for maintenance.
- I. Motors:
1. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
- J. Controls: Regulated redundant gas valve containing pilot solenoid valve, electric gas valve, pilot filter, pressure regulator, pilot shutoff, and manual shutoff all in one body.
1. Gas Control Valve: Single stage.
 2. Ignition: Electronically controlled electric spark with flame sensor.
 3. Fan Thermal Switch: Operates fan on heat-exchanger temperature.
 4. Vent Flow Verification: Differential pressure switch to verify open vent.
 5. Control transformer.
 6. High Limit: Thermal switch or fuse to stop burner.
 7. Wall-Mounted Thermostat:
 - a. Single stage.
 - b. Fan on-off-automatic switch.
 - c. 24-V ac.
 - d. 50 to 90 deg F (10 to 32 deg C) operating range.
- K. Electrical Connection: Factory wire motors and controls for a single electrical connection.

3.1 INSTALLATION

- A. Install and connect gas-fired unit heaters and associated gas and vent features and systems according to NFPA 54, NFPA 409 and applicable local codes and regulations, and manufacturer's written instructions.

3.2 EQUIPMENT MOUNTING

- A. Suspended Units: Suspend from substrate using threaded rods, spring hangers, and building attachments. Secure rods to unit hanger attachments. Adjust hangers so unit is level and plumb.

3.3 CONNECTIONS

- A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Where installing piping adjacent to gas-fired unit heater, allow space for service and maintenance.
- C. Gas Piping: Comply with Section 231123 "Facility Natural-Gas Piping." Gas piping to gas train inlet; provide union with enough clearance for burner removal and service.
- D. Vent Connections: Comply with Section 235123 "Gas Vents."
- E. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- F. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 2. Verify bearing lubrication.
 - 3. Verify proper motor rotation.
 - 4. Test Reports: Prepare a written report to record the following:
 - a. Test procedures used.
 - b. Test results that comply with requirements.

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- c. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
- C. Gas-fired unit heater will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

3.5 ADJUSTING

- A. Adjust initial temperature and humidity set points.
- B. Adjust burner and other unit components for optimum heating performance and efficiency.

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain gas-fired unit heaters.

END OF SECTION 235533.16

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copper building wire rated 600 V or less.
2. Aluminum building wire rated 600 V or less.
3. Metal-clad cable, Type MC, rated 600 V or less.
4. Connectors, splices, and terminations rated 600 V and less.

B. Related Requirements:

1. Drawings and general provisions of the contract, including general and supplementary conditions and Division 01 Specification Sections, apply to this section.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Design Data: Indicate sizing for aluminum conductors substituted for copper conductors. Include proposed modifications to raceways, boxes, wiring gutters, enclosures, etc. to accommodate substituted conductors.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE

A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Alpha Wire Company.
2. American Bare Conductor.
3. Belden Inc.
4. Cerro Wire LLC.
5. Encore Wire Corporation.

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6. General Cable Technologies Corporation.
7. Okonite Company (The).
8. Service Wire Co.
9. Southwire Company.

C. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. RoHS compliant.
3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.

E. Conductor Insulation:

1. Type THHN and Type THWN-2: Comply with UL 83.
2. Type THW and Type THW-2: Comply with NEMA WC-70/ICEA S-95-658 and UL 83.
3. Type XHHW-2: Comply with UL 44.

2.2 ALUMINUM BUILDING WIRE

A. Description: Flexible, insulated and uninsulated, drawn aluminum current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Alpha Wire Company.
2. American Bare Conductor.
3. Belden Inc.
4. Cerro Wire LLC.
5. Encore Wire Corporation.
6. General Cable Technologies Corporation.
7. Okonite Company (The).
8. Southwire Company.

C. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. RoHS compliant.
3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Conductors: Aluminum, complying with ASTM B 800 and ASTM B 801.

E. Conductor Insulation:

1. Type THHN and Type THWN-2: Comply with UL 83.
2. Type THW and Type THW-2: Comply with NEMA WC-70/ICEA S-95-658 and UL 83.
3. Type XHHW-2: Comply with UL 44.

2.3 METAL-CLAD CABLE, TYPE MC

A. Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems; a part of Atkore International.
2. Alpha Wire Company.
3. American Bare Conductor.
4. Belden Inc.
5. Encore Wire Corporation.
6. General Cable Technologies Corporation.
7. Okonite Company (The).
8. Service Wire Co.
9. Southwire Company.

C. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. Comply with UL 1569.
3. RoHS compliant.
4. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Circuits:

1. Single circuit.
2. Only permitted for use as a "fixture whip" from light fixture to junction-box mounted on the structure above.

E. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.

F. Ground Conductor: Insulated.

G. Conductor Insulation:

1. Type TFN/THHN/THWN-2: Comply with UL 83.
2. Type XHHW-2: Comply with UL 44.

- H. Armor: Steel, interlocked.

2.4 CONNECTORS AND SPLICES

- A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. 3M Electrical Products.
 - 2. AFC Cable Systems; a part of Atkore International.
 - 3. Gardner Bender.
 - 4. Hubbell Power Systems, Inc.
 - 5. Ideal Industries, Inc.
 - 6. ILSCO.
 - 7. NSi Industries LLC.
 - 8. O-Z/Gedney; a brand of Emerson Industrial Automation.
 - 9. Service Wire Co.
 - 10. TE Connectivity Ltd.
- C. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.
- D. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.
 - 1. Material: Copper or aluminum.
 - 2. Type: Two hole with standard barrels.
 - 3. Termination: Compression.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper for feeders smaller than No. 4 AWG; copper or aluminum for feeders No. 4 AWG and larger. Conductors may be solid or stranded for No. 12 and larger.
- B. Branch Circuits: Copper. Solid or stranded for No. 12 and larger.
- C. Power-Limited Fire Alarm and Control: Solid for No. 12 AWG and smaller.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type THHN/THWN-2, single conductors in raceway or Type XHHW-2, single conductors in raceway.
- B. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway or Type XHHW-2, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN/THWN-2, single conductors in raceway.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway or Type XHHW-2, single conductors in raceway.
- E. Exposed Branch Circuits, Including in Crawlspace: Type THHN/THWN-2, single conductors in raceway.
- F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway.
- G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway or Type XHHW-2, single conductors in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
- C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material.
 - 1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

3.5 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."
- B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes grounding and bonding systems and equipment.
- B. Section includes grounding and bonding systems and equipment, plus the following special applications:
 - 1. Underground distribution grounding.
 - 2. Foundation steel electrodes.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

2.2 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Advanced Lightning Technology, Ltd.
 - 2. Burndy; Part of Hubbell Electrical Systems.
 - 3. Dossert; AFL Telecommunications LLC.
 - 4. ERICO International Corporation.
 - 5. Fushi Copperweld Inc.
 - 6. Galvan Industries, Inc.; Electrical Products Division, LLC.
 - 7. Harger Lightning & Grounding.
 - 8. ILSCO.
 - 9. O-Z/Gedney; a brand of Emerson Industrial Automation.
 - 10. Robbins Lightning, Inc.
 - 11. Siemens Industry, Inc., Energy Management Division.

2.3 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
 - 4. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 - 5. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

2.4 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- C. Bus-Bar Connectors: Compression type, copper or copper alloy, with two wire terminals.
- D. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.
- E. Water Pipe Clamps:
 - 1. Mechanical type, two pieces with stainless-steel bolts.
 - a. Material: Tin-plated aluminum.
 - b. Listed for direct burial.
 - 2. U-bolt type with malleable-iron clamp and copper ground connector.

2.5 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet (19 mm by 3 m).
- B. Ground Plates: 1/4 inch (6 mm) thick, hot-dip galvanized.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 3/0 AWG minimum.
 - 1. Bury at least 30 inches (600 mm) below grade.
- C. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
 - 1. Install bus horizontally, on insulated spacers 2 inches (50 mm) minimum from wall, 6 inches (150 mm) above finished floor unless otherwise indicated.
- D. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
 - 3. Connections to Ground Rods at Test Wells: Bolted connectors.
 - 4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE

- A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

- A. Comply with IEEE C2 grounding requirements.
- B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches (100 mm) will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches (50 mm) above to 6 inches (150 mm) below concrete. Seal floor opening with waterproof, nonshrink grout.
- C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and

fasten to manhole walls. Connect to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.

- D. Pad-Mounted Transformers and Switches: Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches (150 mm) from the foundation.

3.4 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
 - 1. Feeders and branch circuits.
 - 2. Lighting circuits.
 - 3. Receptacle circuits.
 - 4. Single-phase motor and appliance branch circuits.
 - 5. Three-phase motor and appliance branch circuits.
 - 6. Flexible raceway runs.
 - 7. Armored and metal-clad cable runs.
 - 8. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
- C. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.
- D. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.5 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade unless otherwise indicated.
 - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.

- C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
 - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
 - 3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- D. Grounding and Bonding for Piping:
 - 1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
 - 2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
 - 3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

3.6 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
 - 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
 - 3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.
 - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Perform tests by fall-of-potential method according to IEEE 81.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel slotted support systems.
2. Conduit and cable support devices.
3. Support for conductors in vertical conduit.
4. Structural steel for fabricated supports and restraints.
5. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
6. Fabricated metal equipment support assemblies.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For fabrication and installation details for electrical hangers and support systems.

1. Hangers. Include product data for components.
2. Slotted support systems.
3. Equipment supports.
4. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

C. Delegated-Design Submittal: For hangers and supports for electrical systems.

1. Include design calculations and details of hangers.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, and coordinated with each other, using input from installers of the items involved.

B. Welding certificates.

1.4 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design hanger and support system.
- B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame Rating: Class 1.
 - 2. Self-extinguishing according to ASTM D 635.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch- (10-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c. in at least one surface.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allied Tube & Conduit; a part of Atkore International.
 - b. B-line, an Eaton business.
 - c. ERICO International Corporation.
 - d. Flex-Strut Inc.
 - e. Gripple Inc.
 - f. GS Metals Corp.
 - g. G-Strut.
 - h. Haydon Corporation.
 - i. Metal Ties Innovation.
 - j. MIRO Industries.
 - k. Thomas & Betts Corporation; A Member of the ABB Group.
 - l. Unistrut; Part of Atkore International.
 - 2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
 - 3. Material for Channel, Fittings, and Accessories: Galvanized steel.
 - 4. Channel Width: Selected for applicable load criteria.
 - 5. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 - 6. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 - 7. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 - 8. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

- B. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.
- D. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M steel plates, shapes, and bars; black and galvanized.
- E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 - 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Hilti, Inc.
 - 2) ITW Ramset/Red Head; Illinois Tool Works, Inc.
 - 3) MKT Fastening, LLC.
 - 2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) B-line, an Eaton business.
 - 2) Empire Tool and Manufacturing Co., Inc.
 - 3) Hilti, Inc.
 - 4) ITW Ramset/Red Head; Illinois Tool Works, Inc.
 - 3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
 - 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
 - 5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
 - 6. Toggle Bolts: All-steel springhead type.
 - 7. Hanger Rods: Threaded steel.

2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:
 - 1. NECA 1.
 - 2. NECA 101
 - 3. NECA 102.
 - 4. NECA 105.
 - 5. NECA 111.
- B. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.
- C. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."
- D. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.
- E. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 - 1. Secure raceways and cables to these supports with two-bolt conduit clamps.
- F. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings, and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC and RMC

- C. may be supported by openings through structure members, according to NFPA 70.
- D. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).
- E. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 4. To Existing Concrete: Expansion anchor fasteners.
 - 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
 - 6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts and beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69.
 - 7. To Light Steel: Sheet metal screws.
 - 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.
- F. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

END OF SECTION 260529

SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal conduits and fittings.
2. Nonmetallic conduits and fittings.
3. Metal wireways and auxiliary gutters.
4. Surface raceways.
5. Boxes, enclosures, and cabinets.
6. Handholes and boxes for exterior underground cabling.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" for firestopping at conduit and box entrances.
2. Section 260543 "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks, manholes, and underground utility construction.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

1. Structural members in paths of conduit groups with common supports.
2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

A. Metal Conduit:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

West Quad Development
Terre Haute Regional Airport
Terre Haute, Indiana

- a. AFC Cable Systems; a part of Atkore International.
 - b. Allied Tube & Conduit; a part of Atkore International.
 - c. Anamet Electrical, Inc.
 - d. Calconduit.
 - e. Electri-Flex Company.
 - f. FSR Inc.
 - g. Korkap.
 - h. NEC, Inc.
 - i. Opti-Com Manufacturing Network, Inc (OMNI).
 - j. O-Z/Gedney; a brand of Emerson Industrial Automation.
 - k. Patriot Aluminum Products, LLC.
 - l. Perma-Cote.
 - m. Picoma Industries, Inc.
 - n. Plasti-Bond.
 - o. Republic Conduit.
 - p. Southwire Company.
 - q. Thomas & Betts Corporation; A Member of the ABB Group.
 - r. Topaz Electric; a division of Topaz Lighting Corp.
 - s. Western Tube and Conduit Corporation.
- 2. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 3. GRC: Comply with ANSI C80.1 and UL 6.
 - 4. ARC: Comply with ANSI C80.5 and UL 6A.
 - 5. IMC: Comply with ANSI C80.6 and UL 1242.
 - 6. EMT: Comply with ANSI C80.3 and UL 797.
 - 7. FMC: Comply with UL 1; zinc-coated steel.
 - 8. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- B. Metal Fittings: Comply with NEMA FB 1 and UL 514B.
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AFC Cable Systems; a part of Atkore International.
 - b. Allied Tube & Conduit; a part of Atkore International.
 - c. Anamet Electrical, Inc.
 - d. Calconduit.
 - e. Electri-Flex Company.
 - f. FSR Inc.
 - g. Korkap.
 - h. NEC, Inc.
 - i. NewBasis.
 - j. Opti-Com Manufacturing Network, Inc (OMNI).
 - k. O-Z/Gedney; a brand of Emerson Industrial Automation.
 - l. Patriot Aluminum Products, LLC.
 - m. Perma-Cote.
 - n. Picoma Industries, Inc.
 - o. Plasti-Bond.

- p. Republic Conduit.
 - q. Southwire Company.
 - r. Thomas & Betts Corporation; A Member of the ABB Group.
 - s. Topaz Electric; a division of Topaz Lighting Corp.
 - t. Western Tube and Conduit Corporation.
 - 2. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 3. Fittings, General: Listed and labeled for type of conduit, location, and use.
 - 4. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.
 - 5. Fittings for EMT:
 - a. Material: Steel.
 - b. Type: Setscrew.
 - 6. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
- C. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS AND FITTINGS

A. Nonmetallic Conduit:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AFC Cable Systems; a part of Atkore International.
 - b. Anamet Electrical, Inc.
 - c. Arnco Corporation.
 - d. CANTEX INC.
 - e. CertainTeed Corporation.
 - f. Champion Fiberglass, Inc.
 - g. Condux International, Inc.
 - h. Electri-Flex Company.
 - i. FRE Composites.
 - j. Kraloy.
 - k. Lamson & Sessions.
 - l. Niedax Inc.
 - m. RACO; Hubbell.
 - n. Thomas & Betts Corporation; A Member of the ABB Group.
 - o. Topaz Electric; a division of Topaz Lighting Corp.

- B. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 1. ENT: Comply with NEMA TC 13 and UL 1653.
 - 2. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
 - 3. LFNC: Comply with UL 1660.
- C. Nonmetallic Fittings:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AFC Cable Systems; a part of Atkore International.
 - b. Anamet Electrical, Inc.
 - c. Arnco Corporation.
 - d. CertainTeed Corporation.
 - e. Champion Fiberglass, Inc.
 - f. Condux International, Inc.
 - g. Electri-Flex Company.
 - h. FRE Composites.
 - i. Kraloy.
 - j. Lamson & Sessions.
 - k. Niedax Inc.
 - l. RACO; Hubbell.
 - m. Thomas & Betts Corporation; A Member of the ABB Group.
 - n. Topaz Electric; a division of Topaz Lighting Corp.
 - 2. Fittings, General: Listed and labeled for type of conduit, location, and use.
 - 3. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
 - 4. Fittings for LFNC: Comply with UL 514B.
 - 5. Solvents and Adhesives: As recommended by conduit manufacturer.

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. B-line, an Eaton business.
 - 2. Hoffman; a brand of Pentair Equipment Protection.
 - 3. MonoSystems, Inc.
- B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and sized according to NFPA 70.
 - 1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

- C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

2.4 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Adalet.
 - 2. Crouse-Hinds, an Eaton business.
 - 3. EGS/Appleton Electric.
 - 4. Erickson Electrical Equipment Company.
 - 5. FSR Inc.
 - 6. Hoffman; a brand of Pentair Equipment Protection.
 - 7. Hubbell Incorporated.
 - 8. Hubbell Incorporated; Wiring Device-Kellems.
 - 9. Kraloy.
 - 10. Milbank Manufacturing Co.
 - 11. MonoSystems, Inc.
 - 12. Oldcastle Enclosure Solutions.
 - 13. O-Z/Gedney; a brand of Emerson Industrial Automation.
 - 14. Plasti-Bond.
 - 15. RACO; Hubbell.
 - 16. Spring City Electrical Manufacturing Company.
 - 17. Stahlin Non-Metallic Enclosures.
 - 18. Thomas & Betts Corporation; A Member of the ABB Group.
 - 19. Topaz Electric; a division of Topaz Lighting Corp.
- B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.
- E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.
- F. Metal Floor Boxes:
 - 1. Material: Cast metal or sheet metal.
 - 2. Type: Semi-adjustable.
 - 3. Shape: Rectangular.
 - 4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

- G. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb (23 kg). Outlet boxes designed for attachment of luminaires weighing more than 50 lb (23 kg) shall be listed and marked for the maximum allowable weight.
- H. Paddle Fan Outlet Boxes: Nonadjustable, designed for attachment of paddle fan weighing 70 lb (32 kg).
 - 1. Listing and labeling: Paddle fan outlet boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- I. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- J. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.
- K. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
- L. Device Box Dimensions: 4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep) or 4 inches by 2-1/8 inches by 2-1/8 inches deep (100 mm by 60 mm by 60 mm deep).
- M. Gangable boxes are allowed.
- N. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 or Type 3R with continuous-hinge cover with flush latch unless otherwise indicated.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 - 2. Nonmetallic Enclosures: Plastic.
 - 3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.
- O. Cabinets:
 - 1. NEMA 250, Type 1 or Type 3R galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
 - 2. Hinged door in front cover with flush latch and concealed hinge.
 - 3. Key latch to match panelboards.
 - 4. Metal barriers to separate wiring of different systems and voltage.
 - 5. Accessory feet where required for freestanding equipment.
 - 6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.5 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

- A. General Requirements for Handholes and Boxes:
 - 1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.

2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Armorcast Products Company.
 - b. NewBasis.
 - c. Oldcastle Enclosure Solutions.
 - d. Oldcastle Precast, Inc.
 2. Standard: Comply with SCTE 77.
 3. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
 4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
 5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
 6. Cover Legend: Molded lettering, "ELECTRIC."
 7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
1. Exposed Conduit: GRC.
 2. Concealed Conduit, Aboveground: GRC.
 3. Underground Conduit: RNC, Type EPC-40-PVC, direct buried, unless noted otherwise.
 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
 5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
- B. Indoors: Apply raceway products as specified below unless otherwise indicated.
1. Exposed, Not Subject to Physical Damage: EMT.
 2. Exposed, Not Subject to Severe Physical Damage: EMT].
 3. Exposed and Subject to Severe Physical Damage: GRC.
 4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
 5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
 6. Damp or Wet Locations: GRC.
 7. Boxes and Enclosures: NEMA 250, Type 1.

- C. Minimum Raceway Size: 3/4-inch (21-mm) trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
 - 1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
 - 2. EMT: Use setscrew, steel fittings. Comply with NEMA FB 2.10.
 - 3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
- F. Install surface raceways only where indicated on Drawings.
- G. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F (49 deg C).

3.2 INSTALLATION

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.
- B. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- C. Do not install raceways or electrical items on any "explosion-relief" walls or rotating equipment.
- D. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- E. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (300 mm) of changes in direction.
- G. Make bends in raceway using large-radius preformed ells. Field bending shall be according to NFPA 70 minimum radii requirements. Use only equipment specifically designed for material and size involved.
- H. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- I. Support conduit within 12 inches (300 mm) of enclosures to which attached.
- J. Raceways Embedded in Slabs:

1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot (3-m) intervals.
 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
 3. Arrange raceways to keep a minimum of 2 inches (50 mm) of concrete cover in all directions.
 4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
 5. Change from RNC to GRC before rising above floor.
- K. Stub-ups to Above Recessed Ceilings:
1. Use EMT.
 2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- L. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- M. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- N. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35-mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- O. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- P. Surface Raceways:
1. Install surface raceway with a minimum 2-inch (50-mm) radius control at bend points.
 2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches (1200 mm) and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.
- Q. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces.
- R. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service raceway enters a building or structure.
3. Conduit extending from interior to exterior of building.
4. Where otherwise required by NFPA 70.

S. Expansion-Joint Fittings:

1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F (17 deg C) and that has straight-run length that exceeds 25 feet (7.6 m).
2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
 - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C) temperature change.
 - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C) temperature change.
 - c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F (70 deg C) temperature change.
 - d. Attics: 135 deg F (75 deg C) temperature change.
3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per degree F (0.06 mm per meter of length of straight run per degree C) of temperature change for PVC conduits.
4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

T. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches (1830 mm) of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

U. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to top of box unless otherwise indicated.

V. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between the box and cover plate or the supported equipment and box.

W. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

X. Locate boxes so that cover or plate will not span different building finishes.

- Y. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
- Z. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
- AA. Set metal floor boxes level and flush with finished floor surface.
- BB. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 312000 "Earth Moving" for pipe less than 6 inches (150 mm) in nominal diameter.
2. Install backfill as specified in Section 312000 "Earth Moving."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."
4. Install manufactured duct elbows for stub-up at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
 - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete for a minimum of 12 inches (300 mm) on each side of the coupling.
 - b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
6. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch (25 mm) above finished grade.
- D. Install handholes with bottom below frost line.
- E. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.6 FIRESTOPPING

- A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.7 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 260543 - UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal conduits and fittings, including GRC and PVC-coated steel conduit.
2. Rigid nonmetallic duct.
3. Duct accessories.
4. Precast concrete handholes.
5. Polymer concrete handholes and boxes with polymer concrete cover.
6. Fiberglass handholes and boxes.

1.2 DEFINITIONS

- A. Direct Buried: Duct or a duct bank that is buried in the ground, without any additional casing materials such as concrete.
- B. Duct: A single duct or multiple ducts. Duct may be either installed singly or as component of a duct bank.
- C. Duct Bank:
1. Two or more ducts installed in parallel, with or without additional casing materials.
 2. Multiple duct banks.

1.3 INFORMATIONAL SUBMITTALS

- A. Duct and Duct-Bank Coordination Drawings: Show duct profiles and coordination with other utilities and underground structures.
- B. Product Certificates: For concrete and steel used in precast concrete handholes, as required by ASTM C858.
- C. Source quality-control reports.
- D. Field quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND FITTINGS

- A. GRC: Comply with ANSI C80.1 and UL 6.

- B. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.

2.2 RIGID NONMETALLIC DUCT

- A. Underground Plastic Utilities Duct: Type EPC-40-PVC RNC, complying with NEMA TC 2 and UL 651, with matching fittings complying with NEMA TC 3 by same manufacturer as duct.
- B. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.
- C. Solvents and Adhesives: As recommended by conduit manufacturer.

2.3 DUCT ACCESSORIES

- A. Duct Spacers: Factory-fabricated, rigid, PVC interlocking spacers; sized for type and size of duct with which used, and selected to provide minimum duct spacing indicated while supporting duct during concreting or backfilling.
- B. Underground-Line Warning Tape: Comply with requirements for underground-line warning tape specified in Section 260553 "Identification for Electrical Systems."

2.4 PRECAST CONCRETE HANDHOLES AND BOXES

- A. Description: Factory-fabricated, reinforced-concrete, monolithically poured walls and bottom unless open-bottom enclosures are indicated. Frame and cover shall form top of enclosure and shall have load rating consistent with that of handhole or box.
- B. Comply with ASTM C858 for design and manufacturing processes.
- C. Frame and Cover: Weatherproof steel frame, with steel cover with recessed cover hook eyes and tamper-resistant, captive, cover-securing bolts.
- D. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
- E. Cover Legend: Molded lettering, "ELECTRIC," as indicated for each service.
- F. Configuration: Units shall be designed for flush burial and have open bottom unless otherwise indicated.
- G. Extensions and Slabs: Designed to mate with bottom of enclosure. Same material as enclosure.
 - 1. Extension shall provide increased depth of 12 inches (300 mm).
 - 2. Slab: Same dimensions as bottom of enclosure, and arranged to provide closure.
- H. Joint Sealant: Asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at the installation location with the ground-water level at grade.

- I. Knockout Panels: Precast openings in walls, arranged to match dimensions and elevations of approaching duct, plus an additional 12 inches (300 mm) vertically and horizontally to accommodate alignment variations.
- J. Duct Entrances in Handhole Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.
- K. Handholes 12 inches wide by 24 inches long (300 mm wide by 600 mm long) and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.5 POLYMER CONCRETE HANDHOLES AND BOXES WITH POLYMER CONCRETE COVER

- A. Description: Molded of sand and aggregate, bound together with a polymer resin, and reinforced with steel or fiberglass or a combination of the two.
- B. Standard: Comply with SCTE 77. Comply with tier requirements in "Underground Enclosure Application" Article.
- C. Color: Green.
- D. Configuration: Units shall be designed for flush burial and have open bottom unless otherwise indicated.
- E. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
- F. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
- G. Cover Legend: Molded lettering, "ELECTRIC," as indicated for each service.
- H. Direct-Buried Wiring Entrance Provisions: Knockouts equipped with insulated bushings or end-bell fittings, selected to suit box material, sized for wiring indicated, and arranged for secure, fixed installation in enclosure wall.
- I. Duct Entrance Provisions: Duct-terminating fittings shall mate with entering duct for secure, fixed installation in enclosure wall.
- J. Handholes 12 inches wide by 24 inches long (300 mm wide by 600 mm long) and larger shall have factory-installed inserts for cable racks and pulling-in irons.

2.6 FIBERGLASS HANDHOLES AND BOXES

- A. Description: Molded of fiberglass-reinforced polyester resin, with covers made of fiberglass.
- B. Standard: Comply with SCTE 77. Comply with tier requirements in "Underground Enclosure Application" Article.
- C. Color: Green.

- D. Configuration: Units shall be designed for flush burial and have open bottom unless otherwise indicated.
- E. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
- F. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
- G. Cover Legend: Molded lettering, "ELECTRIC," as indicated for each service.
- H. Duct Entrance Provisions: Duct-terminating fittings shall mate with entering duct for secure, fixed installation in enclosure wall.
- I. Handholes 12 inches wide by 24 inches long (300 mm wide by 600 mm long) and larger shall have factory-installed inserts for cable racks and pulling-in irons.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate layout and installation of duct, duct bank, manholes, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in the field. Notify Architect if there is a conflict between areas of excavation and existing structures or archaeological sites to remain.
- B. Coordinate elevations of duct and duct-bank entrances into manholes, handholes, and boxes with final locations and profiles of duct and duct banks, as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations as required to suit field conditions and to ensure that duct and duct bank will drain to manholes and handholes, and as approved by Architect.

3.2 UNDERGROUND DUCT APPLICATION

- A. Duct for Electrical Feeders 600 V and Less: RNC Type EPC-40-PVC, direct-buried unless otherwise indicated.
- B. Duct for Electrical Branch Circuits: RNC Type EPC-40-PVC, direct-buried unless otherwise indicated.
- C. Underground Ducts Crossing Driveways and Roadways: RNC Type EPC-40 PVC, encased in reinforced concrete.
- D. Stub-ups: Concrete-encased GRC.

3.3 UNDERGROUND ENCLOSURE APPLICATION

- A. Handholes and Boxes for 600 V and Less:

1. Units in Roadways and Other Deliberate Traffic Paths: Precast concrete. AASHTO HB 17, H-10 structural load rating.
2. Units in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: Precast concrete, AASHTO HB 17, H-10 or heavy-duty fiberglass units with polymer concrete frame and cover, SCTE 77, Tier 8 structural load rating.
3. Units Subject to Light-Duty Pedestrian Traffic Only: Fiberglass-reinforced polyester resin, structurally tested according to SCTE 77 with 3000-lbf (13 345-N) vertical loading.
4. Cover design load shall not exceed the design load of the handhole or box.

B. Manholes: Precast concrete.

1. Units Located in Roadways and Other Deliberate Traffic Paths by Heavy or Medium Vehicles: H-20 structural load rating according to AASHTO HB 17.
2. Units Not Located in Deliberate Traffic Paths by Heavy or Medium Vehicles: H-10 load rating according to AASHTO HB 17.

3.4 EARTHWORK

- A. Excavation and Backfill: Comply with Section 312000 "Earth Moving," but do not use heavy-duty, hydraulic-operated, compaction equipment.
- B. Restoration: Replace area immediately after backfilling is completed.
- C. Restore surface features at areas disturbed by excavation, and re-establish original grades unless otherwise indicated. Replace removed sod immediately after backfilling is completed.
- D. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching. Comply with Section 329200 "Turf and Grasses" and Section 329300 "Plants."
- E. Cut and patch existing pavement in the path of underground duct, duct bank, and underground structures according to "Cutting and Patching" Article in Section 017300 "Execution."

3.5 DUCT AND DUCT-BANK INSTALLATION

- A. Where indicated on Drawings, install duct, spacers, and accessories into the duct-bank configuration shown. Duct installation requirements in this Section also apply to duct bank.
- B. Install duct according to NEMA TCB 2.
- C. Slope: Pitch duct a minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope duct from a high point between two manholes, to drain in both directions.
- D. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 48 inches (1200 mm), both horizontally and vertically, at other locations unless otherwise indicated.

1. Duct shall have maximum of two 90 degree bends or the total of all bends shall be no more 180 degrees between pull points.
- E. Joints: Use solvent-cemented joints in duct and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent duct do not lie in same plane.
- F. Installation Adjacent to High-Temperature Steam Lines: Where duct is installed parallel to underground steam lines, perform calculations showing the duct will not be subject to environmental temperatures above 40 deg C. Where environmental temperatures are calculated to rise above 40 deg C, and anywhere the duct crosses above an underground steam line, install insulation blankets listed for direct burial to isolate the duct bank from the steam line.
- G. End Bell Entrances to Manholes and Concrete and Polymer Concrete Handholes: Use end bells, spaced approximately 10 inches (250 mm) o.c. for 5-inch (125-mm) duct, and vary proportionately for other duct sizes.
- H. Terminator Entrances to Manholes and Concrete and Polymer Concrete Handholes: Use manufactured, cast-in-place duct terminators, with entrances into structure spaced approximately 6 inches (150 mm) o.c. for 4-inch (100-mm) duct, and vary proportionately for other duct sizes.
- I. Building Wall Penetrations: Make a transition from underground duct to GRC at least 10 feet (3 m) outside the building wall, without reducing duct line slope away from the building and without forming a trap in the line. Use fittings manufactured for RNC-to-GRC transition. Install GRC penetrations of building walls as specified in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."
- J. Sealing: Provide temporary closure at terminations of duct with pulled cables. Seal spare duct at terminations. Use sealing compound and plugs to withstand at least 15-psig (1.03-MPa) hydrostatic pressure.
- K. Pulling Cord: Install 200-lbf- (1000-N-) test nylon cord in empty ducts.
- L. Concrete-Encased Ducts and Duct Bank:
 1. Excavate trench bottom to provide firm and uniform support for duct. Prepare trench bottoms as specified in Section 312000 "Earth Moving" for pipes less than 6 inches (150 mm) in nominal diameter.
 2. Width: Excavate trench 12 inches (300 mm) wider than duct on each side.
 3. Width: Excavate trench 3 inches (75 mm) wider than duct on each side.
 4. Depth: Install so top of duct envelope is at least 24 inches (600 mm) below finished grade in areas not subject to deliberate traffic, and at least 30 inches (750 mm) below finished grade in deliberate traffic paths for vehicles unless otherwise indicated.
 5. Support duct on duct spacers coordinated with duct size, duct spacing, and outdoor temperature.
 6. Spacer Installation: Place spacers close enough to prevent sagging and deforming of duct, with not less than five spacers per 20 feet (6 m) of duct. Place spacers within 24 inches (600 mm) of duct ends. Stagger spacers approximately 6 inches (150 mm) between tiers. Secure spacers to earth and to duct to prevent floating during concreting. Tie entire

- assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
7. Minimum Space between Duct: 3 inches (75 mm) between edge of duct and exterior envelope wall, 2 inches (50 mm) between ducts for like services, and 4 inches (100 mm) between power and communications ducts.
 8. Elbows: Use manufactured GRC elbows for stub-ups, at building entrances, and at changes of direction in duct run.
 9. Reinforcement: Reinforce concrete-encased duct where crossing disturbed earth and where indicated. Arrange reinforcing rods and ties without forming conductive or magnetic loops around ducts or duct groups.
 10. Forms: Use walls of trench to form side walls of duct bank where soil is self-supporting and concrete envelope can be poured without soil inclusions; otherwise, use forms.
 11. Concrete Cover: Install a minimum of 3 inches (75 mm) of concrete cover between edge of duct to exterior envelope wall, 2 inches (50 mm) between duct of like services, and 4 inches (100 mm) between power and communications ducts.
 12. Concreting Sequence: Pour each run of envelope between manholes or other terminations in one continuous operation.
 13. Pouring Concrete: Comply with requirements in "Concrete Placement" Article in Section 033000 "Cast-in-Place Concrete." Place concrete carefully during pours to prevent voids under and between duct and at exterior surface of envelope. Do not allow a heavy mass of concrete to fall directly onto ducts. Allow concrete to flow around duct and rise up in middle, uniformly filling all open spaces. Do not use power-driven agitating equipment unless specifically designed for duct-installation application.

M. Direct-Buried Duct and Duct Bank:

1. Excavate trench bottom to provide firm and uniform support for duct. Comply with requirements in Section 312000 "Earth Moving" for preparation of trench bottoms for pipes less than 6 inches (150 mm) in nominal diameter.
2. Width: Excavate trench 12 inches (300 mm) wider than duct on each side.
3. Width: Excavate trench 3 inches (75 mm) wider than duct on each side.
4. Depth: Install top of duct at least 36 inches (900 mm) below finished grade unless otherwise indicated.
5. Set elevation of bottom of duct bank below frost line.
6. Support ducts on duct spacers coordinated with duct size, duct spacing, and outdoor temperature.
7. Spacer Installation: Place spacers close enough to prevent sagging and deforming of duct, with not less than five spacers per 20 feet (6 m) of duct. Place spacers within 24 inches (600 mm) of duct ends. Stagger spacers approximately 6 inches (150 mm) between tiers. Secure spacers to earth and to ducts to prevent floating during concreting. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
8. Install duct with a minimum of 3 inches (75 mm) between ducts for like services and 6 inches (150 mm) between power and communications duct.
9. Elbows: Install manufactured duct elbows for stub-ups, at building entrances, and at changes of direction in duct direction unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
10. Install manufactured GRC elbows for stub-ups, at building entrances, and at changes of direction in duct.

11. After installing first tier of duct, backfill and compact. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process. Repeat procedure after placing each tier. After placing last tier, hand place backfill to 4 inches (100 mm) over duct and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction. Comply with requirements in Section 312000 "Earth Moving" for installation of backfill materials.

- a. Place minimum 3 inches (75 mm) of sand as a bed for duct. Place sand to a minimum of 6 inches (150 mm) above top level of duct.
- b. Place minimum 6 inches (150 mm) of engineered fill above concrete encasement of duct.

N. Underground-Line Warning Tape: Bury nonconducting underground line specified in Section 260553 "Identification for Electrical Systems" no less than 12 inches (300 mm) above all concrete-encased duct and duct banks and approximately 12 inches (300 mm) below grade. Align tape parallel to and within 3 inches (75 mm) of centerline of duct bank. Provide an additional warning tape for each 12-inch (300-mm) increment of duct-bank width over a nominal 18 inches (450 mm). Space additional tapes 12 inches (300 mm) apart, horizontally.

3.6 INSTALLATION OF CONCRETE MANHOLES, HANDHOLES, AND BOXES

A. Precast Concrete Handhole and Manhole Installation:

1. Comply with ASTM C891 unless otherwise indicated.
2. Install units level and plumb and with orientation and depth coordinated with connecting duct, to minimize bends and deflections required for proper entrances.
3. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1-inch (25-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

B. Elevations:

1. Handhole Covers: In paved areas and trafficways, set surface flush with finished grade. Set covers of other handholes 1 inch (25 mm) above finished grade.
2. Where indicated, cast handhole cover frame integrally with handhole structure.

C. Drainage: Install drains in bottom of manholes where indicated. Coordinate with drainage provisions indicated.

D. Waterproofing: Apply waterproofing to exterior surfaces of handholes after concrete has cured at least three days. Waterproofing materials and installation are specified in Section 071353 "Elastomeric Sheet Waterproofing." After duct has been connected and grouted, and before backfilling, waterproof joints and connections, and touch up abrasions and scars. Waterproof exterior of manhole chimneys after mortar has cured at least three days.

- E. Dampproofing: Apply dampproofing to exterior surfaces of handholes after concrete has cured at least three days. Dampproofing materials and installation are specified in Section 071113 "Bituminous Dampproofing." After ducts are connected and grouted, and before backfilling, dampproof joints and connections, and touch up abrasions and scars. Dampproof exterior of manhole chimneys after mortar has cured at least three days.

3.7 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting duct, to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of duct, and seal joint between box and extension as recommended by manufacturer.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas and trafficways, set cover flush with finished grade. Set covers of other handholes 1 inch (25 mm) above finished grade.
- D. Install handholes and boxes with bottom below frost line, below grade.
- E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in enclosure.
- F. Field cut openings for duct according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.
- G. For enclosures installed in asphalt paving and subject to occasional, nondeliberate, heavy-vehicle loading, form and pour a concrete ring encircling, and in contact with, enclosure and with top surface screeded to top of box cover frame. Bottom of ring shall rest on compacted earth.
 - 1. Concrete: 3000 psi (20 kPa), 28-day strength, complying with Section 033000 "Cast-in-Place Concrete," with a troweled finish.
 - 2. Dimensions: 10 inches wide by 12 inches deep (250 mm wide by 300 mm deep).

3.8 GROUNDING

- A. Ground underground ducts and utility structures according to Section 260526 "Grounding and Bonding for Electrical Systems."

3.9 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Demonstrate capability and compliance with requirements on completion of installation of underground duct, duct bank, and utility structures.
 - 2. Pull solid aluminum or wood test mandrel through duct to prove joint integrity and adequate bend radii, and test for out-of-round duct. Provide a minimum 12-inch- (300-mm-) long mandrel equal to duct size minus 1/4 inch (6 mm). If obstructions are indicated, remove obstructions and retest.
 - 3. Test handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Section 260526 "Grounding and Bonding for Electrical Systems."
- B. Correct deficiencies and retest as specified above to demonstrate compliance.
- C. Prepare test and inspection reports.

3.10 CLEANING

- A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of duct until duct cleaner indicates that duct is clear of dirt and debris. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.
- B. Clean internal surfaces of manholes, including sump.
 - 1. Sweep floor, removing dirt and debris.
 - 2. Remove foreign material.

END OF SECTION 260543

SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR
ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. Sleeves for Rectangular Openings:

1. Material: Galvanized sheet steel.
2. Minimum Metal Thickness:

- a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and with no side larger than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
- b. For sleeve cross-section rectangle perimeter 50 inches (1270 mm) or more and one or more sides larger than 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.2 SLEEVE-SEAL SYSTEMS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Advance Products & Systems, Inc.
 - b. CALPICO, Inc.
 - c. Metraflex Company (The).
 - d. Pipeline Seal and Insulator, Inc.
 2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 3. Pressure Plates: Stainless steel.
 4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

- A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.
 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Advance Products & Systems, Inc.
 - b. CALPICO, Inc.
 - c. Metraflex Company (The).
 - d. Pipeline Seal and Insulator, Inc.

2.4 GROUT

- A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

- B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

- A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.
 - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.
- B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

- A. Comply with NECA 1.
- B. Comply with NEMA VE 2 for cable tray and cable penetrations.
- C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:
 - 1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
 - a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
 - b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
 - 2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 3. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.
 - 4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
- D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
 2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.
- E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.
- B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

- A. Install sleeve-seal fittings in new walls and slabs as they are constructed.
- B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
- C. Secure nailing flanges to concrete forms.
- D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 260544

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Color and legend requirements for raceways, conductors, and warning labels and signs.
2. Labels.
3. Bands and tubes.
4. Tapes and stencils.
5. Tags.
6. Signs.
7. Cable ties.
8. Paint for identification.
9. Fasteners for labels and signs.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Delegated-Design Submittal: For arc-flash hazard study.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Comply with ASME A13.1 and IEEE C2.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Comply with NFPA 70E requirements for arc-flash warning labels.
- F. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

- G. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 COLOR AND LEGEND REQUIREMENTS

- A. Raceways and Cables Carrying Circuits at 600 V or Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage and system or service type.

- B. Color-Coding for Phase and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder and branch-circuit conductors.

1. Color shall be factory applied or field applied for sizes larger than No. 8 AWG if authorities having jurisdiction permit.
2. Colors for 208/120-V Circuits:
 - a. Phase A: Black.
 - b. Phase B: Red.
 - c. Phase C: Blue.
3. Color for Neutral: White.
4. Color for Equipment Grounds: Bare copper or green.

- C. Warning Label Colors:

1. Identify system voltage with black letters on an orange background.

- D. Warning labels and signs shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."

- E. Equipment Identification Labels:

1. Black letters on a white field.
2. Indicate equipment name, voltage and from where equipment is signed.

2.3 LABELS

- A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Brady Corporation.
 - b. Champion America.
 - c. emedco.
 - d. Grafoplast Wire Markers.
 - e. HellermannTyton.
 - f. LEM Products Inc.
 - g. Marking Services, Inc.
 - h. Panduit Corp.
- B. Snap-around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameter and that stay in place by gripping action.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Brady Corporation.
 - b. HellermannTyton.
 - c. Marking Services, Inc.
 - d. Panduit Corp.
- C. Self-Adhesive Wraparound Labels: Preprinted, 3-mil- (0.08-mm-) thick, polyester or vinyl flexible label with acrylic pressure-sensitive adhesive.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. A'n D Cable Products.
 - b. Brady Corporation.
 - c. Brother International Corporation.
 - d. emedco.
 - e. Grafoplast Wire Markers.
 - f. Ideal Industries, Inc.
 - g. LEM Products Inc.
 - h. Marking Services, Inc.
 - i. Panduit Corp.
 2. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels sized such that the clear shield overlaps the entire printed legend.
 3. Marker for Labels: Permanent, waterproof, black ink marker recommended by tag manufacturer.
 4. Marker for Labels: Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.

- D. Self-Adhesive Labels: Polyester or vinyl, thermal, transfer-printed, 3-mil- (0.08-mm-) thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. A'n D Cable Products.
 - b. Brady Corporation.
 - c. Brother International Corporation.
 - d. emedco.
 - e. Grafoplast Wire Markers.
 - f. HellermannTyton.
 - g. Ideal Industries, Inc.
 - h. LEM Products Inc.
 - i. Marking Services, Inc.
 - j. Panduit Corp.
 2. Minimum Nominal Size:
 - a. 1-1/2 by 6 inches (37 by 150 mm) for raceway and conductors.
 - b. 3-1/2 by 5 inches (76 by 127 mm) for equipment.
 - c. As required by authorities having jurisdiction.

2.4 BANDS AND TUBES

- A. Snap-around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches (50 mm) long, with diameters sized to suit diameter and that stay in place by gripping action.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Brady Corporation.
 - b. HellermannTyton.
 - c. Marking Services, Inc.
- B. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tubes with machine-printed identification labels, sized to suit diameters of and shrunk to fit firmly around item being identified. Full shrink recovery occurs at a maximum of 200 deg F (93 deg C). Comply with UL 224.
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Brady Corporation.

2.5 TAPES AND STENCILS

- A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Carlton Industries, LP.
 - b. Champion America.
 - c. HellermannTyton.
 - d. Ideal Industries, Inc.
 - e. Marking Services, Inc.
- B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide; compounded for outdoor use.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Brady Corporation.
 - b. Carlton Industries, LP.
 - c. emedco.
- C. Tape and Stencil: 4-inch- (100-mm-) wide black stripes on 10-inch (250-mm) centers placed diagonally over orange background and is 12 inches (300 mm) wide. Stop stripes at legends.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. HellermannTyton.
 - b. LEM Products Inc.
 - c. Marking Services, Inc.
- D. Floor Marking Tape: 2-inch- (50-mm-) wide, 5-mil (0.125-mm) pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Carlton Industries, LP.
- E. Underground-Line Warning Tape:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Brady Corporation.
 - b. Ideal Industries, Inc.
 - c. LEM Products Inc.

- d. Marking Services, Inc.
 - e. Reef Industries, Inc.
- 2. Tape:
 - a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical utility lines.
 - b. Printing on tape shall be permanent and shall not be damaged by burial operations.
 - c. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.
- 3. Color and Printing:
 - a. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.
 - b. Inscriptions for Red-Colored Tapes: "ELECTRIC LINE, HIGH VOLTAGE."

2.6 TAGS

A. Write-on Tags:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Carlton Industries, LP.
 - b. LEM Products Inc.
- 2. Polyester Tags: 0.010 inch (0.25 mm) thick, with corrosion-resistant grommet and cable tie for attachment.
- 3. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
- 4. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.7 SIGNS

A. Baked-Enamel Signs:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Carlton Industries, LP.
 - b. Champion America.
 - c. emedco.

2. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
3. 1/4-inch (6.4-mm) grommets in corners for mounting.
4. Nominal Size: 7 by 10 inches (180 by 250 mm).

B. Laminated Acrylic or Melamine Plastic Signs:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Brady Corporation.
 - b. Carlton Industries, LP.
 - c. emedco.
2. Engraved legend.
3. Thickness:
 - a. For signs up to 20 sq. in. (129 sq. cm), minimum 1/16 inch (1.6 mm) thick.
 - b. For signs larger than 20 sq. in. (129 sq. cm), 1/8 inch (3.2 mm) thick.
 - c. Engraved legend with black letters on white face.
 - d. Punched or drilled for mechanical fasteners with 1/4-inch (6.4-mm) grommets in corners for mounting.
 - e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.8 CABLE TIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. HellermannTyton.
 2. Ideal Industries, Inc.
 3. Marking Services, Inc.
- B. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
1. Minimum Width: 3/16 inch (5 mm).
 2. Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D 638: 12,000 psi (82.7 MPa).
 3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
 4. Color: Black, except where used for color-coding.
- C. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
1. Minimum Width: 3/16 inch (5 mm).

2. Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D 638: 12,000 psi (82.7 MPa).
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black.

D. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D 638: 7000 psi (48.2 MPa).
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F (Minus 46 to plus 140 deg C).
5. Color: Black.

2.9 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.
- B. Install identifying devices before installing acoustical ceilings and similar concealment.
- C. Verify identity of each item before installing identification products.
- D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.
- E. Apply identification devices to surfaces that require finish after completing finish work.
- F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.
- G. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

- H. System Identification for Raceways and Cables under 600 V: Identification shall completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.
 - 1. Secure tight to surface of conductor, cable, or raceway.
- I. System Identification for Raceways and Cables over 600 V: Identification shall completely encircle cable or conduit. Place adjacent identification of two-color markings in contact, side by side.
 - 1. Secure tight to surface of conductor, cable, or raceway.
- J. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
- K. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.
- L. Accessible Fittings for Raceways: Identify the covers of each junction and pull box of the following systems with the wiring system legend and system voltage. System legends shall be as follows:
 - 1. "POWER."
- M. Vinyl Wraparound Labels:
 - 1. Secure tight to surface at a location with high visibility and accessibility.
 - 2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.
- N. Snap-around Labels: Secure tight to surface at a location with high visibility and accessibility.
- O. Self-Adhesive Wraparound Labels: Secure tight to surface of raceway or cable at a location with high visibility and accessibility.
- P. Self-Adhesive Labels:
 - 1. On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
 - 2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.
- Q. Snap-around Color-Coding Bands: Secure tight to surface at a location with high visibility and accessibility.
- R. Heat-Shrink, Preprinted Tubes: Secure tight to surface at a location with high visibility and accessibility.
- S. Marker Tapes: Secure tight to surface at a location with high visibility and accessibility.

- T. Self-Adhesive Vinyl Tape: Secure tight to surface at a location with high visibility and accessibility.
 - 1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.
- U. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.
- V. Floor Marking Tape: Apply stripes to finished surfaces following manufacturer's written instructions.
- W. Underground Line Warning Tape:
 - 1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches (400 mm) overall.
 - 2. Limit use of underground-line warning tape to direct-buried cables.
 - 3. Install underground-line warning tape for direct-buried cables and cables in raceways.
- X. Write-on Tags:
 - 1. Place in a location with high visibility and accessibility.
 - 2. Secure using general-purpose cable ties.
- Y. Baked-Enamel Signs:
 - 1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
 - 2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on minimum 1-1/2-inch- (38-mm-) high sign; where two lines of text are required, use signs minimum 2 inches (50 mm) high.
- Z. Metal-Backed Butyrate Signs:
 - 1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
 - 2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on minimum 1-1/2-inch- (38-mm-) high sign; where two lines of text are required, use signs minimum 2 inches (50 mm) high.
- AA. Laminated Acrylic or Melamine Plastic Signs:
 - 1. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
 - 2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on minimum 1-1/2-inch- (38-mm-) high sign; where two lines of text are required, use signs minimum 2 inches (50 mm) high.

BB. Cable Ties: General purpose, for attaching tags, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

3.2 IDENTIFICATION SCHEDULE

- A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.
- B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.
- C. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits, More Than 30 A and 120 V to Ground: Identify with self-adhesive raceway labels.
 1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.
- D. Accessible Fittings for Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive labels containing the wiring system legend and system voltage. System legends shall be as follows:
 1. "POWER."
- E. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use vinyl wraparound labels, self-adhesive wraparound labels, or self-adhesive vinyl tape to identify the phase.
 1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.
- F. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive wraparound labels with the conductor or cable designation, origin, and destination.
- G. Control-Circuit Conductor Termination Identification: For identification at terminations, provide heat-shrink preprinted tubes or self-adhesive wraparound labels with the conductor designation.
- H. Conductors to Be Extended in the Future: Attach write-on tags or marker tape to conductors and list source.
- I. Auxiliary Electrical Systems Conductor Identification: Marker tape or self-adhesive vinyl tape that is uniform and consistent with system used by manufacturer for factory-installed connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
- J. Locations of Underground Lines: Underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.
- K. Workspace Indication: Apply floor marking tape or tape and stencil to finished surfaces. Show working clearances in the direction of access to live parts. Workspace shall comply with NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.
- L. Instructional Signs: Self-adhesive labels, including the color code for grounded and ungrounded conductors.
- M. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive equipment labels or baked-enamel warning signs.
 1. Apply to exterior of door, cover, or other access.
 2. For equipment with multiple power or control sources, apply to door or cover of equipment, including, but not limited to, the following:
 - a. Power-transfer switches.
 - b. Controls with external control power connections.
- N. Arc Flash Warning Labeling: Self-adhesive labels.
- O. Operating Instruction Signs: Self-adhesive labels or baked-enamel warning signs or laminated acrylic or melamine plastic signs.
- P. Equipment Identification Labels:
 1. Indoor Equipment: Self-adhesive label, baked-enamel signs or laminated acrylic or melamine plastic sign.
 2. Outdoor Equipment: Laminated acrylic or melamine sign.

END OF SECTION 260553

SECTION 260923 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Photoelectric switches.
2. Indoor occupancy and vacancy sensors.
3. Switchbox-mounted occupancy and vacancy sensors

B. Related Requirements:

1. Section 262726 "Wiring Devices" for wall-box dimmers, non-networkable wall-switch occupancy sensors, and manual light switches.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Show installation details for the following:
 - a. Occupancy sensors.
 - b. Vacancy sensors.
2. Interconnection diagrams showing field-installed wiring.
3. Include diagrams for power, signal, and control wiring.

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plan(s) and elevations, drawn to scale and coordinated with each other, using input from installers of the items involved.
- B. Field quality-control reports.
- C. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.
- B. Software and firmware operational documentation.

1.5 WARRANTY

- A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace lighting control devices that fail(s) in materials or workmanship within specified warranty period.
1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 OUTDOOR PHOTOELECTRIC SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cooper Industries, Inc.
 2. Intermatic, Inc.
 3. Leviton Manufacturing Co., Inc.
 4. NSi Industries LLC.
- B. Description: Solid state, with SPST dry contacts rated for 1000 W incandescent or 1800 VA inductive, to operate connected relay, contactor coils, or microprocessor input; complying with UL 773A, and compatible with ballasts and LED lamps.
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Light-Level Monitoring Range: 1.5 to 10 fc (16.14 to 108 lux), with an adjustment for turn-on and turn-off levels within that range, and a directional lens in front of the photocell to prevent fixed light sources from causing turn-off.
 3. Time Delay: Fifteen-second minimum, to prevent false operation.
 4. Surge Protection: Metal-oxide varistor.
 5. Mounting: Twist lock complies with NEMA C136.10, with base-and-stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the north sky exposure.
 6. Failure Mode: Luminaire stays ON.
- C. Description: Solid state; one set of NO dry contacts rated for 24 V dc at 1 A, to operate connected load, complying with UL 773, and compatible with luminaire, power pack or lighting control panelboard.
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Light-Level Monitoring Range: 1.5 to 10 fc (16.14 to 108 lux), with an adjustment for turn-on and turn-off levels within that range.
 3. Time Delay: Thirty-second minimum, to prevent false operation.
 4. Mounting: 1/2-inch (13-mm) threaded male conduit.
 5. Failure Mode: Luminaire stays ON.

2.2 INDOOR OCCUPANCY AND VACANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Bryant Electric.
2. Cooper Industries, Inc.
3. Hubbell Building Automation, Inc.
4. Intermatic, Inc.
5. Leviton Manufacturing Co., Inc.
6. Lithonia Lighting; Acuity Brands Lighting, Inc.
7. Lutron Electronics Co., Inc.
8. NSi Industries LLC.
9. Philips Lighting Controls.
10. Sensor Switch, Inc.
11. Square D.

B. General Requirements for Sensors:

1. Wall or ceiling-mounted, solid-state indoor occupancy and vacancy sensors.
2. Passive infrared or dual technology.
3. Integrated or separate power pack.
4. Hardwired connection to switch.
5. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
6. Operation:
 - a. Occupancy Sensor: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
 - b. Vacancy Sensor: Unless otherwise indicated, lights are manually turned on and sensor turns lights off when the room is unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
 - c. Combination Sensor: Unless otherwise indicated, sensor shall be programmed to turn lights on when coverage area is occupied and turn them off when unoccupied, or to turn off lights that have been manually turned on; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
7. Sensor Output: Sensor is powered from the power pack.
8. Power: Line voltage.
9. Mounting:
 - a. Sensor: Suitable for mounting in any position on a standard outlet box.
 - b. Relay: Externally mounted through a 1/2-inch (13-mm) knockout in a standard electrical enclosure.
 - c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
10. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.

11. Bypass Switch: Override the "on" function in case of sensor failure.
- C. PIR Type: Wall or ceiling mounted; detect occupants in coverage area by their heat and movement.
1. Detector Sensitivity: Detect occurrences of 6-inch- (150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm).
 2. Detection Coverage (Room, Ceiling Mounted): Detect occupancy anywhere in a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
 3. Detection Coverage (Corridor, Ceiling Mounted): Detect occupancy within 90 feet (27.4 m) when mounted on a 10-foot- (3-m-) high ceiling.
 4. Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of 1000 square feet (110 square meters) when mounted 48 inches (1200 mm) above finished floor.
- D. Dual-Technology Type: Wall or ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.
1. Sensitivity Adjustment: Separate for each sensing technology.
 2. Detector Sensitivity: Detect occurrences of 6-inch- (150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm), and detect a person of average size and weight moving not less than 12 inches (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inches/s (305 mm/s).
 3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
 4. Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of 1000 square feet (110 square meters) when mounted 48 inches (1200 mm) above finished floor.

2.3 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Bryant Electric.
 2. Cooper Industries, Inc.
 3. Hubbell Building Automation, Inc.
 4. Intermatic, Inc.
 5. Leviton Manufacturing Co., Inc.
 6. Lithonia Lighting; Acuity Brands Lighting, Inc.
 7. Lutron Electronics Co., Inc.
 8. NSi Industries LLC.
 9. Philips Lighting Controls.
 10. Sensor Switch, Inc.
 11. Square D.

- B. General Requirements for Sensors: Automatic-wall-switch occupancy sensor with manual on-off switch, suitable for mounting in a single gang switchbox, using hardwired connection.
 - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 2. Occupancy Sensor Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn lights off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
 - 3. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F (0 to 49 deg C).
 - 4. Switch Rating: Not less than 800-VA LED load at 120 V., 1200-VA LED load at 277 V.

2.4 CONDUCTORS AND CABLES

- A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1.
- B. Examine lighting control devices before installation. Reject lighting control devices that are wet, moisture damaged, or mold damaged.
- C. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.
- D. Install and aim sensors in locations to achieve not less than 90-percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.
- E. Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structure-borne vibration unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.2 WIRING INSTALLATION

- A. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 3/4 inch (19 mm).
- B. Wiring within Enclosures: Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.
- C. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.
- D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.3 IDENTIFICATION

- A. Identify components and power and control wiring according to Section 260553 "Identification for Electrical Systems."
- B. Label time switches and contactors with a unique designation.

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Lighting control devices will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

3.5 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting lighting control devices to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.
 - 1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
 - 2. For daylighting controls, adjust set points and deadband controls to suit Owner's operations.
 - 3. Align high-bay occupancy sensors using manufacturer's laser aiming tool.

3.6 SOFTWARE SERVICE AGREEMENT

- A. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for two years.
- B. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.
 - 1. Upgrade Notice: At least 30 days to allow Owner to schedule and access the system and to upgrade computer equipment if necessary.

3.7 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

END OF SECTION 260923

West Quad Development
Terre Haute Regional Airport
Terre Haute, Indiana

SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.

1.2 DEFINITIONS

A. MCCB: Molded-case circuit breaker.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of panelboard.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details.
2. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.
5. Include evidence of NRTL listing for series rating of installed devices.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
7. Include wiring diagrams for power, signal, and control wiring.
8. Key interlock scheme drawing and sequence of operations.
9. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards.

1.4 INFORMATIONAL SUBMITTALS

A. Panelboard schedules for installation in panelboards.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.6 FIELD CONDITIONS

A. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet (2000 m).

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.

1. Panelboard Warranty Period: 18 months from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANELBOARDS COMMON REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NEMA PB 1.

C. Comply with NFPA 70.

D. Enclosures: Flush and surface-mounted, dead-front cabinets.

1. Rated for environmental conditions at installed location.
 - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
 - b. Outdoor Locations: NEMA 250, Type 3R.
 - c. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
 - d. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.
2. Height: 84 inches (2.13 m) maximum.
3. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims shall cover all live parts and shall have no exposed hardware.
4. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.

E. Incoming Mains Location: Convertible between top and bottom.

F. Phase, Neutral, and Ground Buses: Tin-plated aluminum.

G. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Tin-plated aluminum.
 2. Main and Neutral Lugs: Compression type, with a lug on the neutral bar for each pole in the panelboard.
 3. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.
 4. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
 5. Subfeed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
- H. NRTL Label: Panelboards shall be labeled by an NRTL acceptable to authority having jurisdiction for use as service equipment with one or more main service disconnecting and overcurrent protective devices. Panelboards shall have meter enclosures, wiring, connections, and other provisions for utility metering. Coordinate with utility company for exact requirements.
- I. Future Devices: Panelboards shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
- J. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.

2.2 POWER PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton.
 2. General Electric Company; GE Energy Management - Electrical Distribution.
 3. Schneider Electric; Square D.
 4. Siemens Industry, Inc., Energy Management Division.
- B. Panelboards: NEMA PB 1, distribution type.
- C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
1. For doors more than 36 inches (914 mm) high, provide two latches, keyed alike.
- D. Mains: Circuit breaker or lugs only.
- E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
- F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers.
- G. Contactors in Main Bus: NEMA ICS 2, Class A, mechanically held, general-purpose controller, with same short-circuit interrupting rating as panelboard.

1. External Control-Power Source: 120-V branch circuit.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Eaton.
 2. General Electric Company; GE Energy Management - Electrical Distribution
 3. Schneider Electric; Square D.
 4. Siemens Industry, Inc., Energy Management Division.
- B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- C. Mains: Circuit breaker or lugs only.
- D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- E. Contactors in Main Bus: NEMA ICS 2, Class A, mechanically held, general-purpose controller, with same short-circuit interrupting rating as panelboard.
 1. External Control-Power Source: 120-V branch circuit.
- F. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Eaton.
 2. General Electric Company; GE Energy Management - Electrical Distribution.
 3. Schneider Electric; Square D.
 4. Siemens Industry, Inc., Energy Management Division.
- B. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.
 1. Thermal-Magnetic Circuit Breakers:
 - a. Inverse time-current element for low-level overloads.
 - b. Instantaneous magnetic trip element for short circuits.
 - c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
 3. Electronic Trip Circuit Breakers:
 - a. RMS sensing.

- b. Field-replaceable rating plug or electronic trip.
 - c. Digital display of settings, trip targets, and indicated metering displays.
 - d. Multi-button keypad to access programmable functions and monitored data.
 - e. Ten-event, trip-history log. Each trip event shall be recorded with type, phase, and magnitude of fault that caused the trip.
 - f. Integral test jack for connection to portable test set or laptop computer.
 - g. Field-Adjustable Settings:
 - 1) Instantaneous trip.
 - 2) Long- and short-time pickup levels.
 - 3) Long and short time adjustments.
 - 4) Ground-fault pickup level, time delay, and I squared T response.
- 4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
- 5. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
- 6. GFEP Circuit Breakers: Class B ground-fault protection (30-mA trip).
- 7. Arc-Fault Circuit Interrupter Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
- 8. Subfeed Circuit Breakers: Vertically mounted.
- 9. MCCB Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. Breaker handle indicates tripped status.
 - c. UL listed for reverse connection without restrictive line or load ratings.
 - d. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
 - e. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and HID lighting circuits.
 - f. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
 - g. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.
 - h. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.
 - i. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.
- C. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.
 - 1. Fuses and Spare-Fuse Cabinet: Comply with requirements specified in Section 262813 "Fuses."

2.5 IDENTIFICATION

- A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.

- B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.
- C. Circuit Directory: Directory card inside panelboard door, mounted in transparent card holder.

2.6 ACCESSORY COMPONENTS AND FEATURES

- A. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1.
- B. Install panelboards and accessories according to NEMA PB 1.1.
- C. Mount top of trim 90 inches (2286 mm) above finished floor unless otherwise indicated.
- D. Mount panelboard cabinet plumb and rigid without distortion of box.
- E. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- F. Install overcurrent protective devices and controllers not already factory installed.
 - 1. Set field-adjustable, circuit-breaker trip ranges.
- G. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.
- H. Install filler plates in unused spaces.
- I. Stub four 1-inch (27-EMT) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future.
- J. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

3.2 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems."

- B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- D. Device Nameplates: Label each branch circuit device in power panelboards with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- E. Install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems" identifying source of remote circuit.

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- C. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- D. Panelboards will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results, with comparisons of the two scans. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION 262416

SECTION 262713 - ELECTRICITY METERING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes work to accommodate utility company revenue meters, and Owner's electricity meters used to manage the electrical power system.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For electricity-metering equipment.
 - 1. Include elevation views of front panels of control and indicating devices and control stations.
 - 2. Include diagrams for power, signal, and control wiring.
 - 3. Wire Termination Diagrams and Schedules: Include diagrams for power, signal, and control wiring. Identify terminals and wiring designations and color-codes to facilitate installation, operation, and maintenance. Indicate recommended types, wire sizes, and circuiting arrangements for field-installed wiring, and show circuit protection features. Differentiate between manufacturer-installed and field-installed wiring.
 - 4. Include series-combination rating data for modular meter centers with main disconnect device.

1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.
- B. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An NRTL.

1.6 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of metering equipment that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Cost to repair or replace any parts for two years from date of Substantial Completion.
2. Extended Warranty Period: Cost of replacement parts (materials only, f.o.b. the nearest shipping point to Project site), for eight years, that failed in service due to transient voltage surges.

1.7 COORDINATION

- A. Electrical Service Connections: Coordinate with utility company and utility-furnished components.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 916.

2.2 UTILITY METERING INFRASTRUCTURE

- A. Install metering accessories furnished by the utility company, complying with its requirements.
- B. Utility-Furnished Meters: Connect data transmission facility of metering equipment installed by the Utility.
- C. Current-Transformer Cabinets: Comply with requirements of electrical-power utility company.
- D. Meter Sockets:
 1. Comply with requirements of electrical-power utility company.
 2. Meter Sockets: Steady-state and short-circuit current ratings shall meet indicated circuit ratings.
 3. Meter socket to be MEG (Meter Equipment Group) approved.
- E. Modular Meter Center: Factory-coordinated assembly of a main service disconnect device, wireways, meter socket modules, and feeder circuit breakers arranged in adjacent vertical sections complete with interconnecting buses.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Eaton.
 - b. General Electric Company.
 - c. Siemens Industry, Inc., Energy Management Division.
 - d. Square D.

- e. Milbank.
- 2. Comply with requirements of utility company for meter center.
 - a. Comply with UL 67.
- 3. Housing: NEMA 250, Type 3R enclosure.
- 4. Meter Socket Rating: Coordinated with connected feeder circuit rating.
- 5. Minimum Short-Circuit Rating: As indicated on drawings.
- 6. Steady-state and short-circuit current ratings shall have ratings that match connected circuit ratings.
- 7. Main Disconnect Device: Circuit breaker, series-combination rated for use with downstream feeder and branch circuit breakers and having an adjustable magnetic trip setting for circuit-breaker frame sizes of 250 A and larger. Comply with requirements in Section 262816 "Enclosed Switches and Circuit Breakers." Circuit breakers shall be operable from outside the enclosure to disconnect the unit. Configure cover so it can be opened only when the disconnect switch is open.
- 8. Main Disconnect Device: Fusible switch, UL 98 Type GD, series-combination rated by fuse manufacturer to protect downstream feeder and branch circuit breakers. Comply with requirements in Section 262816 "Enclosed Switches and Circuit Breakers." Switch shall be operable from outside the enclosure to disconnect the unit. Configure cover so that it can be opened only when the disconnect switch is open.
- 9. Feeder Circuit Breakers: Series-combination-rated molded-case units, rated to protect downstream circuit breakers and to house load centers and panelboards that have interrupting capacity as indicated on drawings.
 - a. Identification: Complying with requirements in Section 260553 "Identification for Electrical Systems."
 - b. Physical Protection: Tamper resistant, with hasp for padlock.
- 10. Surge Protection for Main Disconnect: Factory installed, integrally mounted, UL 1449 Type 1. Comply with Section 264313 "Surge Protection for Low-Voltage Electrical Power Circuits."
- 11. Surge Protection at Main Terminal Box: Factory installed, integrally mounted, UL 1449 Type 1. Comply with Section 264313 "Surge Protection for Low-Voltage Electrical Power Circuits."

F. Arc-Flash Warning Labels:

- 1. Labels: Comply with requirements for "Self-Adhesive Equipment Labels" and "Signs" in Section 260553 "Identification for Electrical Systems." Apply a properly sized self-adhesive label for each work location included in the analysis. Labels shall be machine printed, with no field-applied markings.
 - a. The label shall have an orange header with the wording, "WARNING, ARC-FLASH HAZARD," and shall include the following information taken directly from the arc-flash hazard analysis:
 - 1) Location designation.
 - 2) Nominal voltage.

- 3) Flash protection boundary.
- 4) Hazard risk category.
- 5) Incident energy.
- 6) Working distance.
- 7) Engineering report number, revision number, and issue date.

2.3 ELECTRICITY METERS

- A. Furnished and installed by utility company.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with equipment installation requirements in NECA 1.
- B. Install raceways and equipment according to utility company's written instructions. Provide empty conduits for metering leads and extend grounding connections as required by utility company.
- C. Install modular meter center according to switchboard installation requirements in NECA 400.
- D. Install arc-flash labels as required by NFPA 70.
- E. Wiring Method:
 1. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
 2. Minimum conduit size shall be 3/4 inch (19 mm).
- F. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.2 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform tests and inspections.
- C. Tests and Inspections:
 1. Connect a load of known kilowatt rating, 1.5 kW minimum, to a circuit supplied by metered feeder.
 2. Turn off circuits supplied by metered feeder and secure them in off condition.
 3. Run test load continuously for eight hours minimum, or longer, to obtain a measurable meter indication. Use test-load placement and setting that ensures continuous, safe operation.

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4. Check and record meter reading at end of test period and compare with actual electricity used, based on test-load rating, duration of test, and sample measurements of supply voltage at test-load connection. Record test results.
 5. Generate test report and billing for each tenant or activity from the meter reading tests.
- D. Electricity metering will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

END OF SECTION 262713

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SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Standard-grade receptacles, 125 V, 20 A.
2. GFCI receptacles, 125 V, 20 A.
3. Toggle switches, 120/277 V, 20 A.
4. Occupancy sensors.
5. Wall plates.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- B. Comply with NFPA 70.
- C. RoHS compliant.
- D. Comply with NEMA WD 1.
- E. Device Color:
1. Wiring Devices Connected to Normal Power System: White unless otherwise indicated or required by NFPA 70 or device listing.
- F. Wall Plate Color: For plastic covers, match device color.

- G. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 STANDARD-GRADE RECEPTACLES, 125 V, 20 A

A. Duplex Receptacles, 125 V, 20 A:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Leviton Manufacturing Co., Inc.
 - d. Legrand, P&S.
2. Description: Two pole, three wire, and self-grounding.
3. Configuration: NEMA WD 6, Configuration 5-20R.
4. Standards: Comply with UL 498 and FS W-C-596.

B. Weather-Resistant Duplex Receptacle, 125 V, 20 A:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Leviton Manufacturing Co., Inc.
 - d. Legrand, P&S.
2. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
3. Configuration: NEMA WD 6, Configuration 5-20R.
4. Standards: Comply with UL 498.
5. Marking: Listed and labeled as complying with NFPA 70, "Receptacles in Damp or Wet Locations" Article.

2.3 GFCI RECEPTACLES, 125 V, 20 A

A. Duplex GFCI Receptacles, 125 V, 20 A:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Leviton Manufacturing Co., Inc.
 - d. Legrand, P&S.

2. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding.
3. Configuration: NEMA WD 6, Configuration 5-20R.
4. Type: Feed through.
5. Standards: Comply with UL 498, UL 943 Class A, and FS W-C-596.

2.4 TOGGLE SWITCHES, 120/277 V, 20 A

A. Single-Pole Switches, 120/277 V, 20 A:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Leviton Manufacturing Co., Inc.
 - d. Legrand, P&S.
2. Standards: Comply with UL 20 and FS W-S-896.

B. Two-Pole Switches, 120/277 V, 20 A:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Leviton Manufacturing Co., Inc.
 - d. Legrand, P&S.
2. Comply with UL 20 and FS W-S-896.

C. Three-Way Switches, 120/277 V, 20 A:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Leviton Manufacturing Co., Inc.
 - d. Legrand, P&S.
2. Comply with UL 20 and FS W-S-896.

D. Four-Way Switches, 120/277 V, 20 A:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Eaton (Arrow Hart).
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Leviton Manufacturing Co., Inc.
 - d. Legrand, P&S.
2. Standards: Comply with UL 20 and FS W-S-896.

2.5 WALL PLATES

- A. Single Source: Obtain wall plates from same manufacturer of wiring devices.
- B. Single and combination types shall match corresponding wiring devices.
 1. Plate-Securing Screws: Metal with head color to match plate finish.
 2. Material for Finished Spaces: Smooth, high-impact thermoplastic.
 3. Material for Unfinished Spaces: Smooth, high-impact thermoplastic.
 4. Material for Damp Locations: Thermoplastic with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.
- C. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.
- B. Coordination with Other Trades:
 1. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
 2. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
 3. Install wiring devices after all wall preparation, including painting, is complete.
- C. Device Installation:
 1. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
 2. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.
- D. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the left.
 2. Install hospital-grade receptacles in patient-care areas with the ground pin or neutral blade at the top.
- E. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
- F. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

3.2 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
1. Test Instruments: Use instruments that comply with UL 1436.
- B. Tests for Receptacles:
1. Line Voltage: Acceptable range is 105 to 132 V.
 2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
 3. Ground Impedance: Values of up to 2 ohms are acceptable.
 4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
 5. Using the test plug, verify that the device and its outlet box are securely mounted.
- C. Wiring device will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION 262726

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SECTION 262813 - FUSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cartridge fuses rated 600 V ac and less for use in the following:
 - a. Enclosed switches.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Bussmann, an Eaton business.
 2. Edison; a brand of Bussmann by Eaton.
 3. Littelfuse, Inc.

2.2 CARTRIDGE FUSES

- A. Characteristics: NEMA FU 1, current-limiting, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.
1. Type RK-1: 250-V, zero- to 600-A rating, 200 kAIC, time delay.
 2. Type RK-5: 250-V, zero- to 600-A rating, 200 kAIC, time delay.
 3. Type CC: 600-V, zero- to 30-A rating, 200 kAIC, fast acting, time delay.
 4. Type CD: 600-V, 31- to 60-A rating, 200 kAIC, fast acting, time delay.
 5. Type J: 600-V, zero- to 600-A rating, 200 kAIC, time delay.
 6. Type L: 600-V, 601- to 6000-A rating, 200 kAIC, time delay.
 7. Type T: 250-V, zero- to 1200-A rating, 200 kAIC, very fast acting, time delay.

- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with NEMA FU 1 for cartridge fuses.
- D. Comply with NFPA 70.
- E. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.
- B. Install spare-fuse cabinet(s) in location shown on the Drawings or as indicated in the field by Owner.

3.2 IDENTIFICATION

- A. Install labels complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems" and indicating fuse replacement information inside of door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION 262813

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Nonfusible switches.
3. Shunt trip switches.
4. Molded-case circuit breakers (MCCBs).
5. Molded-case switches.
6. Enclosures.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

1. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Provide in PDF electronic format.

B. Shop Drawings: For enclosed switches and circuit breakers.

1. Include plans, elevations, sections, details, and attachments to other work.
2. Include wiring diagrams for power, signal, and control wiring.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Seismic Qualification Certificates: For enclosed switches and circuit breakers, accessories, and components, from manufacturer.

C. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Accredited by NETA.
 - 1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

1.6 WARRANTY

- A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single manufacturer.
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
- D. Comply with NFPA 70.

2.2 FUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. ABB Inc.
 - 2. Eaton.
 - 3. General Electric Company.
 - 4. Siemens Industry, Inc., Energy Management Division.
- B. Type HD, Heavy Duty:
 - 1. Single throw.
 - 2. Three pole.
 - 3. 240-V ac.
 - 4. 1200 A and smaller.

5. UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses.
6. Lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
4. Service-Rated Switches: Labeled for use as service equipment.

2.3 NONFUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton.
2. General Electric Company.
3. Siemens Industry, Inc., Energy Management Division.

B. Type GD, General Duty, Three Pole, Single Throw, 240-V ac, 600 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
4. Service-Rated Switches: Labeled for use as service equipment.

2.4 MOLDED-CASE CIRCUIT BREAKERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton.
2. General Electric Company.
3. NOARK Electric North America.
4. Siemens Industry, Inc., Energy Management Division.

B. Circuit breakers shall be constructed using glass-reinforced insulating material. Current carrying components shall be completely isolated from the handle and the accessory mounting area.

- C. Circuit breakers shall have a toggle operating mechanism with common tripping of all poles, which provides quick-make, quick-break contact action. The circuit-breaker handle shall be over center, be trip free, and reside in a tripped position between on and off to provide local trip indication. Circuit-breaker escutcheon shall be clearly marked on and off in addition to providing international I/O markings. Equip circuit breaker with a push-to-trip button, located on the face of the circuit breaker to mechanically operate the circuit-breaker tripping mechanism for maintenance and testing purposes.
- D. The maximum ampere rating and UL, IEC, or other certification standards with applicable voltage systems and corresponding interrupting ratings shall be clearly marked on face of circuit breaker. Circuit breakers shall be 100 percent rated.
- E. MCCBs shall be equipped with a device for locking in the isolated position.
- F. Lugs shall be suitable for 167 deg F (75 deg C) rated wire.
- G. Standards: Comply with UL 489 with interrupting capacity to comply with available fault currents.
- H. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
- I. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:
 - 1. Long- and short-time pickup levels.
 - 2. Long- and short-time time adjustments.
 - 3. Ground-fault pickup level, time delay, and I-squared t response.
- J. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.
- K. Features and Accessories:
 - 1. Standard frame sizes, trip ratings, and number of poles.
 - 2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
 - 3. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
 - 4. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.

2.5 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: UL 489, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

- B. Enclosure Finish: The enclosure shall be finished with gray baked enamel paint, electrodeposited on cleaned, phosphatized steel (NEMA 250 Type 1) or gray baked enamel paint, electrodeposited on cleaned, phosphatized galvanized steel (NEMA 250 Types 3R, 12).
- C. Conduit Entry: NEMA 250 Types 4, 4X, and 12 enclosures shall contain no knockouts. NEMA 250 Types 7 and 9 enclosures shall be provided with threaded conduit openings in both endwalls.
- D. Operating Mechanism: The circuit-breaker operating handle shall be directly operable through the front cover of the enclosure (NEMA 250 Type 1) or directly operable through the dead front trim of the enclosure (NEMA 250 Type 3R). The cover interlock mechanism shall have an externally operated override. The override shall not permanently disable the interlock mechanism, which shall return to the locked position once the override is released. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock.
- E. Enclosures designated as NEMA 250 Type 4, 4X stainless steel, 12, or 12K shall have a dual cover interlock mechanism to prevent unintentional opening of the enclosure cover when the circuit breaker is ON and to prevent turning the circuit breaker ON when the enclosure cover is open.
- F. NEMA 250 Type 7/9 enclosures shall be furnished with a breather and drain kit to allow their use in outdoor and wet location applications.

PART 3 - EXECUTION

3.1 ENCLOSURE ENVIRONMENTAL RATING APPLICATIONS

- A. Enclosed Switches and Circuit Breakers: Provide enclosures at installed locations with the following environmental ratings.
 - 1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
 - 2. Outdoor Locations: NEMA 250, Type 3R.
 - 3. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
 - 4. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.
 - 5. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7.

3.2 INSTALLATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

- C. Temporary Lifting Provisions: Remove temporary lifting of eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- D. Install fuses in fusible devices.
- E. Comply with NFPA 70 and NECA 1.
- F. Set field-adjustable circuit-breaker trip ranges to values indicated on the Drawings.

3.3 IDENTIFICATION

- A. Comply with requirements in Section 260553 "Identification for Electrical Systems."
 - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 - 2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- C. Perform tests and inspections.
- D. Tests and Inspections for Switches:
 - 1. Visual and Mechanical Inspection:
 - a. Inspect physical and mechanical condition.
 - b. Inspect anchorage, alignment, grounding, and clearances.
 - c. Verify that the unit is clean.
 - d. Verify blade alignment, blade penetration, travel stops, and mechanical operation.
 - e. Verify that fuse sizes and types match the Specifications and Drawings.
 - f. Verify that each fuse has adequate mechanical support and contact integrity.
 - g. Inspect bolted electrical connections for high resistance using one of the two following methods:
 - 1) Use a low-resistance ohmmeter.
 - a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.

- a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.
 - h. Verify that operation and sequencing of interlocking systems is as described in the Specifications and shown on the Drawings.
 - i. Verify correct phase barrier installation.
 - j. Verify lubrication of moving current-carrying parts and moving and sliding surfaces.
- 2. Electrical Tests:
 - a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
 - b. Measure contact resistance across each switchblade fuseholder. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
 - c. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
 - d. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.
 - e. Perform ground fault test according to NETA ATS 7.14 "Ground Fault Protection Systems, Low-Voltage."

E. Tests and Inspections for Molded Case Circuit Breakers:

- 1. Visual and Mechanical Inspection:
 - a. Verify that equipment nameplate data are as described in the Specifications and shown on the Drawings.
 - b. Inspect physical and mechanical condition.
 - c. Inspect anchorage, alignment, grounding, and clearances.
 - d. Verify that the unit is clean.
 - e. Operate the circuit breaker to ensure smooth operation.
 - f. Inspect bolted electrical connections for high resistance using one of the two following methods:
 - 1) Use a low-resistance ohmmeter.
 - a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

- 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.

- a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.

- g. Inspect operating mechanism, contacts, and chutes in unsealed units.
- h. Perform adjustments for final protective device settings in accordance with the coordination study.

2. Electrical Tests:

- a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
- b. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with circuit breaker closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
- c. Perform a contact/pole resistance test. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
- d. Perform insulation resistance tests on all control wiring with respect to ground. Applied potential shall be 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable. Test duration shall be one minute. For units with solid state components, follow manufacturer's recommendation. Insulation resistance values shall be no less than two megohms.
- e. Determine the following by primary current injection:
 - 1) Long-time pickup and delay. Pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
 - 2) Short-time pickup and delay. Short-time pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
 - 3) Ground-fault pickup and time delay. Ground-fault pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
 - 4) Instantaneous pickup. Instantaneous pickup values shall be as specified and within manufacturer's published tolerances.
- f. Test functionality of the trip unit by means of primary current injection. Pickup values and trip characteristics shall be as specified and within manufacturer's published tolerances.

- g. Perform minimum pickup voltage tests on shunt trip and close coils in accordance with manufacturer's published data. Minimum pickup voltage of the shunt trip and close coils shall be as indicated by manufacturer.
 - h. Verify correct operation of auxiliary features such as trip and pickup indicators; zone interlocking; electrical close and trip operation; trip-free, anti-pump function; and trip unit battery condition. Reset all trip logs and indicators. Investigate units that do not function as designed.
 - i. Verify operation of charging mechanism. Investigate units that do not function as designed.
 - 3. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 - 4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- F. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
- G. Prepare test and inspection reports.
- 1. Test procedures used.
 - 2. Include identification of each enclosed switch and circuit breaker tested and describe test results.
 - 3. List deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION 262816

West Quad Development
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SECTION 265119 - LED INTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes the interior LED luminaires as shown on the drawings.

1. Downlight.
2. Highbay, linear.
3. Highbay, nonlinear.
4. Linear industrial.
5. Lowbay.
6. Recessed, linear.
7. Strip light.
8. Surface mount, linear.
9. Surface mount, nonlinear.
10. Suspended, linear.
11. Suspended, nonlinear.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of luminaire.
- B. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

- A. Provide luminaires from a single manufacturer for each luminaire type.

1.6 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
- B. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Ambient Temperature: 41 to 104 deg F (5 to 40 deg C).
 - 1. Relative Humidity: Zero to 95 percent.
- B. Altitude: Sea level to 500 feet (152 m).

2.2 LUMINAIRE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
 - 1. Label shall include the following lamp characteristics:
 - a. "USE ONLY" and include specific lamp type.
 - b. Lamp diameter, shape, size, wattage, and coating.
 - c. CCT and CRI.
- C. Recessed luminaires shall comply with NEMA LE 4.
- D. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.
- E. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
- F. Refer to drawing for types of fixtures and other requirements. Fixtures that are not listed will not be considered unless approved by the Engineer prior to bidding.

2.3 MATERIALS

- A. Metal Parts:
 - 1. Free of burrs and sharp corners and edges.
 - 2. Sheet metal components shall be steel unless otherwise indicated.
 - 3. Form and support to prevent warping and sagging.
- B. Steel:
 - 1. ASTM A 36/A 36M for carbon structural steel.
 - 2. ASTM A 568/A 568M for sheet steel.

- C. Stainless Steel:
 - 1. 1. Manufacturer's standard grade.
 - 2. 2. Manufacturer's standard type, ASTM A 240/240 M.
- D. Galvanized Steel: ASTM A 653/A 653M.
- E. Aluminum: ASTM B 209.

2.4 METAL FINISHES

- A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.5 LUMINAIRE SUPPORT

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.
- C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gage (2.68 mm).
- D. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.
- E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1.
- B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- C. Install lamps in each luminaire.
- D. Supports:
 - 1. Sized and rated for luminaire weight.
 - 2. Able to maintain luminaire position after cleaning and relamping.
 - 3. Provide support for luminaire without causing deflection of ceiling or wall.
 - 4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.

- E. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.2 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
 - 2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
- B. Luminaire will be considered defective if it does not pass operation tests and inspections.
- C. Prepare test and inspection reports.

END OF SECTION 265119

SECTION 265213 - EMERGENCY AND EXIT LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Emergency lighting units.
2. Exit signs.
3. Luminaire supports.

1.2 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color Rendering Index.
- C. Emergency Lighting Unit: A lighting unit with integral or remote emergency battery powered supply and the means for controlling and charging the battery and unit operation.
- D. Fixture: See "Luminaire" Paragraph.
- E. Lumen: Measured output of lamp and luminaire, or both.
- F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of emergency lighting unit and exit sign, arranged by designation.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of luminaire.
- B. Sample Warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.6 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Warranty for Emergency Lighting Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR EMERGENCY LIGHTING

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. NRTL Compliance: Fabricate and label emergency lighting units, exit signs, and batteries to comply with UL 924.
- C. Comply with NFPA 70 and NFPA 101.
- D. Comply with NEMA LE 4 for recessed luminaires.
- E. Comply with UL 1598 for recessed luminaires.
- F. Internal Type Emergency Power Unit: Self-contained, modular, battery-inverter unit, factory mounted within luminaire body.
 - 1. Emergency Connection: Operate lamps continuously at an output of 1100 lumens each upon loss of normal power. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture ballast.
 - 2. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
 - 3. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 - a. Ambient Temperature: Less than 0 deg F (minus 18 deg C) or exceeding 104 deg F (40 deg C), with an average value exceeding 95 deg F (35 deg C) over a 24-hour period.
 - b. Ambient Storage Temperature: Not less than minus 4 deg F (minus 20 deg C) and not exceeding 140 deg F (60 deg C).
 - c. Humidity: More than 95 percent (condensing).

- d. Altitude: Exceeding 3300 feet (1000 m).
- 4. Test Push-Button and Indicator Light: Visible and accessible without opening fixture or entering ceiling space.
 - a. Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
 - b. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
- 5. Battery: Sealed, maintenance-free, nickel-cadmium type.
- 6. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.
- 7. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

2.2 EMERGENCY LIGHTING

- A. General Requirements for Emergency Lighting Units: Self-contained units.
- B. Emergency Luminaires:
 - 1. Emergency Luminaires: As indicated on Drawings, with the following additional features:
 - a. Operating at nominal voltage of 120 V ac.
 - b. Internal emergency power unit.
 - c. Rated for installation in damp locations, and for sealed and gasketed fixtures in wet locations.
 - d. UL 94 flame rating.

2.3 EXIT SIGNS

- A. Internally Lighted Signs:
 - 1. Operating at nominal voltage of 120 V ac.
 - 2. Lamps for AC Operation: LEDs; 50,000 hours minimum rated lamp life.
 - 3. Self-Powered Exit Signs (Battery Type): Internal emergency power unit.

2.4 MATERIALS

- A. Metal Parts:
 - 1. Free of burrs and sharp corners and edges.
 - 2. Sheet metal components shall be steel unless otherwise indicated.
 - 3. Form and support to prevent warping and sagging.

B. Doors, Frames, and Other Internal Access:

1. Smooth operating, free of light leakage under operating conditions.
2. Designed to permit relamping without use of tools.
3. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

C. Conduit: Electrical metallic tubing, minimum 3/4 inch (21 mm) in diameter.

2.5 METAL FINISHES

- A. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 LUMINAIRE SUPPORT COMPONENTS

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1.
- B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- C. Install lamps in each luminaire.
- D. Supports:
1. Sized and rated for luminaire weight.
 2. Able to maintain luminaire position when testing emergency power unit.
 3. Provide support for luminaire and emergency power unit without causing deflection of ceiling or wall.
 4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire and emergency power unit weight and vertical force of 400 percent of fixture weight.
- E. Wall-Mounted Luminaire Support:
1. Attached to structural members.
 2. Do not attach fixtures directly to gypsum board.
- F. Suspended Luminaire Support:

1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of fixture oscillations. Support outlet box vertically to building structure using approved devices.
3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and wire support for suspension for each unit length of fixture chassis, including one at each end.
4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

G. Ceiling Grid Mounted Luminaires:

1. Secure to any required outlet box.
2. Secure emergency power unit using approved fasteners in a minimum of four locations, spaced near corners of emergency power unit.

H. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION 265213

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SECTION 265619 - LED EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior solid-state luminaires that are designed for and exclusively use LED lamp technology.
2. Luminaire supports.
3. Luminaire-mounted photoelectric relays.

B. Related Requirements:

1. Section 260923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.

1.2 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color rendering index.
- C. Fixture: See "Luminaire."
- D. IP: International Protection or Ingress Protection Rating
- E. Lumen: Measured output of lamp and luminaire, or both.
- F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of luminaire.
- B. Delegated-Design Submittal: For luminaire supports.
1. Include design calculations for luminaire supports.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans, drawn to scale and coordinated.
- B. Product Certificates: For each type of the following:

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1. Luminaire.
2. Photoelectric relay.

C. Sample warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1. Provide a list of all lamp types used on Project. Use ANSI and manufacturers' codes.
2. Provide a list of all photoelectric relay types used on Project; use manufacturers' codes.

1.6 FIELD CONDITIONS

A. Mark locations of exterior luminaires for approval by Architect prior to the start of luminaire installation.

1.7 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LUMINAIRE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. NRTL Compliance: Luminaires shall be listed and labeled for indicated class and division of hazard by an NRTL.
- C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
- D. UL Compliance: Comply with UL 1598 and listed for wet location.
- E. Nominal Operating Voltage: 120 V ac.
- F. Lamp Rating: Lamp marked for outdoor use.
- G. Source Limitations: Obtain luminaires from single source from a single manufacturer.

- H. Source Limitations: For luminaires, obtain each color, grade, finish, type, and variety of luminaire from single source with resources to provide products of consistent quality in appearance and physical properties.

2.2 LUMINAIRE TYPES

- A. Refer to drawings for types of fixtures and other requirements. Fixtures that are not listed will not be considered unless approved by the Engineer prior to bidding.

2.3 MATERIALS

- A. Metal Parts: Free of burrs and sharp corners and edges.
- B. Sheet Metal Components: As indicated on drawings.
- C. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses.
- D. Diffusers and Globes:
 - 1. Acrylic Diffusers: 100 percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 - 2. Glass: Annealed crystal glass unless otherwise indicated.
 - 3. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.
- E. Lens and Refractor Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.
- F. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:
 - 1. White Surfaces: 85 percent.
 - 2. Specular Surfaces: 83 percent.
 - 3. Diffusing Specular Surfaces: 75 percent.
- G. Housings:
 - 1. Rigidly formed, weather- and light-tight enclosure that will not warp, sag, or deform in use.
 - 2. Provide filter/breather for enclosed luminaires.

2.4 FINISHES

- A. Variations in Finishes: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- B. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.
- C. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
 - 2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20 requirements; and seal aluminum surfaces with clear, hard-coat wax.
 - 3. Class I, Clear-Anodic Finish: AA-M32C22A41 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
 - 4. Class I, Color-Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker), complying with AAMA 611.
 - a. Color: As indicated on drawings.
- D. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1 or SSPC-SP 8.
 - 2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.
 - a. Color: As selected from manufacturer's standard catalog of colors.

2.5 LUMINAIRE SUPPORT COMPONENTS

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

- A. Comply with NECA 1.
- B. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.
- C. Install lamps in each luminaire.
- D. Fasten luminaire to structural support.
- E. Supports:
 - 1. Sized and rated for luminaire weight.
 - 2. Able to maintain luminaire position after cleaning and relamping.
 - 3. Support luminaires without causing deflection of finished surface.
 - 4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.
- F. Wall-Mounted Luminaire Support:
 - 1. Attached to structural members in walls.
- G. Wiring Method: Install cables in raceways. Conceal raceways and cables.
- H. Install luminaires level, plumb, and square with finished grade unless otherwise indicated.
- I. Coordinate layout and installation of luminaires with other construction.
- J. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.
- K. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" and Section 260533 "Raceways and Boxes for Electrical Systems" for wiring connections and wiring methods.

3.2 CORROSION PREVENTION

- A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.
- B. Steel Conduits: Comply with Section 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- (0.254-mm-) thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.3 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

- A. Inspect each installed luminaire for damage. Replace damaged luminaires and components.
- B. Perform the following tests and inspections:
 - 1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
 - 2. Verify operation of photoelectric controls.
- C. Illumination Tests:
 - 1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
- D. Luminaire will be considered defective if it does not pass tests and inspections.
- E. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.5 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain luminaires and photocell relays.

END OF SECTION 265619

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Section 133419 - Metal Building Systems.

1.2 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.
- B. Related Requirements:
 - 1. Contractor shall design foundation for pre-engineered metal building load reactions. The foundation design shall be prepared by an engineer registered in the State of Indiana.
 - 2. Foundation design options and soil design parameters per Geotechnical Report 24050033IND by CTL Engineering, Inc. dated June 24, 2024, are as follows:
 - a. Undercutting: Undercut existing soils to a minimum 3 feet depth below the bottom of proposed continuous wall and spread footing locations. Subgrade removal and replacement at the undercut elevation shall be per Geotechnical Report spread footing support requirements. Shallow foundation units on compacted granular fill may be proportioned using an allowable soil bearing capacity not exceeding 1,000 psf.
 - b. Improved Soil Using Rammed Aggregate Piers: Rammed aggregate piers may be used to modify the soft compressible clay soils and allows for spread footings with soil bearing pressure in the order of 3,000 to 4,000 psf. Rammed aggregate pier soil reinforcement shall be designed and installed by a specialty geotechnical contractor and prepared by an engineer registered in the State of Indiana.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.
- B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- D. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 - 1. Location of construction joints is subject to approval of the Architect.
- E. Samples: For waterstops and vapor retarder.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Welding certificates.
- C. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Form materials and form-release agents.
 - 4. Steel reinforcement and accessories.
 - 5. Waterstops.
 - 6. Curing compounds.
 - 7. Floor and slab treatments.
 - 8. Bonding agents.
 - 9. Adhesives.
 - 10. Vapor retarders.
 - 11. Semirigid joint filler.
 - 12. Joint-filler strips.
 - 13. Repair materials.
- D. Material Test Reports: For the following, from a qualified testing agency:
 - 1. Aggregates.
- E. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer, detailing fabrication, assembly, and support of formwork.

1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal.
- F. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.
- G. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- B. Testing Agency Qualifications: An independent agency, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.
- C. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- D. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.
- B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

1.8 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301 (ACI 301M).
 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- B. Hot-Weather Placement: Comply with ACI 301 (ACI 301M) and as follows:
1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
1. ACI 301 (ACI 301M).
 2. ACI 117 (ACI 117M).

2.2 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
1. Plywood, metal, or other approved panel materials.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
- D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.
- E. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

- F. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- G. Form Ties: Factory-fabricated, removable or snap-off glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.
 - 2. Furnish ties that, when removed, leave holes no larger than 1 inch (25 mm) in diameter in concrete surface.
 - 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.3 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.
- C. Steel Bar Mats: ASTM A 184/A 184M, fabricated from ASTM A 615/A 615M, Grade 60 (Grade 420)] deformed bars, assembled with clips.
- D. Plain-Steel Wire: ASTM A 1064/A 1064M, as drawn.
- E. Deformed-Steel Wire: ASTM A 1064/A 1064M.
- F. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, plain, fabricated from as-drawn steel wire into flat sheets.

2.4 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), plain-steel bars, cut true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - 1. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.5 CONCRETE MATERIALS

A. Cementitious Materials:

1. Portland Cement: ASTM C 150/C 150M, Type I/II
2. Fly Ash: ASTM C 618, Class F or C.
3. Slag Cement: ASTM C 989/C 989M, Grade 100 or 120.
4. Silica Fume: ASTM C 1240, amorphous silica.

B. Normal-Weight Aggregates: ASTM C 33/C 33M aggregate or better, graded and as follow:

1. Class: ASTM C33 5S or better, Severe weathering region for foundations and foundation walls. For exterior slabs and pavement: ASTM C33-5S, Number 57 (1-inch) crushed limestone, or other aggregate which has been demonstrated to produce durable exterior concrete free of pop outs and spalling. Class 3M can be used for interior slab-on-grade and elevated for slabs.
2. Maximum Coarse-Aggregate Size: 1 inch (25 mm)] nominal.
3. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Air-Entraining Admixture: ASTM C 260/C 260M.

D. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

E. Water: ASTM C 94/C 94M and potable.

2.6 WATERSTOPS (Basis of Design)

A. Flexible PVC Waterstops: CE CRD-C 572, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

1. GreenStreak: Type 757; Sika Corporation
2. Profile: Flat dumbbell with center bulb
3. Dimensions: 6 inches by 1/4 inch thick (225 mm by 10 mm thick); nontapered.

2.7 VAPOR RETARDERS

A. Sheet Vapor Retarder: Polyethylene sheet, ASTM D 4397, not less than 15 mils thick.

2.8 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
 - 1. Spray-Film; ChemMasters.
 - 2. Sure Film; Dayton Superior Corporation.
 - 3. Euclid Chemical Co.
 - 4. Vapor Aid; Kaufman Products, Inc.
 - 5. Lambco Skin; Lambert Corporation.
 - 6. L&M Construction Chemicals, Inc.
 - 7. Waterhold; Metalcrete Industries.
 - 8. SikaFilm; Sika Corporation.
 - 9. Certi-Vex EnvioAssist; Vexcon Chemicals, Inc.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable
- E. Liquid Curing Compounds:
 - 1. Curing compounds shall comply with ASTM C309.
 - 2. Provide products which are compatible with floor coatings or toppings specified.
 - 3. Manufacturer shall guarantee that Manufacturer's material is compatible with the intended application.
 - 4. No wax based compounds allowed.
 - 5. No acrylics allowed where toppings or coatings are to be applied.
 - 6. Compounds:
 - a. Curing:
 - 1) 1100 Clear by W.R. Meadows.
 - 2) Rez Cure (J-11-W) by Dayton Superior.
 - 3) Masterkure by Master Builders.
 - 4) L & M Cure by L & M Chemical.
 - 5) Or equal.
 - b. Curing and Hardening:
 - 1) Liqui-Hard by W.R. Meadows.
 - 2) Sil-Cure (J-13) by Dayton Superior.
 - 3) L & M Chem Hard by L & M Chemical.
 - 4) Or equal.
- F. Hardened Concrete Topping
 - 1. Heavy duty emery mineral topping premixed.
 - 2. Dayton Superior Corporation, Emery Tuff Top, L&M Construction chemicals, Inc. or equal.

3. If the selected epoxy coating also serves as a hardened concrete topping per the manufacturers specifications in a multi-coat system, then a separate hardened concrete topping is not required where the epoxy coating is specified.

G. Sealer: Vocomp-25 by W.R. Meadows (water based acrylic), 2 coats; or equal.

2.9 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, aromatic polyurea with a Type A shore durometer hardness range of 90 to 95 according to ASTM D 2240.
- C. Bonding Agent: ASTM C 1059/C 1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
 1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- E. Reglets: Fabricate reglets of not less than 0.022-inch- (0.55-mm-) thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- F. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch (0.85 mm) thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.10 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.
 1. Cement Binder: ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by underlayment manufacturer.
 4. Compressive Strength: Not less than [4100 psi (29 MPa)] <Insert strength> at 28 days when tested according to ASTM C 109/C 109M.

2.11 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301 (ACI 301M).
 - 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 - 1. Fly Ash: 25 percent.
 - 2. Combined Fly Ash and Pozzolan: 25 percent.
 - 3. Slag Cement: 50 percent.
 - 4. Combined Fly Ash or Pozzolan and Slag Cement: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.
 - 5. Silica Fume: 10 percent.
 - 6. Combined Fly Ash, Pozzolans, and Silica Fume: 35 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
 - 7. Combined Fly Ash or Pozzolans, Slag Cement, and Silica Fume: 50 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.

For concrete exposed to deicers, limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements.

- C. Limit water-soluble, chloride-ion content in hardened concrete 0.15 percent by weight of cement. For Mix Type C (Tank Enclosure Walls including Foundation Mat) limit water-soluble chloride-ion content to 0.08 percent.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
 - 2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 - 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a w/c ratio below 0.50.

2.12 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Footings and Foundation Walls: Normal-weight concrete. Foundations designed by others, specifications below are minimum requirements.
 - 1. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.
 - 2. Maximum W/C Ratio: 0.45.
 - 3. Slump Limit: 4 inches (100 mm); 7 inches (200 mm) for concrete with verified slump of 2 to 4 inches (50 to 100 mm) before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch (25 mm).

- B. Slabs-on-Grade and Exterior Equipment Pads: Normal-weight concrete. Slabs designed by others, specifications below are minimum requirements.

1. Minimum Compressive Strength: 4500 psi (31 MPa) at 28 days.
2. Maximum W/C Ratio: 0.45
3. Minimum Cementitious Materials Content: 520 lb/cu. yd. (309 kg/cu. m)
4. Slump Limit: 5 inches (125 mm), plus or minus 1 inch (25 mm).
5. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch (19-mm) nominal maximum aggregate size.
Do not allow air content of trowel-finished floors to exceed 3 percent.

2.13 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.14 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301 (ACI 301M), to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 (ACI 117M).
- C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
1. Class A, 1/8 inch (3.2 mm)] for smooth-formed finished surfaces.
 2. Class D, 1 inch (25 mm) for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.
 2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEM INSTALLATION

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
 2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
 3. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.
1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved its 28-day design compressive strength.

- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material are not acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORING AND RESHORING INSTALLATION

- A. Comply with ACI 318 (ACI 318M) and ACI 301 (ACI 301M) for design, installation, and removal of shoring and reshoring.
 - 1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

3.5 VAPOR-RETARDER INSTALLATION

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
 - 1. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.

3.6 STEEL REINFORCEMENT INSTALLATION

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
 - 1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded-wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.
- F. Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M. Use epoxy-coated steel wire ties to fasten epoxy-coated steel reinforcement.

- G. Zinc-Coated Reinforcement: Repair cut and damaged zinc coatings with zinc repair material according to ASTM A 780/A 780M. Use galvanized-steel wire ties to fasten zinc-coated steel reinforcement.

3.7 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
 - 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 - 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 - 6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 - 7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
 - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 - 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 - 1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
 - 2. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

- E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.8 WATERSTOP INSTALLATION

- A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.

3.9 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301 (ACI 301M).
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301 (ACI 301M).
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.

5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

3.10 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 1. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete.
- C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.11 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
 1. Apply float finish to surfaces indicated.
- C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
 2. Finish surfaces to the following tolerances, according to ASTM E 1155 (ASTM E 1155M), for a randomly trafficked floor surface:

- a. Specified overall values of flatness, F(F) 50; and of levelness, F(L) 35; with minimum local values of flatness, F(F) 35; and of levelness, F(L) 25; for slabs-on-grade.
 - b. Specified overall values of flatness, F(F) 30; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 15; for elevated slabs.
3. Finish and measure surface, so gap at any point between concrete surface and an unlevelled, freestanding, 10-ft.- (3.05-m-) long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch (3.2 mm).
4. Slab sections as defined by construction joints not meeting the tolerance criteria shall be removed. At the Owner's option, non-conforming joints in areas with finish flooring may be ground till conforming.
- D. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thinset method.. While concrete is still plastic, slightly scarify surface with a fine broom.
 1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.
 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.
- F. Floor Sealer:
 1. Apply 2 coat clear sealer to Open Hangar floor areas (non-enclosed by wall construction) in accordance with the Manufacturer's recommendations
 2. Ensure that surface preparation and cleanliness requirements are adhered to for both coats.

3.12 MISCELLANEOUS CONCRETE ITEM INSTALLATION

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations:
 1. Coordinate sizes and locations of concrete bases with actual equipment provided.

2. Construct concrete bases 4 inches (100 mm) high unless otherwise indicated, and extend base not less than 6 inches (150 mm) in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
3. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.
4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.
5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
6. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
7. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.

3.13 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 (ACI 301M) for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers. Do not use polyethylene sheets on exposed interior floors
 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less

than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.

- a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies does not interfere with bonding of floor covering used on Project.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
- a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer[unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project].
4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.14 LIQUID FLOOR TREATMENT APPLICATION

- A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions. Verify that treatment is compatible with any other concrete toppings used in the same location.
1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
 2. Do not apply to concrete that is less than 14 days' old.
 3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.
- B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

3.15 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least six month. Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.16 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension to solid concrete. Limit cut depth to 3/4 inch (19 mm). Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar matches surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 2. After concrete has cured at least 14 days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.

4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.
- G. Repair tank enclosure wall tie holes and defects according to manufacturer's recommendations with one of the following preapproved patch materials:
1. Krystol Bari-Cote by Kryton.
 2. Patch 'N Plug by Xypex.
 3. Penecrete Mortar by Penetron.
 4. Aquafin Plug IC by Aquafin.

3.17 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified testing and inspecting agency to perform field tests and prepare test reports.
- B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and submit reports.
- C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:
1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mixture placed each day.

- a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231/C 231M, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below or 80 deg F (27 deg C) and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M.
 - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
 - a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
 - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
7. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
9. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
11. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

D. Measure floor and slab flatness and levelness according to ASTM E 1155 (ASTM E 1155M) within 72 hours of finishing.

3.18 PROTECTION OF LIQUID FLOOR TREATMENTS

A. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

END OF SECTION 033000

SECTION 133419 - METAL BUILDING SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Metal Framing Components
- B. Metal Wall Panels and Trim
- C. Metal Roof Panels and Trim
- D. Metal Building Accessories

1.2 RELATED SECTIONS

- A. Section 03- Cast-in-place concrete.
- B. Section 05 – Cold Formed Metal Framing
- C. Section 07 – Soffit panels
- D. Section 07 – Sheet metal flashing and trim
- E. Section 08 - Overhead doors.
- F. Section 08 – Hollow metal doors and frames
- G. Section 08 – Hangar door

1.3 REFERENCE STANDARDS

- A. American Institute of Steel Construction (AISC):
 - 1. AISC Specification for Structural Steel Buildings.
 - 2. AISC Serviceability Design Considerations for Low-Rise Buildings
- B. American Iron and Steel Institute (AISI):
 - 1. AISI North American Specification for the Design of Cold-Formed Steel Structural Members
- C. American Welding Society (AWS):
 - 1. AWS D1.1 / D1.1M – Structural Welding Code – Steel.
 - 2. AWS D1.3 / D1.3M – Structural Welding Code – Sheet Steel
- D. Association for Iron & Steel Technology (AISE):
 - 1. AISE 13 – Specifications for Design and Construction of Mill Buildings.
- E. ASTM International (ASTM):
 - 1. ASTM A 36 – Standard Specification for Carbon Structural Steel
 - 2. ASTM A 48 – Specification for Gray Iron Castings
 - 3. ASTM A 123 – Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
 - 4. ASTM A 307 – Specification for Carbon Steel Bolts and Studs, 60 000 psi Tensile Strength

5. ASTM A 325 – Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
 6. ASTM A 354 – Standard Specification for Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally Threaded Fasteners
 7. ASTM A 475 – Specification for Zinc-Coated Steel Wire Strand
 8. ASTM A 490 – Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength
 9. ASTM A 500 – Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
 10. ASTM A 529 – Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality.
 11. ASTM A 563 – Specification for Carbon and Alloy Steel Nuts
 12. ASTM A 572 – Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
 13. ASTM A 653 / A 653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
 14. ASTM A 792 / A 792M – Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process
 15. ASTM A 992 – Standard Specification for Structural Steel Shapes.
 16. ASTM A 1011 – Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
 17. ASTM A 1039 – Specification for Steel, Sheet, Hot Rolled, Carbon, Commercial, Structural, and High-Strength Low-Alloy, Produced by Twin-Roll Casting Process
 18. ASTM E 96 / E 96M – Standard Test Methods for Water Vapor Transmission of Materials.
 19. ASTM E 108—Spread-of Flame Testing: Class 1A Rating.
 20. ASTM E 283 – Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
 21. ASTM E 331 – Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
 22. ASTM E 1592 – Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference
 23. ASTM E 1646 – Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference
 24. ASTM E 1680 – Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems
 25. ASTM E 2140 – Test Method for Water Penetration of Metal Roof Panel Systems by Static Water Pressure Head
 26. ASTM F 436 – Specification for Hardened Steel Washers
 27. ASTM F 1145 – Specification for Turnbuckles, Swaged, Welded, Forged
 28. ASTM F 1554 – Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength
- F. CSA – Canadian Standards Association
- G. CWB – Canadian Welding Bureau
- H. IAS – International Accreditation Service

- I. LGSI – Light Gauge Steel Institute
- J. SJI – Steel Joist Institute
- K. Indiana Product Approval:
- L. FM Global:
 - 1. FMRC Standard 4471 – Approval Standard for Class 1 Roofs for Hail Damage Resistance, Combustibility, and Wind Uplift Resistance.
- M. Metal Building Manufacturers Association (MBMA):
 - 1. MBMA Metal Building Systems Manual
- N. Underwriters Laboratories (UL):
 - 1. UL 580 – Standard for Tests for Uplift Resistance of Roof Assemblies

1.4 DEFINITIONS

- A. Metal Building System: A building system that will employ:
 - Either continuous or simple-span ‘Z’ or ‘C’-shaped cold-formed purlins or open-web steel joists for support of the roof cladding.
 - Simple-span ‘Z’ or ‘C’-shaped cold-formed purlins or open-web steel joists for support of the steel wall cladding.
 - Three-plate, built-up rigid space frames and/or cold-formed ‘C’ or hot-rolled I-shaped post-and-beam framing to support the roof and wall secondary members.
 - All systems (cladding, roof and wall secondary, lateral primary framing, and longitudinal bracing) work together to provide resistance to vertical and lateral loading demands.
- B. Gable Symmetrical: A continuous frame building with the ridge in the center of the building, consisting of tapered or straight columns and tapered or straight rafters. The sidewall girts may be continuous (by-passing the columns) or simple span (inset in the column line). The rafters may or may not have interior columns.
- C. Gable Asymmetrical: A continuous frame building with an off-center ridge, consisting of tapered or straight columns and tapered or straight rafters. The eave height and roof slope may differ on each side of the ridge. The sidewall girts may be continuous (by-passing the columns) or simple span (flush in the column line). The rafters may or may not have interior columns.
- D. Single-Slope: A continuous frame building which does not contain a ridge, but consists of one continuous slope from side to side. The building consists of straight or tapered columns and tapered or straight rafters. The sidewall girts may be continuous (by-passing the columns) or simple span (flush in the column line). The rafters may or may not have interior columns.
- E. Lean-To (LTO): A building extension, which does not contain a ridge, but consists of one continuous slope from side to side. These units usually have the same roof slope and girt design as the building to which they are attached and supported by.
- F. Roof Slope: Pitch expressed as inches of rise for each 12" of horizontal run.

- G. Building Width: Measured from outside to outside of sidewall secondary structural member (girt).
- H. Building Eave Height: A nominal dimension measured from the finished floor to top flange of eave strut.
- I. Building Length: Measured from outside to outside of endwall secondary structural member.
- J. Auxiliary Loads: Dynamic loads induced by cranes, conveyors, or other material handling systems.
- K. Collateral Loads: The weight of any non-moving equipment or material, such as ceilings, electrical or mechanical equipment, sprinkler systems, plumbing, or ceilings.
- L. Dead Load: The actual weight of the building system (as provided by the metal building supplier) supported by a given member.
- M. Floor Live Loads: Loads induced on a floor system by occupants of a building and their furniture, equipment, etc.
- N. Roof Live Loads: Loads produced by maintenance activities, rain, erection activities, and other movable or moving loads but not including wind, snow, seismic, crane, or dead loads.
- O. Roof Snow Loads: Gravity load induced by the weight of snow or ice on the roof, assumed to act on the horizontal projection of the roof.
- P. Seismic Loads: Loads acting in any direction on a structural system due to the action of an earthquake.
- Q. Wind Loads: The loads on a structure induced by the forces of wind blowing from any horizontal direction.

1.5 DESIGN REQUIREMENTS

A. General

- 1. The building manufacturer will use standards, specifications, recommendations, findings and/or interpretations of professionally-recognized groups such as AISC, AISI, AWS, ASTM, CSA, CWB, MBMA, Federal Specifications, and unpublished research by MBMA as the basis for establishing design, drafting, fabrication, and quality criteria, practices, and tolerances. The Manufacturer's design, drafting, fabrication and quality criteria, practices, and tolerances shall govern, unless specifically countermanded by the contract documents.
- 2. Design structural mill sections and built-up plate sections in accordance with:
 - a. (US) code-appropriate edition of AISC's "Specification for the Design, Fabrication and Erection of Structural Steel for Buildings", ANSI/AISC 360 ASD method.
 - b. (Canada) CSA S16, "Design of Steel Structures", latest edition.
- 3. Cold-Formed steel structural members and panels will generally be designed in accordance with "Specifications for the Design of Cold-Formed Steel Structural Members", 2007 Edition, ANSI/AISI S-100-07 or CAN CSA S136-07.
- 4. Design weldments per the following:
 - a. Structural Welding
 - 1) (US) Design per AWS D1.1, "Structural Welding Code – Steel", Latest Edition.

- 2) (Canada) Design per CWB W59, “Welded Steel Construction (Metal Arc Welding)”, Latest Edition.
 - b. Cold-Formed Welding
 - 1) (US) Design per AWS D1.3, “Structural Welding Code – Sheet Steel”, Latest Edition.
 - 2) (Canada) Design per CWB W59, “Welded Steel Construction (Metal Arc Welding)”, Latest Edition.
- B. Design Code:
 1. Structural design for the building structural system shall be provided by the metal building system manufacturer for the following design criteria:
 - a. Governing Building Code: IBC 2012 and 2014 Indiana Amendments
 - b. Occupancy Category: S-1 with B accessory
- C. Design Loads:
 1. Dead Loads.
 - a. Self weight
 - b. Collateral load: 6 psf
 - c. Future solar panel: 5psf
 - d. Fan weight: 150 pounds with cable sway braces in each hangar bay
 2. Roof Live Loads
 - a. 20 psf (reduced as allowed by the building code)
 3. Live Loads.
 - a. Offices/Future Mezzanine*: 50 psf**
 - b. Future Stairs: 100 psf
 - c. Mechanical: 125 psf

*Future mezzanine accommodate in frame
**Indicates 15 psf partition load in addition to load
 4. Wind Loads.
 - a. Basic Wind Speed, $V = 115$ mph
 - b. Occupancy Category = II
 - c. Importance Factor, $I_w = 1.0$
 - d. Exposure Category: = C
 - e. Internal Pressure Coefficient, $G_{cpi} = +0.55$ (Partially enclosed building)
 5. Seismic Loads.
 - a. Risk Category: = II
 - b. Importance Factor, $I_e = 1.0$
 - c. Site Class: = D
 - d. Mapped Spectral Response Accelerations
 - $S_s = 0.257$
 - $S_1 = 0.113$
 - e. Spectral Response Coefficients
 - $S_{DS} = 0.273$
 - $S_{D1} = 0.177$
 6. Snow Loads.
 - a. Ground Snow Load, $P_g = 20$ psf
 - b. Exposure Factor, $C_e = 1.0$
 - c. Temperature Factor, $C_t = 1.0$

d. Importance Factor, $I_s = 1.0$

D. General Serviceability Limits :

1. Deflection Limits shall be in accordance with the applicable provisions of the Metal Building Systems Manual (MBMA), latest edition.
2. Vertical Deflections:
 - a. Roof Secondary (Purlins) – $L/150$.
 - b. Main Frame roof beams – $L/180$.
3. Horizontal Deflections:
 - a. Wall Secondary (Girts) – $L/90$.
 - b. Main Frames – $H/60$.
4. Vertical deflection limits apply for snow load (50-year mean-recurrence interval) plus collateral load, or the code required live load. The horizontal drift and deflections limits apply for the loads induced by a basic wind speed corresponding to a 10 year mean-recurrence interval.

1.6 SUBMITTALS

- A. Submit under provisions of Section 01 33 00.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
 2. Storage and handling requirements and recommendations.
 3. Installation methods.
- C. Shop Drawings: Provide complete erection drawings for the proper identification and assembly of all building components. Drawings will show anchor bolt settings, transverse cross-sections, sidewall, endwall and roof framing, flashing and sheeting, and accessory installation details.
- D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- E. Verification Samples: For each finish product specified, two samples, representing actual product, color, and patterns.
- F. Certifications: Shop drawings and design analysis shall bear the seal of a registered professional engineer upon request. Design analysis shall be on file and furnished by manufacturer upon request.
- G. Bill of Materials: Bills of material shall be furnished and shall include item weights.

- H. Preventative Maintenance Manual.
- I. Welder's Certifications: Certification of welder qualifications shall be furnished as specified by the Project Engineer.

1.7 QUALITY ASSURANCE

- A. Manufacturer / Fabricator Qualifications:
 - 1. (US) All primary products specified in this section will be supplied by a single IAS AC 472 Accredited Manufacturer /Fabricator with a minimum of five (5) years' experience.
 - 2. (Canada) All primary products specified in this section will be supplied by a single Manufacturer / Fabricator certified by the CAN/CSA A660-10, "Certification of Manufacturers of Steel Building Systems" program.
- B. Weldments/Welder/Weld Inspection Qualifications:
 - 1. (US) Welding inspection and welding inspector qualification for structural steel shall be in accordance with AWS D1.1, "Structural Welding Code – Steel", latest edition. Welding inspection and welding inspector qualification for cold-formed steel shall be in accordance with AWS D1.3, "Structural Welding Code – Sheet Steel", latest edition.
 - 2. (Canada) The metal building manufacturer shall be certified per CWB W47.1, "Certification of Companies for Fusion Welding of Steel", latest edition.
- C. Erector Qualifications: All products listed in this section are to be installed by a single installer with a minimum of five (5) years demonstrated experience in installing products of the same type and scope as specified.
- D. Design: Standard drawings and design analysis must bear the seal of a registered professional engineer. Design analysis must be on file and furnished by manufacturer upon request.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Acceptance Requirements: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Storage and Handling Requirements:
 - 1. Store and handle materials in accordance with manufacturer's instructions.
 - 2. Keep materials in manufacturer's original, unopened containers and packaging until installation.
 - 3. Do not store materials directly on ground.
 - 4. Store materials on flat, level surface, raised above ground, with adequate support to prevent sagging.
 - 5. Protect materials and finish during storage, handling, and installation to prevent damage.

- C. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
- D. Store and dispose of hazardous materials, and materials contaminated by hazardous materials, in accordance with requirements of local authorities having jurisdiction.

1.9 WARRANTY

- A. Building System Warranty
 - 1. Furnish manufacturer's standard warranty for the metal building system, excluding paint.
 - 2. The manufacturer shall warranty the metal building system against failure due to defective material or workmanship for a period of one (1) year from date of shipment.
 - 3. The liability under this warranty shall be limited to furnishing, but not dismantling or installing, necessary replacement material F.O.B. manufacturer's plant. In no event shall the manufacturer be liable for loss of profits, or other incidental, consequential, or special damages.
- B. Standing Seam Roof Weathertightness Warranty
 - 1. Furnish manufacturer's weathertightness warranty for a maximum of 20 years against leaks in standing seam roof panels, arising out of or caused by ordinary wear and tear under normal weather and atmospheric conditions.
- C. Roof and Wall Paint Finish Warranty
 - 1. Paint Systems
 - a. Furnish manufacturer's standard warranty for the metal panel paint system against chipping, peeling, blistering, fading in excess of 5 NBS Hunter units as set forth in ASTM-D-2244, and chalking in excess of 8 units as set forth in ASTM-D-4214.
 - b. The warranty shall be for a period of 30 years from the date of shipment for PVDF paint systems.
 - c. The warranty shall be for a period of 25 years from the date of shipment for silicone-polyester paint systems.
 - 2. Galvalume® systems (basis of design) or equal
 - a. Furnish manufacturer's standard warranty for the Galvalume® panels against rupture, structural failure, or perforation due to normal atmospheric conditions.
 - b. The warranty shall be for a period of 20 years from the date of shipment for Galvalume® systems.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer:

1. Erect-A-Tube; www.erect-a-tube.com (basis of design)
2. Nucor Building Systems; <http://www.nucorbuildingsystems.com>
3. Or approved equal

2.2 MATERIALS

A. Primary Framing Steel:

1. Steel for hot rolled shapes must conform to the requirements of ASTM Specifications A-36, A-572 or A-992, with minimum yield of 36 or 50 ksi, respectively.
2. Steel for built-up sections must conform to the requirements of ASTM A-1011, A-1018, A-529, A-572 or A-36 as applicable, with minimum yield of 42, 46, 50, or 55 ksi as indicated by the design requirements.
3. Round Tube must conform to the requirements of ASTM A-500 Grade B with minimum yield strength of 42 ksi.
4. Square and Rectangular Tube must conform to the requirements of ASTM A-500 Grade B with a minimum yield strength of 46 ksi.
5. Steel for Cold-Formed Endwall "C" sections must conform to the requirements of ASTM A-1011 or A-1039 Grade 55, or ASTM A-653 Grade 55 with minimum yield strength of 55 ksi.
6. X-bracing will conform to ASTM A-36 or ASTM A-529 for rod and angle bracing or ASTM A-475 for cable bracing.

B. Secondary Framing Steel:

1. Steel used to form purlins, girts and eave struts must meet the requirements of ASTM A-1011 or ASTM A-1039 Grade 55 for primed material or ASTM A-653 Grade 55 for galvanized material with a minimum yield of 55 ksi.
2. Design Thicknesses – Gauge to be determined by design to meet specified loading conditions.

C. Panels:

1. Roll-formed Galvalume®, pre-painted Galvalume® or Galvanized G90 Exterior-Side and G60 Interior-Side (basis of design) or equal.
2. Standing Seam Panels must have:
 - a. (For US and Export) 50 percent minimum aluminum-zinc alloy- coating and conform to ASTM A-792 or ASTM A-653 with a minimum yield of 50 ksi.
 - b. (For Canada) 55 percent minimum aluminum-zinc alloy- coating with Galvalume® finish or 50 percent minimum aluminum-zinc alloy- coating with paint finish and conform to ASTM A-792 or ASTM A-653 with a minimum yield of 50 ksi.
3. Through-fastened panels must have:
 - a. (For US and Export) 50 percent minimum aluminum-zinc alloy coating and conform to ASTM A-792 or ASTM A-653 with a minimum yield of 50 ksi.

- b. (For Canada) 55 percent minimum aluminum-zinc alloy- coating with Galvalume finish or 50 percent minimum aluminum-zinc alloy- coating with paint finish and conform to ASTM A-792 or ASTM A-653 with a minimum yield of 50 ksi.
 - 4. Panel Finish:
 - a. SP Finish: Modified Siliconized Polyester paint system with a 25-year finish warranty.
 - b. PVDF Finish: 70% PVDF paint system with a 30-year finish warranty.
 - D. Panel Fasteners:
 - 1. For Galvalume® and Painted finished roof panels: Long Life Cast Zinc head.
 - 2. For wall panels: Coated carbon steel.
 - 3. Color of exposed fastener heads to match the wall and roof panel finish.
 - 4. Concealed Fasteners: Self-drilling type, of size required.
 - E. Flashing and Trim: Match material, finish, and color of adjacent components. Provide trim at rakes, including peak and corner assemblies, high and low eaves, corners, bases, framed openings and as required or specified to provide weathertightness and a finished appearance.
 - F. Roof Clips:
 - 1. All clips must have factory-applied mastic and designed so that movement between the panel and the clip does not occur.
 - 2. Short or Tall Fixed clips; shall be either 3 ½ inches (89mm) or 4 ½ inches (114mm) in height. Used for applications where only a moderate amount of thermal expansion and contraction in the roof panel is expected.
 - 3. Short or Tall Sliding clips: shall be either 3 ½ inches (89mm) or 4 ½ inches (114mm) in height and provide either 1-7/8 inches or 3 7/8 inches of travel for panel thermal expansion and contraction, depending on clip choice.
 - G. Sealant And Closures:
 - 1. Sidelaps: Factory applied non-skinning Butyl mastic.
 - 2. Endlaps, Eave, Ridge Assembly, and Gable Flashings: Field applied 100% solids butyl-based elastomeric tape sealant, furnished in pre-cut lengths.
 - 3. Outside Closures: Closed-cell, plastic or metal
 - 4. Inside Closures: Closed-cell, plastic or metal
- 2.3 PRIMARY FRAMING
 - A. Rigid Frames: Fabricated as welded built-up "I" sections or hot-rolled sections.
 - 1. Frame Design: Gable Symmetrical.
 - 2. Frame Design: Lean-To.
 - 3. Frame Type: Clear-Span.
 - B. Rigid Frame Columns:
 - 1. Straight/Uniform depth
 - 2. Tapered
 - C. Rigid Frame Rafters:

1. Straight/Uniform depth
 2. Tapered
- D. Endwall Frames / Roof Beams: Fabricated as mill-rolled sections or built-up "I" sections depending on design requirements. Fabricate endwall columns of cold-formed "C" sections, mill-rolled sections, or built-up "I" sections depending on design requirements.
- E. Interior Columns: Columns supporting rafters of mainframes shall be of the following cross-section type(s):
1. Pipe (Round HSS).
 2. Tube (Square HSS).
 3. "I"-Shaped (Built-Up or Mill-Rolled depending on design requirements).
- F. Finish: Red-Oxide or Gray Primer, or galvanized (pre coated galvanized cold-form, hot-dipped otherwise).
- G. Field Bolted Connections: All field bolted connections shall be designed and detailed utilizing ASTM A-325 or A-490 depending on design requirement.

2.4 SECONDARY FRAMING

- A. Purlins and Girts: Purlins and girts shall be cold-formed "Z" sections with stiffened flanges. Flange stiffeners shall be sized to comply with the requirements of the latest edition of AISI and LGSI. They shall be pre-punched at the factory to provide for field bolting to the rigid frames. They shall be simple or continuous span as required by design. Connection bolts will install through the purlin/girt webs, not purlin/girt flanges.
- B. Purlins (Excluding Open Web Joists): Horizontal structural members which support roof coverings.
1. Depth: 8"
 2. Maximum Length: To be determined by design.
 3. Finish: Red Oxide Primer.
 4. Finish: Gray Primer.
 5. Finish: Pre-Coated Galvanized.
- C. Girts: Horizontal structural members that support vertical panels.
1. Depth: To be determined by design
 2. Maximum Length: To be determined by design.
 3. Finish: Red Oxide Primer.
 4. Finish: Gray Primer.
 5. Finish: Pre-Coated Galvanized.
- D. Eave Struts: Unequal flange, cold-formed "C" sections or "Z" purlins.
1. Depth: To be determined by design
 2. Maximum Length: To be determined by design.
 3. Finish: Red Oxide Primer.

4. Finish: Gray Primer.
 5. Finish: Pre-Coated Galvanized.
- E. Base Framing: Base members to which the base of the wall covering may be attached to the perimeter of the slab. Secured to the concrete slab with mechanical anchors.
1. Formed base sill.
 2. Base channel.
 - a. With flashing.
 - b. Without flashing.
 3. Base angle.
 - a. With flashing.
 - b. Without flashing.
 4. Base girt.
 - a. With flashing.
 - b. Without flashing.
 5. Finish: Red Oxide Primer.
 6. Finish: Gray Primer.
 7. Finish: Pre Coated Galvanized.
- F. Roof joist system.
1. Open web, parallel chord, simple span load carrying members suitable for the direct support of roof systems utilizing material sizes and yield strengths as required.
 2. Roof joist system with reduced bridging on qualified "CFR" projects.
 3. Bridging
 - a. All Bolted
 - b. Welded
 4. Joist attachment
 - a. Welded
 - b. All Bolted (No welding required)
 - c. Alt. Bolted (Some welding required)
 5. Open web members shall be fabricated of material that conforms to the material specifications designated by the Steel Joist Institute as acceptable for this product.
- 2.5 ROOF PANELS (Nucor Building Systems, Basis of Design)
- A. AWI "SR2" Insulated Roof Panel: A mechanically seamed trapezoidal standing seam roof sandwich panel with concealed clips. Installed directly over purlins. Tested in accordance with ASTM E 283 and E 331 for water penetration and air infiltration.
1. Exterior panel gauge: 26 (Std.).
 2. Interior panel gauge: 26 (Std.).
 3. Size / Thermal Value: 40 inches (1016mm) wide by 3.25 inches (83mm) high (R-26).
 4. Color: As specified in Article 2.8 PANEL FINISHES.
 5. Standard Finish:
 - a. Exterior: Smooth with Mesa profile.
 - b. Interior: Light Embossed with Mesa profile.

2.6 WALL PANELS (Nucor Building Systems, Basis of Design)

- A. AWI "DM40" Insulated Panel: A through-fastened wall sandwich panel with concealed fasteners.
 - 1. Exterior panel gauge: 26 (Std.).
 - 2. Interior panel gauge: 26 (Std.).
 - 3. Size / Thermal Value: 40 inches (1016mm) wide by 3 inches (76mm) high (R-24).
 - 4. Color: As specified in Article 2.8 PANEL FINISHES.
 - 5. Standard Finish:
 - a. Exterior: Light Embossed with Mesa profile.
 - b. Interior: Light Embossed with Mesa profile.

2.7 ACCESSORIES

- A. Roof Line Trim:
 - 1. Trim Type: Simple Eave/Rake Trim.
- B. Purlin Extensions: Overhanging or projecting roof structure at the end of a building.
- C. Framed Openings: Used to frame out doors, windows, louvers, and any other openings. Refers to the framing members and flashing which surround an opening and includes jambs, header and or sill, trim, and fasteners.
- D. Walk Doors: Personnel entry doors.
 - 1. Size: As noted on the Contract Drawings.
- E. Windows: Self-flashing, self-framing horizontal slide or fixed narrow-lite windows.
 - 1. Type / Size: As noted on the Contract Drawings.
- F. Soffit Panels:
 - 1. Classic Wall Panel: A through-fastened sidewall panel with 1 1/4 inch (32mm) ribs at 12 inches (305mm) on center. The area between the ribs is reinforced to minimize oil-canning.
 - a. Gauge: 26 (std.).
 - b. Dimensions: 36 inches (915mm) wide by 1 1/4 inch (32mm) high.
 - c. Finish: As specified in Article 2.8 PANEL FINISHES.
- G. Facades: Decorative structural and panel system projecting from the face of a wall panel.
- H. Partitions: Interior or exterior walls that are inside the building footprint to section off parts of the interior space of a building.

- I. Roof Curbs: Welded units fabricated for Metal Roof application. Minimum 18 gauge Galvalume™ coated steel, with welds cleaned and treated with protective coating compatible with the Galvalume™ substrate.
 - 1. Top of curb to be level with ground, with 1 ½” top flange.
 - 2. Curb walls insulated with 1 ½”-3lb.density fiberglass insulation.
 - 3. Welded cricket on upslope side of curb to divert water.
 - 4. Metal or plastic rib covers supplied loose for flexibility when installing curb.
 - 5. Standard sub-frame shall be minimum 16 gauge steel.
 - 6. All fasteners and sealants required for installation shall be furnished by Roof Curb manufacturer.
- J. Roof Vents: Accessories used on the roof to allow air to pass through.
 - 1. Gravity Ridge Vents: Can be used as single unit or continuous.
 - a. Size: 9 inch by 10 foot (229x3048mm) with Damper & Lockerpull.
 - b. Size: 12 inch by 10 foot (305x3048mm) with Damper & Lockerpull.
- K. Pipe Flashings: Aluminum base with EPDM boot. The base flange must bend to form a seal with surface irregularities or roof pitch.
 - 1. Size: ¼” to 4” (6 to 102mm) Pipe
 - 2. Size: 4” to 7” (102 to 178mm) Pipe
 - 3. Size: 7” to 13” (178 to 330mm) Pipe

2.8 PANEL FINISHES

- A. Insulated Roof panel:
 - 1. Exterior panel:
 - a. PVDF Resin, 30-year Finish Warranty:
 - 1) Color: Color as selected by owner from manufacturer’s standard colors; match existing hangar of phase 1.
 - 2. Interior panel:
 - a. Siliconized Polyester Resin, 25-year Finish Warranty:
 - 1) Color: Color as selected by owner from manufacturer’s standard colors; match existing hangar of phase 1.
- B. Insulated Wall panel:
 - 1. Exterior panel:
 - a. PVDF Panel Paint System (PVDF Resin, 30-year Finish Warranty):
 - 1) Color: Color as selected by the owner from the manufacturer’s standard colors; match existing hangar of phase 1.
 - 2. Interior panel:
 - a. Siliconized Polyester Resin, 25-year Finish Warranty:
 - 1) Color: Color as selected by the owner from the manufacturer’s standard colors; match existing hangar of phase 1.

- C. Soffit Panel:
 - 1. Siliconized Polyester Resin, 25-year Finish Warranty:
 - a. Color: Color as selected by the owner from the manufacturer's standard colors; match existing hangar of phase 1.

2.9 FABRICATION

- A. General:
 - 1. Shop-fabricate all framing members for field bolted assembly. The surfaces of the bolted connections must be smooth and free from burrs or distortions.
 - 2. Shop connections must conform to the manufacturer's standard design practices as defined in this section. Certification of welder qualifications will be furnished when required and specified in advance.
 - 3. All framing members must carry an identifying mark.
- B. Primary Framing:
 - 1. Plates, Stiffeners and Related Members.: Factory weld base plates splice plates, cap plates, and stiffeners into place on the structural members.
 - 2. Bolt Holes and Related Machining: Shop fabricate base plates, splices and flanges to include bolt connection holes. Shop fabricated webs to include bracing holes.
 - 3. Secondary structural connections (purlins and girts) to be ordinary bolted connections, which may include welded clips.
 - 4. Manufacturer is responsible for all welding inspection in accordance with the manufacturer's IAS Accreditation or CAN/CSA A660 Certification. Special inspection by the buyer or owner may be done in the manufacturer's facility and must be noted on the Contract Documents.
 - 5. Non-Destructive Testing (NDT) - NDT shall be performed and documented as required by the governing building code for this project.
- C. Open-Web Roof Joists:
 - 1. Purlins for 'long-bay' building layouts shall consist of open-web bar joists designed under Steel Joist Institute (SJI) specifications by an SJI-Certified Joist Manufacturer for the prescribed loads.
 - 2. Joist system includes joist bridging and joist-seat-to-supporting structural connections using 3/8" diameter self-drilling bolts made from ASTM A354 Grade BD steel.
 - 3. Field welding of joist bridging and seats is an alternative method for connection of joists to supporting primary structural members.
- D. Zee Purlins:
 - 1. Fabricate purlins from cold-formed "Z" sections with stiffened flanges. Size flange stiffeners to comply with the requirements of the latest edition of AISI. Connection bolts will install through the webs, not the flanges.
- E. Girts
 - 1. Girts must be simple or continuous span as required by design. Connection bolts will install through the webs, not the flanges.
- F. Bracing:

1. Diagonal Bracing:
 - a. Wind bracing in the roof and/or walls need not be furnished where it can be shown that the diaphragm strength of the roof and/or wall covering is adequate to resist the applied wind or seismic forces. Diagonal bracing in the roof and sidewalls may be used to resist longitudinal loads (wind, crane, etc.) in the structure if diaphragm action cannot be used.
 - b. Diagonal bracing will be furnished to length and equipped with hillside washers and nuts at each end. It may consist of rods threaded each end or galvanized cable with suitable threaded end anchors. If load requirements so dictate, bracing may be of structural angle and/or pipe, bolted in place.
 2. Special Bracing: When diagonal bracing is not permitted in the sidewall, a rigid frame type portal or fixed base column will be used. Shear walls can also be used where adequate to resist the applied wind or seismic forces.
 3. Flange Braces: The compression flange of all primary framing must be braced laterally with angles connecting to the bottoms chords of purlins or to the webs of girts so that the flange compressive stress is within allowable limits for any combination of loading.
 4. Bridging:
 - a. Laterally bridge the top and bottom chords of the open-web bar joists as required by design thereof and specified on the building erection drawings.
- G. Standing Seam Panels - General:
1. One side of the panel is configured as female, having factory applied hot-melt mastic inside the female seam. The female side will hook over the male side and when seamed creates a continuous lock, forming a weathertight seam.
 2. Panels are factory notched at both ends so that field installation can commence or terminate from either end of the building. Panels cannot start at both ends of the building and work towards each other.
 3. Maximum panel length is 55 feet (16,764mm) unless otherwise noted in the Contract Documents.
 4. Endlaps:
 - a. Endlaps must have a 16 gauge backup plate and have the (8) endlap joint fasteners installed in dimpled locations in the flat with (1) endlap joint fastener installed in each trapezoid shoulder for a total of (10) fasteners at each endlap.
 - b. Apply mastic between the panels and secured with #12-14 x 1 1/4 inch (32mm) self-drilling fasteners through the panels and backup plate to form a compression joint.
 - c. "Through-the-Roof" fasteners may only be used at endlaps and eaves.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Erector present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Before erection proceeds, survey elevations and locations of concrete and masonry bearing surfaces and locations of anchor rods, bearing plates and other embedment's to receive structural framing, with Erector present, for compliance with requirements and metal building system manufacturer's tolerances.
- C. Proceed with erection only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Provide temporary shores, guys, braces, and other supports during erection to keep structural framing secure, plumb, and in alignment against temporary construction loads equal in intensity to design loads. Remove temporary supports when permanent structural framing connections and bracing are in place, unless otherwise indicated.

3.3 INSTALLATION

- A. The erection of the building system shall be performed by a qualified erector, in accordance with the appropriate erection drawings, erection guides and /or other documents furnished by manufacturer, using proper tools, equipment and safety practices.
- B. Erection practices shall conform to "Common Industry Practices", Section 6, MBMA (LR)-Building Systems Manual.
- C. There shall be no field modifications to primary structural members except as authorized and specified by manufacturer.

3.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SP-01 LABOR AGREEMENT

The Terre Haute Regional Airport Board of Directors Resolution No. 1-2009 shall apply to this project and is made a part of this Specification.

RESOLUTION NO. 1-2009 TERRE HAUTE INTERNATIONAL AIRPORT AUTHORITY

Be it hereby **RESOLVED**, by the Terre Haute International Airport Authority as follows:

1. The following language shall be included in all solicitations for bids and instructions to bidders for all public works contracts in excess of Two thousand dollars (\$2,000.00) authorized by the Terre Haute International Airport Authority:

The successful bidder and any and all levels of subcontractor, regardless of tier, as a condition of being awarded a contract or subcontract, shall be required to enter into a Project Labor Agreement for the _____ Project with the local labor unions representing experienced and skilled construction workers in the area, and will be bound by the provisions of that Agreement in the same manner as any other provision of the contract.

Provided, however, that this requirement shall not be mandatory for public works projects for the routine repair, replacement or maintenance of existing capital improvements if the costs of the project are estimated to be less than \$150,000.00.

2. Said Project Labor Agreement shall:
 - a. Bind the contractor and all subcontractors on the _____ Project to comply with the Project Labor Agreement.
 - b. Allow the contractor and subcontractor(s) to compete for contracts and subcontracts without regard to whether they are otherwise parties to collective bargaining agreements.
 - c. Contain guarantees against strikes, lockouts or other similar job disruptions.
 - d. Set forth effective, prompt and mutually binding procedures for resolving labor disputes that arise during the Project.
 - e. Provide other mechanisms for labor-management cooperation on matters of mutual interest and concern including productivity, quality of work, safety and health.
 - f. The apparent successful contractor shall submit to the Construction Manager/Project Manager a signed copy of the required Project Labor Agreement reached pursuant to this requirement prior to contract award.

Passed and adopted this 28th day of October, 2009.


Darryl Huyett, President
Terre Haute International Airport Authority

ATTEST:


Jerry Davis, Secretary
Terre Haute International Airport Authority

END OF ITEM SP-01

SP-02 WHEEL STOPS

DESCRIPTION

SP-02-1.1. This item shall consist of furnishing and installing precast wheel stops meeting the material and dimensions as indicated in the plans.

METHOD OF MEASUREMENT

SP-02-2.1. The quantity of wheel stops will be measured per each.

METHOD OF PAYMENT

SP-02-3.1. Payment for wheel stops will be made at the contract price for the number of wheel stops furnished and installed.

Payment will be made under:

SP-02-3.1 Wheel stop – per each

END OF ITEM SP-02

END OF SUPPLEMENTAL TECHNICAL SPECIFICATIONS



PART 10: GEOTECHNICAL INVESTIGATION REPORT

CTL Engineering, Inc.

1310 S. Franklin Road
Indianapolis, Indiana 46239

Phone: (317) 295-8650 • Fax: (317) 295-8395

www.ctleng.com



Consulting Engineers – Testing – Inspection Services – Analytical Laboratories

June 25, 2024

Woolpert, Inc.

333 N Alabama Street, Suite 200

Indianapolis, IN 46204

Attention: Mr. Chris Snyder, PE
Vice President

Reference: Geotechnical Exploration
Proposed West Quad Hangar Development
Terre Haute Regional Airport (HUF)
Terre Haute, Indiana
CTL Project No.: 24050033IND

Dear Mr. Snyder:

In accordance with your authorization to proceed, CTL Engineering, Inc. has completed the geotechnical Exploration services on the above referenced site. The attached report includes the results of the field testing, and geotechnical recommendations for the proposed hangar developments.

Thank you for the opportunity to be of service to you on this project. If you have any questions or need further information, please contact us at (317) 295-8650.

Sincerely,

CTL ENGINEERING, INC.

A handwritten signature in blue ink that reads "Shawn M. Marcum". The signature is written in a cursive, flowing style.

Shawn M. Marcum, PE
Senior Project Engineer

GEOTECHNICAL EXPLORATION

**PROPOSED WEST QUAD HANGAR DEVELOPMENT
TERRE HAUTE REGIONAL AIRPORT (HUF)
TERRE HAUTE, INDIANA
CTL PROJECT NO.: 24050033IND**

PREPARED FOR:

**WOOLPERT, INC.
333 N ALABAMA STREET, SUITE 200
INDIANAPOLIS, IN 46204**

PREPARED BY:

**CTL ENGINEERING, INC.
1310 S. FRANKLIN ROAD
INDIANAPOLIS, INDIANA 46239**

JUNE 25, 2024



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I. PROJECT LOCATION AND DESCRIPTION

The project involves the design and construction of new hangar, Taxiway/Apron and parking facilities at the Terre Haute Regional Airport (HUF) in Terre Haute, Indiana. The proposed hangar is estimated to have a finish floor elevation of approximately El 573 and will have a footprint on the order of 60 feet by 180 feet. It is expected that the new development will be approximately 238 feet by 541 feet constructed over 1 to 2 feet of fill material.

Plans for the hangar development were not available at the time of this report. CTL should be provided the opportunity to review the recommendations within this report once final plans become available.

II. SUBSURFACE EXPLORATION

Five test borings designated as C-1 through C-5 were drilled within the proposed project limits to depths ranging from 10 to 25 feet below existing grade. Additionally, three offset test borings designated C-1A, C-3A and C-5A were drilled to depths ranging from 3 to 7 feet for the purpose of obtaining undisturbed soil samples (Shelby Tubes). The test borings were performed at the locations shown on the attached Boring Location Plan in Appendix A and Test Boring Records in Appendix B.

The test borings were advanced with an ATV-mounted drill rig utilizing hollow-stem-augers (HSA) between April 17th and April 18th, 2024. Standard Penetration Tests (SPT) were performed using a 140-pound automatic hammer falling 30 inches to drive a 2-inch O.D. split barrel sampler for 18 inches.

Soil samples obtained from the drilling operation were preserved in glass jars and visually classified in the field by the drilling crew and in the laboratory by an engineer. Representative soil samples were tested for natural moisture content, pH, Atterberg limits and grain size distribution. Unconfined compressive strength tests were performed on the Shelby tube soil samples.

Drilling, soil sampling and laboratory testing were performed following standard geotechnical engineering practices and current ASTM procedures. Results from field tests are shown on the enclosed Test Boring Records in Appendix B and laboratory test sheets are shown on in Appendix C.

The test borings were located in the field using a Trimble Geo7X GPS System. The surface elevations at the boring locations were estimated from county GIS mapping. The boring locations and surface elevations shown on the Boring Location Plan in Appendix A, Test

Boring Records in Appendix B and Soil Profile in Appendix D should be considered approximate.

III. FINDINGS

A. Subsurface Conditions

Test borings typically encountered approximately 8 to 10 inches of surficial soil (topsoil) at the surface. Below the topsoil, the test borings typically encountered medium stiff to stiff lean clay with sand (CL) soils to depths ranging from 3 to 3.5 feet, overlying very soft to medium stiff sandy lean clay (CL) soils to depths ranging from 3 to 12.5 feet, underlain by soft to stiff sandy silty clay (CL-ML) soils to depths ranging from 8 to 17 feet, overlying hard sandy lean clay (CL) glacial till soils to the boring termination depths. Standard Penetration Blowcounts (N-values) of the soils in the upper 5 feet ranged from 3 to 11 blows per foot (bpf) with moisture content values ranging from 17 to 28 percent. N-values between 5 to 15 feet ranged from 0 to 10 bpf with moisture content values ranging from 18 to 36 percent, while N-values of soils below the depth of 15 feet ranged from 46 to more than 50 bpf with moisture content values ranging from 8 to 11.

The cohesive soils exhibited Liquid Limit (LL) values ranging from 21 to 30 percent and Plasticity Index (PI) values of 7 to 9 percent. The pH values of the subgrade soils ranged from 6.2 to 6.8. Detailed information of soil type and standard penetration values are shown in the Test Boring Records in Appendix B and laboratory test results in Appendix C.

B. Groundwater

Groundwater level and soil cave-in depths were recorded during and following the drilling operation as shown on the enclosed Test Boring Records in Appendix B and as summarized below in Table 1. It should be noted that groundwater levels recorded during this subsurface exploration may not be a reliable indication of long-term groundwater levels. Fluctuations in the groundwater level can occur with seasonal and weather conditions

Table 1 – Summary of Groundwater Depths

Boring No.	Groundwater Depth (feet)			Cave-in Depth (feet)
	During Drilling	At Completion	Delayed	
C- 1	8.0	10.2	3.4 @ 24 Hrs.	17.0
C- 2	Dry	6.0	4.7 @ 1 Hr.	7.5
C- 3	7.0	8.3	4.1 @ 3 Hrs.	16.6
C- 4	15.0	12.6	3.9 @ 2 Hrs.	13.8
C- 5	Dry	Dry	Dry @ 24 Hrs.	6.7

IV. DISCUSSIONS AND RECOMMENDATIONS

Based on available mapping of underground coal mines in Vigo County, the proposed project sites are underlain by abandoned underground coal mines. The coal seam was recorded at a depth of 91 feet with a thickness of 5 feet. Determination of existing voids below the project site due to underground mining is beyond the scope of this study. The Owner must be aware that there is inherent risk in construction over abandoned underground mines in that subsidence may occur due to collapse of the mine.

The existing very soft to soft soils are not suitable for foundation support of the proposed hangars without undercutting at the proposed footing locations. Details regarding the needed undercuts at the proposed footing locations are provided in Section IV.B.

Alternatively, the foundation soils could be improved using rammed aggregate piers to provide adequate bearing and to reduce settlements to within tolerable limits. Rammed aggregate piers may be used to modify the soft compressible natural clay soils and thus would allow for the use of conventional spread footings with bearing pressures on the order of 3,000 to 4,000 psf. The rammed aggregate pier soil reinforcement, modification and improvement system shall be designed and installed by a specialty geotechnical contractor. Foundations that bear on the reinforced, modified and improved subgrade materials as described above can be designed to support the allowable bearing pressures of the proposed structures while limiting settlement within required project tolerances without the need for undercutting and replacing the existing soils or the use of deep foundations. The ground improvement plan and final foundation design criteria shall be developed and prepared by an engineer registered in the State of Indiana from the specialty geotechnical contractor who shall be entirely responsible for the design, installation, performance and warranty of the system.

A. Excavations

Very soft to soft soils were encountered below the soil overburden which will require undercutting or soil improvements. Temporary retention systems, trench boxes or other shielding systems may be necessary for construction of the proposed structure and/or the installation of the pipes leading to and from the proposed structures. The temporary shoring systems may be designed using the estimated soil parameters provided below in Table 2 for this project along the recommendations provided in the following paragraphs.

Table 2 – Estimated Soil Parameters for Shoring Design

Soil Parameters	Materials Type			
	Lean Clay with Sand (CL)	Sandy Lean Clay (CL)	Sandy Silty Clay (CL-ML)	Glacial Till Sandy Lean Clay (CL)
Total Unit Weight, pcf	115	105	110	130
Cohesion, psf	100	25	50	150
Angle of Internal Friction, Degrees	23	20	23	26
At Rest Pressure, K_o	0.61	0.66	0.61	0.56
Active Pressure, K_a	0.44	0.49	0.44	0.39
Passive Pressure, K_p	2.28	2.04	2.28	2.56
Approx. depths below existing grade, Feet	0 ~ 3	3 ~ 13	8 ~ 17	17 ~ 25

1. Care should be taken while excavating adjacent to existing structures so as not undermine the existing support. The effect of the excavation on the adjacent structures should be considered. Depending upon the type of foundation system of nearby structures, underpinning may be required.
2. Nearby structures and other surface supported features should be monitored on a daily basis to evaluate the effect of the excavation and any dewatering. Results of the monitoring should be provided to the Structural Engineer on a daily basis. The Structural Engineers should determine acceptable limits of lateral and vertical deflections prior to excavation. In the event that excessive lateral or vertical movement is noted, the Structural Engineers should be notified immediately.
3. Short-term excavations in excess of 5.0 feet in depth should be sloped or shored in accordance with OSHA regulations. Temporary soil excavation should be

laid back at a slope rate no steeper than 2:1 H:V (Horizontal to Vertical). Slope rates for excavation sidewalls in excess of 5 feet in height should be designed by a Professional Engineer.

Temporary shoring systems, where required, should be designed by a Licensed Engineer familiar with the design of earth retention systems. The design of the shoring system should also take into account loading adjacent to the excavation such as foundation or vehicular loads and soil stockpiles.

4. Cobbles, boulders and miscellaneous debris may be present within the subsurface soils at these sites which could make installation of sheet piling difficult. Sheet piling may need to be relocated and re-driven if large cobbles, boulders or debris are encountered.
5. For structures that will require dewatering, the groundwater level should be lowered at least 3 feet below the base of excavations using wells, well points, or sumps. The dewatering system should be designed and installed by a specialty dewatering contractor. Please refer to Table 1 for groundwater elevations. Fluctuations in the groundwater level can occur with seasonal and weather conditions. Additionally, perched groundwater may be encountered at isolated locations which are capable of producing significant amounts of water into excavations.

B. Spread Footing Support

The existing very soft to soft soils encountered in the test borings are not suitable for foundation support without undercutting at the proposed footing locations. The following foundation recommendations are provided.

1. The proposed hangars may be supported on continuous wall or spread column footings provided a minimum 3 feet undercut at the proposed footing locations. Shallow foundation units may be proportioned using an allowable soil bearing capacity not exceeding 1,000 psf. It will be necessary to undercut at the footing locations to a depth of 3 feet below the proposed footing bearing elevation and backfill the undercut excavation with compacted granular or aggregate fill. The lateral limits at the base of the undercut excavation should extend at least 1.5 feet from the outside edges of the footings. A nonwoven geotextile shall be placed along the base and sides of the undercut excavation if aggregate fill is used. All footing bearing surfaces should be observed and approved by the Geotechnical Engineer.

2. Minimum widths for individual columns and continuous wall footings should be 24 and 18 inches, respectively. Minimum widths are required to provide a margin of safety against local or punching shear failure.
3. Settlement of the proposed structure as recommended above may vary across the site due to variations in soil composition, void ratio and loading. However, it is estimated that total and differential settlements will be on the order of 1-inch and 3/4-inch, respectively.
4. Exterior footings should be constructed at a minimum depth of 3 feet below the lowest adjacent exterior grade to offset the effects of frost penetration.
5. Exposed foundation materials should be protected from freezing weather, severe drying, and water. Foundation subgrade materials that become unsuitable due to weather exposure should be removed prior to concrete placement and excavate only the footings that can be replaced with concrete the same day.

C. Floor Slab Support

1. The floor slab may be supported directly on a base course of approved granular materials placed on top of engineered fill or native soils prepared as described in IV.B.
2. Granular base should be a minimum of 6 inches thick to provide adequate support.
3. A Modulus of Subgrade Reaction value of 75 pounds per cubic inch (pci) may be used in the evaluation of subgrade soils for slab support. An increased Modulus of Subgrade Reaction may be used for areas modified using rammed aggregate piers.

D. Site Preparation and Earthwork

1. All surface objects, grass, vegetation, topsoil and roots, shall be removed from within the construction limits. Topsoil can be stockpiled separately and reused for landscaping purposes.
2. Excavation into the underlying soils may be accomplished using conventional excavation equipment. Glacial till soils and cobbles and/or boulders may be encountered in excavations. Very soft to stiff cohesive soils and hard glacial till soils were encountered within the anticipated excavation depths.

3. Below ground utilities located within 5 feet of the proposed structures should be relocated. Excavations resulting from removal of any existing underground utilities should be backfilled with compacted approved fill.
4. During earthwork operations, care should be taken to provide adequate drainage on the exposed soils. Absorption of heavy rainfall, accumulations of water and heavy construction traffic may result in softening of these soils, hence, severely weakening the strength of the subgrade soils.
5. On-site excavated soils (except topsoil, soft/loose soils and soils with more than 5 percent organics) are generally considered suitable for use for backfill fill provided proper moisture content is maintained during placement. A portion of the excavated soils may exhibit natural moisture content above the optimum moisture. Such soils may require air-drying and/or chemical modification prior to placement.
6. Fill material required for the project should consist of INDOT B borrow, silt-clay soil and/or sand and gravel material. Topsoil, organically contaminated material and/or soils with Liquid Limit of more than 50 percent are not suitable for use as fill. Additionally, soils with a maximum dry weight of less than 100 pounds per cubic foot should not be used in the upper 24 inches of the subgrade beneath any sidewalks, fields and paving areas. All fill material should be tested, inspected and approved by the Engineer.
7. Fill supporting structures should be compacted to 98 percent of the material's standard Proctor maximum dry density (MDD) as determined by ASTM D 698. A reduced percentage of compaction can be used in lawn or non-structural areas. The engineered fill should not be placed in a frozen condition or over a frozen subgrade.
8. Depending upon the time of construction and seasonal amount of precipitation, ponding and/or perched water may be encountered in some locations. In such an event, water should be diverted through trenches and removed using construction sump pumps or otherwise as suggested by the Contractor and approved by the Engineer.
9. Subsequent to site clearing and grading, the exposed soils should be proofrolled using a fully loaded (20-ton), tandem-axle dump truck. Unsuitable areas observed under the proofrolling should be disked, dried and re-compacted, if weather permits. Otherwise, the unsuitable soils should be stabilized by undercutting and replacing with properly compacted engineered fill.

10. Temporary excavations in excess of 5.0 feet in depth should be sloped, braced and/or shored according to OSHA requirements. Excavation to the bottom of the recommended footing depths may be accomplished using conventional excavation equipment. Temporary excavations should be sloped at a rate no steeper than 2:1 Horizontal to Vertical (H:V). Open excavations left for more than 24 hours and/or excavations exposed to rain may result in slope failures. All excavations should be monitored during construction by the Contractor.

E. Pavement Considerations

If conventional subgrade preparation by scarifying, air-drying and re-compaction of the in-place cohesive soils is used, then a CBR value of 2.5 or a resilient modulus of 3,750 psi may be used in the design of the pavement. The soils are encountered to be in frost group FG-3 and FG-4 for the frost design.

In areas where re-compaction of the in-place cohesive soils cannot be achieved due to weather or schedule constraints, the subgrade soils may be modified in-place using cement stabilization (typically 5% by weight). It is estimated that approximately 80% of the subgrade areas will need stabilization.

The proposed pavement section soils should be compacted in accordance with FAA requirements, and should pass proofrolling as described in the above site preparation and earthwork section.

Pavement underdrains may be installed within the construction limits of this project. Note that installation of underdrains and catch basins will generally improve long-term performance of the pavement.

All subgrade soils and pavement materials should conform to the latest issue of FAA Standards for Specifying Construction of Airports.

F. Seismic Coefficients

The subsurface conditions at this site meet the requirements for Site Class D based on the 2012 IBC and Table 20.3-1 of 2010 ASCE 7 Chapter 20. Given a Site Class D, and the geographic location of the project site, the design parameters listed below may be used. Additional seismic coefficients, if needed, can be found in Appendix E of this report.

Site Class D

$$PGA_M = 0.196g \quad S_S = 0.259g \quad S_{DS} = 0.275g \quad S_1 = 0.114g \quad S_{D1} = 0.178g$$

V. CONCLUDING REMARKS

The evaluations, conclusions, and recommendations in this report are based on our interpretation of the field and laboratory data obtained during the exploration, our understanding of the project and our experience with similar sites and subsurface conditions using generally accepted geotechnical engineering practices. Although individual test borings are representative of the subsurface conditions at the boring locations on the dates drilled, they are not necessarily representative of the subsurface conditions between boring locations or subsurface conditions during other seasons of the year.

During the design process, it is recommended that CTL work with the project designers to confirm that this geotechnical recommendations are properly incorporated into the final plans and specifications, and to assist with establishing criteria for the construction observation and testing. CTL is not responsible for independent conclusions, opinions and recommendations made by others based on the data and the recommendations provided in this report.

The report was prepared by CTL Engineering, Inc. (Consultant) solely for the use of the Client in accordance with an executed contract. The Client's use of or reliance on this report is limited by the terms and conditions of the contract and by the qualifications and limitations stated in the report. It is also acknowledged that the Client's use of and reliance of this report is limited for reasons which include actual site conditions that may change with time; hidden conditions, not discoverable within the scope of the assessment, may exist at the site; and the scope of the Exploration may have been limited by time, budget and other constraints imposed by the Client.

Neither the report, nor its contents, conclusions or recommendations, are intended for the use of any party other than the Client. Consultant and the Client assume no liability for any reliance placed on this report by such party. The rights of the Client under contract may not be assigned to any person or entity, without the consent of the Consultant which consent shall not be unreasonably withheld.

This geotechnical report does not address the environmental conditions of the site. The Consultant is not responsible for consequences or conditions arising from facts that were concealed, withheld, or not fully disclosed at the time the assessment was conducted.

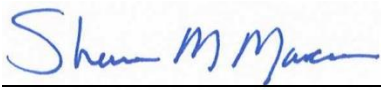
To the fullest extent permitted by law, the Consultant and Client agree to indemnify and hold each other, and their officers and employees harmless from and against claims, damages, losses and expenses arising out of unknown or concealed conditions. Furthermore, neither the Consultant nor its employees shall be liable to the Owner in an amount in excess of the available professional liability insurance coverage of the

Consultant. In addition, Client and Consultant agree neither shall be liable for any special, indirect or consequential damages of any kind or nature.

The Consultant's services have been provided consistent with its professional standard of care. No other warranties are made, either expressed or implied.

Sincerely,

CTL ENGINEERING, INC.



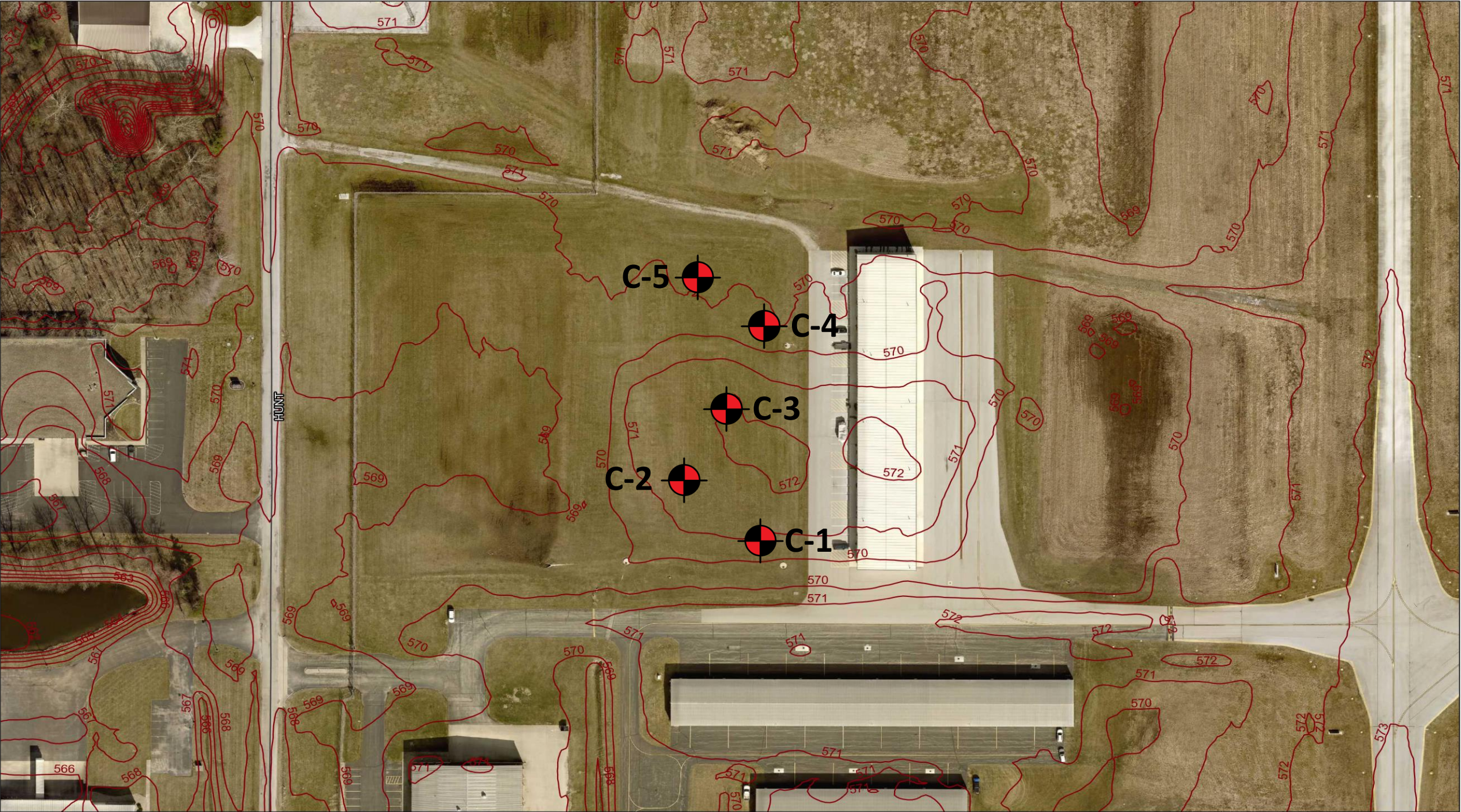
Shawn M. Marcum, PE
Senior Geotechnical Engineer




Syed Ahmad Husain
Staff Geotechnical Engineer

APPENDIX A
BORING LOCATION PLAN





LEGEND	 Test Borings
---------------	--

BORING LOCATION PLAN					
Source: Beacon GIS		Date 6/17/2024	Geotechnical Exploration Woolpert, Inc. Proposed West Quad Hanger Development Terre Haute Reginal Airport (HUF)- Terre Haute, Indiana		
	CTL ENGINEERING, INC. GEOTECHNICAL ENGINEERS TESTING * INSPECTION LABORATORY SERVICES	Scale None			
		Drawn By SAH	Reviewed By SM	Page 1 of 1	Project No. 24050033IND

APPENDIX B
TEST BORING RECORDS

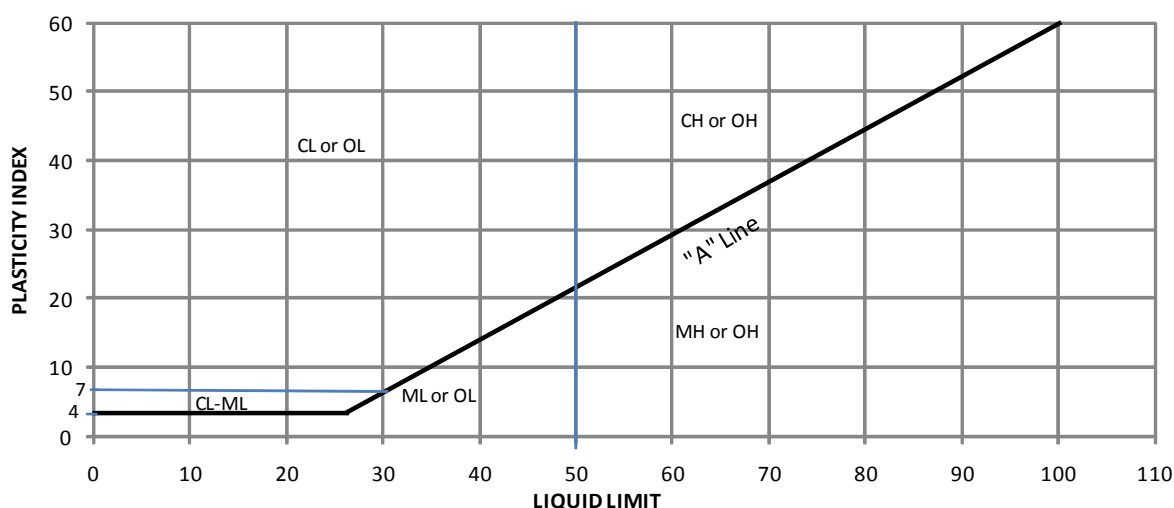


SOIL DESCRIPTIONS BASED ON THE UNIFIED SOIL CLASSIFICATION SYSTEM

ASTM D 2487 and D 2488

Major Division			Group Symbol	Letter Symbol	Group Name*
Coarse Grained Soils Less Than 50 Percent Passing the # 200 Sieve	Gravel - Percent GRAVEL > percent SAND	Gravel with < 5% Fines		GW	Well Graded GRAVEL
			GP	Poorly Graded GRAVEL	
		Gravel with Between 5 and 15% Fines		GW-GM	Well Graded GRAVEL with silt
				GW-GC	Well Graded Gravel with clay
				GP-GM	Poorly Graded GRAVEL with silt
				GP-GC	Poorly Graded GRAVEL with clay
		Gravel with ≥ 15% Fines		GM	Silty GRAVEL
				GC	Clayey GRAVEL
	Sand - Percent SAND ≥ percent GRAVEL	Sand with < 5% Fines		SW	Well Graded SAND
				SP	Poorly Graded SAND
		Sand with Between 5 and 15% Fines		SW-SM	Well Graded SAND with silt
				SW-SC	Well Graded SAND with clay
				SP-SM	Poorly Graded SAND with silt
				SP-SC	Poorly Graded SAND with clay
		Sand with ≥ 15% Fines		SM	Silty SAND
				SC	Clayey SAND
Fine Grained Soils 50 percent or more Passing the # 200 Sieve	SILT and CLAY	Liquid Limit Less Than 50		ML	SILT
				CL	Lean CLAY
				CL-ML	SILTY CLAY
				OL	Organic SILT, CLAY, or SILTY CLAY
		Liquid Limit 50 or Greater		MH	Elastic SILT
				CH	Fat CLAY
				OH	Organic SILT or CLAY
Highly Organic Soils				PT	Peat
* Additional Modifiers	Coarse Grained Soils	with silt or clay		5 to 12 % Silt or Clay by weight	
		Silty or Clayey		more than 12 % Silt or Clay by weight	
	Fine Grained Soils	with sand or gravel		15 to 29 % Sand or Gravel by weight	
		Sandy or Gravelly		30 % or more Sand or Gravel by weight	

"A" LINE GRAPH



SOIL DESCRIPTION

NON-COHESIVE SOIL DESCRIPTION

STANDARD PENETRATION BLOWCOUNTS PER FOOT (BPF)

Very Loose	0 - 4
Loose	5 - 10
Medium Dense.....	11 - 30
Dense	31 - 50
Very Dense	Over 50

COHESIVE SOIL DESCRIPTION

STANDARD PENETRATION BLOWCOUNTS PER FOOT (BPF)

Very Soft	0 - 1
Soft	2 - 4
Medium Stiff	5 - 8
Stiff	9 - 15
Very Stiff.....	16 - 30
Hard	Over 30

GRADATION COMPONENT

SIZE

Boulders.....	Larger than 8"
Cobbles.....	8" - 3"
Gravel	Passing 3" Retained on #4
Sand	Passing #4 Retained on #200
Silt	0.075 mm to 0.005 mm
Clay	Smaller than 0.005 mm

COMPONENT MODIFIERS

SIZE

Traces	0 - 10%
Little	11 - 20%
Some	21 - 35%
And	36 - 50%

MOISTURE TERMS

DESCRIPTION

Dry	Powdery
Damp	Below Plastic
Moist	Above Plastic Limit & Below Liquid Limit
Wet	Above Liquid Limit

TEST BORING RECORD

CLIENT : Woolpert, Inc
 PROJECT : Proposed West Quad Hanger Development (HUF)
 LOCATION : Terre Haute, Indiana
 PROJECT NO. : 24050033IND

BORING NO.: **C-1**
 SHEET 1 OF 2
 DATE STARTED : 04-17-24
 DATE COMPLETED : 04-17-24

Boring Elevation: 571 Feet	Boring Depth : 25.0 Feet	Boring Method : HSA	Hammer : Automatic
Latitude : 39.453353	Station: _____	Rig Type : CME- 550 ATV	Hammer Efficiency: 79.5%
Longitude -87.312292	Offset : _____	Casing Diameter : 3.25" I.D.	Driller : J. Stierwalt
	Line : _____	Core Size : ---	Temperature : 80° F
			Weather : Sunny

GROUNDWATER: ▼ Encountered at 8.0' ▼ At completion 10.2' ▼ Delayed Reading 3.4 @ 24Hrs ☒ Caved in at 17.0'

Stratum Elevation	Sample Depth	SOIL/MATERIAL DESCRIPTION	Stratum Depth	Sample Number	SPT per 6"	SPT per 12" (N)	Recovery (%)	Moisture Content (%)	Total Unit Weight (pcf)	Unconfined Compression (ksf)	Atterberg Limits		
											LL	PL	PI
570.1		TOPSOIL (10")	0.9										
		Brown, Moist, Stiff, LEAN CLAY with SAND (CL) (As Lab 3)		SS-1	4 5 6	11	100	22					
568.0			3.0										
	5			SS-2	1 2 2	4	33	27					
		Light Brown to Gray, Moist, Soft to Medium Stiff, SANDY LEAN CLAY (CL) (As Lab 1)		SS-3	0 0 2	2	100	30					
	10			SS-4	2 2 3	5	100	21			24	15	9
558.5			12.5										
	15	Light Gray, Moist, Medium Stiff, SANDY SILTY CLAY (CL-ML) (As Lab 2)		SS-5	0 2 3	5	100	23					
554.0			17.0										
	20	Light Gray, Damp, Hard, SANDY LEAN CLAY (CL) with Traces of Gravel (TILL) (Visual)		SS-6	7 20 34	54	100	9					

Continued on next page



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BORING METHOD

HSA - Hollow Stem Auger
 SFA - Solid Flight Auger
 RC - Rock Coring
 MD - Mud Drilling
 WD - Wash Drilling
 HA - Hand Auger

SAMPLING METHOD

SS - Split Spoon Sample
 ST - Shelby Tube Sample
 CR - Rock Core Sample
 BS - Bag Sample
 AC - Auger Cuttings

ABBREVIATIONS

* - Hand Penetrometer
 LL - Liquid Limit
 PL - Plastic Limit
 PI - Plasticity Index
 SPT - Standard Penetration Test

TEST BORING RECORD

CLIENT : Woolpert, Inc

BORING NO.: **C-1**

PROJECT : Proposed West Quad Hanger Development (HUF)

SHEET 2 OF 2

Stratum Elevation	Sample Depth	SOIL/MATERIAL DESCRIPTION	Stratum Depth	Sample Number	SPT per 6"	SPT per 12" (N)	Recovery (%)	Moisture Content (%)	Total Unit Weight (pcf)	Unconfined Compression (ksf)	Atterberg Limits		
											LL	PL	PI
546.0	25	Light Gray, Damp, Hard, SANDY LEAN CLAY (CL) with Traces of Gravel (TILL) (Visual)	25.0	SS-7	20 41 45	86	100	8					
		Bottom of Boring at 25.0 feet											
		Boring backfilled according to Aquifer Protection Guidelines											
	30												
	35												
	40												
	45												



CTL Engineering, Inc.
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BORING METHOD

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TEST BORING RECORD

CLIENT : Woolpert, Inc
 PROJECT : Proposed West Quad Hanger Development (HUF)
 LOCATION : Terre Haute, Indiana
 PROJECT NO. : 24050033IND

BORING NO.: **C-1A**
 SHEET 1 OF 1
 DATE STARTED : 04-18-24
 DATE COMPLETED : 04-18-24

Boring Elevation: 571 Feet	Boring Depth : 7.0 Feet	Boring Method : HSA	Hammer : Automatic
Latitude : 39.453357	Station: _____	Rig Type : CME- 550 ATV	Hammer Efficiency: 79.5%
Longitude -87.312293	Offset : _____	Casing Diameter : 3.25" I.D.	Driller : J. Stierwalt
	Line : _____	Core Size : ---	Temperature : 55° F
			Weather : Sunny

GROUNDWATER:

Stratum Elevation	Sample Depth	SOIL/MATERIAL DESCRIPTION	Stratum Depth	Sample Number	SPT per 6"	SPT per 12" (N)	Recovery (%)	Moisture Content (%)	Total Unit Weight (pcf)	Unconfined Compression (ksf)	Atterberg Limits		
											LL	PL	PI
570.1		TOPSOIL (10")	0.9										
		Brown, LEAN CLAY with SAND (CL) (As Lab 3) (Refer to boring C-1 for soil descriptions)	3.0										
568.0													
	5	Light Brown, SANDY LEAN CLAY (CL) (As Lab 1) (Refer to boring C-1 for soil descriptions)	7.0	ST-1			100	28	121.2	1.2 @ 11.4%			
564.0		Bottom of Boring at 7.0 feet Boring backfilled according to Aquifer Protection Guidelines											
	10												



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BORING METHOD

HSA - Hollow Stem Auger
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 RC - Rock Coring
 MD - Mud Drilling
 WD - Wash Drilling
 HA - Hand Auger

SAMPLING METHOD

SS - Split Spoon Sample
 ST - Shelby Tube Sample
 CR - Rock Core Sample
 BS - Bag Sample
 AC - Auger Cuttings

ABBREVIATIONS

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TEST BORING RECORD


CLIENT : Woolpert, Inc
 PROJECT : Proposed West Quad Hanger Development (HUF)
 LOCATION : Terre Haute, Indiana
 PROJECT NO. : 24050033IND

BORING NO.: **C-2**
 SHEET 1 OF 1
 DATE STARTED : 04-18-24
 DATE COMPLETED : 04-18-24

Boring Elevation: 572 Feet	Boring Depth : 10.0 Feet	Boring Method : HSA	Hammer : Automatic
Latitude : 39.453572	Station: _____	Rig Type : CME- 550 ATV	Hammer Efficiency: 79.5%
Longitude -87.312625	Offset : _____	Casing Diameter : 3.25" I.D.	Driller : J. Stierwalt
	Line : _____	Core Size : ---	Temperature : 60° F
			Weather : Sunny

GROUNDWATER: ▼ Encountered at Dry ▼ At completion 6.0' ▼ Delayed Reading 4.7 @ 1Hr ☒ Caved in at 7.5'

Stratum Elevation	Sample Depth	SOIL/MATERIAL DESCRIPTION	Stratum Depth	Sample Number	SPT per 6"	SPT per 12" (N)	Recovery (%)	Moisture Content (%)	Total Unit Weight (pcf)	Unconfined Compression (ksf)	Atterberg Limits		
											LL	PL	PI
571.1		TOPSOIL (10")	0.9		3								
		Brown to Light Brown, Moist, Medium Stiff, LEAN CLAY with SAND (CL) (As Lab 3)		SS-1	3	7	100	18					
					4								
					3								
569.0			3.0	SS-2	2	6	100	24					
					4								
					1								
	5			SS-3	2	4	67	29					
					2								
		Light Brown, Moist, Very Soft to Soft, SANDY LEAN CLAY (CL) (As Lab 1)		SS-4	0								
					0	0	100	28					
					0								
					2								
				SS-5	2	4	100	18					
					2								
562.0	10	Bottom of Boring at 10.0 feet	10.0										
		Boring backfilled according to Aquifer Protection Guidelines											
	15												

 CTL Engineering, Inc. Phone: 317-295-8650	BORING METHOD	SAMPLING METHOD	ABBREVIATIONS
	HSA - Hollow Stem Auger SFA - Solid Flight Auger RC - Rock Coring MD - Mud Drilling WD - Wash Drilling HA - Hand Auger	SS - Split Spoon Sample ST - Shelby Tube Sample CR - Rock Core Sample BS - Bag Sample AC - Auger Cuttings	* - Hand Penetrometer LL - Liquid Limit PL - Plastic Limit PI - Plasticity Index SPT - Standard Penetration Test

TEST BORING RECORD

CLIENT : Woolpert, Inc
 PROJECT : Proposed West Quad Hanger Development (HUF)
 LOCATION : Terre Haute, Indiana
 PROJECT NO. : 24050033IND

BORING NO.: **C-3**
 SHEET 1 OF 2
 DATE STARTED : 04-18-24
 DATE COMPLETED : 04-18-24

Boring Elevation: 572 Feet	Boring Depth : 24.8 Feet	Boring Method : HSA	Hammer : Automatic
Latitude : 39.453808	Station: _____	Rig Type : CME- 550 ATV	Hammer Efficiency: 79.5%
Longitude -87.312480	Offset : _____	Casing Diameter : 3.25" I.D.	Driller : J. Stierwalt
	Line : _____	Core Size : ---	Temperature : 60° F
			Weather : Sunny

GROUNDWATER: ▼ Encountered at 7.0' ▼ At completion 8.3' ▼ Delayed Reading 4.1 @ 3Hrs ☒ Caved in at 16.6'

Stratum Elevation	Sample Depth	SOIL/MATERIAL DESCRIPTION	Stratum Depth	Sample Number	SPT per 6"	SPT per 12" (N)	Recovery (%)	Moisture Content (%)	Total Unit Weight (pcf)	Unconfined Compression (ksf)	Atterberg Limits		
											LL	PL	PI
571.3		TOPSOIL (8")	0.7										
		Light Brown, Moist, Stiff, LEAN CLAY with SAND (CL) (As Lab 3)		SS-1	3 4 5	9	78	24					
568.5	5		3.5	SS-2	2 1 2	3	78	28					
		Light Brown, Very Moist, Soft to Very Soft, SANDY LEAN CLAY (CL) (As Lab 1)		SS-3	0 0 0	0	89	36					
564.0	10		8.0	SS-4	2 2 3	5	100	18					
		Gray, Moist, Soft to Medium Stiff to Soft, SANDY SILTY CLAY (CL-ML) (As Lab 2)		SS-5	1 2 2	4	100	19					
555.0	15		17.0	SS-6	15 35 50/3"		103	9					
	20	Gray, Damp, Hard, SANDY LEAN CLAY (CL) with Traces of Gravel (TILL) (Visual)											

Continued on next page



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BORING METHOD
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 SFA - Solid Flight Auger
 RC - Rock Coring
 MD - Mud Drilling
 WD - Wash Drilling
 HA - Hand Auger

SAMPLING METHOD
 SS - Split Spoon Sample
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 CR - Rock Core Sample
 BS - Bag Sample
 AC - Auger Cuttings

ABBREVIATIONS
 * - Hand Penetrometer
 LL - Liquid Limit
 PL - Plastic Limit
 PI - Plasticity Index
 SPT - Standard Penetration Test

TEST BORING RECORD

CLIENT : Woolpert, Inc

BORING NO.: **C-3**

PROJECT : Proposed West Quad Hanger Development (HUF)

SHEET 2 OF 2

Stratum Elevation	Sample Depth	SOIL/MATERIAL DESCRIPTION	Stratum Depth	Sample Number	SPT per 6"	SPT per 12" (N)	Recovery (%)	Moisture Content (%)	Total Unit Weight (pcf)	Unconfined Compression (ksf)	Atterberg Limits		
											LL	PL	PI
547.2	25	Gray, Damp, Hard, SANDY LEAN CLAY (CL) with Traces of Gravel (TILL) (Visual)	24.8	SS-7	15 31 50/4"		100	11					
		Bottom of Boring at 24.8 feet											
		Boring backfilled according to Aquifer Protection Guidelines											
	30												
	35												
	40												
	45												



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BORING METHOD

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TEST BORING RECORD

CLIENT : Woolpert, Inc
 PROJECT : Proposed West Quad Hanger Development (HUF)
 LOCATION : Terre Haute, Indiana
 PROJECT NO. : 24050033IND

BORING NO.: **C-3A**
 SHEET 1 OF 1
 DATE STARTED : 04-18-24
 DATE COMPLETED : 04-18-24

Boring Elevation: 572 Feet	Boring Depth : 5.0 Feet	Boring Method : HSA	Hammer : Automatic
Latitude : 39.453812	Station: _____	Rig Type : CME- 550 ATV	Hammer Efficiency: 79.5%
Longitude -87.312473	Offset : _____	Casing Diameter : 3.25" I.D.	Driller : J. Stierwalt
	Line : _____	Core Size : ---	Temperature : 60° F
			Weather : Sunny

GROUNDWATER:

Stratum Elevation	Sample Depth	SOIL/MATERIAL DESCRIPTION	Stratum Depth	Sample Number	SPT per 6"	SPT per 12" (N)	Recovery (%)	Moisture Content (%)	Total Unit Weight (pcf)	Unconfined Compression (ksf)	Atterberg Limits		
											LL	PL	PI
571.3		TOPSOIL (8")	0.7										
		Light Brown, LEAN CLAY with SAND (CL) (As Lab 3) (Refer to boring C-3 for soil descriptions)											
568.5		Light Brown, SANDY LEAN CLAY (CL) (As Lab 1) (Refer to boring C-3 for soil descriptions)	3.5	ST-1			71	23	123.4	2.5 @ 6.2%			
567.0	5	Bottom of Boring at 5.0 feet Boring backfilled according to Aquifer Protection Guidelines	5.0										
10													



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BORING METHOD

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TEST BORING RECORD

CLIENT : Woolpert, Inc
 PROJECT : Proposed West Quad Hanger Development (HUF)
 LOCATION : Terre Haute, Indiana
 PROJECT NO. : 24050033IND

BORING NO.: **C-4**
 SHEET 1 OF 2
 DATE STARTED : 04-18-24
 DATE COMPLETED : 04-18-24

Boring Elevation: 570 Feet	Boring Depth : 25.0 Feet	Boring Method : HSA
Latitude : 39.454063	Station: _____	Rig Type : CME- 550 ATV
Longitude -87.312311	Offset : _____	Casing Diameter : 3.25" I.D.
	Line : _____	Core Size : ---

Hammer : Automatic	Hammer Efficiency: 79.5%	Driller : J. Stierwalt
Temperature : 60° F	Weather : Sunny	

GROUNDWATER: ▼ Encountered at 15.0' ▼ At completion 12.6' ▼ Delayed Reading 3.9 @ 2Hrs ☒ Caved in at 13.8'

Stratum Elevation	Sample Depth	SOIL/MATERIAL DESCRIPTION	Stratum Depth	Sample Number	SPT per 6"	SPT per 12" (N)	Recovery (%)	Moisture Content (%)	Total Unit Weight (pcf)	Unconfined Compression (ksf)	Atterberg Limits		
											LL	PL	PI
569.3		TOPSOIL (8")	0.7										
		Brown, Moist, Stiff, LEAN CLAY with SAND (CL) (As Lab 3)		SS-1	3 5 4	9	100	17					
567.0			3.0										
	5	Light Brown, Moist, Soft, SANDY LEAN CLAY (CL) (As Lab 1)		SS-2	2 2 2	4	33	28					
				SS-3	2 2 2	4	33	27					
562.0			8.0										
	10	Light Gray, Moist, Soft to Stiff, SANDY SILTY CLAY (CL-ML) (Lab 2)		SS-4	2 1 1	2	67	18			21	14	7
				SS-5	1 3 7	10	100	18					
	15												
553.0			17.0										
	20	Gray, Damp, Hard, SANDY LEAN CLAY (CL) with Traces of Gravel (TILL) (Visual)		SS-6	8 20 26	46	100	8					

Continued on next page

BORING METHOD		SAMPLING METHOD		ABBREVIATIONS	
HSA - Hollow Stem Auger	SS - Split Spoon Sample	*	- Hand Penetrometer		
SFA - Solid Flight Auger	ST - Shelby Tube Sample	LL	- Liquid Limit		
RC - Rock Coring	CR - Rock Core Sample	PL	- Plastic Limit		
MD - Mud Drilling	BS - Bag Sample	PI	- Plasticity Index		
WD - Wash Drilling	AC - Auger Cuttings	SPT	- Standard Penetration Test		
HA - Hand Auger					



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TEST BORING RECORD

CLIENT : Woolpert, Inc

BORING NO.: **C-4**

PROJECT : Proposed West Quad Hanger Development (HUF)

SHEET 2 OF 2

Stratum Elevation	Sample Depth	SOIL/MATERIAL DESCRIPTION	Stratum Depth	Sample Number	SPT per 6"	SPT per 12" (N)	Recovery (%)	Moisture Content (%)	Total Unit Weight (pcf)	Unconfined Compression (ksf)	Atterberg Limits		
											LL	PL	PI
545.0	25	Gray, Damp, Hard, SANDY LEAN CLAY (CL) with Traces of Gravel (TILL) (Visual)	25.0	SS-7	9 25 46	71	100	9					
		Bottom of Boring at 25.0 feet											
		Boring backfilled according to Aquifer Protection Guidelines											
	30												
	35												
	40												
	45												



CTL Engineering, Inc.
Phone: 317-295-8650

BORING METHOD

HSA - Hollow Stem Auger
SFA - Solid Flight Auger
RC - Rock Coring
MD - Mud Drilling
WD - Wash Drilling
HA - Hand Auger

SAMPLING METHOD

SS - Split Spoon Sample
ST - Shelby Tube Sample
CR - Rock Core Sample
BS - Bag Sample
AC - Auger Cuttings

ABBREVIATIONS

* - Hand Penetrometer
LL - Liquid Limit
PL - Plastic Limit
PI - Plasticity Index
SPT - Standard Penetration Test

TEST BORING RECORD

CLIENT : Woolpert, Inc
 PROJECT : Proposed West Quad Hanger Development (HUF)
 LOCATION : Terre Haute, Indiana
 PROJECT NO. : 24050033IND

BORING NO.: **C-5**
 SHEET 1 OF 1
 DATE STARTED : 04-18-24
 DATE COMPLETED : 04-18-24

Boring Elevation: 570 Feet	Boring Depth : 10.0 Feet	Boring Method : HSA	Hammer : Automatic
Latitude : 39.454205	Station: _____	Rig Type : CME- 550 ATV	Hammer Efficiency: 79.5%
Longitude -87.312603	Offset : _____	Casing Diameter : 3.25" I.D.	Driller : J. Stierwalt
	Line : _____	Core Size : ---	Temperature : 60° F
			Weather : Sunny

GROUNDWATER: ▼ Encountered at Dry ▼ At completion Dry ▼ Delayed Reading Dry @ 24Hrs ☒ Caved in at 6.7'

Stratum Elevation	Sample Depth	SOIL/MATERIAL DESCRIPTION	Stratum Depth	Sample Number	SPT per 6"	SPT per 12" (N)	Recovery (%)	Moisture Content (%)	Total Unit Weight (pcf)	Unconfined Compression (ksf)	Atterberg Limits		
											LL	PL	PI
569.1		TOPSOIL (10")	0.9		3								
				SS-1	4	9	100	19					
					5								
		Brown, Moist, Stiff to Medium Stiff, LEAN CLAY with SAND (CL) (Lab 3)			1								
				SS-2	3	6	100	26			30	21	9
566.5			3.5		3								
					3								
				SS-3	3	5	100	25					
	5				2								
		Light Brown, Moist, Medium Stiff to Very Soft, SANDY LEAN CLAY (CL) (As Lab 1)											
					0								
				SS-4	0	0	17	25					
					0								
562.0			8.0										
		Light Gray, Moist, Soft, SANDY SILTY CLAY (CL-ML) (Lab 2)			0								
				SS-5	2	4	100	18					
560.0	10		10.0		2								
		Bottom of Boring at 10.0 feet											
		Boring backfilled according to Aquifer Protection Guidelines											
	15												



CTL Engineering, Inc.
 Phone: 317-295-8650

BORING METHOD

HSA - Hollow Stem Auger
 SFA - Solid Flight Auger
 RC - Rock Coring
 MD - Mud Drilling
 WD - Wash Drilling
 HA - Hand Auger

SAMPLING METHOD

SS - Split Spoon Sample
 ST - Shelby Tube Sample
 CR - Rock Core Sample
 BS - Bag Sample
 AC - Auger Cuttings

ABBREVIATIONS

* - Hand Penetrometer
 LL - Liquid Limit
 PL - Plastic Limit
 PI - Plasticity Index
 SPT - Standard Penetration Test

TEST BORING RECORD

CLIENT : Woolpert, Inc

PROJECT : Proposed West Quad Hanger Development (HUF)

LOCATION : Terre Haute, Indiana

PROJECT NO. : 24050033IND

BORING NO.: **C-5A**

SHEET 1 OF 1

DATE STARTED : 04-18-24

DATE COMPLETED : 04-18-24

Boring Elevation: 570 Feet	Boring Depth : 3.0 Feet	Boring Method : HSA	Hammer : Automatic
Latitude : 39.454205	Station: _____	Rig Type : CME- 550 ATV	Hammer Efficiency: 79.5%
Longitude -87.312603	Offset: _____	Casing Diameter : 3.25" I.D.	Driller : J. Stierwalt
	Line : _____	Core Size : ---	Temperature : 60° F
			Weather : Sunny

GROUNDWATER:

[illegible]

CTL Engineering, Inc.
Phone: 317-295-8650

BORING METHOD

HSA - Hollow Stem Auger
SFA - Solid Flight Auger
RC - Rock Coring
MD - Mud Drilling
WD - Wash Drilling
HA - Hand Auger

SAMPLING METHOD

SS	- Split Spoon Sample
ST	- Shelby Tube Sample
CR	- Rock Core Sample
BS	- Bag Sample
AC	- Auger Cuttings

ABBREVIATIONS

*	- Hand Penetrometer
LL	- Liquid Limit
PL	- Plastic Limit
PI	- Plasticity Index
SPT	- Standard Penetration Test

APPENDIX C

LABORATORY TESTING

Summary of Classification Test Results

Grain Size Distribution Curves

Unconfined Compressive Strength Test Results

Summary of Special Laboratory Test Results



Lab No.	Boring No.	Latitude	Longitude	Sample No.	Depth	Soil Classification	ASTM Group	Grain Size Distribution (%)				WC	LL	PL	PI	Max. Dry Density (pcf)	Optimum Moisture Content (%)	CBR (%)		
								Gravel	Sand	Silt	Clay							90%	95%	100%
Lab 1	C-1	39.45335	-87.31229	SS-4	8.5-10.0	SANDY LEAN CLAY	CL	0.0	30.5	42.0	27.4	21	24	15	9					
Lab 2	C-4	39.45406	-87.31231	SS-4	8.5-10.0	SANDY SILTY CLAY	CL-ML	0.2	41.2	38.4	20.2	18	21	14	7					
Lab 3	C-5	39.45420	-87.31260	SS-2	2.0-3.5	LEAN CLAY with SAND	CL	0.0	20.3	51.5	28.1	26	30	21	9					

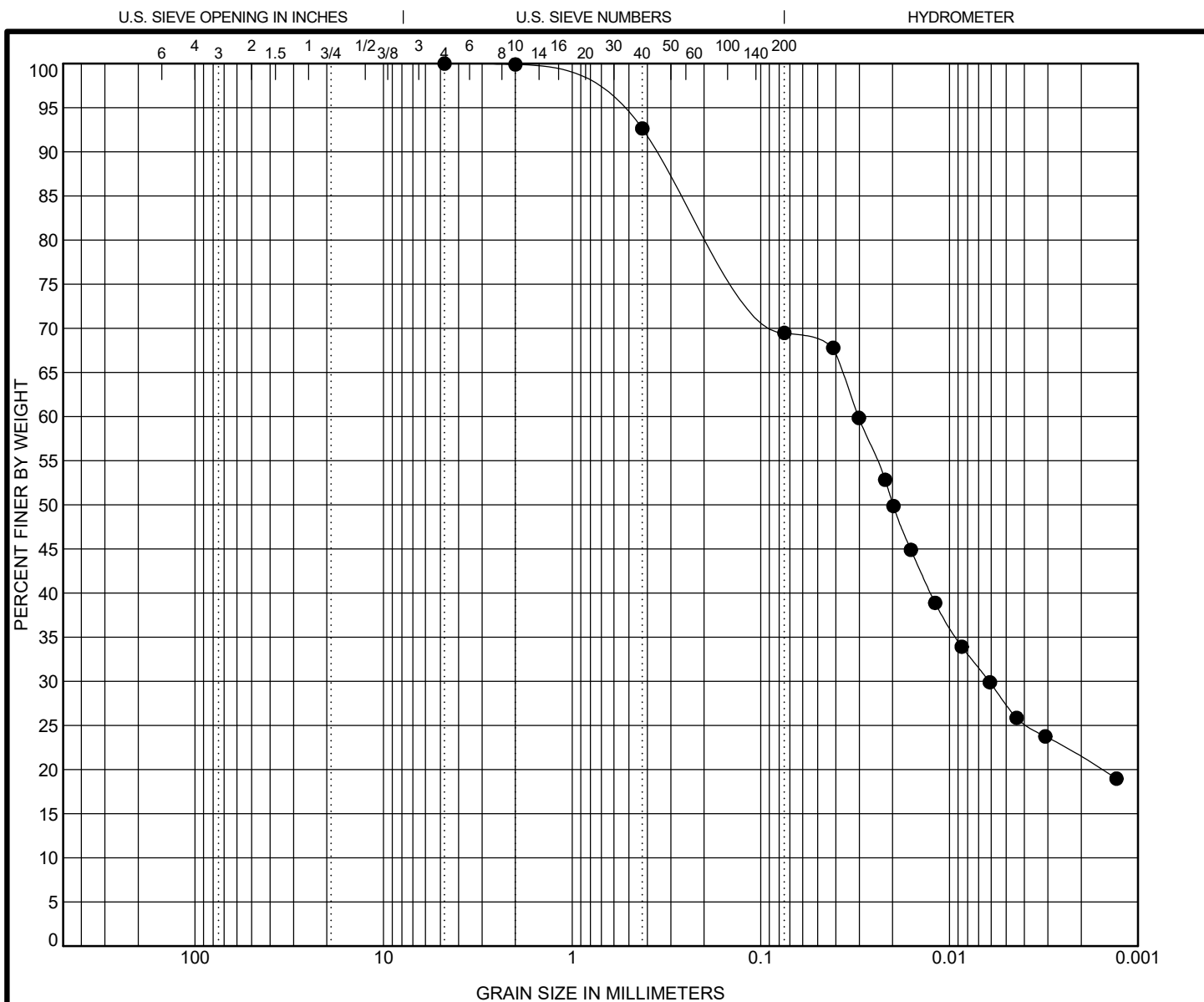
SUMMARY OF CLASSIFICATION TEST RESULTS


CTL Engineering, Inc.
 Phone: 317-295-8650

Project: Proposed West Quad Hanger Development (HUF)

Location: Terre Haute, Indiana

Project No.: 24050033IND



COBBLES	GRAVEL		SAND			SILT OR CLAY
	Coarse	Fine	Coarse	Medium	Fine	

Boring No.	C-1	Classification					MC	LL	PL	PI	Cc	Cu
Sample	SS-4	SANDY LEAN CLAY					21.4	24	15	9		
Depth	8.5-10.0	CL										
Latitude	39.453353	Lab 1										
Longitude	-87.312292											
Fine material soaking time	Minutes	D100	D60	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay		
		4.75	0.03	0.02	0.006		0.0	30.5	42.1	27.4		
Remarks												



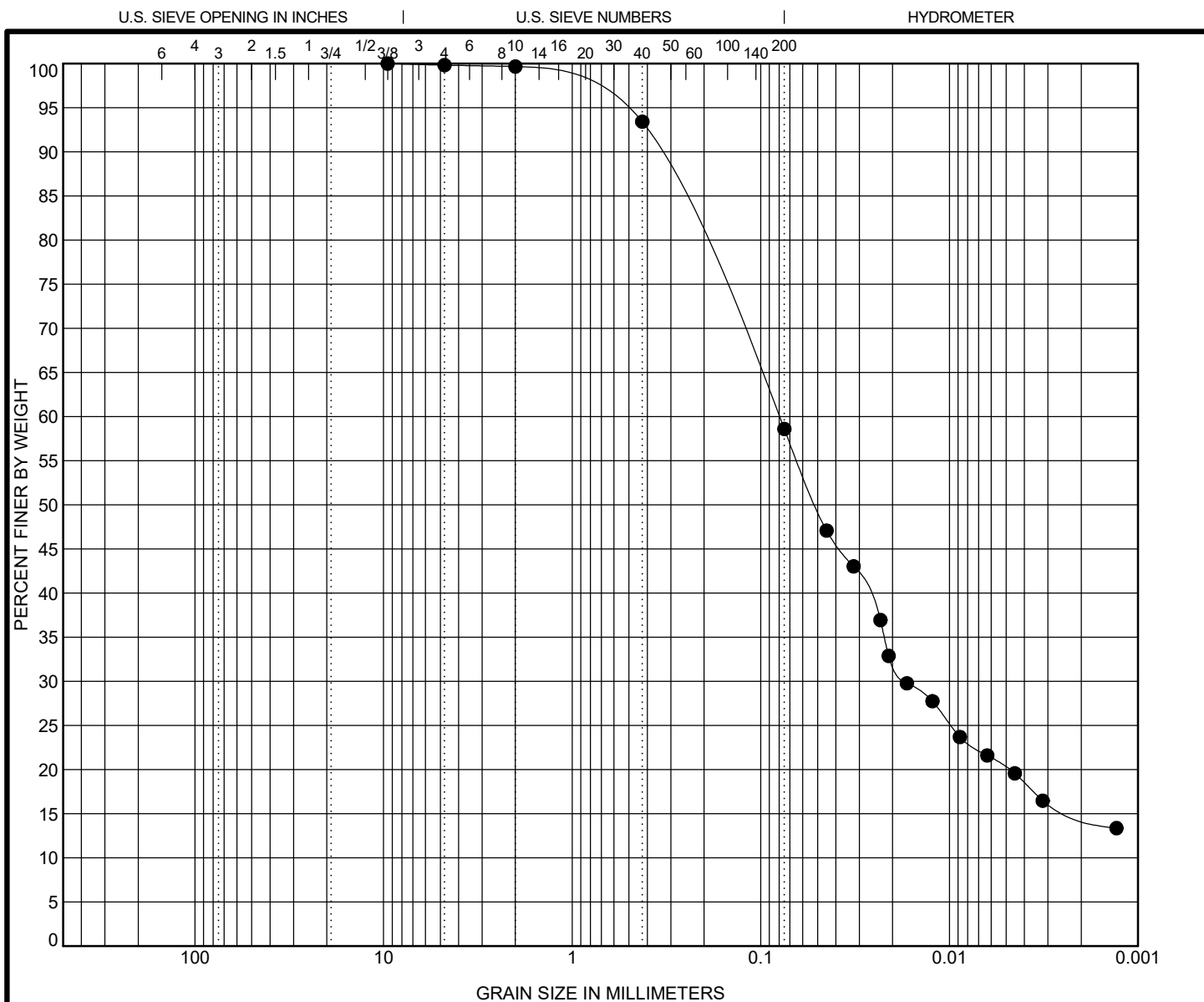
CTL Engineering, Inc.
Phone: 317-295-8650

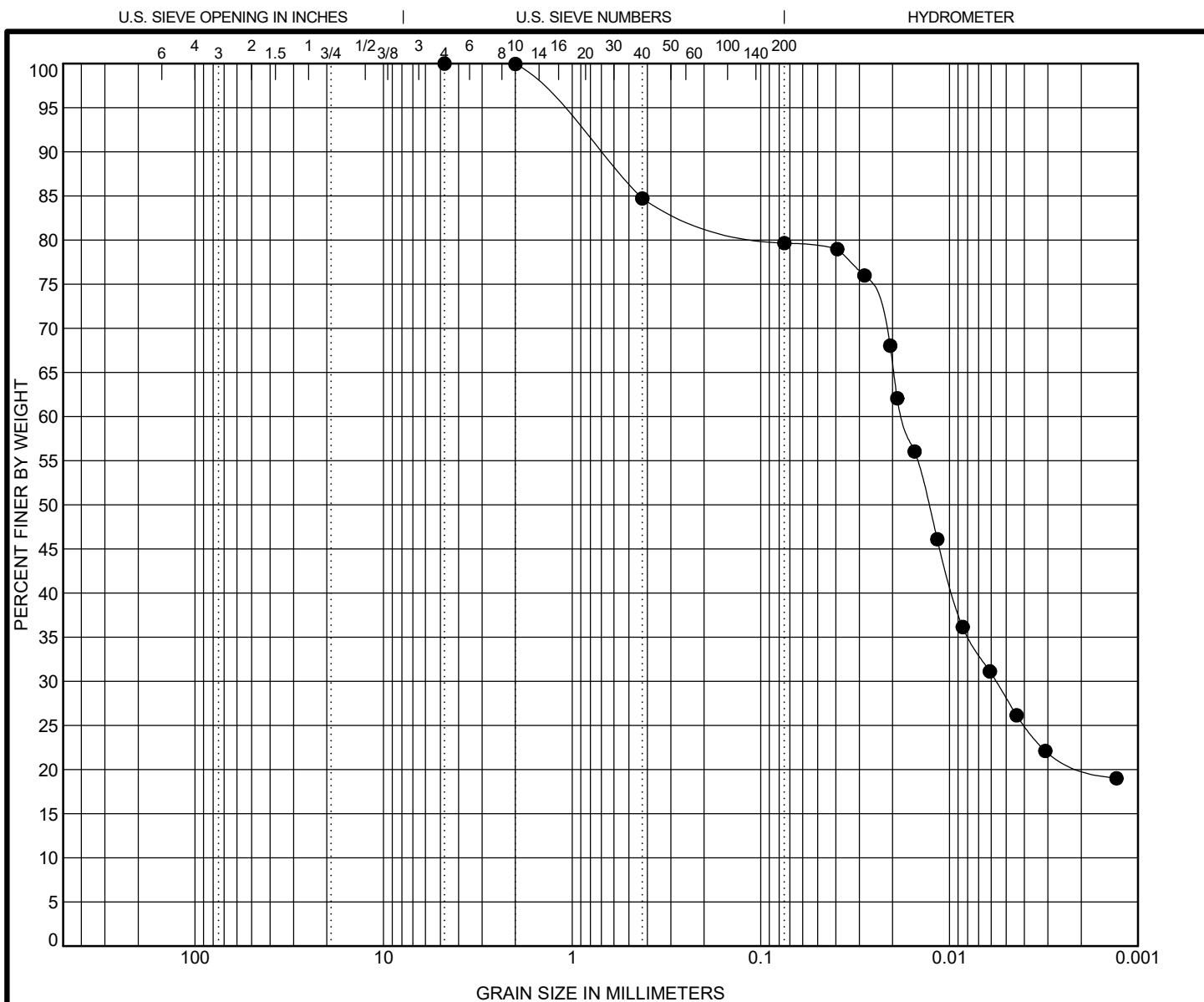
GRAIN SIZE DISTRIBUTION

Project: Proposed West Quad Hanger Development (HUF)

Location: Terre Haute, Indiana

CTL Project No.: 24050033IND





COBBLES	GRAVEL		SAND			SILT OR CLAY
	Coarse	Fine	Coarse	Medium	Fine	

Boring No.	C-5	Classification					MC	LL	PL	PI	Cc	Cu
Sample	SS-2	LEAN CLAY with SAND					25.8	30	21	9		
Depth	2.0-3.5	CL										
Latitude	39.454205	Lab 3										
Longitude	-87.312603											
Fine material soaking time	Minutes	D100	D60	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay		
		4.75	0.018	0.013	0.006		0.0	20.3	51.5	28.1		
Remarks												



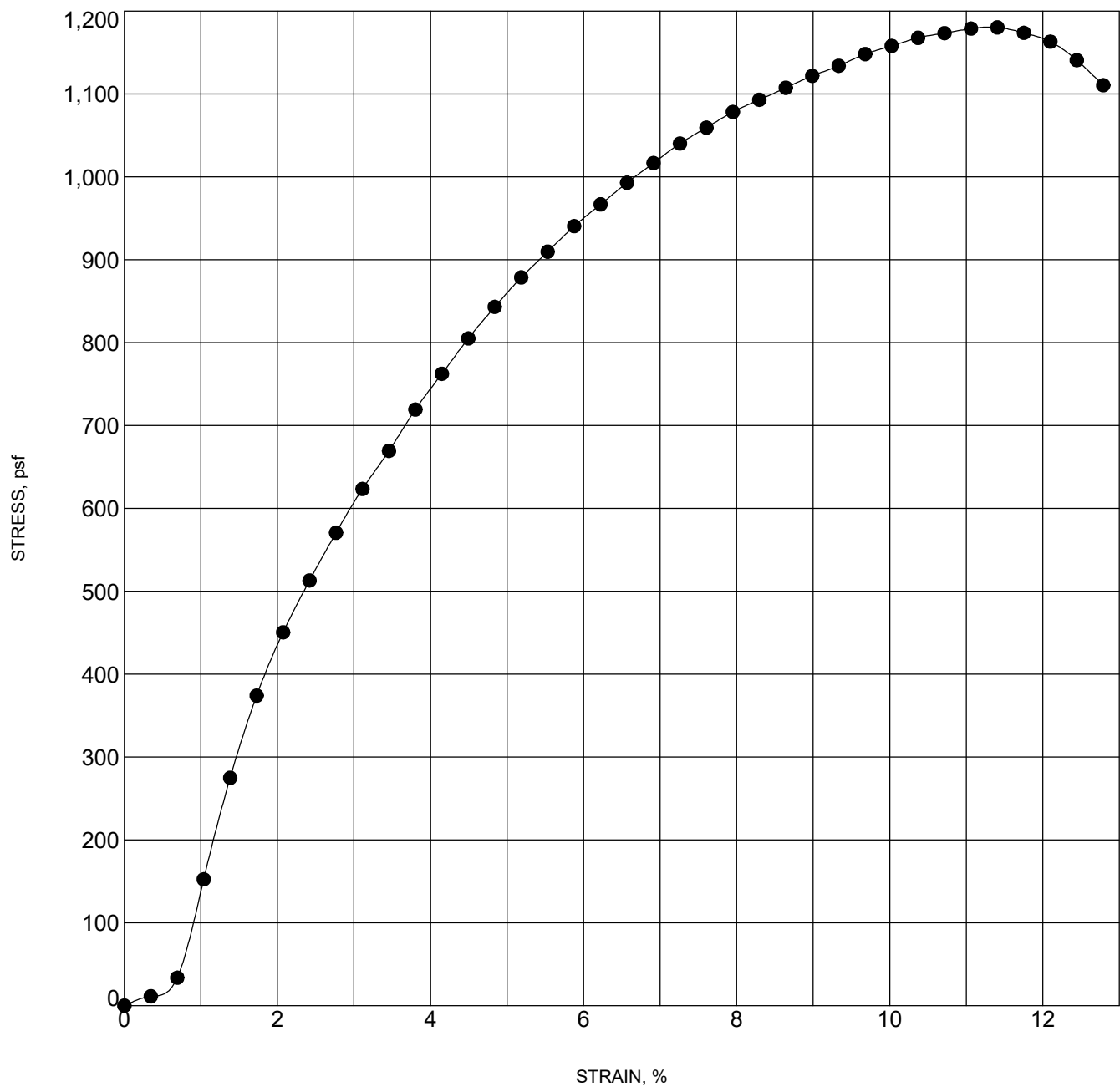
CTL Engineering, Inc.
Phone: 317-295-8650


GRAIN SIZE DISTRIBUTION

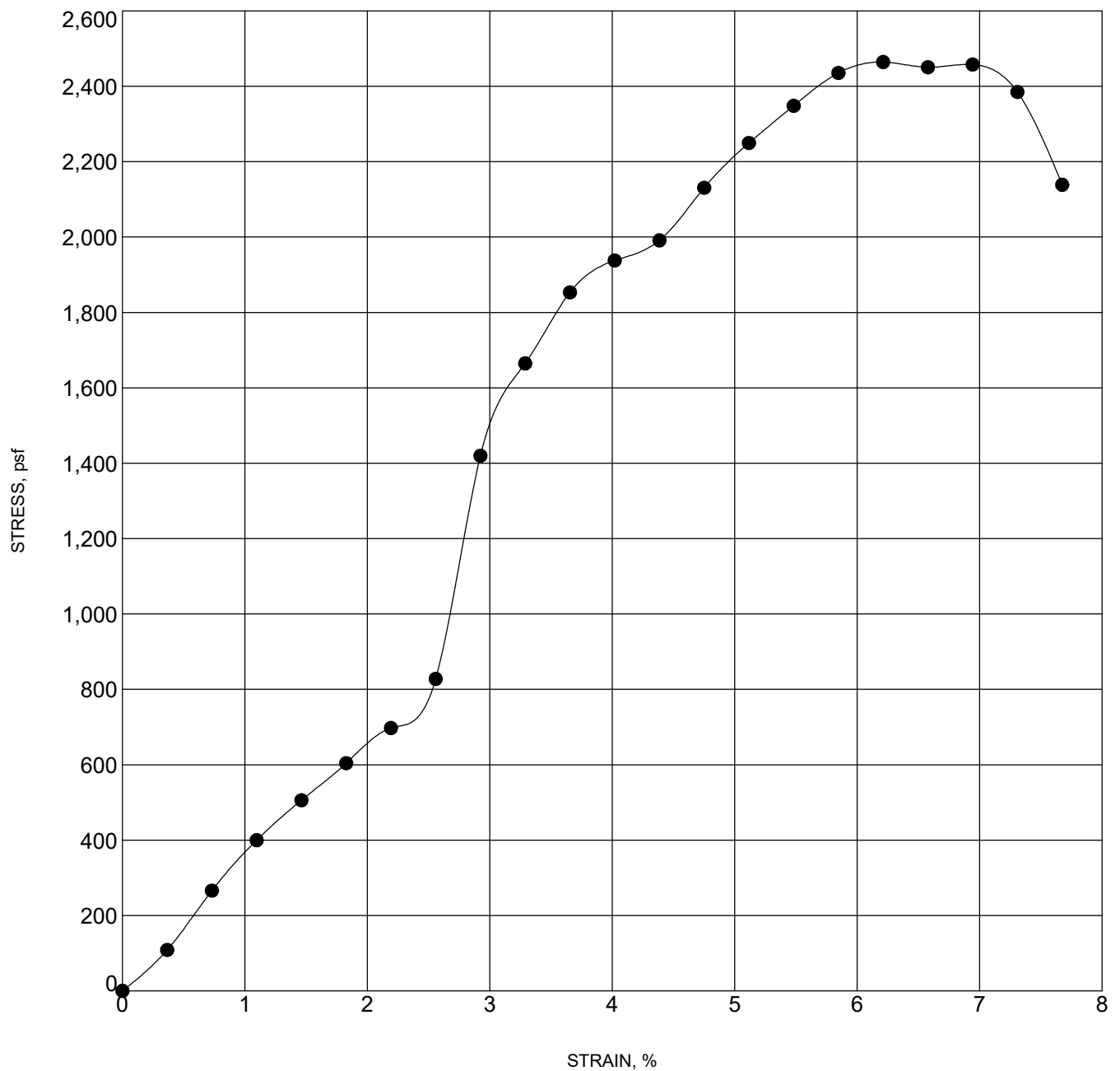
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Location: Terre Haute, Indiana

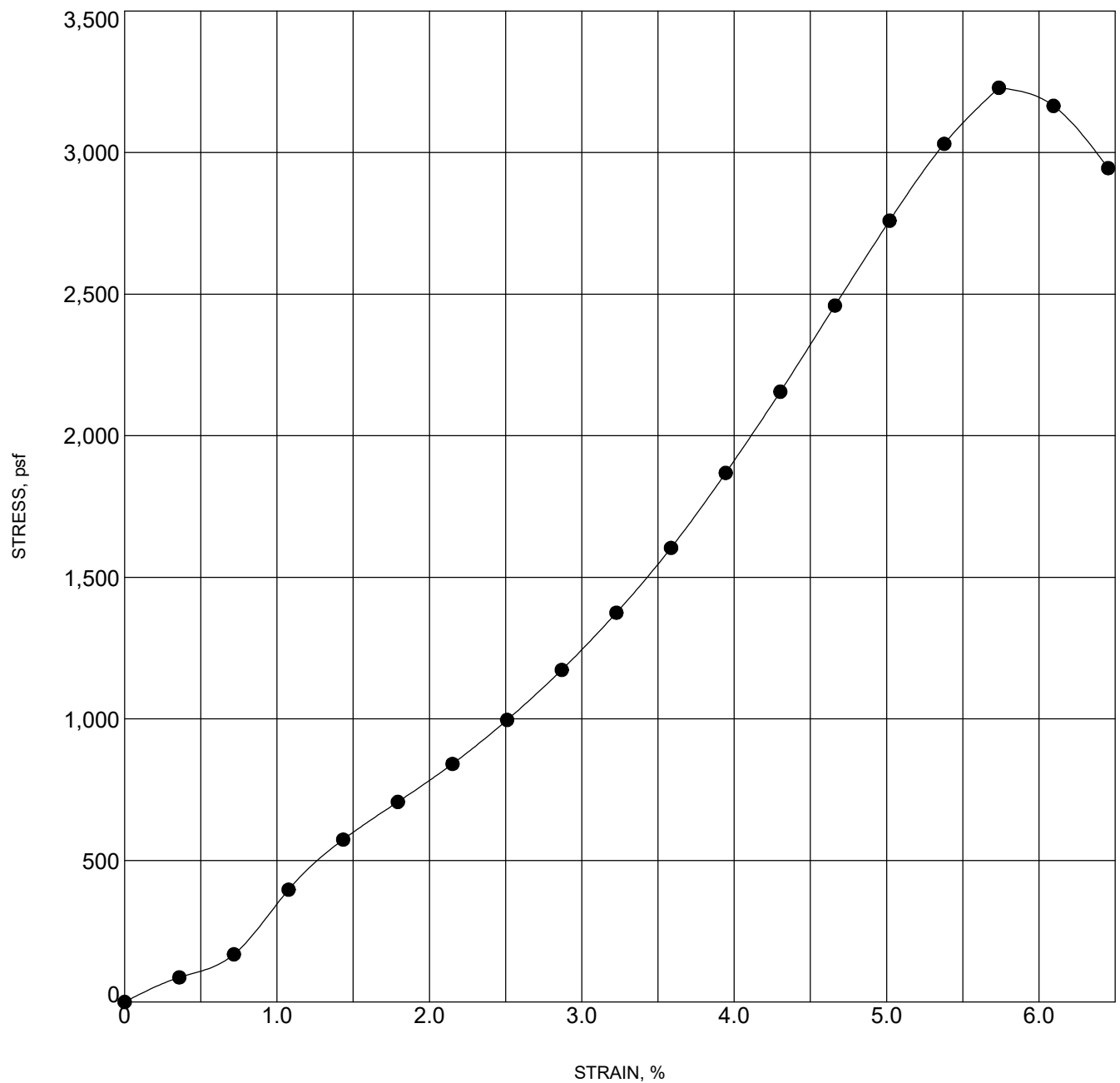
CTL Project No.: 24050033IND




Boring Information		Test Results	
Boring No.	C-1A	Natural Moisture Content (%)	28.0
Sample	ST-1	Natural Wet Density, pcf	121.2
Depth	5.0 - 7.0	Natural Dry Density, pcf	94.7
Latitude	39.453357	Unconfined Compression Strength, psf	1180
Longitude	-87.312293	Failure Strain (%)	11.4
		SOIL DESCRIPTION	SANDY LEAN CLAY (CL)
 CTL Engineering, Inc. Phone: 317-295-8650		UNCONFINED COMPRESSIVE STRENGTH	
		Project: Proposed West Quad Hanger Development (HUF)	
		Location: Terre Haute, Indiana	
		Project No.: 24050033IND	



Boring Information		Test Results	
Boring No.	C-3A	Natural Moisture Content (%)	23.1
Sample	ST-1	Natural Wet Density, pcf	123.4
Depth	3.0 - 5.0	Natural Dry Density, pcf	100.3
Latitude	39.453812	Unconfined Compression Strength, psf	2464
Longitude	-87.312473	Failure Strain (%)	6.2
		SOIL DESCRIPTION	SANDY LEAN CLAY (CL)
 CTL Engineering, Inc. Phone: 317-295-8650		UNCONFINED COMPRESSIVE STRENGTH	
		Project: Proposed West Quad Hanger Development (HUF)	
		Location: Terre Haute, Indiana	
		Project No.: 24050033IND	



Boring Information		Test Results	
Boring No.	C-5A	Natural Moisture Content (%)	19.5
Sample	ST-1	Natural Wet Density, pcf	127.2
Depth	1.0 - 3.0	Natural Dry Density, pcf	106.4
Latitude	39.454205	Unconfined Compression Strength, psf	3229
Longitude	-87.312603	Failure Strain (%)	5.7
		SOIL DESCRIPTION	LEAN CLAY with SAND (CL)
 CTL Engineering, Inc. Phone: 317-295-8650		UNCONFINED COMPRESSIVE STRENGTH	
		Project: Proposed West Quad Hanger Development (HUF)	
		Location: Terre Haute, Indiana	
		Project No.: 24050033IND	

Boring No.	Latitude	Longitude	Sample No.	Depth	Moisture Content (%)	Wet Density (pcf)	Dry Density (pcf)	Unconfined Compression (psf)	Failure Strain (%)	Loss on Ignition (%)	Calcium Carbonate (%)	pH
C-1	39.453353	-87.312292	SS-1	1.0-2.5	22.1							
C-1	39.453353	-87.312292	SS-2	3.5-5.0	27.0							
C-1	39.453353	-87.312292	SS-3	6.0-7.5	29.6							
C-1	39.453353	-87.312292	SS-4	8.5-10.0	21.4							6.2
C-1	39.453353	-87.312292	SS-5	13.5-15.0	22.9							
C-1	39.453353	-87.312292	SS-6	18.5-20.0	9.1							
C-1	39.453353	-87.312292	SS-7	23.5-25.0	8.0							
C-1A	39.453357	-87.312293	ST-1	5.0-7.0	28.0	121.2	94.7	1180	11.4			
C-2	39.453572	-87.312625	SS-1	0.5-2.0	18.5							
C-2	39.453572	-87.312625	SS-2	2.0-3.5	23.8							
C-2	39.453572	-87.312625	SS-3	3.5-5.0	29.0							
C-2	39.453572	-87.312625	SS-4	6.0-7.5	27.8							
C-2	39.453572	-87.312625	SS-5	8.5-10.0	17.7							
C-3	39.453808	-87.312480	SS-1	1.0-2.5	23.6							
C-3	39.453808	-87.312480	SS-2	3.5-5.0	28.1							
C-3	39.453808	-87.312480	SS-3	6.0-7.5	35.9							
C-3	39.453808	-87.312480	SS-4	8.5-10.0	18.0							
C-3	39.453808	-87.312480	SS-5	13.5-15.0	18.9							
C-3	39.453808	-87.312480	SS-6	18.5-19.8	9.3							
C-3	39.453808	-87.312480	SS-7	23.5-24.8	10.6							
C-3A	39.453812	-87.312473	ST-1	3.0-5.0	23.1	123.4	100.3	2464	6.2			
C-4	39.454063	-87.312311	SS-1	1.0-2.5	17.2							
C-4	39.454063	-87.312311	SS-2	3.5-5.0	28.0							
C-4	39.454063	-87.312311	SS-3	6.0-7.5	26.6							
C-4	39.454063	-87.312311	SS-4	8.5-10.0	17.8							6.4
C-4	39.454063	-87.312311	SS-5	13.5-15.0	18.4							
C-4	39.454063	-87.312311	SS-6	18.5-20.0	7.9							
C-4	39.454063	-87.312311	SS-7	23.5-25.0	8.6							
C-5	39.454205	-87.312603	SS-1	0.5-2.0	19.0							
C-5	39.454205	-87.312603	SS-2	2.0-3.5	25.8							6.8
C-5	39.454205	-87.312603	SS-3	3.5-5.0	25.1							
C-5	39.454205	-87.312603	SS-4	6.0-7.5	25.2							
C-5	39.454205	-87.312603	SS-5	8.5-10.0	17.9							
C-5A	39.454205	-87.312603	ST-1	1.0-3.0	19.5	127.2	106.4	3229	5.7			



CTL Engineering, Inc.
Phone: 317-295-8650

SUMMARY OF SPECIAL LABORATORY TEST RESULTS

Project: Proposed West Quad Hanger Development (HUF)

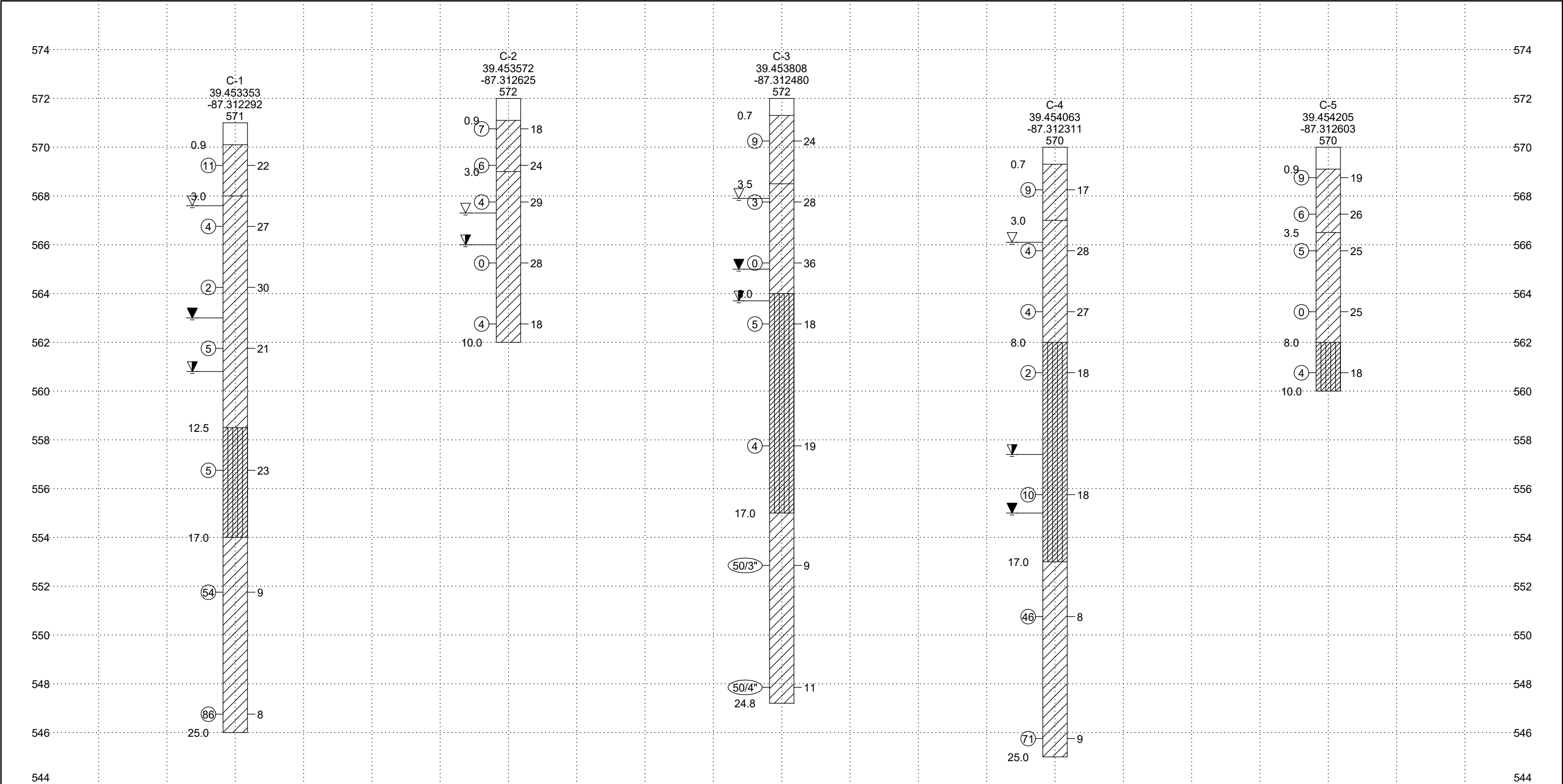
Location: Terre Haute, Indiana










CTL Project No.: 24050033IND

APPENDIX D

SOIL PROFILE
UNDERGROUND MINE MAPS





<div></div> <div>CTL Engineering, Inc. 1310 S. Franklin Rd. Indianapolis, Indiana 46239 Phone: 317-295-8650 Website: www.ctleng.com</div>	LEGEND			SOIL PROFILE		
	<div> TOPSOIL</div>	<div><div>GROUND WATER DURING DRILLING</div><div>GROUND WATER AT COMPLETION OF DRILLING</div><div>GROUND WATER AT "71" HOURS AFTER COMPLETION</div></div> <div> W MOISTURE CONTENT IN PERCENT (w)</div> <div> N STANDARD PENETRATION IN BLOWS PER FOOT (N)</div>	<div>Scale As Shown</div>	<div>Woolpert, Inc</div> <div>Proposed West Quad Hanger Development</div> <div>Terre Haute Reginal Airport (HUF)</div> <div>Terre Haute, Indiana</div>		
	<div> LEAN CLAY</div>		<div>Date 6/17/24</div>			
	<div> SILTY CLAY</div>		<div>Drawn By SAH</div>			
				<div>Reviewed By SM</div>	<div>Project No. 24050033IND</div>	<div>Page 1 of 1</div>



COAL MINE INFORMATION SYSTEM

Mine/Pit Data Sheet

MINENUMB

800388

Underground

MINE NAME HISTORY

Mine Name	Start	End
Glen Ayr #1 Mine	1908	1937
Freeman Mine (5)	1001	9009
Burke Mine (2)	1001	9009

START DATE

MIN	Start	MAX
1908	1908	1908

END DATE

MIN	End	MAX
1937	1937	1937

STATE/INTERIM PERMITS REGULATORY PERMITS

Permit Number
N/A

Permit Number
N/A

State Permits were issued prior to the passage of the Surface Mining Control and Reclamation Act of 1977. Interim Permits were issued from 1977 until 1982, when the Regulatory Program gained primacy.

MINE OWNERSHIP HISTORY

Company Name	Start	End
Glen Ayr Coal Co.	1908	1937
Standard Fuel Coal Co.	1001	9009

OPERATIONS

Coal Removal Method	Shaft
Removal Equipment	UNKNOWN
Transportation Type	UNKNOWN
Preparation Method	UNKNOWN

COUNTIES

County Name	Primary
Vigo	Yes

QUADRANGLES

Quadrangle Name	Primary
Seelyville	Yes

TRS LOCATIONS

Twp	DR	Rng	DR	SecType	Sec	Quarters
12	N	8	W	Sec.	28	
12	N	8	W	Sec.	29	
12	N	8	W	Sec.	20	SE
12	N	8	W	Sec.	21	SW
12	N	8	W	Sec.	21	NE SE SW

COAL GEOLOGY

Coal Seam/Member	Depth (ft)	Thickness (ft)	Roof Lithology	Floor Lithology	Original Correlation
Survant Coal	91	5	UNKNOWN	UNKNOWN	CO-4 RSG

COMMENTS

NOTES AND COMMENTS
Mine includes entries from Old Freeman and Burke Mines (SW SE SW and NW SW SW) Glen Ayr must have mined through their old works.

CITATIONS

Abbreviated Citation	Internal No.	Digital
USBM Negative	343192	No
USBM Negative	343193	No
USBM Negative	343194	No

Indiana Geological Survey

Indiana University

Monday, September 12, 2016

Explanation of Year Codes:

7007 Mine is currently in operation

1001 Minimum date is unknown

9009 Maximum date is unknown

COAL MINE INFORMATION SYSTEM

Mine/Pit Data Sheet

MINENUMB

800388

Underground

USBM Negative	343195	No
USBM Negative	343196	No
USBM Negative	343197	Yes
USBM Negative	343221	No
USBM Negative	343222	No
CIM #27, Seelyville	999916	Yes
PCM #1, Vigo Co.	999920	No

Indiana Geological Survey

Indiana University

Monday, September 12, 2016

Explanation of Year Codes:

7007 Mine is currently in operation

1001 Minimum date is unknown

9009 Maximum date is unknown

APPENDIX E
SEISMIC COEFFICIENTS

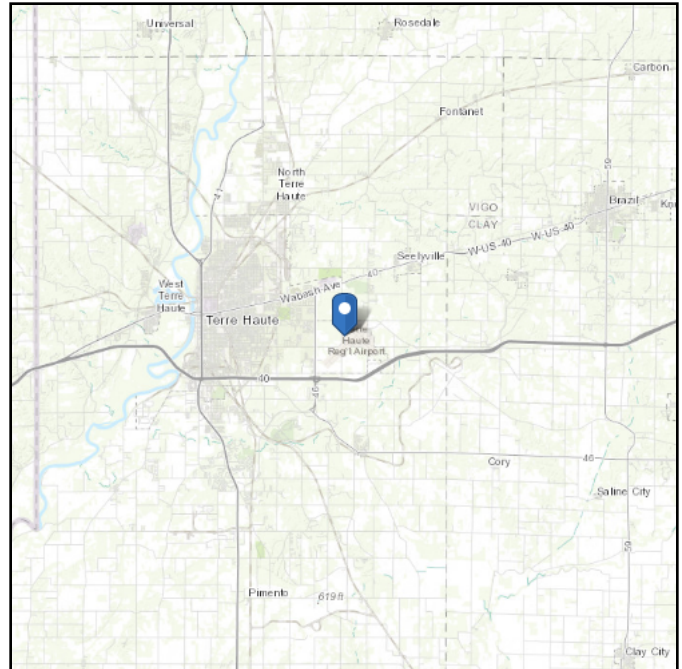
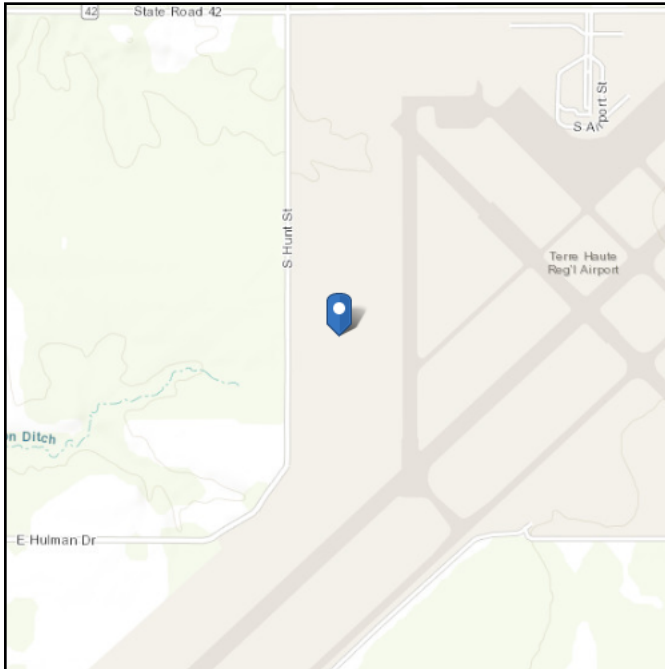


ASCE Hazards Report

Address:
No Address at This Location

Standard: ASCE/SEI 7-10
Risk Category: II
Soil Class: D - Stiff Soil

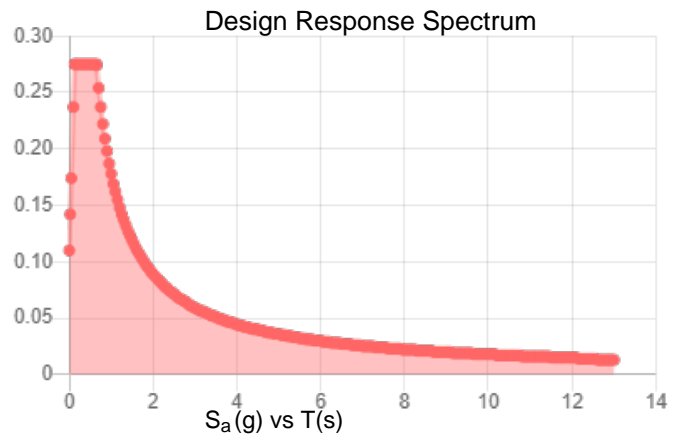
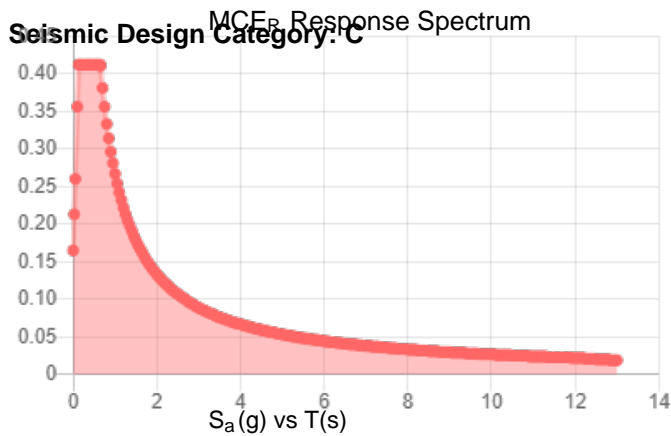
Latitude: 39.453808
Longitude: -87.31248
Elevation: 571.8633379157679 ft
(NAVD 88)



Site Soil Class: D - Stiff Soil

Results:

S_S :	0.259	S_{D1} :	0.178
S_1 :	0.114	T_L :	12
F_a :	1.593	PGA :	0.127
F_v :	2.345	PGA_M :	0.196
S_{MS} :	0.412	F_{PGA} :	1.546
S_{M1} :	0.267	I_e :	1
S_{DS} :	0.275		



Data Accessed: Tue Jun 25 2024

Date Source:

USGS Seismic Design Maps based on ASCE/SEI 7-10, incorporating Supplement 1 and errata of March 31, 2013, and ASCE/SEI 7-10 Table 1.5-2. Additional data for site-specific ground motion procedures in accordance with ASCE/SEI 7-10 Ch. 21 are available from USGS.

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