ADDENDUM NO. 01

PROJECT: **VIGO COUNTY SECUIRTY CENTER**
Terre Haute, Indiana 47807

TO: All Prospective Bidders and others to whom Plans and Specifications for the above referenced Project have been issued.

OWNER: **VIGO COUNTY BOARD OF COMMISSIONERS**
650 South 1st Street
Terre Haute, IN 47807
812.231.6200

ARCHITECT: **DLZ INDIANA, LLC**
157 East Maryland Street
Indianapolis, Indiana 46204
317.633.4120
DLZ Project Number: 1663-1190-90

CONSTRUCTION MANAGER: **GARMONG CONSTRUCTION SERVICES**
3050 Poplar Street
Terre Haute, IN 47803
812.234.1403

DATE: **September 12, 2019**

The items included in this Addendum are to become a part of the original Contract Documents including Drawings and Project Manual dated September 05, 2019 as if included herein. Only these items are to be altered. The remainder of the original Drawings and Project Manual remain valid in their entirety. Bidders must acknowledge receipt of this Addendum in the space provided on the Proposal Form. Failure to do so may subject the Bidder to disqualification.

PROJECT MANUAL – VOLUME 1

ITEM NO. 1. TABLE OF CONTENTS

a. Added SECTION 263214 STATIONARY LOAD BANK WITH AUTOMATIC LOAD LEVELING CONTROL
b. Deleted SECTIONS 271313, 271323 AND 271333.
c. Added SECTION 271300 COMMUNICATIONS BACKBONE CABLING.
d. Added SECTION 271500 COMMUNICATIONS HORIZONTAL CABLING.
e. Deleted SECTIONS 271513 AND 271533.
f. Added “FOR ELECTRONIC SAFETY AND SEURITY to SECTION 280510.
g. Added SECTION 281300 ACCESS CONTROL SYSTEM.
h. Added SECTION 282300 VIDEO COMMUNICATION SYSTEM
i. Added “IP” to SECTION 285123

PROJECT MANUAL – VOLUME 2

ITEM NO. 2. SECTION 034100 – PRECAST STRUCTURAL CONCRETE

a. Sentence 1.2.B.12: Added this specification section “Interior Painting”.
b. Sentence 1.2.B.12: This sentence becomes 1.2.B.13.
c. Sentence 1.2.B.13: This sentence becomes 1.2.B.14.

d. Sentence 1.2.B.14: This sentence becomes 1.2.B.15.
e. Sentence 1.2.B.15: This sentence becomes 1.2.B.16.
f. Section 1.7.I.4: Added this sentence.
g. Section 2.2.B, 1 and 2: Revised this section.
h. Section 2.2.C: Delete this sentence add “Not Used”.
i. Section 2.4.A.1: Revised this sentence.
j. Section 2.4.A.2: Added this sentence.
k. Section 2.6: “Stainless-Steel Connection Materials” delete this section add “Not Used”.
l. Section 2.9.B and 1: Added these sentences.
m. Section 2.10.A: “Concrete Mixtures” added this section.
n. Section 2.10.A: Becomes 2.10.B.
o. Section 2.10.B: Becomes 2.10.C.
p. Section 2.10.C: Becomes 2.10.D.
q. Section 2.10.D: Becomes 2.10.E.
r. Section 2.10.E: Becomes 2.10.F.
s. Section 2.10.F: Becomes 2.10.G.
t. Section 2.10.G: Becomes 2.10.H.
u. Section 2.10.H: Becomes 2.10.I.
v. Section 2.10.I: Becomes 2.10.J.
w. Section 2.12.Q.3: Deleted “fiber”.
x. Section 2.12.Q.3, a, b, and c: Delete these items.
y. Section 2.16.A.2: Revised this sentence.
z. Section 2.16.A.3.a: Revised this sentence.
aa. Section 2.16.A.4, a and b: Added these sentences.

ITEM NO. 3. SECTION 084523 – FIBERGLASS-SANDWICH-PANEL ASSEMBLIES

a. Section 2.1.H.1. Changed U-factor to 0.28.
b. Section 2.6.D. Changed the aluminum finish and warranty.

ITEM NO. 4. SECTION 087100 – DOOR HARDWARE

a. Hardware Group 02 – NOT USED. Delete this hardware group in its entirety.
b. Hardware Group 02A – NOT USED. Delete this hardware group in its entirety.
c. Hardware Group 03.

1. Delete 1 EA PASSAGE SET
   Add the following hardware:

1 EA	POWER TRANSFER	EPT10	689	VON
1 EA	ELEC LOCKSET (W/ RX)	L9092TEU 06A RX CON 12/24 VDC	626	SCH
1 EA	DOOR POSITION SWITCH	MS2049F		DET
1 EA	CREDENTIAL REDER	BY DIV 28		
1 EA	POWER SUPPLY	BY DIV 28		

DOOR NORMALLY CLOSED AND OCKED. PRESENTING VALID CREDENTIAL TO READER WILL MOMENTARILY UNLOCK LOCKSET, ALLOWING ACCESS. DOOR REMAINS LOCKED UPON LOSS OF POWER. FREE EGRESS AT ALL TIMES.

a. Hardware Group 16. Delete doors “C1070A” and “C1071A”.
b. Hardware Group 17. Delete doors “B1124”, “C1070B” and “C1071B”.
c. Hardware Group 26. Add doors “B1004”, “B1011, B1012 and B1013”.
d. Hardware Group 29. Add doors “C1070A” and “C1071A”.
e. Hardware Group 31. Add doors “B1005”, B1006”, “B1010”, “B1124”, “C1070B” and “C1071B”.
f. Hardware Group 34. Delete Door “C1052A”.

ITEM NO. 5. SECTION 101423 PANEL SIGNAGE

a. Section 1.2.A.5: Added this sentence for exterior signs.
b. Section 2.2: Added “Interior” to title.
c. Section 2.5: “Exterior Panel Signs” added this section.
d. Section 2.5: Becomes 2.6 and added “Interior” to title.
e. Section 2.6: Becomes 2.7.
f. Section 2.7: Becomes 2.8.

PROJECT MANUAL – VOLUME 3

Not Used

PROJECT MANUAL – VOLUME 4

ITEM NO. 6. SECTION 260519 – LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

a. Replace section in its entirety with attached.

ITEM NO. 7. SECTION 260536 – GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

a. Replace section in its entirety with attached.

ITEM NO. 8. SECTION 260529 – HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

a. Replace section in its entirety with attached.

ITEM NO. 9. SECTION 260533 – RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

a. Replace section in its entirety with attached.

ITEM NO. 10. SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

a. Replace section in its entirety with attached.

ITEM NO. 11. SECTION 260548.16 – SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

a. Replace section in its entirety with attached.

ITEM NO. 12. SECTION 260553 – IDENTIFICATION FOR ELECTRICAL SYSTEMS

a. Replace section in its entirety with attached.

ITEM NO. 13. SECTION 260573.13 – SHORT-CIRCUIT STUDIES

a. Replace section in its entirety with attached.

ITEM NO. 14. SECTION 260573.16 – COORDINATION STUDIES

a. Replace section in its entirety with attached.

ITEM NO. 15. SECTION 260573.19 – ARC-FLACH HAZARD ANALYSIS

a. Replace section in its entirety with attached.

ITEM NO. 16. SECTION 260923 – LIGHTING CONTROL DEVICES

a. Replace section in its entirety with attached.

ITEM NO. 17. SECTION 262213 – LOW-VOLTAGE DISTRIBUTION TRANSFORMERS

a. Replace section in its entirety with attached.

ITEM NO. 18. SECTION 262313 – PARALLELING LOW-VOLTAGE SWITCHGEAR
a. Replace section in its entirety with attached.

ITEM NO. 19. SECTION 262413 – SWITCHBOARDS
a. Replace section in its entirety with attached.

ITEM NO. 20. SECTION 262416 – PANELBOARDS
a. Replace section in its entirety with attached.

ITEM NO. 21. SECTION 262500 – ENLCOSED BUS ASSEMBLIES
a. Replace section in its entirety with attached.

ITEM NO. 22. SECTION 262726 – WIRING DEVICES
a. Replace section in its entirety with attached.

ITEM NO. 23. SECTION 262813 – FUSES
a. Replace section in its entirety with attached.

ITEM NO. 24. SECTION 262816 – ENCLOSED SWITCHES AND CIRCUIT BREAKERS
a. Replace section in its entirety with attached.

ITEM NO. 25. SECTION 262913.03 – MANUAL AND MAGNETIC MOTOR CONTROLLERS
a. Replace section in its entirety with attached.

ITEM NO. 26. SECTION 262923 – VARIBALE-FREQUENCY MOTOR CONTROLLERS
a. Replace section in its entirety with attached.

ITEM NO. 27. SECTION 263213 – ENGINE GENERATORS
a. Replace section in its entirety with attached.

ITEM NO. 28. SECTION 263214 – STATIONARY LOAD BANK WITH LOAD LEVELING CONTROL
a. Add attached section in its entirety.

ITEM NO. 29. SECTION 263353 – STATIC UNINTERRUPTIBLE POWER SUPPLY
a. Replace section in its entirety with attached.

ITEM NO. 30. SECTION 263600 – TRANSFER SWITCHES
a. Replace section in its entirety with attached.

ITEM NO. 31. SECTION 264313 – SURGE PROTECTION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS
a. Replace section in its entirety with attached.

ITEM NO. 32. SECTION 265119 – LED INTERIOR LIGHTING
a. Replace section in its entirety with attached.

ITEM NO. 33. SECTION 265613 – LIGHTING POLES AND STANDARDS
a. Replace section in its entirety with attached.

ITEM NO. 34. SECTION 265619 – LED EXTERIOR LIGHTING
a. Replace section in its entirety with attached.

ITEM NO. 35. SECTION 270526 – GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS
a. Replace section in its entirety with attached.

ITEM NO. 36. SECTION 270528 – PATHWAYS FOR COMMUNICATIONS SYSTEMS
a. Replace section in its entirety with attached.

ITEM NO. 37. SECTION 270529 – HANGARS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS
a. Replace section in its entirety with attached.

ITEM NO. 38. SECTION 270536 – CABLE TRAYS FOR COMMUNICATIONS SYSTEMS
a. Replace section in its entirety with attached.

ITEM NO. 39. SECTION 270544 – SLEEVES AND SLEEVE SEALS FOR COMMUNICATIONS PATHWAYS AND CABLING
a. Replace section in its entirety with attached.

ITEM NO. 40. SECTION 270548.16 – SEISMIC CONTROLS FOR COMMUNICATIONS SYSTEMS
a. Replace section in its entirety with attached.

ITEM NO. 41. SECTION 270553 – IDENTIFICATION FOR COMMUNICATIONS SYSTEMS
a. Replace section in its entirety with attached.

ITEM NO. 42. SECTION 271100 – COMMUNICATIONS EQUIPMENT ROOM FITTINGS
a. Replace section in its entirety with attached.

ITEM NO. 43. SECTION 271116 – COMMUNICATIONS RACKS, FRAMES AND ENCLOSURES
a. Replace section in its entirety with attached.

ITEM NO. 44. SECTION 271300- COMMUNICATIONS BACKBONE CABLING
a. Add section with attached in its entirety.

ITEM NO. 45. SECTION 271313 – COMMUNICATIONS COPPER BACKBONE CABLING
a. Delete section without replacement.

ITEM NO. 46. SECTION 271333 – COMMUNICATIONS COAXIAL BACKBONE CABLING
a. Delete section without replacement.

ITEM NO. 47. SECTION 271500 – COMMUNICATIONS HORIZONTAL CABLING
a. Delete section without replacement.

ITEM NO. 48. SECTION 271513 – COMMUNICATIONS COPPER HORIZONTAL CABLING
a. Delete section without replacement.

ITEM NO. 49. SECTION 271533 – COMMUNICATIONS COAXIAL HORIZONTAL CABLING
a. Delete section without replacement.

ITEM NO. 50. SECTION 284621.11 – ADDRESSABLE FIRE-ALARM SYSTEMS

a. Replace section in its entirety with attached.

ITEM NO. 51. SECTION 333245 – HORIZONTAL SHAFT COMMUNITER

a. ADD SECTION 333245 IN ITS ENTIRETY.

DRAWINGS – VOLUME I

ITEM NO. 52. DRAWING SD- 201-D SITE LAYOUT PLAN – AREA D

a. Remove Drawing SD-201-D and replace with SD-201-D dated 9/12/19. General changes include additional utility pads for comminutor and electrical load bank.

ITEM NO. 53. DRAWING SD- 205 SITE IMPROVEMENTS COORDINATE SCHEDULE

a. Remove Drawing SD-205 and replace with SD-205 dated 9/12/19. General changes include updated and new coordinates for added utility pads.

ITEM NO. 54. DRAWING SD- 401 OVERALL SITE UTILITY PLAN

a. Remove Drawing SD-401 and replace with SD-401 dated 9/12/19. General changes include updated water main vault location and updated water main location.

ITEM NO. 55. DRAWING SD- 401-A –SITE UTILITY PLAN – AREA A

a. Remove Drawing SD-401-A and replace with SD-401-A dated 9/12/19. General changes includes updated water main vault location and updated water main location.

ITEM NO. 56. DRAWING SD- 401-C –SITE UTILITY PLAN – AREA C

a. Remove Drawing SD-401-C and replace with SD-401-C dated 9/12/19. General changes include updated water main vault location and updated water main location.

ITEM NO. 57. DRAWING SD- 401-D – SITE UTILITY PLAN – AREA D

a. Remove Drawing SD-401-D and replace with SD-401-D dated 9/12/19. General changes include updated water main vault location and updated water main location. The sanitary sewer has been updated, including relocation of the comminutor structure.

ITEM NO. 58. DRAWING SD- 402 - ON-SITE SANITARY SEWER PROFILES

a. Remove Drawing SD-402 and replace with SD-402 dated 9/12/19. General changes include updated sanitary sewer profiles.

ITEM NO. 59. DRAWING SD- 501 OVERALL PLANTING PLAN

a. Remove Drawing SD-501 and replace with SD-501 dated 9/12/19. General changes include updated seeding quantities and seeding hatch.

ITEM NO. 60. DRAWING SD- 600 PLAN AND PROFILE

a. Remove Drawing SD-600 and replace with SD-600 dated 9/12/19. General changes include updated water main location.

ITEM NO. 61. DRAWING SD- 601 PLAN AND PROFILE

a. Remove Drawing SD-601 and replace with SD-601 dated 9/12/19. General changes include updated water main location.

ITEM NO. 62. DRAWING SD- 602 PLAN AND PROFILE

a. Remove Drawing SD-602 and replace with SD-602 dated 9/12/19. General changes include updated water main location.

ITEM NO. 63. DRAWING SD- 603 PLAN AND PROFILE

a. Remove Drawing SD-602 and replace with SD-602 dated 9/12/19. General changes include updated water main location.

ITEM NO. 64. DRAWING SD- 806 – SITE DETAILS - 6

a. Remove Drawing SD-806 and replace with SD-806 dated 9/12/19. General changes include updated water main details.

ITEM NO. 65. DRAWING S-001 –GENERAL NOTES AND ABBREVIATIONS

a. Remove sheet S-001 and replace with S-001 dated 9/12/19. General changes include updated formatting and references and are clouded.

ITEM NO. 66. DRAWING S-101 – FOUNDATION PLAN - OVERALL

a. Remove sheet S-101 and replace with S-101 dated 9/12/19. General changes include updated limits of security wall reinforcing.

ITEM NO. 67. DRAWING S-101-A – FOUNDATION PLAN – AREA A

a. Remove sheet S-101-A and replace with S-101-A dated 9/12/19. Changes are individually clouded.

ITEM NO. 68. DRAWING S-101-B- FOUNDATION PLAN – AREA B

a. Remove sheet S-101-B and replace with S-101-B dated 9/12/19. General changes include removing FD tag at detention toilets and clarifying recess under showers and required floor drains at showers. Other changes are individually clouded.

ITEM NO. 69. DRAWING S-101-C – FOUNDATION PLAN – AREA C

a. Remove sheet S-101-C and replace with S-101-C dated 9/12/19. General changes include clarifying recess under showers and required floor drains at showers. Other changes are individually clouded.

ITEM NO. 70. DRAWING S-101-D – FOUNDATION PLAN – AREA D

a. Remove sheet S-101-D and replace with S-101-D dated 9/12/19. General changes include clarifying recess under showers and required floor drains at showers. Other changes are individually clouded.

ITEM NO. 71. DRAWING S-101-E – FOUNDATION PLAN - AREA E

a. Remove sheet S-101-E and replace with S-101-E dated 9/12/19. General changes include clarifying recess under showers and required floor drains at showers. Other changes are individually clouded.

ITEM NO. 72. DRAWING S-102 – MEZZANINE FLLOR AND ROOF FRAMING PLANS – AREA BC

a. Remove sheet S-102 and replace with S-102 dated 9/12/19. Changes are individually clouded.

ITEM NO. 73. DRAWING S-103-B ROOF FRAMING PLAN – AREA B

a. Remove sheet S-103-B and replace with S-103-B dated 9/12/19. Changes are individually clouded and clarify joist spacing adjacent to vestibule and mechanical mezzanine.

ITEM NO. 74. DRAWIN S-103-C ROOF FRAMING PLAN – AREA C

a. Remove sheet S-103-C and replace with S-103-C dated 9/12/19. Changes are individually clouded and clarify joist spacing adjacent to mechanical mezzanine.

ITEM NO. 75. DRAWING S-531 – TYPICAL FOUNDATION DETAILS AND SECTIONS – 2

a. Remove sheet S-531 and replace with S-531 dated 9/12/19. Changes are individually clouded.

DRAWINGS – VOLUME 2

ITEM NO. 76. DRAWING A-070 - FIRST FLOOR - SECURITY WALL PLAN

a. Updated Security Legend

ITEM NO. 77. DRAWING A-071 - MEZZANINE - SECURITY WALL PLAN

a. Updated Security Legend

ITEM NO. 78. A-101-A – FIRST AND MEZZANINE FLOOR PLANS – AREA A

PLAN 3 - ALTERNATE - FIRST FLOOR PLAN – AREA A

1. Sectional Door A1000C. Change door Number from “A1000C” to “1000E” to match Base Bid.
2. Sectional Door A1000E. Change door Number from “A1000E” to “1000G” to match Base Bid.
3. Sectional Door A1000F. Change door Number from “A1000F" to “1000K” to match Base Bid.
4. Vehicle Sallyport A1000. Add Door Number “A1000F” to man door.
5. Swing Door A1000G. Change door Number from “A1000G” to “1000L”.
6. Storage A1001. Add Door Number A1001 to man door.
7. Evidence Storage A1002. Add Door Number A1002 to man door.
8. Vehicle Evidence Storage A1003. Add Door Number A1003A to man door.

ITEM NO. 79. DRAWINGS A-101-C - FIRST FLOOR PLAN - AREA C

a. Corrected door number C1053A

ITEM NO. 80. DRAWINGS A-101-D - FIRST FLOOR PLAN - AREA d

a. Corrected door frame for door D1012A

ITEM NO. 81. DRAWING A-335 – WALL SECTIONS

a. Section 4. Lower masonry lintel and DHM frame head from 108’-0” to 107’-4”.

ITEM NO. 82. DRAWING A-601 – DOOR AND FRAME SCHEDULE - AREAS A, B, & C

DOOR AND FRAME SCHEDULE COMMENTS:

1. Note 3. Change “SECTIONAL DOOR” to read “OVERHEAD COILING DOOR”.
2. Note 11. Change “ALTERNATE NO. #4” to read “DOORS DELETED UNDER ALTERNATE NO. #4”.

DOOR AND FRAME SCHEDULE – AREAS A, B & C

1. Opening A1000B
    a. HDWR Set. Delete “BH-59” and substitute “- - -”.
2. Opening A1000C
    a. HDWR Set. Delete “BH-59” and substitute “- - -”.
3. Opening A1000DHDWR Set. Delete “BH-59” and substitute “- - -”.
    a. Opening A1000E
4. HDWR Set. Delete “BH-59” and substitute “- - -”.
    a. Comments. Delete “11”.
5. Opening A1000G

a. HDWR Set. Delete “BH-59” and substitute “- - -”.
b. Comments. Delete “11”.

6. Opening A1000H
    a. HDWR Set. Delete “BH-59” and substitute “- - -”.
7. Opening A1000J
    a. HDWR Set. Delete “BH-59” and substitute “- - -”.
8. Opening A1000K
    a. HDWR Set. Delete “BH-59” and substitute “- - -”.
9. Opening A1003B
    a. HDWR Set. Delete “BH-59” and substitute “- - -”.
10. Opening A2001
    a. Door Type. Delete “B” and substitute “A”.
11. Opening B1004
    a. HDWR Set. Delete “BH-02” and substitute “BH-26”.
12. Opening B1005
    a. HDWR Set. Delete “BH-02A” and substitute “BH-31”.
13. Opening B1006
    a. HDWR Set. Delete “BH-02A” and substitute “BH-31”.
14. Opening B1010
    a. HDWR Set. Delete “BH-02A” and substitute “BH-31”.
15. Opening B1011
    a. HDWR Set. Delete “BH-02” and substitute “BH-26”.
16. Opening B1012
    a. HDWR Set. Delete “BH-02” and substitute “BH-26”.
17. Opening B1013
    a. HDWR Set. Delete “BH-02” and substitute “BH-26”.
18. Opening B1048A
    a. Door Glazing. Add “LP-3”.
19. Opening B1059
    a. Door Glazing. Add “LP-3”.
20. Opening B1124.
    a. HDWR Set. Delete “BH-17” and substitute “BH-31”.
21. Opening B2000B
    a. Frame Mat’l. Add “HM-G”
22. Opening C1036A
    a. Frame Glazing. Delete “IG-1” and substitute “LG-1”.
23. Opening C1052A
    a. HDWR Set. Delete “BH-34" and substitute “S-09”.
    b. Comments. Add “7”.
24. Opening C1052B
    a. HDWR Set. Delete “BH-59” and substitute “- - -”.
25. Opening C1053A
    a. HDWR Set. Add “BH-51”.
26. Opening C1070A
    a. HDWR Set. Delete “BH-16” and substitute “BH-29”.
27. Opening C1070B
    a. HDWR Set. Delete “BH-17” and substitute “BH-31”.

28. Opening C1071A
    a. HDWR Set. Delete “BH-16” and substitute “BH-29”.
29. Opening C1071B
    a. HDWR Set. Delete “BH-17” and substitute “BH-31”.

ITEM NO. 83. DRAWING A-602 – DOOR AND FRAME SCHEDULE - AREAS D & E

DOOR AND FRAME SCHEDULE COMMENTS:

1. Note 3. Change “SECTIONAL DOOR” to read “OVERHEAD COILING DOOR”.
2. Note 11. Change “ALTERNATE NO. #4” to read “DOORS DELETED UNDER ALTERNATE NO. #4”.

DOOR AND FRAME SCHEDULE – AREAS D & E

1. Opening D10001
    a. Fire Rating. Add “- - -”.
2. Opening D10002
    a. Fire Rating. Add “- - -”.
3. Opening D1002A
    a. Comments. Delete “7, 10” and substitute "7, 8”.
4. Opening D1002B
    a. Comments. Delete “7, 11” and substitute "7, 8”.
5. Opening D1005D
    a. HDWR Set. Delete “BH-59” and substitute “- - -”.
6. Opening D1012A
    a. Frame Type. Delete “F-3” and substitute “F-2”.
    b. HDWR Set. Delete “S-02C” and substitute “S--07”.
7. Opening D1016A
    a. Comments. Add “7”.
8. Opening D1060A
    a. Comments. Add “7”.
9. Opening D1070A
    a. Fire Rating. Add “45”.
    b. Comments. Add “7”.
10. Opening D1080A
    a. Fire Rating. Add “45”.
    b. Comments. Add “7”.
11. Opening E1002A
    a. Comments. Delete “7, 10” and substitute “7, 8”.
12. Opening E1002B
    a. Comments. Delete “7, 11” and substitute “7, 8”.
13. Opening 1009D
    a. HDWR Set. Delete “BH-59” and substitute “- - -”.
14. Opening 1013
    a. Frame Glazing. Add “- - -”.
15. Opening E1050A
    a. Door Glazing. Add “GCP-2MF”.
    b. Frame Type. Add “F-17A”
    c. Frame Glazing. Add “GCP-2MF”.
    d. Fire Rating. Add “45”.
    e. HDWR Set. Add “S-04A”.
    f. Comments. Add “7”.
16. Opening E1060A

a. Door Glazing. Add “GCP-2MF”.
b. Frame Glazing. Add “GCP-2MF”.
c. Comments. Add “7”.

17. Opening E1070A
a. Door Glazing. Add “GCP-2MF”.
b. Frame Glazing. Add “GCP-2MF”.
c. Comments. Add “7”.

ITEM NO. 84. DRAWING A-603 – FRAME SCHEDULES
DOOR AND FRAME SCHEDULE COMMENTS:
1. Note 3. Change “SECTIONAL DOOR” to read “OVERHEAD COILING DOOR”.
2. Note 11. Change “ALTERNATE NO. #4” to read “DOORS DELETED UNDER ALTERNATE NO. #4”.

ITEM NO. 85. DRAWING A-605 – DOOR & WINDOW TYPES
BORROWED LITE ELEVATIONS
1. Borrowed Lite Elevations BL-1C and BL-1D. Delete 5’-4” frame height and substitute 4’-8” frame height. Top of frame to be 7’-4” AFF.

ITEM NO. 86. DRAWING A-801-D - FIRST FLOOR REFLECTED CEILING PLAN - AREA D
a. Changed ceiling type in room D1005B.

ITEM NO. 87. DRAWING A-801-E - FIRST FLOOR REFLECTED CEILING PLAN - AREA E
a. Changed ceiling type in room E1009B.

ITEM NO. 88. DRAWING A-802-D - SECOND FLOOR REFLECTED CEILING PLAN - AREA D
a. Changed ceilings in rooms D1001A, D1001B, D1002A, AND D1002B.

ITEM NO. 89. DRAWING A-802-E - SECOND FLOOR REFLECTED CEILING PLAN - AREA E
a. Changed ceilings in rooms E1001A, E1001B, E1002A, AND E1002B.

DRAWINGS – VOLUME 3

ITEM NO. 90. DRAWING M-102-D – MEZZANINE DUCTWORK PLAN – AREA D
a. Provide note 233303 for one (1) smoke damper. See attached for revised drawing.

ITEM NO. 91. DRAWING M-102-E – MEZZANINE DUCTWORK PLAN – AREA E
a. Provide note 233303 for three (3) smoke dampers. See attached for revised drawing.

ITEM NO. 92. DRAWING P-101-B – FIRST FLOOR PLUMBING PLAN – AREA B
a. The 4” sanitary pipe drop and associated trap primer pipe from B2000 Mechanical shifted south. See attached for revised drawing.

ITEM NO. 93. DRAWING P-102-BC – MECHANICAL MEZZANINE PLUMBING PLAN – AREA B & C
a. FS-1 in B2000 Mechanical shifted south. See attached for revised drawing.

DRAWINGS – VOLUME 4

ITEM NO. 94. DRAWING E-101 – ELECTRICAL SITE PLAN (NORTH)
a. Replace drawing in its entirety with attached.

ITEM NO. 95. DRAWING E-102 – ELECTRICAL SITE PLAN (SOUTH)
a. Replace drawing in its entirety with attached.

ITEM NO. 96. DRAWING E-201-B – FIRST FLOOR POWER PLAN – AREA B
a. Replace drawing in its entirety with attached.

ITEM NO. 97. DRAWING E-201-C – FIRST FLOOR POWER PLAN – AREA C
a. Replace drawing in its entirety with attached.

ITEM NO. 98. DRAWING E-201-D – FIRST FLOOR POWER PLAN – AREA D
a. Replace drawing in its entirety with attached.

ITEM NO. 99. DRAWING E-201-E – FIRST FLOOR POWER PLAN – AREA E
a. Replace drawing in its entirety with attached.

ITEM NO. 100. DRAWING E-201-K – ENLARGED KITCHEN PLAN – ELECTRICAL
a. Replace drawing in its entirety with attached.

ITEM NO. 101. DRAWING E-301 – OVERALL FIRST FLOOR LIGHTING PLAN
a. Replace drawing in its entirety with attached.

ITEM NO. 102. DRAWING E-301-A – FIRST FLOOR AND MEZZANINE LIGHTING PLANS – AREA A
a. Replace drawing in its entirety with attached.

ITEM NO. 103. DRAWING E-301-B – FIRST FLOOR LIGHTING PLAN – AREA B
a. Replace drawing in its entirety with attached.

ITEM NO. 104. DRAWING E-301-C – FIRST FLOOR LIGHTING PLAN – AREA C
a. Replace drawing in its entirety with attached.

ITEM NO. 105. DRAWING E-301-D – FIRST FLOOR AND LOWER LEVEL LIGHTING PLANS – AREA D
a. Replace drawing in its entirety with attached.

ITEM NO. 106. DRAWING E-301-E – FIRST FLOOR AND LOWER LEVEL LIGHTING PLANS – AREA E
a. Replace drawing in its entirety with attached.

ITEM NO. 107. DRAWING E-302 – MEZZANINE LIGHTING PLAN - OVERALL
a. Replace drawing in its entirety with attached.

ITEM NO. 108. DRAWING E-302-D – MEZZANINE LIGHTING PLAN – AREA D
a. Replace drawing in its entirety with attached.

ITEM NO. 109. DRAWING E-302-E – MEZZANINE LIGHTING PLAN – AREA E
a. Replace drawing in its entirety with attached.

ITEM NO. 110. DRAWING E-401-B – FIRST FLOOR SYSTEMS PLAN – AREA B
a. Replace drawing in its entirety with attached.

ITEM NO. 111. DRAWING E-401-C – FIRST FLOOR SYSTEMS PLAN – AREA C
a. Replace drawing in its entirety with attached.

ITEM NO. 112. DRAWING E-401-D – FIRST FLOOR AND LOWER LEVEL SYSTEMS PLANS – AREA D
a. Replace drawing in its entirety with attached.

ITEM NO. 113. DRAWING E-401-E – FIRST FLOOR AND LOWER LEVEL SYSTEMS PLANS – AREA E
a. Replace drawing in its entirety with attached.

ITEM NO. 114. DRAWING E-402-D – MEZZANINE SYSTEMS PLAN – AREA D
a. Replace drawing in its entirety with attached.

ITEM NO. 115. DRAWING E-402-E – MEZZANINE SYSTEMS PLAN – AREA E
a. Replace drawing in its entirety with attached.

ITEM NO. 116. DRAWING E-501 – FIRST FLOOR CABLE TRAY PLAN - OVERALL
a. ADD attached drawing in its entirety.

ITEM NO. 117. DRAWING E-502 – MEZZANINE CABLE TRAY PLAN - OVERALL
a. ADD attached drawing in its entirety.

ITEM NO. 118. DRAWING E-601 – ONE-LINE DIAGRAM
a. Replace drawing in its entirety with attached.

ITEM NO. 119. DRAWING E-606 – LIGHT FIXTURE SCHEDULES
a. Replace drawing in its entirety with attached.

ITEM NO. 120. DRAWING E-701 – PANELBOARD SCHEDULES
a. Replace drawing in its entirety with attached.

ITEM NO. 121. DRAWING E-702 – PANELBOARD SCHEDULES
a. Replace drawing in its entirety with attached.

ITEM NO. 122. DRAWING E-703 – PANELBOARD SCHEDULES
a. Replace drawing in its entirety with attached.

ITEM NO. 123. DRAWING E-704 – PANELBOARD SCHEDULES
a. Replace drawing in its entirety with attached.

ITEM NO. 124. DRAWING E-705 – PANELBOARD SCHEDULES
a. Replace drawing in its entirety with attached.

ITEM NO. 125. DRAWING E-706 – PANELBOARD SCHEDULES
a. Replace drawing in its entirety with attached.

ITEM NO. 126. DRAWING E-707 – PANELBOARD SCHEDULES
a. Replace drawing in its entirety with attached.

ITEM NO. 127. DRAWING E-801 – ELECTRICAL DETAILS
a. Replace drawing in its entirety with attached.

ITEM NO. 128. DRAWING E-802 – ELECTRICAL DETAILS
a. Replace drawing in its entirety with attached.

ITEM NO. 129. DRAWING E-806 – ELECTRICAL DETAILS

a. Replace drawing in its entirety with attached.

ITEM NO. 130. DRAWING E-807 – ELECTRICAL DETAILS

a. Replace drawing in its entirety with attached.

ATTACHMENTS:

PROJECT MANUAL – VOLUME 1

Not Used

PROJECT MANUAL – VOLUME 2

1. SECTION 087100 – DOOR HARDWARE

PROJECT MANUAL – VOLUME 3

Not used

PROJECT MANUAL – VOLUME 4

1. SECTION 260519 – LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
2. SECTION 260526 – GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
3. SECTION 260529 – HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS
4. SECTION 260533 – RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS
5. SECTION 260544 – SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING
6. SECTION 260548.16 – SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS
7. SECTION 260553 – IDENTIFICATION FOR ELECTRICAL SYSTEMS
8. SECTION 260573.13 – SHORT-CIRCUIT STUDIES
9. SECTION 260573.16 – COORDINATION STUDIES
10. SECTION 260573.19 – ARC-FLACH HAZARD ANALYSIS
11. SECTION 260923 – LIGHTING CONTROL DEVICES
12. SECTION 262213 – LOW-VOLTAGE DISTRIBUTION TRANSFORMERS
13. SECTION 262313 – PARALLELING LOW-VOLTAGE SWITCHGEAR
14. SECTION 262413 – SWITCHBOARDS
15. SECTION 262416 – PANELBOARDS
16. SECTION 262500 – ENLCOSED BUS ASSEMBLIES
17. SECTION 262726 – WIRING DEVICES
18. SECTION 262813 – FUSES
19. SECTION 262816 – ENCLOSED SWITCHES AND CIRCUIT BREAKERS
20. SECTION 262913.03 – MANUAL AND MAGNETIC MOTOR CONTROLLERS
21. SECTION 262923 – VARIBALE-FREQUENCY MOTOR CONTROLLERS
22. SECTION 263213 – ENGINE GENERATORS
23. SECTION 263214 – STATIONARY LOAD BANK WITH LOAD LEVELING CONTROL
24. SECTION 263353 – STATIC UNINTERRUPTIBLE POWER SUPPLY
25. SECTION 263600 – TRANSFER SWITCHES
26. SECTION 264313 – SURGE PROTECTION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS
27. SECTION 265119 – LED INTERIOR LIGHTING
28. SECTION 265613 – LIGHTING POLES AND STANDARDS
29. SECTION 265619 – LED EXTERIOR LIGHTING
30. SECTION 270526 – GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS
31. SECTION 270528 – PATHWAYS FOR COMMUNICATIONS SYSTEMS
32. SECTION 270529 – HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS
33. SECTION 270536 – CABLE TRAYS FOR COMMUNICATIONS SYSTEMS
34. SECTION 270544 – SLEEVES AND SLEEVE SEALS FOR COMMUNICATIONS PATHWAYS AND CABLING

35. SECTION 270548.16 – SEISMIC CONTROLS FOR COMMUNICATIONS SYSTEMS
36. SECTION 270553 – IDENTIFICATION FOR COMMUNICATIONS SYSTEMS
37. SECTION 271100 – COMMUNICATIONS EQUIPMENT ROOM FITTINGS
38. SECTION 271116 – COMMUNICATIONS RACKS, FRAMES AND ENCLOSURES
39. SECTION 271300- COMMUNICATIONS BACKBONE CABLING
40. SECTION 271500 – COMMUNICATIONS HORIZONTAL CABLING
41. SECTION 274133 – MATER ANTENNA TELEVISION SYSTEMS
42. SECTION 284621.11 – ADDRESSABLE FIRE-ALARM SYSTEMS
43. SECTION 281300 – ACCESS CONTROL SYSTEM
44. SECTION 282300 – VIDEO COMMUNICATION SYSTEM

DRAWINGS – VOLUME 1

SD-201-D	SITE LAYOUT PLAN – AREA D
SD-205	SITE IMPROVEMENTS COORDINATE SCHEDULE
SD-401	OVERALL SITE UTILITY PLAN
SD-401-A	SITE UTILITY PLAN – AREA A
SD-401-C	SITE UTILITY PLAN – AREA C
SD-401-D	SITE UTILITY PLAN – AREA D
SD-402	ON-SITE SANITARY SEWER PROFILES
SD-501	OVERALL PLANTING PLAN
SD- 600	PLAN AND PROFILE
SD-601	PLAN AND PROFILE
SD-602	PLAN AND PROFILE
SD-603	PLAN AND PROFILE
SD-806	SITE DETAILS -6
S-001	GENERAL NOTES AND ABBREVIATIONS
S-101	FOUNDATION PLAN - OVERALL
S-101-A	FOUNDATION PLAN – AREA A
S-101-B	FOUNDATION PLAN – AREA B
S-101-C	FOUNDATION PLAN – AREA C-
S-101-D	FOUNDATION PLAN – AREA D
S-101-E	FOUNDATION PLAN – AREA E
S-102	MEZZANINE FLLOR AND ROOF FRAMING PLANS – AREA BC
S-103-B	ROOF FRAMING PLAN – AREA B
S-103-C	ROOF FRAMING PLAN – AREA C
S-531	TYPICAL FOUNDATION DETAILS AND SECTIONS – 2

DRAWINGS – VOLUME 2

A-070	FIRST FLOOR - SECURITY WALL PLAN
A-071	MEZZANINE - SECURITY WALL PLAN
A-101-A	FIRST AND MEZZANINE FLOOR PLANS – AREA A
A-101-C	FIRST FLOOR PLAN – AREA C
A-101-D	FIRST FLOOR PLAN – AREA D
A-335	WALL SECTIONS
A-601	DOOR AND FRAME SCHEDULE – AREAS A, B, & C
A-602	DOOR AND FRAME SCHEDULE – AREAS D & E
A-603	FRAME SCHEDULES
A-605	DOOR & WINDOW TYPES
A-801-D	FIRST FLOOR REFLECTED CEILING PLAN - AREA D
A-801-E	FIRST FLOOR REFLECTED CEILING PLAN - AREA E

A-801-D SECOND FLOOR REFLECTED CEILING PLAN - AREA D
A-802-D SECOND FLOOR REFLECTED CEILING PLAN - AREA D
A-802-E SECOND FLOOR REFLECTED CEILING PLAN - AREA E

DRAWINGS – VOLUME 3

M-102-D MEZZANINE DUCTWORK PLAN – AREA D
M-102-E MEZZANINE DUCTWORK PLAN – AREA F
P-101-B FIRST FLOOR PLUMBING PLAN – AREA B
P-102-BC MECHANICAL MEZZANINE PLUMBING PLAN – AREA B & C

DRAWINGS – VOLUME

E-101 – ELECTRICAL SITE PLAN (NORTH)
E-102 – ELECTRICAL SITE PLAN (SOUTH)
E-201-B – FIRST FLOOR POWER PLAN – AREA B
E-201-C – FIRST FLOOR POWER PLAN – AREA C
E-201-D – FIRST FLOOR POWER PLAN – AREA D
E-201-E – FIRST FLOOR POWER PLAN – AREA E
E-201-K – ENLARGED KITCHEN PLAN – ELECTRICAL
E-301 – OVERALL FIRST FLOOR LIGHTING PLAN
E-301-A – FIRST FLOOR AND MEZZANINE LIGHTING PLANS – AREA A
E-301-B – FIRST FLOOR LIGHTING PLAN – AREA B
E-301-C – FIRST FLOOR LIGHTING PLAN – AREA C
E-301-D – FIRST FLOOR AND LOWER LEVEL LIGHTING PLANS – AREA D
E-301-E – FIRST FLOOR AND LOWER LEVEL LIGHTING PLANS – AREA E
E-302 – MEZZANINE LIGHTING PLAN - OVERALL
E-302-D – MEZZANINE LIGHTING PLAN – AREA D
E-302-E – MEZZANINE LIGHTING PLAN – AREA E
E-401-B – FIRST FLOOR SYSTEMS PLAN – AREA B
E-401-C – FIRST FLOOR SYSTEMS PLAN – AREA C
E-401-D – FIRST FLOOR AND LOWER LEVEL SYSTEMS PLANS – AREA D
E-401-E – FIRST FLOOR AND LOWER LEVEL SYSTEMS PLANS – AREA E
E-402-D – MEZZANINE SYSTEMS PLAN – AREA D
E-402-E – MEZZANINE SYSTEMS PLAN – AREA E
E-501 – FIRST FLOOR CABLE TRAY PLAN - OVERALL
E-502 – MEZZANINE CABLE TRAY PLAN - OVERALL
E-601 – ONE-LINE DIAGRAM
E-606 – LIGHT FIXTURE SCHEDULES
E-701 – PANELBOARD SCHEDULES
E-702 – PANELBOARD SCHEDULES
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E-706 – PANELBOARD SCHEDULES
E-707 – PANELBOARD SCHEDULES
E-801 – ELECTRICAL DETAILS
E-802 – ELECTRICAL DETAILS
E-806 – ELECTRICAL DETAILS
E-807 – ELECTRICAL DETAILS

END OF ADDENDUM NO. 01

MATCHLINE – AREA C
MATCHLINE – AREA D

MATCHLINE – AREA D
MATCHLINE – AREA B

VIGO COUNTY SECURITY CENTER

ADD LOAD BANK

ADD COMMINUTER PAD

EXISTING UTILITY EASEMENT

CONSTRUCTION LIMITS

MATCHLINE – AREA D
MATCHLINE – AREA G

SAN

SITE LAYOUT AND GEOMETRICS PLAN – AREA D
SCALE – 1" = 20'
SCALE IN FEET 20 0 10 20 40

GENERAL IMPROVEMENTS NOTES

A. UTILITIES SHOWN ARE APPROXIMATE. FIELD VERIFY PRIOR TO CONSTRUCTION.

B. DIMENSIONS ARE TAKEN FROM THE FACE OF CURBS, COORDINATES, WALLS, AND/OR BUILDINGS UNLESS OTHERWISE NOTED.

C. CONSTRUCTION LIMITS SHOWN ARE APPROXIMATE. ADJUSTMENTS TO THE LIMITS INCIDENTAL TO CONSTRUCTION ACTIVITIES MAY BE PERMITTED WITH THE APPROVAL OF THE ARCHITECT. CONTRACTOR SHALL FIELD MARK ANY PROPOSED CHANGES TO THE CONSTRUCTION LIMITS FOR ARCHITECT APPROVAL PRIOR TO BEGINNING CONSTRUCTION.

D. ALL AREAS DISTURBED, NOT BUILT, PAVED OR OTHERWISE COVERED BY CONSTRUCTION, SHALL BE SEEDED PER THE REQUIREMENTS OF SPEC. SECTION 329200. REFER TO SPECIFICATION SECTION 329300 FOR PLANTING/TOPSOIL MIX.

E. CONTRACTOR IS RESPONSIBLE FOR ALL NECESSARY TRAFFIC MAINTENANCE PLANS, PERMITS, AND COORDINATION WITH APPROPRIATE JURISDICTIONS REGARDING PUBLIC R.O.W. WORK.

F. CONCRETE JOINTING SHOWN TO IDENTIFY DESIGN INTENT. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS IDENTIFYING ALL EXPANSION, CONTROL & CONSTRUCTION JOINTS FOR ARCHITECTS APPROVAL PRIOR TO CONSTRUCTION.

G. RAISED PEDESTRIAN TABLE WITH RAMPED ENDS. SEE ALSO GRADING PLAN.

SITE IMPROVEMENT KEY

1	CONCRETE PAVEMENT, TYPE 1	3 02-801
2	CONCRETE PAVEMENT, TYPE 2	4 02-801
3	CONCRETE PAVERS	5 02-801
4	ASPHALT PAVEMENT, TYPE 1	1 02-801
5	ASPHALT PAVEMENT, TYPE 2	2 02-801
5A	ASPHALT PAVEMENT, TYPE 2 – ALTERNATE BID	2 02-801
6	CONCRETE CURB	8 02-801
7	CONCRETE CURB TAPER	9 02-801
8	STEEL LANDSCAPE EDGING	9 02-804
9	OUTDOOR WASTE RECEPTACLE	4 02-802
10	"SHUTTLE PARKING ONLY" SIGN	1 02-803
10A	"SHERIFF VEHICLE PARKING ONLY SIGN"	1 02-803
11	ACCESSIBLE PARKING PAVEMENT MARKING	2 02-803
12	LAWN/LANDSCAPE AREA	
13	CONCRETE PARKING BLOCK	10 02-801
14	PAVEMENT MARKING – 4"	
15	PAVEMENT MARKING HATCH – 4"@3' O.C., 45°	
16	PIPE BOLLARD	1 02-802
16A	PIPE BOLLARD – REFER TO ARCHITECTURAL	
17	CONCRETE MAINTENANCE STRIP	5 02-804
18	GROUND MOUNTED LOAD BANK – REFER TO ELECTRICAL	
19	CHAIN LINK PEDESTRIAN GATE – ALTERNATE BID	10 02-803
20	CHAIN LINK SECURITY FENCE – ALTERNATE BID	9 02-803
21	PARALLEL ADA RAMP	8 02-802
22	LOUVERED SCREEN PANEL SYSTEM – ALTERNATE BID	5 02-803
23	SECURITY BOLLARD	2 02-801
24	DUMPSTER – BY OWNER	
25	MULCHED PLANTING BED	1 02-804
26	CONCRETE MOW STRIP – ALTERNATE BID	6 02-804
27	COVERED SMOKING SHELTER	6 02-802
28	FLAGPOLE	7 02-803
29	YIELD SIGN	2 02-803
30	AUTHORIZED VEHICLES ONLY SIGN	1 02-803
31	MONUMENT SIGN	3 02-803
32	DIRECTIONAL SIGNAGE (LOCATION 1)	5 02-803
32A	DIRECTIONAL SIGNAGE (LOCATION 2)	5 02-803
33	OUTDOOR TABLE ENSEMBLE	3 02-802
34	BARRIER ARM GATE AND OPERATOR BOLLARD	1 02-804
35	SALLYPORT CONTROL BOLLARD – REFER TO ELECTRICAL AND SECURITY	
36	MASONRY WALL	7 02-803
37	MASONRY SEATWALL	8 02-803
38	OUTDOOR BENCH	2 02-802
39	GRASS PAVING	7 02-804
40	PAD MOUNTED HVAC EQUIPMENT – REFER TO MECHANICAL	
41	PAD MOUNTED TRANSFORMER – REFER TO ELECTRICAL	
42	PAD MOUNTED GENERATOR – REFER TO ELECTRICAL	
43	AGGREGATE SURFACE	11 02-801
44	SIGN, "DROP-OFF ZONE NO PARKING"	11 02-803
45	OUTDOOR WASTE RECEPTACLE	1 02-802
46	PERPENDICULAR CURB RAMP	6 02-803
47	CONCRETE CURB TURNOUT	10 02-804
48	DELINEATOR STAKE	1 02-802
49	"RESERVED PARKING" SIGN	12 02-801
49A	"RESERVED PARKING" SIGN "VAN ACCESSIBLE"	1 02-803
52	BARRIER ARM GATE	3 02-803
51	SECURITY INTERFACE CONTROL EQUIPMENT – REFER TO SECURITY	
52	SITE LIGHTING – REFER TO ELECTRICAL	
53	COMMINUTER PAD – SEE SHEET SD-401-D	
#	IMPROVEMENT COORDINATE. SEE SD-204 AND SD-205 FOR SCHEDULE.	

Indiana 811 Know what's below. Call before you dig.

KEYPLAN

NORTH

F
E
A C
B D

DLZ
ARCHITECTURE • ENGINEERING • PLANNING
SURVEYING • CONSTRUCTION SERVICES
DLZ INDIANA, LLC

JEFFREY K. HIGGY — REGISTERED — LANDSCAPE ARCHITECT — STATE OF INDIANA — 9-12-19

NO.	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: JTF CHK'D: CGH
DESIGNED: JKH
APPRV'D: JKH
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

SITE LAYOUT PLAN - AREA D

DRAWING NUMBER SD-201-D

SITE DEVELOPMENT

IMPROVEMENT COORDINATE SCHEDULE

KEY	NORTHING	EASTING	DESCRIPTION
412	1522198.556	2855596.303	CORNER – CURB
413	1522166.901	2855651.066	EDGE OF PAVEMENT – CCURB
414	1522081.679	2855646.013	END OF SEATWALL
415	1522178.227	2855657.699	END OF RADIUS – CURB
416	1522175.733	2855662.033	CENTER OF RADIUS – CURB
417	1522180.128	2855664.417	END OF RADIUS – CURB
418	1522170.558	2855681.048	END OF RADIUS – CURB
419	1522162.757	2855676.560	CENTER OF RADIUS – CURB
420	1522157.132	2855683.585	END OF RADIUS – CURB
421	1522188.382	2855644.554	CENTER OF RADIUS – CURB
422	1522145.035	2855619.634	END OF RADIUS – CURB
423	1522131.594	2855594.857	EDGE OF SPEED TABLE
424	1522147.489	2855706.228	END OF RADIUS – ASPHALT 1
425	1522124.228	2855607.672	END OF RADIUS – CURB
426	1522071.288	2855590.696	END OF OUTDOOR BENCH
427	1522070.738	2855592.209	EDGE OF PAVEMENT – CONCRETE 1
430	1522117.624	2855585.587	CENTER OF END SECURITY BOLLARD – SECURITY
431	1522122.567	2855589.571	EDGE OF PAVEMENT – CONCRETE
432	1522116.825	2855589.531	EDGE OF PAVEMENT – CONCRETE
433	1522080.738	2855592.278	EDGE OF PAVEMENT – CONCRETE 1
434	1522070.759	2855589.209	EDGE OF PAVEMENT – CONCRETE 1
435	1522067.063	2855589.183	EDGE OF PAVEMENT – CONCRETE 1
436	1522083.656	2855657.350	EDGE OF LANDSCAPE EDGING
438	1522178.944	2855852.957	CENTER OF SIGN
440	1521928.971	2855749.299	CENTER OF BOLLARD
441	1521915.820	2855319.094	CENTER OF BOLLARD
442	1521918.790	2855319.110	CENTER OF BOLLARD
443	1521924.295	2855320.143	EDGE OF PAVEMENT – CONCRETE
444	1521916.297	2855320.146	END OF RADIUS – CURB
445	1521916.294	2855310.147	CENTER OF RADIUS – CURB
446	1521914.294	2855310.149	END OF RADIUS – CURB
447	1521916.291	2855308.147	END OF RADIUS – CURB
448	1521926.292	2855318.141	END OF RADIUS – CURB
449	1521926.292	2855310.142	END OF RADIUS – CURB
450	1521924.289	2855308.142	END OF RADIUS – CURB
451	1521915.852	2855339.098	CENTER OF BOLLARD
452	1521918.822	2855339.114	CENTER OF BOLLARD
453	1521917.327	2855339.319	CENTER OF SALLYPORT CONTROL
454	1521916.328	2855340.150	END OF RADIUS – CURB
455	1521916.326	2855338.150	CENTER OF RADIUS – CURB
456	1521914.323	2855334.153	END OF RADIUS – CURB
457	1521916.320	2855332.150	END OF RADIUS – CURB
458	1521926.326	2855338.136	END OF RADIUS – CURB
459	1521926.323	2855334.136	END OF RADIUS – CURB
460	1521924.328	2855340.139	END OF RADIUS – CURB
461	1521915.878	2855359.098	CENTER OF BOLLARD
462	1521918.848	2855359.114	CENTER OF BOLLARD
463	1521917.339	2855359.319	CENTER OF SALLYPORT CONTROL
464	1521916.354	2855358.150	END OF RADIUS – CURB
465	1521924.352	2855358.139	CENTER OF RADIUS – CURB
466	1521916.350	2855352.182	END OF RADIUS – CURB
467	1521924.350	2855352.170	END OF RADIUS – CURB
468	1521926.352	2855358.136	END OF RADIUS – CURB
469	1521926.353	2855354.167	END OF RADIUS – CURB
470	1521924.354	2855360.139	END OF RADIUS – CURB
471	1521915.910	2855379.098	CENTER OF BOLLARD
472	1521984.455	2855849.695	CENTER – RECEPTACLE
473	1521917.385	2855379.318	CENTER OF SALLYPORT CONTROL
474	1521916.386	2855380.150	END OF RADIUS – CURB
475	1521916.383	2855378.150	CENTER OF RADIUS – CURB
476	1521914.378	2855378.153	END OF RADIUS – CURB
477	1521924.375	2855372.123	END OF RADIUS – CURB
478	1521926.383	2855378.136	END OF RADIUS – CURB
479	1521926.377	2855374.120	END OF RADIUS – CURB
480	1521924.386	2855380.139	END OF RADIUS – CURB
481	1521924.292	2855310.144	CENTER OF RADIUS – CURB
482	1521924.323	2855334.139	CENTER OF RADIUS – CURB
483	1521926.352	2855356.136	CENTER OF RADIUS – CURB
484	1521924.378	2855374.123	CENTER OF RADIUS – CURB
485	1522276.525	2855137.286	CENTER OF GATE CALL BOX
486	1522273.320	2855137.256	CENTER OF BOLLARD
487	1522267.369	2855139.209	CENTER OF SECURITY EQUIPMENT
488	1522267.701	2855141.197	CENTER OF BOLLARD
489	1522270.534	2855137.235	CENTER OF GATE MECHANISM
490	1522270.493	2855141.224	CENTER OF GATE MECHANISM
491	1521895.845	2855136.549	END – CENTERLINE OF FIRE LANE
492	1521804.805	2856012.282	END – CENTERLINE OF FIRE LANE
493	1522347.603	2855921.741	EDGE OF PAVEMENT, ASPHALT
494	1521869.251	2855163.572	END OF RADIUS – FIRE LANE ALT
495	1521854.251	2855163.567	CENTER OF RADIUS – FIRE LANE ALT
496	1521854.245	2855148.567	END OF RADIUS – FIRE LANE ALT
497	1522352.803	2855924.734	CENTER OF SECURITY GATE MOTOR
498	1522221.439	2855260.842	END OF SCREEN – ALT
499	1522044.340	2855492.215	CORNER – STEEL LANDSCAPE EDGING
500	1522062.213	2855492.189	CORNER – STEEL LANDSCAPE EDGING
501	1522042.860	2855506.218	CORNER – CONCRETE 1
502	1522067.051	2855547.102	EDGE OF PAVEMENT – CONCRETE 1
503	1522080.762	2855589.279	EDGE OF PAVEMENT – CONCRETE 1
504	1522090.357	2855563.148	EDGE OF PAVEMENT – CONCRETE 1
505	1522090.368	2855560.148	EDGE OF PAVEMENT – CONCRETE 1
506	1522100.371	2855560.218	EDGE OF PAVEMENT – CONCRETE 1
507	1522100.350	2855563.218	EDGE OF PAVEMENT – CONCRETE 1
508	1522109.529	2855563.282	EDGE OF PAVEMENT – CONCRETE 1
509	1522109.549	2855560.300	EDGE OF PAVEMENT – CONCRETE 1
510	1522119.371	2855560.351	EDGE OF PAVEMENT – CONCRETE 1
511	1522119.350	2855563.351	EDGE OF PAVEMENT – CONCRETE 1
512	1522396.080	2855790.338	END – CENTER OF SIGN
513	1522077.267	2855590.739	END OF OUTDOOR BENCH
514	1522093.825	2855561.644	END OF OUTDOOR BENCH

IMPROVEMENT COORDINATE SCHEDULE

KEY	NORTHING	EASTING	DESCRIPTION
515	1522099.803	2855561.687	END OF OUTDOOR BENCH
516	1522113.071	2855561.753	END OF OUTDOOR BENCH
517	1522119.049	2855561.795	END OF OUTDOOR BENCH
518	1522083.648	2855583.235	EDGE OF CONCRETE PAVERS
519	1522078.961	2855590.812	CENTER OF WASTE RECEPTACLE
520	1522091.954	2855561.632	CENTER OF WASTE RECEPTACLE
521	1522168.410	2855584.037	EDGE OF CONCRETE PAVERS
522	1522164.936	2855585.012	EDGE OF PAVEMENT – CONCRETE 1
523	1522161.501	2855590.989	END OF STEEL LANDSCAPE EDGING
524	1522185.234	2855591.154	CORNER – LANDSCAPE EDGING
525	1522152.404	2855606.818	EDGE OF SPEED TABLE
526	1522197.325	2855585.239	EDGE OF PAVEMENT – CONCRETE 1
527	1522401.282	2855793.329	END – CENTER OF SIGN
528	1521985.471	2855876.304	CENTER OF SIGN
529	1522357.449	2855906.639	CENTER OF GATE CALL BOX
530	1522355.848	2855909.419	CENTER OF BOLLARD
531	1522354.452	2855911.839	CENTER OF GATE MECHANISM
532	1522357.916	2855913.830	CENTER OF GATE MECHANISM
533	1522191.821	2855470.947	END OF RADIUS – CURB
534	1522169.811	2855509.286	END OF RADIUS – CURB
535	1522234.180	2855521.273	END – CURB
536	1522226.728	2855531.891	CENTER – SIGN POST
537	1522217.846	2855547.330	CENTER – SIGN POST
538	1521962.506	2855819.429	CORNER – CONCRETE UTILITY PAD
539	1521954.506	2855819.442	CORNER – CONCRETE UTILITY PAD
540	1521954.492	2855811.442	CORNER – CONCRETE UTILITY PAD
541	1521902.513	2855806.389	CORNER – CONCRETE UTILITY PAD
542	1521877.513	2855806.422	CORNER – CONCRETE UTILITY PAD
543	1521902.492	2855790.389	CORNER – CONCRETE UTILITY PAD
544	1522212.099	2855126.579	END OF RADIUS – ASPHALT 2
545	1522209.112	2855126.703	END OF RADIUS – ASPHALT 2
546	1522211.890	2855150.876	END OF RADIUS – ASPHALT 2
547	1522208.907	2855150.702	END OF RADIUS – ASPHALT 2/END OF CURB
548	1522329.145	2855252.146	END OF RADIUS – ASPHALT 2
549	1521893.160	2855215.157	END OF RADIUS – ASPHALT 2
550	1521898.155	2855220.162	END OF RADIUS – ASPHALT 2
551	1521898.107	2855270.162	END OF RADIUS – ASPHALT 2
552	1521893.101	2855275.162	END OF RADIUS – ASPHALT 2
553	1521898.160	2855215.162	CENTER OF RADIUS – ASPHALT 2
554	1521898.101	2855275.162	CENTER OF RADIUS – ASPHALT 2
555	1521913.155	2855220.178	CORNER – ASPHALT 2
556	1521913.101	2855270.180	CORNER – ASPHALT 2
557	1521869.207	2855280.148	EDGE OF PAVEMENT, ASPHALT 2
558	1521620.473	2855560.659	CORNER – CONCRETE MOW STRIP ALT
559	1521620.431	2855592.325	CORNER – CONCRETE MOW STRIP ALT
560	1521621.475	2855559.660	CORNER – CONCRETE MOW STRIP ALT
561	1521621.430	2855593.326	CORNER – CONCRETE MOW STRIP ALT
562	1521711.645	2855559.779	CORNER – CONCRETE MOW STRIP ALT
563	1521711.647	2855560.779	CORNER – CONCRETE MOW STRIP ALT
564	1521711.692	2855592.446	CORNER – CONCRETE MOW STRIP ALT
565	1521711.694	2855593.446	CORNER – CONCRETE MOW STRIP ALT
566	1521706.669	2855560.773	CORNER – CONCRETE STOOP
567	1521706.647	2855592.439	CORNER – CONCRETE STOOP
568	1521902.534	2855822.389	CORNER – CONCRETE UTILITY PAD
569	1521877.534	2855822.422	CORNER – CONCRETE UTILITY PAD
570	1521877.521	2855812.422	CORNER – CONCRETE UTILITY PAD
571	1521902.521	2855812.389	CORNER – CONCRETE UTILITY PAD
572	1521985.245	2855844.564	CORNER – SMOKING SHELTER
573	1522101.932	2855800.310	CORNER – CONCRETE 1
574	1522098.459	2855794.315	CORNER – CONCRETE 1
575	1522153.861	2855710.066	CORNER – CONCRETE 1
576	1522148.711	2855706.984	CORNER – CONCRETE 1
577	1522161.126	2855685.411	CORNER – CONCRETE 1
578	1522165.393	2855677.995	CORNER – CONCRETE 1
579	1522174.370	2855662.393	EDGE OF PAVEMENT – CONCRETE 1
580	1522158.296	2855652.980	CORNER – CONCRETE 1
581	1522150.814	2855715.361	CORNER – CONCRETE 1
582	1522145.717	2855712.188	CORNER – CONCRETE 1
583	1522021.312	2855414.999	CORNER – CONCRETE
584	1521924.292	2855318.143	CENTER OF RADIUS – CURB
585	1521916.294	2855318.146	CENTER OF RADIUS – CURB
586	1521914.294	2855318.148	END OF RADIUS – CURB
587	1521917.295	2855319.296	CENTER OF SALLY PORT CONTROL
588	1521924.320	2855332.139	END OF RADIUS – CURB
589	1521924.326	2855338.139	CENTER OF RADIUS – CURB
590	1521916.323	2855334.150	CENTER OF RADIUS – CURB
591	1521914.353	2855354.185	END OF RADIUS – CURB
592	1521914.352	2855358.153	END OF RADIUS – CURB
593	1521916.354	2855360.150	END OF RADIUS – CURB
594	1521924.353	2855354.170	CENTER OF RADIUS – CURB
595	1521916.353	2855354.182	CENTER OF RADIUS – CURB
596	1522115.887	2855590.830	END OF SEATWALL
597	1521918.879	2855379.114	CENTER OF BOLLARD
598	1521914.378	2855374.138	END OF RADIUS – CURB
599	1521916.375	2855372.135	END OF RADIUS – CURB
600	1521916.378	2855374.135	CENTER OF RADIUS – CURB
601	1521924.383	2855378.139	CENTER OF RADIUS – CURB
602	1521855.915	2855397.401	EDGE OF CONCRETE STOOP
603	1521855.915	2855402.401	EDGE OF CONCRETE STOOP
605	1522093.801	2855590.816	END OF OUTDOOR BENCH
606	1522099.779	2855590.858	END OF OUTDOOR BENCH
607	1522100.143	2855592.365	EDGE OF PAVEMENT – CONCRETE 1
608	1522100.163	2855589.414	EDGE OF PAVEMENT – CONCRETE 1
609	1522090.153	2855592.365	EDGE OF PAVEMENT – CONCRETE 1
610	1522090.174	2855589.344	EDGE OF PAVEMENT – CONCRETE 1
611	1522128.309	2855569.527	EDGE OF CONCRETE PAVERS
612	1522143.168	2855569.651	EDGE OF CONCRETE PAVERS
613	1522135.147	2855583.566	EDGE OF CONCRETE PAVERS
614	1522120.303	2855583.472	EDGE OF CONCRETE PAVERS

IMPROVEMENT COORDINATE SCHEDULE

KEY	NORTHING	EASTING	DESCRIPTION
615	1522206.065	2855570.071	EDGE OF CONCRETE PAVERS
616	1522198.030	2855584.015	EDGE OF CONCRETE PAVERS
617	1522213.611	2855570.124	EDGE OF CONCRETE PAVERS
618	1522205.578	2855584.068	EDGE OF CONCRETE PAVERS
619	1522137.935	2855583.824	EDGE OF PAVEMENT – CONCRETE 1
620	1522146.211	2855569.424	EDGE OF PAVEMENT – CONCRETE 1
621	1522150.419	2855494.454	EDGE OF CONCRETE
622	1522138.550	2855508.719	EDGE OF CONCRETE
623	1522128.904	2855498.703	EDGE OF CONCRETE
624	1522126.743	2855500.785	EDGE OF CONCRETE
625	1522136.620	2855511.039	EDGE OF CONCRETE
626	1522124.535	2855525.563	EDGE OF CONCRETE
627	1522126.842	2855527.482	EDGE OF CONCRETE
628	1522143.034	2855572.405	CENTER OF SECURITY BOLLARD – STANDARD
629	1522138.196	2855580.822	CENTER OF SECURITY BOLLARD – STANDARD
630	1522140.615	2855576.614	CENTER OF SECURITY BOLLARD – STANDARD
631	1522173.509	2855572.618	CENTER OF SECURITY BOLLARD – STANDARD
632	1522168.671	2855581.035	CENTER OF SECURITY BOLLARD – STANDARD
633	1522171.090	2855576.827	CENTER OF SECURITY BOLLARD – STANDARD
634	1522364.645	2855854.431	CENTER OF SIGN
635	1522429.632	2855807.132	CORNER – CURB TURNOUT
636	1522428.785	2855808.944	CORNER – CURB TURNOUT
637	1521944.684	2855927.645	EDGE OF PAVEMENT – CONCRETE 2
638	1522065.237	2855125.538	CORNER – CURB TURNOUT
639	1522067.237	2855125.554	CORNER – CURB TURNOUT
640	1522228.254	2855577.226	CENTER OF SECURITY BOLLARD – STANDARD
641	1522225.835	2855581.435	CENTER OF SECURITY BOLLARD – STANDARD
642	1522230.673	2855573.017	CENTER OF SECURITY BOLLARD – STANDARD
643	1521854.245	2855124.310	CENTER OF DELINEATOR STAKE
644	1521854.245	2855148.817	CENTER OF DELINEATOR STAKE
645	1521706.912	2855124.380	CENTER OF DELINEATOR STAKE
646	1521706.947	2855148.880	CENTER OF DELINEATOR STAKE
647	1521616.351	2855161.987	CENTER OF DELINEATOR STAKE
648	1521633.681	2855179.305	CENTER OF DELINEATOR STAKE
649	1521578.806	2855252.574	CENTER OF DELINEATOR STAKE
650	1521603.306	2855252.592	CENTER OF DELINEATOR STAKE
651	1521579.087	2855574.594	CENTER OF DELINEATOR STAKE
652	1521603.577	2855563.696	CENTER OF DELINEATOR STAKE
653	1521603.596	2855589.696	CENTER OF DELINEATOR STAKE
~~654~~	~~1521579.368~~	~~2855896.614~~	~~CENTER OF DELINEATOR STAKE~~
655	1521603.868	2855896.595	CENTER OF DELINEATOR STAKE
656	1521634.343	2855969.982	CENTER OF DELINEATOR STAKE
657	1521617.044	2855987.331	CENTER OF DELINEATOR STAKE
658	1521707.794	2856000.306	CENTER OF DELINEATOR STAKE
659	1521707.845	2856024.806	CENTER OF DELINEATOR STAKE
660	1521804.796	2856000.031	CENTER OF DELINEATOR STAKE
661	1521804.820	2856024.532	CENTER OF DELINEATOR STAKE
662	1521706.647	2855564.606	CORNER – ASPHALT DRIVE
663	1521706.668	2855588.606	CORNER – ASPHALT DRIVE
664	1521603.328	2855564.696	CORNER – ASPHALT DRIVE
665	1521603.349	2855588.696	CORNER – ASPHALT DRIVE
666	1522012.312	2855957.326	END OF CONCRETE WALK
667	1522354.696	2855915.441	CENTER OF SECURITY EQUIPMENT
668	1522022.173	2855730.706	CENTER OF BUILDING COLUMN, (G,18)
669	1522022.173	2855603.831	CENTER OF BUILDING COLUMN, (G,13)
670	1521950.009	2855835.118	CORNER – CONCRETE UTILITY PAD
671	1521959.011	2855835.105	CORNER – CONCRETE UTILITY PAD
672	1521959.021	2855841.836	CORNER – CONCRETE UTILITY PAD
673	1521950.019	2855841.849	CORNER – CONCRETE UTILITY PAD
674	1521578.609	2855887.283	CENTER, BOLLARD
675	1521570.609	2855887.306	CENTER, BOLLARD
676	1521578.622	2855901.283	CENTER, BOLLARD
677	1521570.622	2855901.306	CENTER, BOLLARD
678	1521579.609	2855886.281	CORNER, COMMINUTER PAD
679	1521569.609	2855886.309	CORNER, COMMINUTER PAD
680	1521569.623	2855902.309	CORNER, COMMINUTER PAD
681	1521579.623	2855902.281	CORNER, COMMINUTER PAD

1 REMOVED DELINEATOR STAKE

1 ADDED UTILITY

DLZ
ARCHITECTURE • ENGINEERING • PLANNING
SURVEYING • CONSTRUCTION SERVICES
DLZ INDIANA, LLC

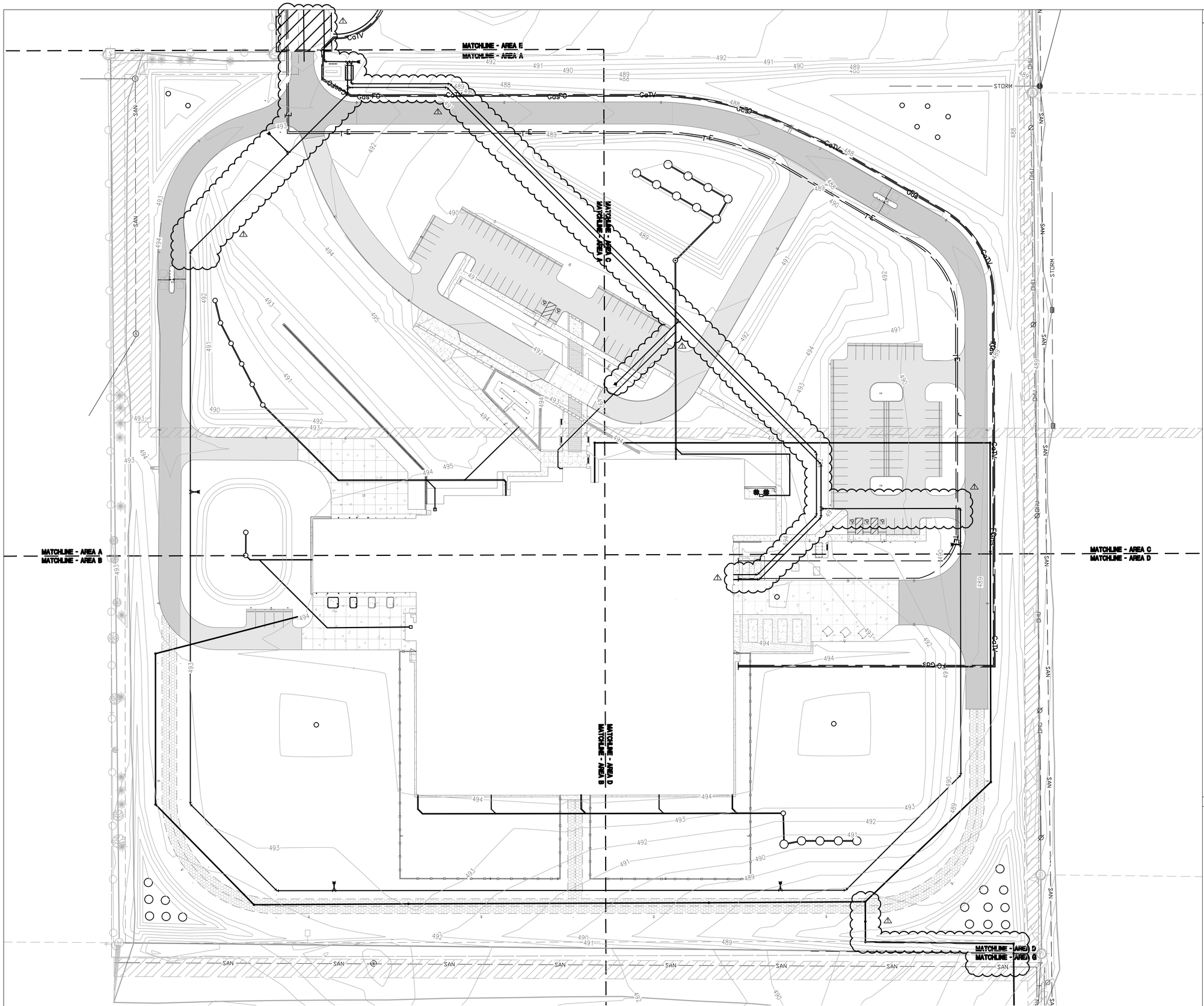
JEFFREY K. HIRSCH REGISTERED LANDSCAPE ARCHITECT
9-12-19

NO.	REVISION	DATE
1	ADDENDUM #01	09/12/19

DRAWN: JTF CHK'D: CGH
DESIGNED: JKH
APPRV'D: JKH
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER
1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA
SITE IMPROVEMENTS COORDINATE SCHEDULE

DRAWING NUMBER
SD-205
SITE DEVELOPMENT



1 SD-401 OVERALL SITE UTILITY PLAN

NORTH

SCALE – 1" = 40'

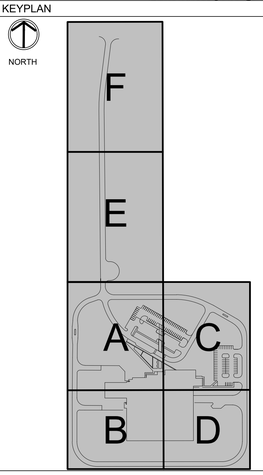
SCALE IN FEET
40 0 20 40 80

GENERAL NOTES

1. UTILITIES AND UNDERGROUND OBSTACLES SHOWN ARE APPROXIMATE. FIELD VERIFY UTILITY LOCATIONS PRIOR TO COMMENCEMENT OF EARTHWORK AND/OR UTILITY ACTIVITIES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE TO OBSTRUCTION AND UTILITY LINES ENCOUNTERED DURING CONSTRUCTION. CONTRACTOR SHALL NOTIFY AND HAVE THE UTILITY LOCATED AT LEAST 48 HOURS IN ADVANCE PRIOR TO EXCAVATING.
2. CONSTRUCTION LIMITS SHOWN ARE APPROXIMATE. ADJUSTMENTS TO THE LIMITS INCIDENTAL TO CONSTRUCTION ACTIVITIES MAY BE PERMITTED WITH THE APPROVAL OF THE ENGINEER. CONTRACTOR SHALL FIELD MARK ANY PROPOSED CHANGES TO THE CONSTRUCTION LIMITS FOR ENGINEER APPROVAL PRIOR TO BEGINNING CONSTRUCTION.
3. CONTRACTOR IS RESPONSIBLE FOR COORDINATION OF ALL APPROPRIATE JURISDICTION REGARDING R.O.W WORK AND UTILITY COMPANIES.
4. ALL WATER MAIN PIPING SHALL HAVE A MINIMUM COVER OF 60". MAINTAIN ELEVATION ON PIPE BETWEEN VALVES AND FITTINGS.
5. CONTRACTOR TO COORDINATE EXISTING WATER MAIN CONNECTION WITH UTILITY. CONTRACTOR SHALL VERIFY EXISTING WATER MAIN ELEVATION AND LOCATION.
6. NO OPEN TRENCHES WILL BE ALLOWED IN THE EVENING AFTER DAILY CONSTRUCTION OPERATIONS HAVE FINISHED, EXCEPT IN THE AREA OF THE TRENCHING BOX. CONTRACTOR TO PROVIDE CONSTRUCTION FENCING AROUND TRENCHING BOX AREA FOR PUBLIC SAFETY.
7. ALL BURIED WATER MAIN GREATER THAN OR EQUAL TO 4" DIAMETER SHALL BE SUPPORTED WITH CONCRETE THRUST BLOCKING AND RESTRAINED JOINTS AT ALL JOINTS, BENDS, TEES, CROSSES AND VALVES.
8. IF VALVE IS GREATER THAN 10 FEET BELOW FINAL GRADE, CONTRACTOR SHALL SUPPLY EXTENDED VALVE BOX AND VALVE ROD.
9. COORDINATE GAS METER WITH UTILITY.
10. WATER MAIN PIPING SHALL MAINTAIN AT LEAST 10 FEET HORIZONTAL AND 18 INCHES VERTICAL SEPARATION FROM ALL OTHER UTILITIES.

Indiana 811 Know what's below. Call before you dig.

KEYPLAN



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SURVEYING • CONSTRUCTION SERVICES

PAUL J. KAY REGISTERED PROFESSIONAL ENGINEER 19900533 STATE OF INDIANA 9/12/19
PAUL J. KAY 9/12/19

MATTHEW D. DOYLE REGISTERED PROFESSIONAL ENGINEER No. PE10505380 STATE OF INDIANA 9/12/19
MATTHEW D. DOYLE 9/12/19

NO.	REVISION	DATE
1	ADDENDUM NO. 1	9/12/19

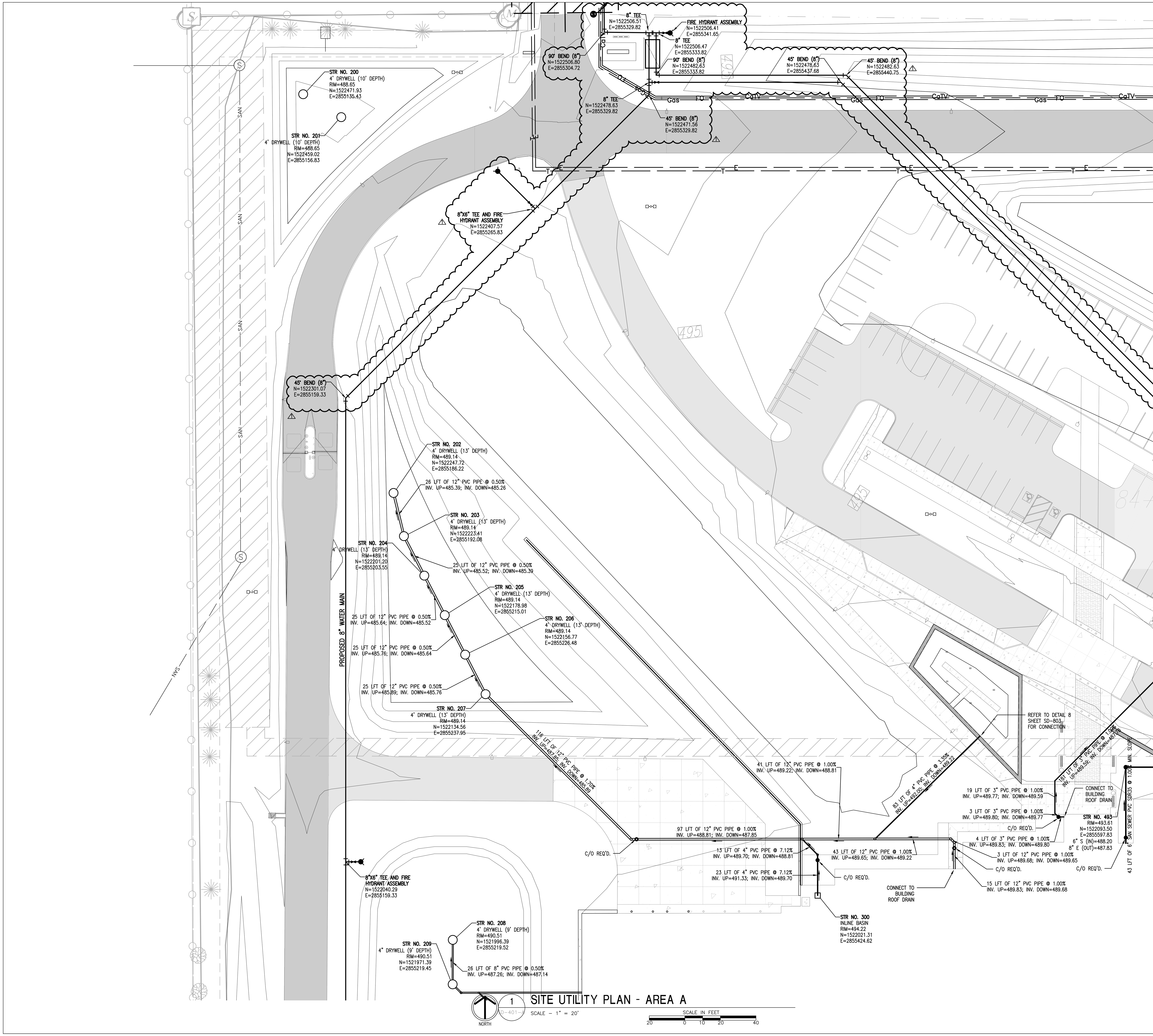
DRAWN: JNJ CHK'D: KRD
DESIGNED: JLP
APPRV'D: JLP
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

OVERALL SITE UTILITY PLAN

DRAWING NUMBER SD-401

SITE DEVELOPMENT



1 SITE UTILITY PLAN - AREA A
SCALE - 1" = 20'

GENERAL NOTES

1. UTILITIES AND UNDERGROUND OBSTACLES SHOWN ARE APPROXIMATE. FIELD VERIFY UTILITY LOCATIONS PRIOR TO COMMENCEMENT OF EARTHWORK AND/OR UTILITY ACTIVITIES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE TO OBSTRUCTION AND UTILITY LINES ENCOUNTERED DURING CONSTRUCTION. CONTRACTOR SHALL NOTIFY AND HAVE THE UTILITY LOCATED AT LEAST 48 HOURS IN ADVANCE PRIOR TO EXCAVATING.
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7. ALL BURIED WATER MAIN GREATER THAN OR EQUAL TO 4" DIAMETER SHALL BE SUPPORTED WITH CONCRETE THRUST BLOCKING AND RESTRAINED JOINTS AT ALL JOINTS, BENDS, TEES, CROSSES AND VALVES.
8. IF VALVE IS GREATER THAN 10 FEET BELOW FINAL GRADE, CONTRACTOR SHALL SUPPLY EXTENDED VALVE BOX AND VALVE ROD.
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10. WATER MAIN PIPING SHALL MAINTAIN AT LEAST 10 FEET HORIZONTAL AND 18 INCHES VERTICAL SEPARATION FROM ALL OTHER UTILITIES.

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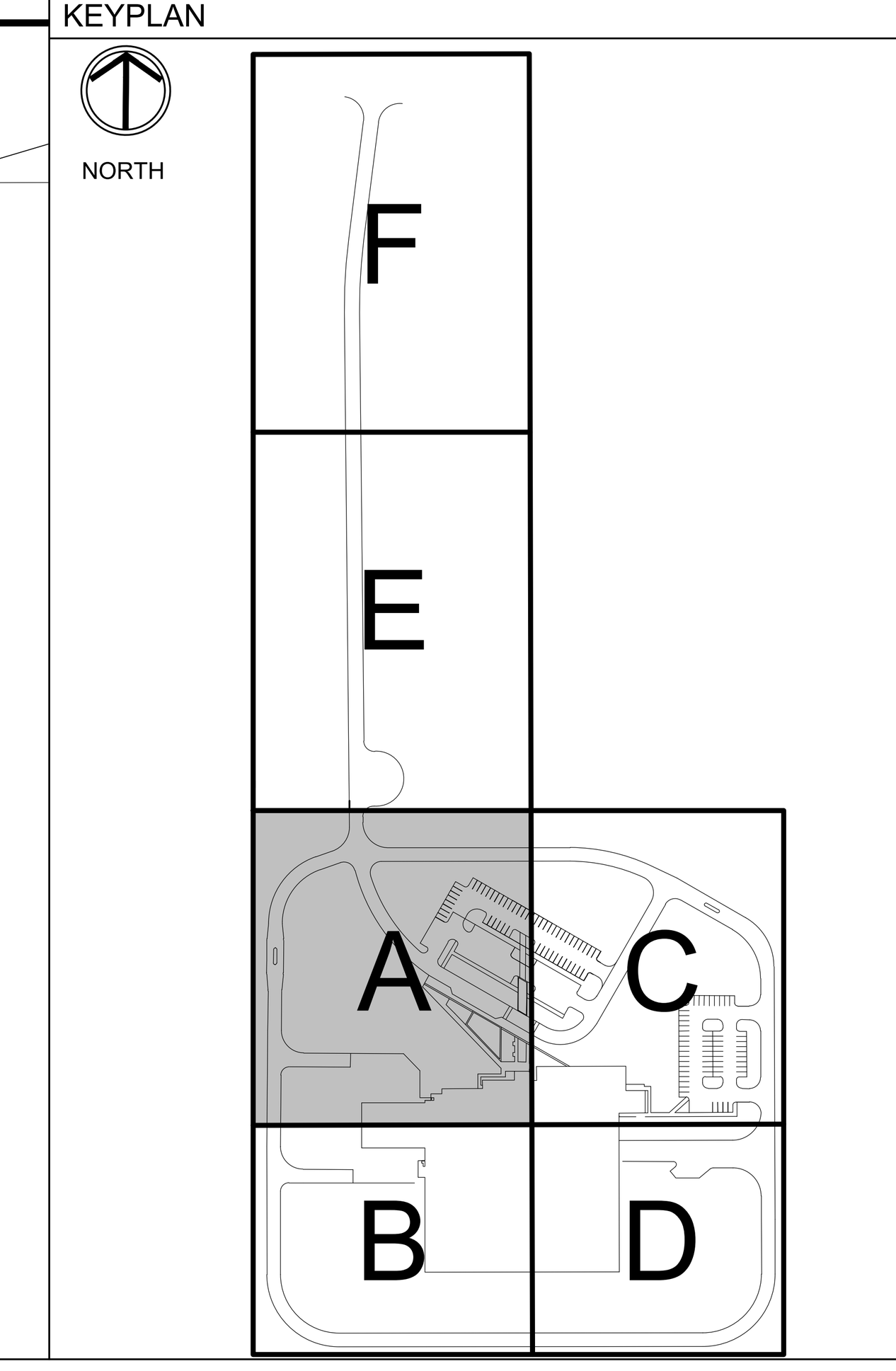
SURVEYING • CONSTRUCTION SERVICES

JAMIE L. POCZEKAY
REGISTERED No. 19900533
STATE OF INDIANA
PROFESSIONAL ENGINEER
9/12/19

MATHEU D. DOYLE
REGISTERED No. PE10505380
STATE OF INDIANA
PROFESSIONAL ENGINEER
9/12/19

Indiana 811
Know what's below. Call before you dig.

KEYPLAN



NO.	REVISION	DATE
1	ADDENDUM NO. 1	9/12/19

DRAWN: JNJ CHK'D: KRD
DESIGNED: JLP
APPRV'D: JLP
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER
1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

SITE UTILITY PLAN - AREA A

DRAWING NUMBER
SD-401-A
SITE DEVELOPMENT

GENERAL NOTES

1. UTILITIES AND UNDERGROUND OBSTACLES SHOWN ARE APPROXIMATE. FIELD VERIFY UTILITY LOCATIONS PRIOR TO COMMENCEMENT OF EARTHWORK AND/OR UTILITY ACTIVITIES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE TO OBSTRUCTION AND UTILITY LINES ENCOUNTERED DURING CONSTRUCTION. CONTRACTOR SHALL NOTIFY AND HAVE THE UTILITY LOCATED AT LEAST 48 HOURS IN ADVANCE PRIOR TO EXCAVATING.
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4. ALL WATER MAIN PIPING SHALL HAVE A MINIMUM COVER OF 60". MAINTAIN ELEVATION ON PIPE BETWEEN VALVES AND FITTINGS.
5. CONTRACTOR TO COORDINATE EXISTING WATER MAIN CONNECTION WITH UTILITY. CONTRACTOR SHALL VERIFY EXISTING WATER MAIN ELEVATION AND LOCATION.
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8. IF VALVE IS GREATER THAN 10 FEET BELOW FINAL GRADE, CONTRACTOR SHALL SUPPLY EXTENDED VALVE BOX AND VALVE ROD.
9. COORDINATE GAS METER WITH UTILITY.
10. WATER MAIN PIPING SHALL MAINTAIN AT LEAST 10 FEET HORIZONTAL AND 18 INCHES VERTICAL SEPARATION FROM ALL OTHER UTILITIES.

[redacted]

STR NO. 225
4' DRYWELL (13" DEPTH)
RIM=484.21
N=1522459.28
E=2855931.26

STR NO. 228
4' DRYWELL (13" DEPTH)
RIM=484.21
N=1522458.39
E=2855958.83

STR NO. 229
4' DRYWELL (13" DEPTH)
RIM=484.21
N=1522447.02
E=2855981.09

STR NO. 226
4' DRYWELL (13" DEPTH)
RIM=484.21
N=1522436.13
E=2855947.46

STR NO. 227
4' DRYWELL (13" DEPTH)
RIM=484.21
N=1522424.76
E=2855969.72

STR NO. 493
STA. 80+00.00
RIM=493.61
N=1522093.50
E=2855597.83
6" S (IN)=488.20
8" E (OUT)=487.83

C/O REQ'D.

244 LFT OF 8" SAN SEWER PVC SDR35 @ 0.45%

118 LFT OF 6" PVC PIPE @ 1.00%
INV. UP=490.76; INV. DOWN=489.59

9 LFT OF 6" PVC PIPE @ 1.00%
INV. UP=489.59; INV. DOWN=489.50

12 LFT OF 12" PVC PIPE @ 2.77%
INV. UP=489.83; INV. DOWN=489.50

CONNECT TO BUILDING ROOF DRAIN

STR NO. 302
INLINE BASIN
RIM=494.07
N=1522036.45
E=2855778.47

45 LFT OF 6" PVC PIPE @ 1.00%
INV. UP=491.72; INV. DOWN=490.76

31 LFT OF 6" PVC PIPE @ 1.00%
INV. UP=491.52; INV. DOWN=491.21

45° BEND (8")
N=1522082.47
E=2855838.22

45° BEND (8")
N=1522070.32
E=2855843.23

8" TEE
N=1522022.12
E=2855843.30

90° BEND (8")
N=1522022.33
E=2855994.42

45° BEND (8")
N=1522014.72
E=2855838.31

45° BEND (8")
N=1522012.66
E=2855843.32

PROPOSED 8" WATER MAIN

PROPOSED 8" WATER MAIN

PROPOSED 8" WATER MAIN

8"X6" TEE AND FIRE HYDRANT ASSEMBLY
N=1521983.29
E=2855994.48

90° BEND (8")
N=1522124.74
E=2855994.26

118 LFT OF 8" SAN SEWER PVC SDR35 @ 0.45%

STR NO. 495
STA. 84+28.74
RIM=488.88
N=1522093.50
E=2856026.57
8" W (IN)=484.98
8" S (OUT)=484.88

MATCHLINE - AREA C
MATCHLINE - AREA D

1 SITE UTILITY PLAN - AREA C
SD-401-C
SCALE - 1" = 20'
NORTH
SCALE IN FEET
20 0 10 20 40

KEYPLAN
NORTH
F
E
A C
B D

Indiana 811
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DLZ
ARCHITECTURE • ENGINEERING • PLANNING
SURVEYING • CONSTRUCTION SERVICES
DLZ INDIANA, LLC

LANCE R. PRZYBYLKAY — REGISTERED PROFESSIONAL ENGINEER — 19900533 — STATE OF INDIANA — 9/12/19

MATTHEW D. DOYLE — REGISTERED PROFESSIONAL ENGINEER — No. PE10505380 — STATE OF INDIANA — 9/12/19

NO.	REVISION	DATE
1	ADDENDUM NO. 1	9/12/19

DRAWN: JNJ CHK'D: KRD
DESIGNED: JLP
APPRV'D: JLP
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

SITE UTILITY PLAN - AREA C

DRAWING NUMBER SD-401-C

SITE DEVELOPMENT

MATCHLINE - AREA C
MATCHLINE - AREA D

MATCHLINE - AREA D
MATCHLINE - AREA B

6" SAN SEWER LATERAL @ 1.00% MIN. SLOPE
C/O REQ'D.
PROPOSED 8" WATER MAIN
CONNECT TO BUILDING SEWER
45° BEND (8")
N=1521950.66
E=2855774.44
45° BEND (8")
N=1521945.41
E=2855776.26
STR NO. 230
4' DRYWELL (9' DEPTH)
RIM=492.82
N=1521926.47
E=2855795.49
STR NO. 246
4' DRYWELL (8' DEPTH)
RIM=492.24
N=1521788.98
E=2855857.09
STR NO. 496
STA. 85+46.65
RIM=488.84
N=1521975.59
E=2856026.79
8" N (IN)=484.35
8" S (OUT)=484.35
SEE DETAIL 6 SHEET SD-807
CATV
GAS
FO
SAN
DHU
PROPOSED 8" WATER MAIN
260 LFT OF 8" SAN SEWER PVC SDR35 @ 0.49%
87+00
STR NO. 497
STA. 87+96.45
RIM=487.38
N=1521725.79
E=2856027.36
8" SW (OUT)=482.03
8" N (IN)=483.12
CONNECT TO BUILDING ROOF DRAIN
16 LFT OF 4" PVC PIPE @ 6.39%
INV. UP=489.83; INV. DOWN=488.87
8 LFT OF 4" PVC PIPE @ 6.39%
INV. UP=488.87; INV. DOWN=488.42
16 LFT OF 10" PVC PIPE @ 8.20%
INV. UP=489.83; INV. DOWN=488.60
8 LFT OF 10" PVC PIPE @ 8.20%
INV. UP=488.60; INV. DOWN=488.02
STR NO. 247
MANHOLE C4
RIM=492.62
N=1521692.00
E=2855802.32
6" SAN SEWER LATERAL (FOR FUTURE CONNECTION) CAP PIPE AND INSTALL PIPE MARKER
45° BEND (8")
N=1521733.43
E=2855994.87
85 LFT OF 10" PVC PIPE @ 0.50%
INV. UP=488.83; INV. DOWN=488.41
80 LFT OF 10" PVC PIPE @ 0.50%
INV. UP=488.41; INV. DOWN=488.01
51 LFT OF 10" PVC PIPE @ 2.03%
INV. UP=488.01; INV. DOWN=486.99
34 LFT OF 10" PVC PIPE @ 1.00%
INV. UP=486.99; INV. DOWN=486.66
6" SAN SEWER LATERAL @ 1.0% MIN. SLOPE
20 LFT OF 12" PVC PIPE @ 0.50%
INV. UP=486.56; INV. DOWN=486.46
20 LFT OF 12" PVC PIPE @ 0.50%
INV. UP=486.46; INV. DOWN=486.36
20 LFT OF 12" PVC PIPE @ 0.50%
INV. UP=486.36; INV. DOWN=486.26
20 LFT OF 12" PVC PIPE @ 0.50%
INV. UP=486.66; INV. DOWN=486.56
STR NO. 244
8' DRYWELL (12' DEPTH)
RIM=490.55
N=1521662.03
E=2855882.13
STR NO. 243
8' DRYWELL (12' DEPTH)
RIM=490.55
N=1521662.03
E=2855862.13
STR NO. 241
8' DRYWELL (12' DEPTH)
RIM=490.56
N=1521662.03
E=2855822.13
STR NO. 242
8' DRYWELL (12' DEPTH)
RIM=490.55
N=1521662.03
E=2855842.13
STR NO. 240
8' DRYWELL (12' DEPTH)
RIM=490.47
N=1521658.40
E=2855803.11
8"X6" TEE AND FIRE HYDRANT ASSEMBLY
N=1521608.53
E=2855799.17
45° BEND (8")
N=1521608.59
E=2855870.04
PROPOSED 8" WATER MAIN
89+00
169 LFT OF 8" SAN SEWER PVC SDR35 @ 0.49%
STR NO. 237
8' DRYWELL (12' DEPTH)
RIM=481.61
N=1521608.97
E=2856019.80
STR NO. 235
8' DRYWELL (12' DEPTH)
RIM=481.61
N=1521590.13
E=2856024.46
STR NO. 234
8' DRYWELL (12' DEPTH)
RIM=481.61
N=1521590.10
E=2855999.07
STR NO. 239
8' DRYWELL (12' DEPTH)
RIM=481.61
N=1521631.73
E=2856037.28
STR NO. 238
8' DRYWELL (12' DEPTH)
RIM=481.61
N=1521608.76
E=2856041.36
STR NO. 236
8' DRYWELL (12' DEPTH)
RIM=481.61
N=1521589.79
E=2856042.75
STR NO. 233
8' DRYWELL (12' DEPTH)
RIM=481.61
N=1521571.19
E=2856043.46
STR NO. 499
STA. 63+53.14
RIM=484.36
N=1521550.66
E=2856052.04
10" W (IN)=477.37
10" S (OUT)=475.37
PROPOSED 8" WATER MAIN
59+00
326 LFT OF 8" SAN SEWER PVC SDR35 @ 0.45%
STR NO. 489
STA. 59+79.14
RIM=488.47
N=1521594.99
E=2855721.54
8" W (IN)=482.04
8" E (OUT)=481.94
60+00
61+00
170 LFT OF 8" SAN SEWER PVC SDR35 @ 0.45%
61+84
STR NO. 490
STA. 61+48.84
RIM=485.95
N=1521596.69
E=2855891.23
8" W (IN)=481.18
8" NE (IN)=481.18
10" S (OUT)=479.18
62+00
63+00
63+58
161 LFT OF 10" SAN SEWER PVC SDR35 @ 0.53%
MATCHLINE - AREA D
MATCHLINE - AREA G
STR NO. 490A
STA. 61+70.32
RIM=485.60
N=1521574.61
E=2855891.29
10" N (IN)=479.08
10" S (OUT)=478.98
COMMINUTER REQ'D.
SEE COMMINUTER NOTES THIS SHEET.
STR NO. 498
STA. 61+92.45
RIM=485.99
N=1521552.48
E=2855891.36
10" N (IN)=478.88
10" E (OUT)=477.90
STR NO. 231
8' DRYWELL (12' DEPTH)
RIM=481.61
N=1521571.75
E=2856004.22
STR NO. 232
8' DRYWELL (12' DEPTH)
RIM=481.61
N=1521571.47
E=2856024.29
FO

1 SITE UTILITY PLAN - AREA D
SD-401-D
SCALE – 1" = 20'
NORTH
SCALE IN FEET
20 0 10 20 40

GENERAL NOTES

1. UTILITIES AND UNDERGROUND OBSTACLES SHOWN ARE APPROXIMATE. FIELD VERIFY UTILITY LOCATIONS PRIOR TO COMMENCEMENT OF EARTHWORK AND/OR UTILITY ACTIVITIES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE TO OBSTRUCTION AND UTILITY LINES ENCOUNTERED DURING CONSTRUCTION. CONTRACTOR SHALL NOTIFY AND HAVE THE UTILITY LOCATED AT LEAST 48 HOURS IN ADVANCE PRIOR TO EXCAVATING.
2. CONSTRUCTION LIMITS SHOWN ARE APPROXIMATE. ADJUSTMENTS TO THE LIMITS INCIDENTAL TO CONSTRUCTION ACTIVITIES MAY BE PERMITTED WITH THE APPROVAL OF THE ENGINEER. CONTRACTOR SHALL FIELD MARK ANY PROPOSED CHANGES TO THE CONSTRUCTION LIMITS FOR ENGINEER APPROVAL PRIOR TO BEGINNING CONSTRUCTION.
3. CONTRACTOR IS RESPONSIBLE FOR COORDINATION OF ALL APPROPRIATE JURISDICTION REGARDING R.O.W WORK AND UTILITY COMPANIES.
4. ALL WATER MAIN PIPING SHALL HAVE A MINIMUM COVER OF 60". MAINTAIN ELEVATION ON PIPE BETWEEN VALVES AND FITTINGS.
5. CONTRACTOR TO COORDINATE EXISTING WATER MAIN CONNECTION WITH UTILITY. CONTRACTOR SHALL VERIFY EXISTING WATER MAIN ELEVATION AND LOCATION.
6. NO OPEN TRENCHES WILL BE ALLOWED IN THE EVENING AFTER DAILY CONSTRUCTION OPERATIONS HAVE FINISHED, EXCEPT IN THE AREA OF THE TRENCHING BOX. CONTRACTOR TO PROVIDE CONSTRUCTION FENCING AROUND TRENCHING BOX AREA FOR PUBLIC SAFETY.
7. ALL BURIED WATER MAIN GREATER THAN OR EQUAL TO 4" DIAMETER SHALL BE SUPPORTED WITH CONCRETE THRUST BLOCKING AND RESTRAINED JOINTS AT ALL JOINTS, BENDS, TEES, CROSSES AND VALVES.
8. IF VALVE IS GREATER THAN 10 FEET BELOW FINAL GRADE, CONTRACTOR SHALL SUPPLY EXTENDED VALVE BOX AND VALVE ROD.
9. COORDINATE GAS METER WITH UTILITY.
10. WATER MAIN PIPING SHALL MAINTAIN AT LEAST 10 FEET HORIZONTAL AND 18 INCHES VERTICAL SEPARATION FROM ALL OTHER UTILITIES.

COMMINUTER NOTES

1. REFER TO SPECIFICATION SECTION 333245 FOR COMMINUTER SPECIFICATIONS.
2. INSTALL 8'x8'x2' BASE SLAB REINFORCED W/#5@12" EACH WAY TOP AND BOTTOM.
3. REFER TO ELECTRICAL DRAWINGS FOR CONNECTION DETAILS.

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LICENSED PROFESSIONAL ENGINEER — JAMES L. PRZEKAY — STATE OF INDIANA — 19900533 — 9/12/19
REGISTERED LANDSCAPE ARCHITECT — MATTHEW D. DOYLE — STATE OF INDIANA — No. PE10500380 — 9/12/19

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KEYPLAN
NORTH
F
E
A
C
B
D

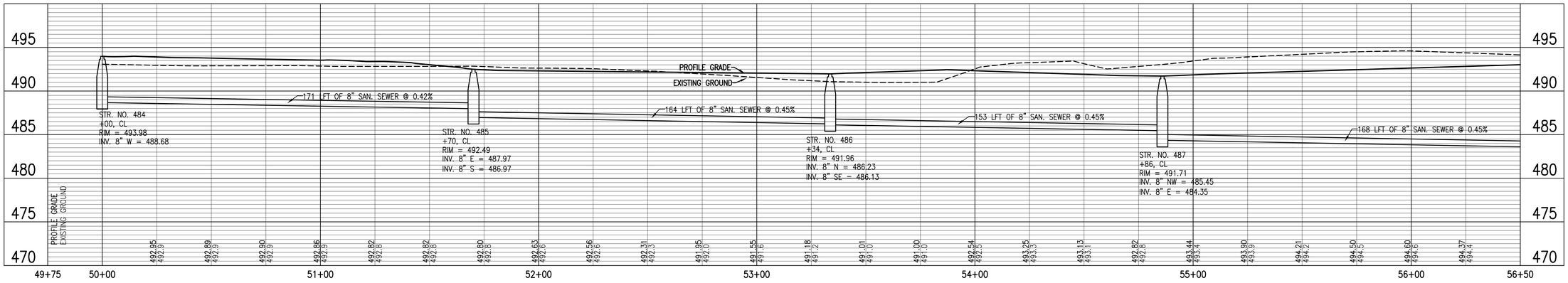
NO.	REVISION	DATE
1	ADDENDUM NO. 1	9/12/19

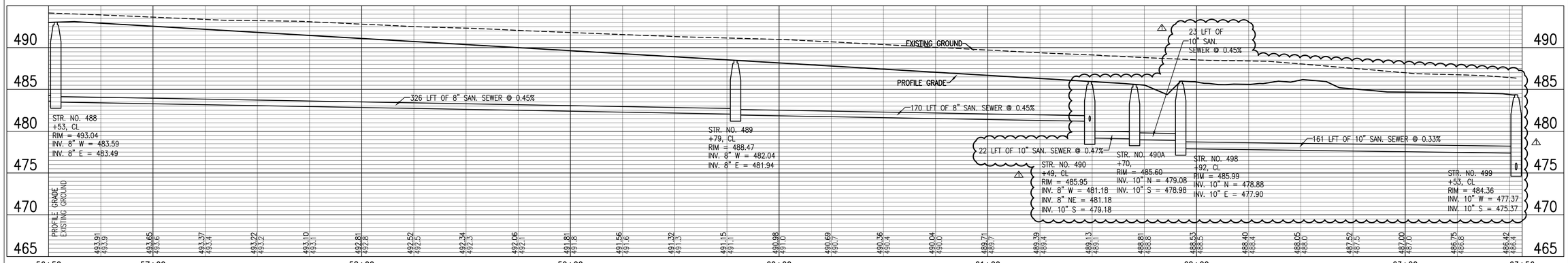
DRAWN: JNJ
CHK'D: KRD
DESIGNED: JLP
APPRVD: JLP
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER 1663-1190-90

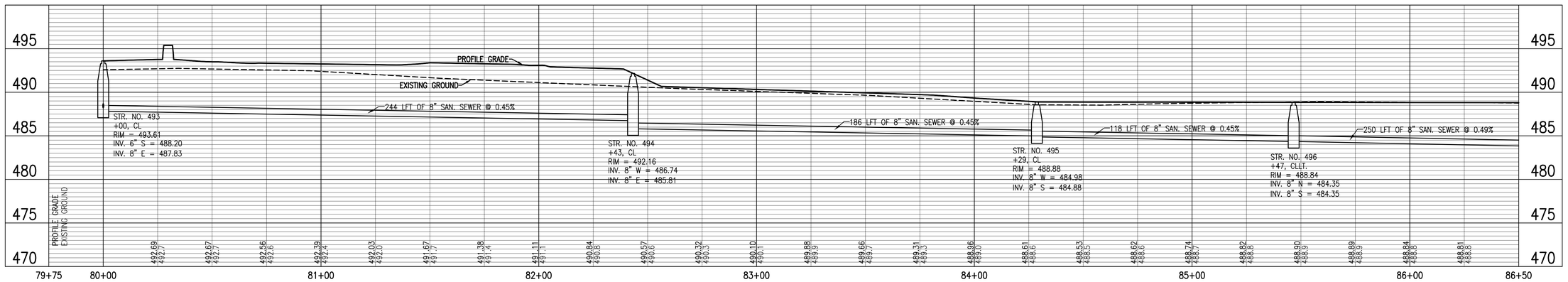
A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

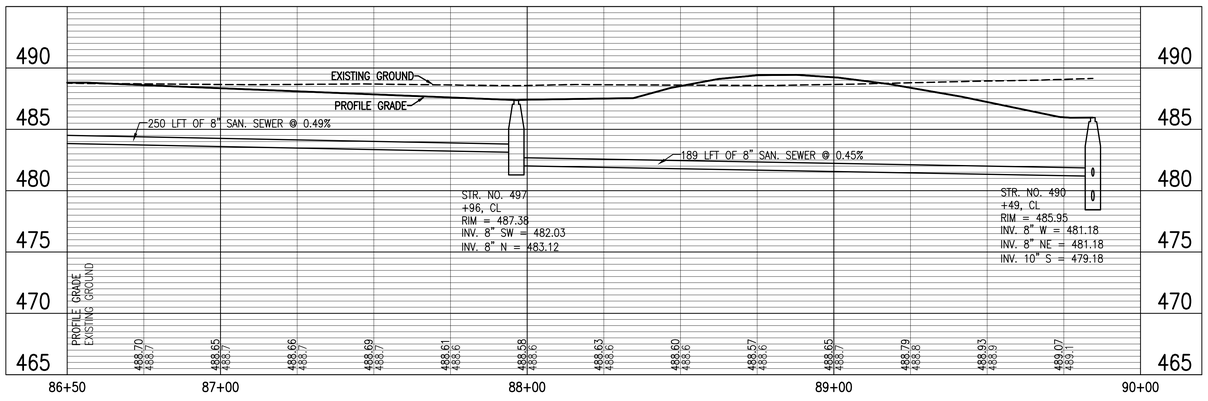
SITE UTILITY PLAN - AREA D

DRAWING NUMBER SD-401-D
SITE DEVELOPMENT









SEE SHEET SD-701 FOR
CONTINUATION OF SANITARY SEWER

1 / SD-402 ON-SITE SANITARY SEWER PROFILES

HORIZ. SCALE – 1" = 20'
VERT. SCALE – 1" = 5'

HORIZ. SCALE IN FEET
20 0 10 20 40

VERT. SCALE IN FEET
5 0 2.5 5 10

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LANCE E. PRZEKAY
REGISTERED
19900533
PROFESSIONAL ENGINEER
STATE OF INDIANA
9/12/19

REGISTERED
JAMES D. DOYLE
No. PE10500380
STATE OF
VA ★ PROFESSIONAL ENGINEER
9/12/19

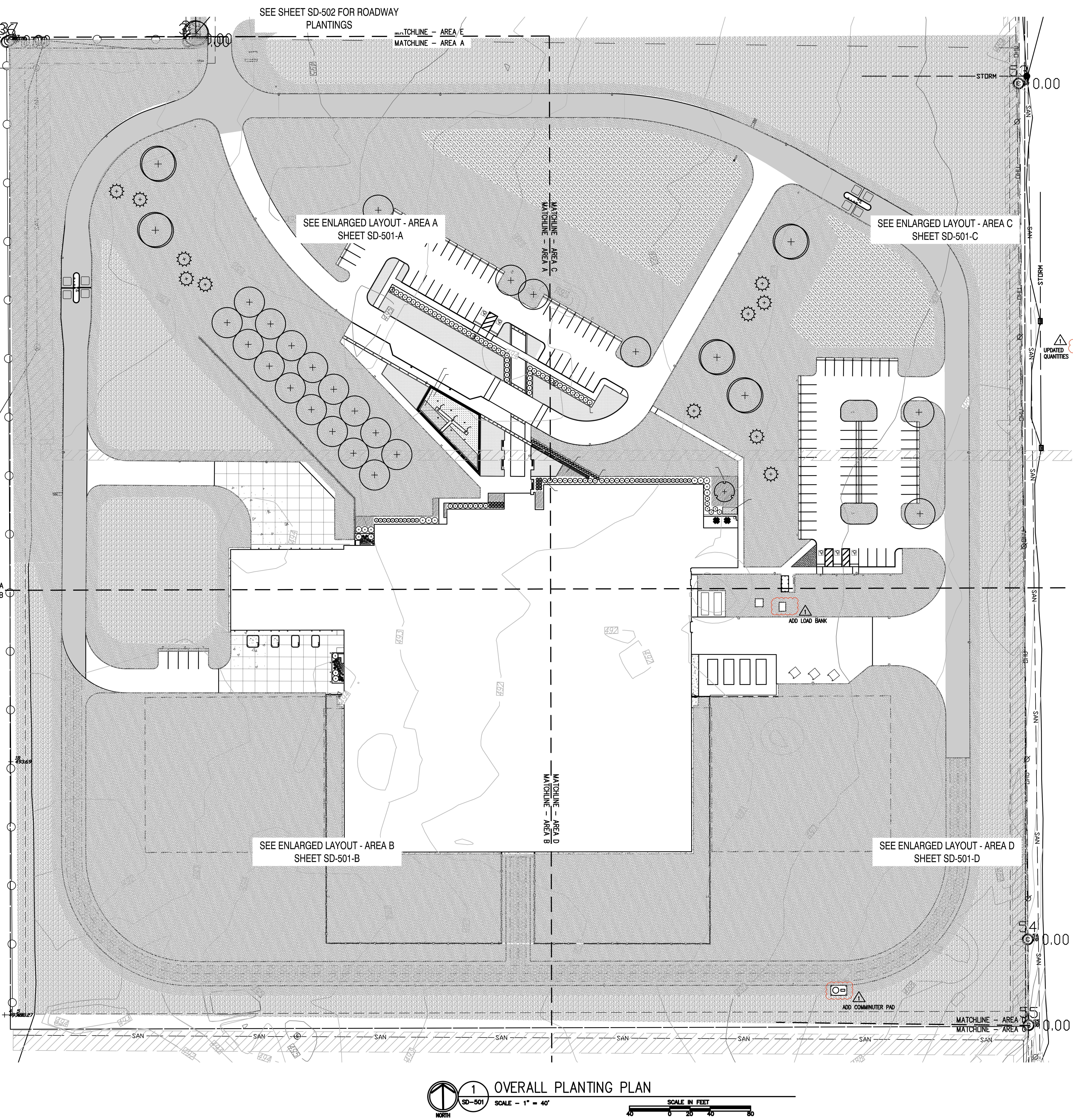
NO.	REVISION	DATE
1	ADDENDUM NO. 1	9/12/19

DRAWN: JNJ CHK'D: KRD
DESIGNED: JLP CHK'D: JLP
APPRV'D:
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

ON-SITE SANITARY SEWER PROFILES

DRAWING NUMBER
SD-402
SITE DEVELOPMENT



1 SD-501 OVERALL PLANTING PLAN

SCALE - 1" = 40'

SCALE IN FEET 40 0 20 40 80

NORTH

PLANT SCHEDULE MAIN SITE				
TREES	BOTANICAL / COMMON NAME	CONT	CAL	QTY
ACE-RS	Acer rubrum `Red Sunset` / Red Sunset Maple	B & B	2.5"Cal	16
COR-C	Cornus florida `Cherokee Princess` / Cherokee Princess Dogwood	B & B	2"Cal	1
PLA-B	Platanus x acerifolia `Bloodgood` / London Plane Tree	B & B	3"Cal	5
ULM-PA	Ulmus x `Patriot` / Patriot Elm	B & B	2"Cal	6
EVERGREEN TREES	BOTANICAL / COMMON NAME	CONT	CAL	QTY
PIC-P	Picea pungens / Colorado Spruce	B & B	6-8` HT.	11
SHRUBS	BOTANICAL / COMMON NAME	CONT		QTY
ILE-J	Ilex verticillata `Jim Dandy` / Jim Dandy Winterberry	No. 3 Cont.		3
ILE-SH	Ilex verticillata `Shortcake` / Shortcake Winterberry	No. 3 Cont.		22
SYR-P	Syringa patula `Miss Kim` / Miss Kim Lilac	No. 5 Cont.		6
TAX-E	Taxus x media `Everlow` / Everlow Yew	No. 5 Cont.		26
THU-N	Thuja occidentalis `Nigra` / Nigra Cedar	B & B		11
VIB-N	Viburnum farreri `Nanum` / Dwarf Fragrant Viburnum	No. 3 Cont.		44
COURTYARD PLANTINGS	BOTANICAL / COMMON NAME	CONT		QTY
HAK-A	Hakonechloa macra `All Gold` / Japanese Forest Grass	No. 2 Cont.		22
HEU-W	Heuchera x `Wild Rose` / Coral Bells	No. 2 Cont.		20
HOS-W	Hosta x `Shadowland Wu-La-La` / Wu-La-La Hosta	No. 2 Cont.		16
TAX-DF	Taxus x media `Densiformis` / Dense Yew	No. 5 Cont.		5
EVERGREEN SHRUBS	BOTANICAL / COMMON NAME	CONT		QTY
JUN-N	Juniperus chinensis `Nick`s Compact` / `Nick`s Compact` Juniper	No. 3 Cont.		53
EVERGREEN SHRUB MASSINGS	BOTANICAL / COMMON NAME	CONT		QTY
JUN-BU	Juniperus sabina `Buffalo` / Buffalo Juniper	No. 3 Cont.		37
GROUND COVERS	BOTANICAL / COMMON NAME	CONT		QTY
LIR-S	Liriope spicata / Creeping Lily Turf	No. 1 Cont.		380
PEN-L	Pennisetum alopecuroides `Little Bunny` / Little Bunny Fountain Grass	No. 1 Cont.		291
SOD/SEED	BOTANICAL / COMMON NAME	CONT		QTY
NAT-1	Native Seed Mix 1 / Native Grasses	BULK		177,015 sf
NAT-2	Native Seed Mix 2 / Native Grasses with Accent Forbs	BULK		38,487 sf
TURF-1	Turf Seed / Turf Type Tall Fescue / Bluegrass Blend	BULK		457,337 sf
TURF-2	Turf Sod / Turf Type Tall Fescue / Bluegrass Blend	STD. ROLL		8,386 sf

PLANT SCHEDULE ROADWAY				
TREES	BOTANICAL / COMMON NAME	CONT	CAL	QTY
GLE-S	Gleditsia triacanthos `Skyline` / Skyline Honey Locust	B & B	2"Cal	10
QUE-P	Quercus palustris / Pin Oak	B & B	2.5"Cal	16
SOD/SEED	BOTANICAL / COMMON NAME	CONT		QTY
TURF-1	Turf Seed / Turf Type Tall Fescue / Bluegrass Blend	BULK		44,587 sf

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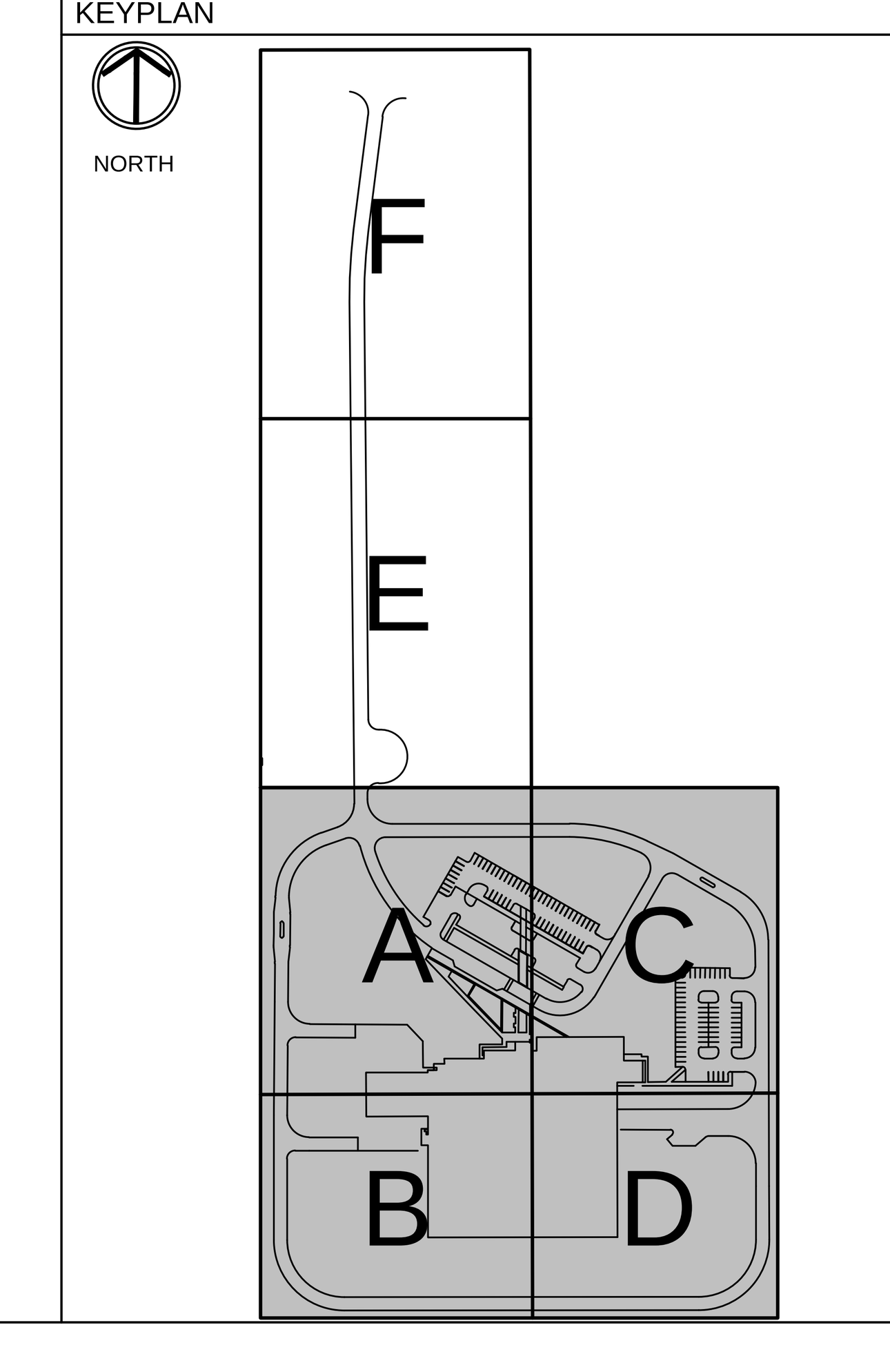
DLZ INDIANA, LLC

JEFFREY K. HIRSCH REGISTERED LANDSCAPE ARCHITECT INDIANA No. 0K00142
9-12-19

Know what's below. Call before you dig.

KEYPLAN



NO.	REVISION	DATE
1	ADDENDUM #01	09/12/19

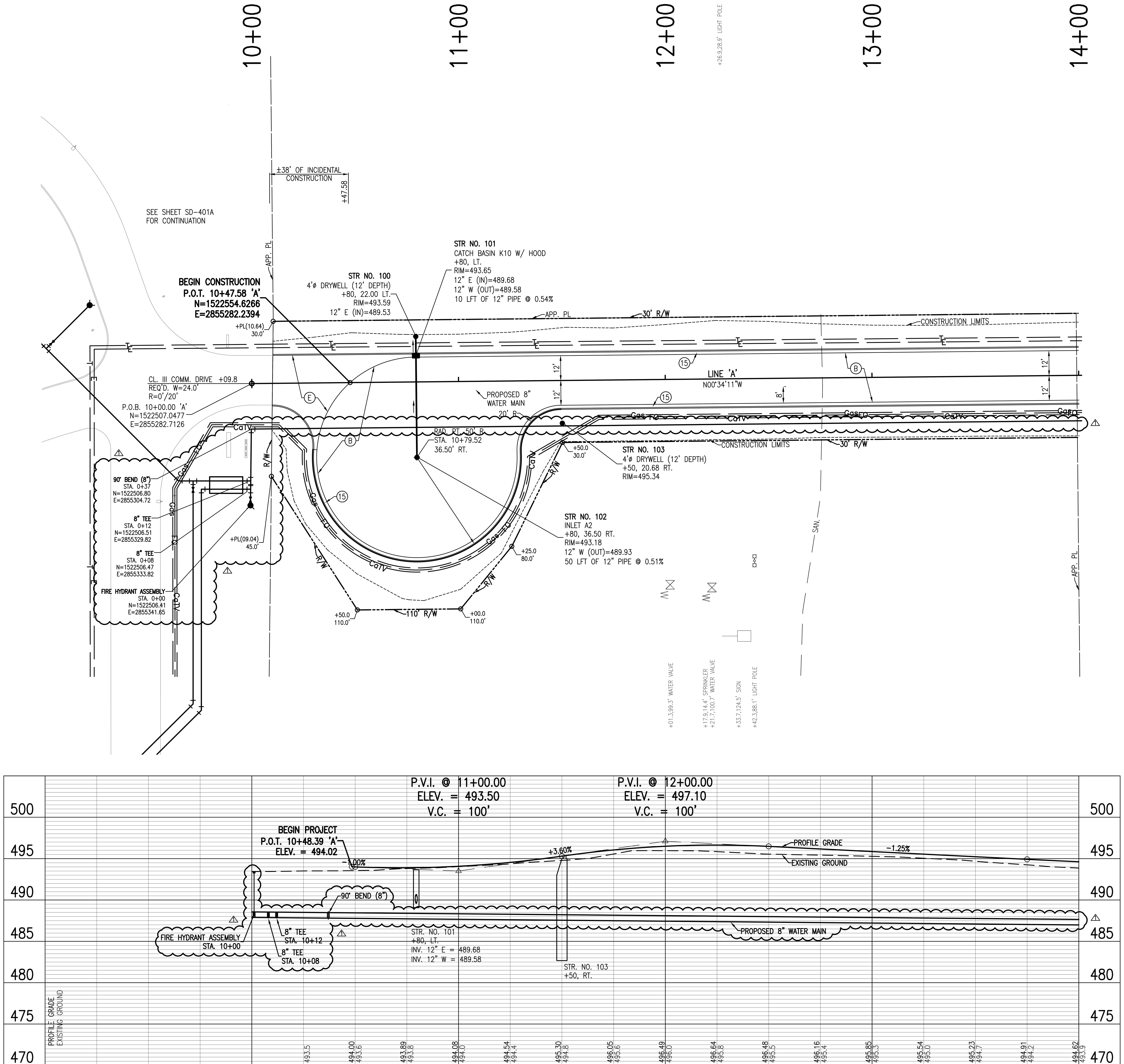
DRAWN: JTF CHK'D: CGH
DESIGNED: JKH
APPRV'D: JKH
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

OVERALL PLANTING PLAN

DRAWING NUMBER SD-501

SITE DEVELOPMENT



PLAN AND PROFILE

1 SD-601

HORIZ. SCALE - 1" = 20'

VERT. SCALE - 1" = 5'

HORIZ. SCALE IN FEET: 20 0 10 20 40

VERT. SCALE IN FEET: 5 0 2.5 5 10

WATER UTILITY INSTALLATION NOTES

1. INSTALLATION OF WATER MAIN, FITTINGS, VALVES, FIRE HYDRANTS, AND APPURTENANCES SHALL BE IN ACCORDANCE WITH INDIANA AMERICAN WATER STANDARDS AND SPECIFICATIONS, LATEST REVISION.
2. IT IS THE CONTRACTOR'S RESPONSIBILITY TO FIELD VERIFY THE LOCATION, SIZE AND MATERIAL OF THE EXISTING WATER MAIN PRIOR TO CONSTRUCTION.
3. FOR PVC C900 PIPE INSTALLATION: DR14 PIPE IS REQUIRED. DEFLECTION OF PIPE JOINTS AND BENDING OF PIPES ARE NOT PERMITTED. ALL ANGLES SHALL BE MADE WITH PROPER FITTINGS. WHEN RESTRAINT OF PIPE-TO-PIPE JOINTS ARE REQUIRED, ALL JOINTS SHALL BE RESTRAINED WITH EXTERNAL SPLIT SERRATED RESTRAINT HARNESSES. SELECT FILL MATERIAL REQUIRED FOR BEDDING AND EMBEDMENT REGARDLESS OF PIPE'S PROXIMITY TO PAVEMENT.
4. FOR DUCTILE IRON PIPE INSTALLATION: THICKNESS CLASS 52 FOR TYPICAL DISTRIBUTION MAINS 12-INCH NOMINAL SIZE AND SMALLER. WHEN RESTRAINT OF PIPE-TO-PIPE JOINTS ARE REQUIRED, PUSH-ON RESTRAINING GASKETS WITH INTEGRAL STAINLESS STEEL LOCKING SEGMENTS ARE PERMITTED ON PIPE-TO-PIPE CONNECTIONS 12-INCH NOMINAL SIZE AND SMALLER ONLY. PIPE-TO-PIPE CONNECTIONS GREATER THAN 12-INCH NOMINAL SIZE SHALL BE RESTRAINED PER SPECIFICATION SECTION 15105.
5. ENCASE ALL DUCTILE IRON PIPING, DUCTILE IRON FITTINGS, VALVES, HYDRANTS, AND ALL OTHER METALLIC APPURTENANCES IN 12MIL POLYETHYLENE.
6. ALL FIRE HYDRANT LATERALS SHALL BE DUCTILE IRON PIPE.
7. ALL MJ T-BOLTS AND FLANGE BOLTS SHALL HAVE XYLAN OR FLUOROKOTE #1 CORROSION RESISTANT COATING.
8. ALL FITTINGS SHALL BE RESTRAINED USING MJ RETAINER GLANDS OR POURED CONCRETE THRUST BLOCKS.
9. COPPER-CLAD STEEL TRACER WIRE REQUIRED ON INSTALLATION OF ALL PIPE. TRACER WIRE SHALL BE TAPED TO PIPE OR POLYETHYLENE ENCASEMENT AT A MINIMUM SPACING OF 10-FEET. SPLICES SHALL BE ENCASED IN WATERPROOF CONNECTORS. CONTINUITY SHALL BE TESTED AFTER COMPLETION OF BACKFILL.
10. SELECT FILL MATERIAL REQUIRED FOR FINAL BACKFILL WHEN WITHIN 5-FEET OF PAVEMENT PER SPECIFICATION SECTION 02210.
11. MAINTAIN THE REQUIRED 10-FEET OF HORIZONTAL SEPARATION AND 18-INCHES OF VERTICAL SEPARATION FROM SANITARY AND STORM SEWERS. MAINTAIN 8-FEET OF HORIZONTAL SEPARATION FROM SANITARY AND STORM STRUCTURES. SEE 327 IAC 8-3.2-9 OF THE INDIANA ADMINISTRATIVE CODE FOR MORE INFORMATION.
12. MAINTAIN MINIMUM COVER DEPTH OF 60" AND A MAXIMUM OF 60"+24".

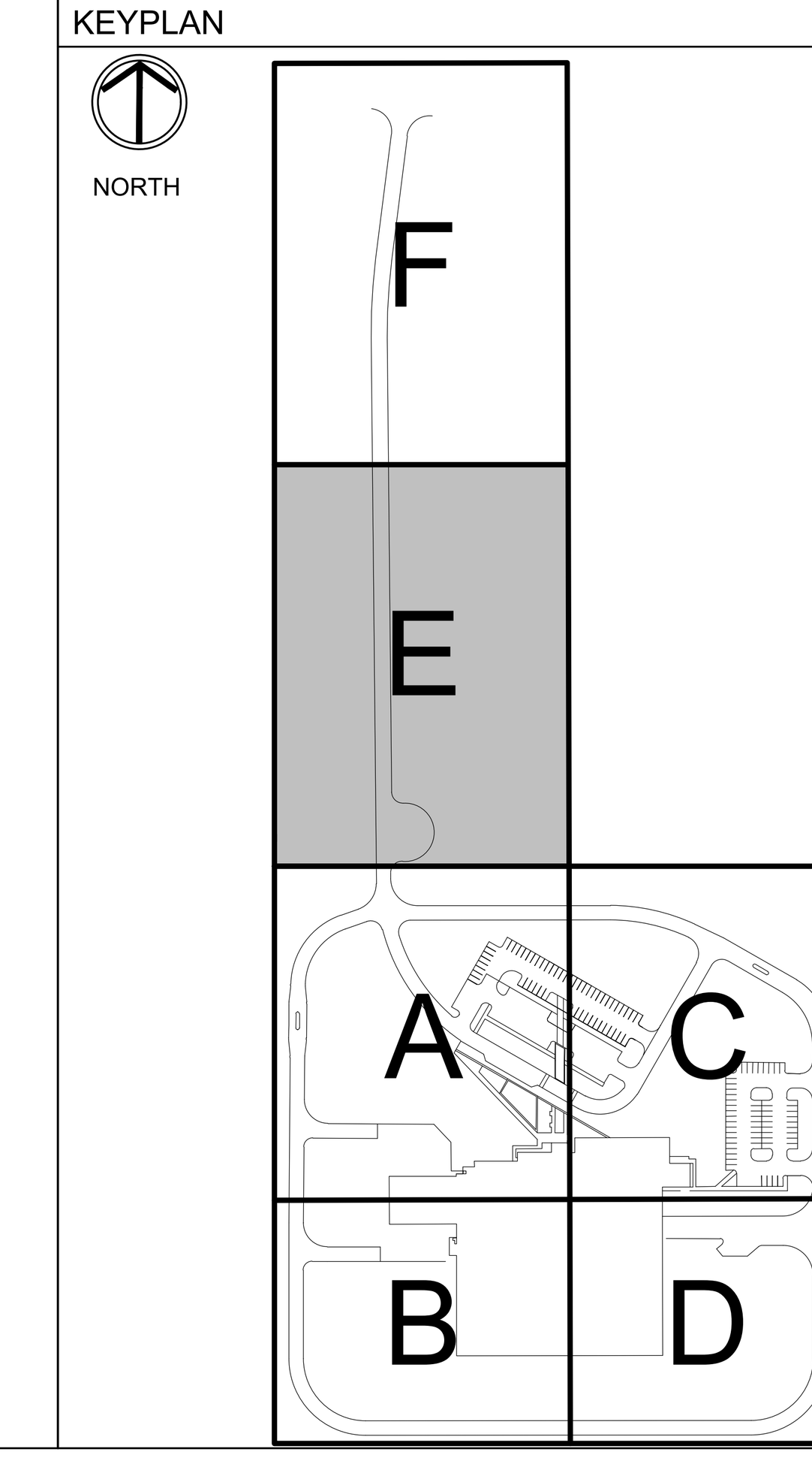
LEGEND

(15) COMBINED CONCRETE CURB AND GUTTER

(B) 165#/SYD HMA, SURFACE, ON 495#/SYD HMA, INTERMEDIATE, ON 6" COMPACTED AGGREGATE, NO. 53, BASE, ON SUBGRADE TREATMENT TO BE: 10" OF SUBGRADE SCARIFIED AND COMPACTED

Indiana 811 — Know what's below. Call before you dig.

KEYPLAN



DLZ — ARCHITECTURE • ENGINEERING • PLANNING • SURVEYING • CONSTRUCTION SERVICES

NO.	REVISION	DATE
1	ADDENDUM NO. 1	9/12/19

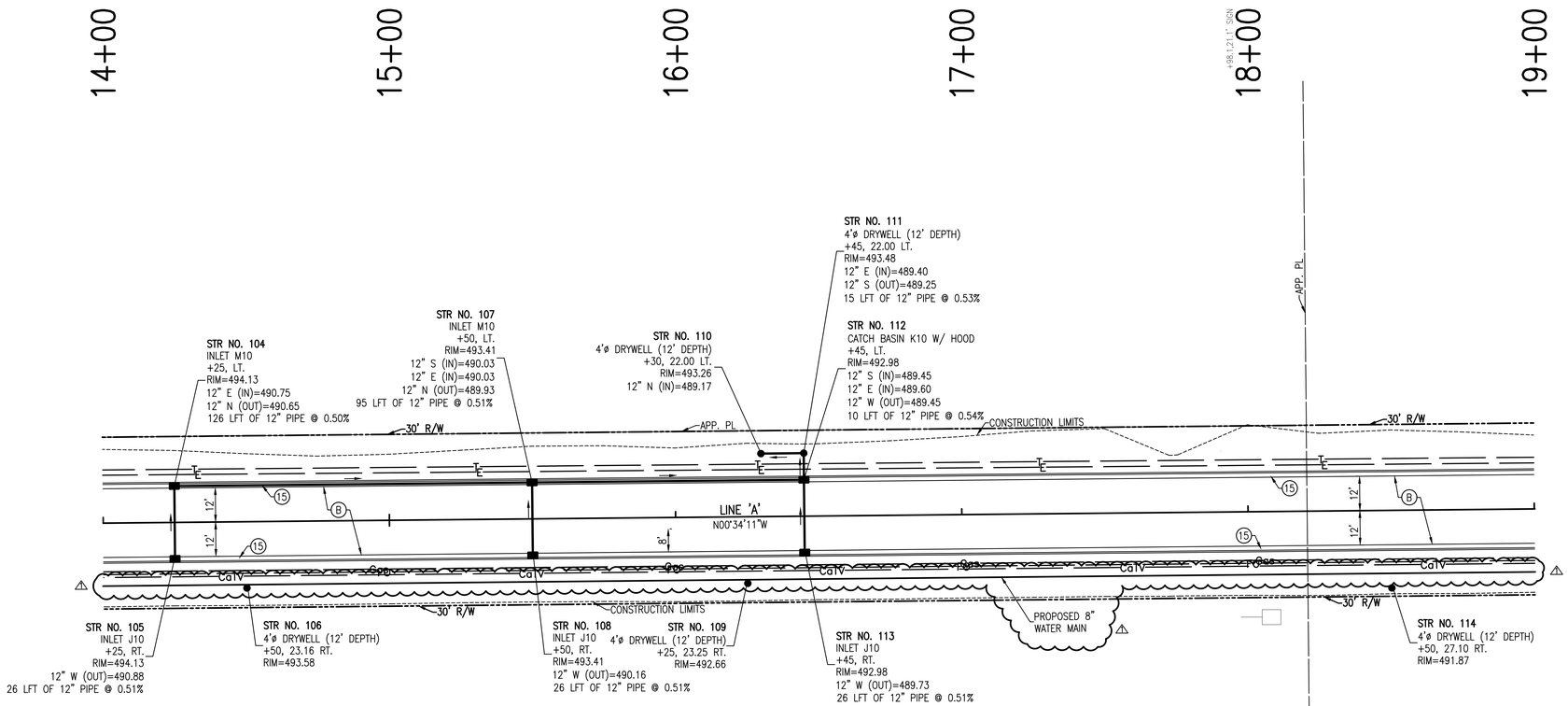
DRAWN: TH CHK'D: PDF
DESIGNED: MDD
APPR'D: MDD
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER: 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

PLAN AND PROFILE

DRAWING NUMBER: SD-601

SITE DEVELOPMENT



PLAN AND PROFILE

1 / SD-602

NORTH

HORIZ. SCALE – 1" = 20'
VERT. SCALE – 1" = 5'

HORIZ. SCALE IN FEET
20 0 10 20 40

VERT. SCALE IN FEET
5 0 2.5 5 10

WATER UTILITY INSTALLATION NOTES

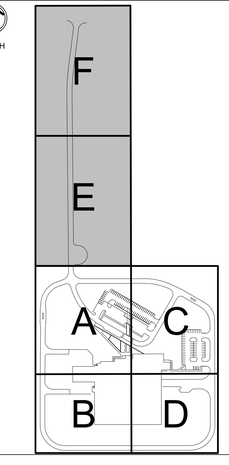
1. INSTALLATION OF WATER MAIN, FITTINGS, VALVES, FIRE HYDRANTS, AND APPURTENANCES SHALL BE IN ACCORDANCE WITH INDIANA AMERICAN WATER STANDARDS AND SPECIFICATIONS, LATEST REVISION.
2. IT IS THE CONTRACTOR'S RESPONSIBILITY TO FIELD VERIFY THE LOCATION, SIZE AND MATERIAL OF THE EXISTING WATER MAIN PRIOR TO CONSTRUCTION.
3. FOR PVC C900 PIPE INSTALLATION: DR14 PIPE IS REQUIRED. DEFLECTION OF PIPE JOINTS AND BENDING OF PIPES ARE NOT PERMITTED. ALL ANGLES SHALL BE MADE WITH PROPER FITTINGS. WHEN RESTRAINT OF PIPE-TO-PIPE JOINTS ARE REQUIRED, ALL JOINTS SHALL BE RESTRAINED WITH EXTERNAL SPLIT SERRATED RESTRAINT HARNESSES. SELECT FILL MATERIAL REQUIRED FOR BEDDING AND EMBEDMENT REGARDLESS OF PIPE'S PROXIMITY TO PAVEMENT.
4. FOR DUCTILE IRON PIPE INSTALLATION: THICKNESS CLASS 52 FOR TYPICAL DISTRIBUTION MAINS 12-INCH NOMINAL SIZE AND SMALLER. WHEN RESTRAINT OF PIPE-TO-PIPE JOINTS ARE REQUIRED, PUSH-ON RESTRAINING GASKETS WITH INTEGRAL STAINLESS STEEL LOCKING SEGMENTS ARE PERMITTED ON PIPE-TO-PIPE CONNECTIONS 12-INCH NOMINAL SIZE AND SMALLER ONLY. PIPE-TO-PIPE CONNECTIONS GREATER THAN 12-INCH NOMINAL SIZE SHALL BE RESTRAINED PER SPECIFICATION SECTION 15105.
5. ENCASE ALL DUCTILE IRON PIPING, DUCTILE IRON FITTINGS, VALVES, HYDRANTS, AND ALL OTHER METALLIC APPURTENANCES IN 12MIL POLYETHYLENE.
6. ALL FIRE HYDRANT LATERALS SHALL BE DUCTILE IRON PIPE.
7. ALL MJ T-BOLTS AND FLANGE BOLTS SHALL HAVE XYLAN OR FLUOROKOTE #1 CORROSION RESISTANT COATING.
8. ALL FITTINGS SHALL BE RESTRAINED USING MJ RETAINER GLANDS OR POURED CONCRETE THRUST BLOCKS.
9. COPPER-CLAD STEEL TRACER WIRE REQUIRED ON INSTALLATION OF ALL PIPE. TRACER WIRE SHALL BE TAPED TO PIPE OR POLYETHYLENE ENCASEMENT AT A MINIMUM SPACING OF 10-FEET. SPLICES SHALL BE ENCASED IN WATERPROOF CONNECTORS. CONTINUITY SHALL BE TESTED AFTER COMPLETION OF BACKFILL.
10. SELECT FILL MATERIAL REQUIRED FOR FINAL BACKFILL WHEN WITHIN 5-FEET OF PAVEMENT PER SPECIFICATION SECTION 02210.
11. MAINTAIN THE REQUIRED 10-FEET OF HORIZONTAL SEPARATION AND 18-INCHES OF VERTICAL SEPARATION FROM SANITARY AND STORM SEWERS. MAINTAIN 8-FEET OF HORIZONTAL SEPARATION FROM SANITARY AND STORM STRUCTURES. SEE 327 IAC 8-3.2-9 OF THE INDIANA ADMINISTRATIVE CODE FOR MORE INFORMATION.
12. MAINTAIN MINIMUM COVER DEPTH OF 60" AND A MAXIMUM OF 60"+24".

LEGEND

(15) COMBINED CONCRETE CURB AND GUTTER
(B) 165#/SYD HMA, SURFACE, ON
495#/SYD HMA, INTERMEDIATE, ON
6" COMPACTED AGGREGATE, NO. 53, BASE, ON
SUBGRADE TREATMENT TO BE:
10" OF SUBGRADE SCARIFIED AND COMPACTED

Indiana 811 Know what's below. Call before you dig.

KEYPLAN



DLZ
ARCHITECTURE • ENGINEERING • PLANNING
SURVEYING • CONSTRUCTION SERVICES
DLZ INDIANA, LLC

LANCE R. PRZYKAY REGISTERED 19900533 PROFESSIONAL ENGINEER STATE OF INDIANA 9/12/19

MATTHEW D. DOYLE REGISTERED No. PE10500380 STATE OF INDIANA PROFESSIONAL ENGINEER 9/12/19

NO.	REVISION	DATE
1	ADDENDUM NO. 1	9/12/19

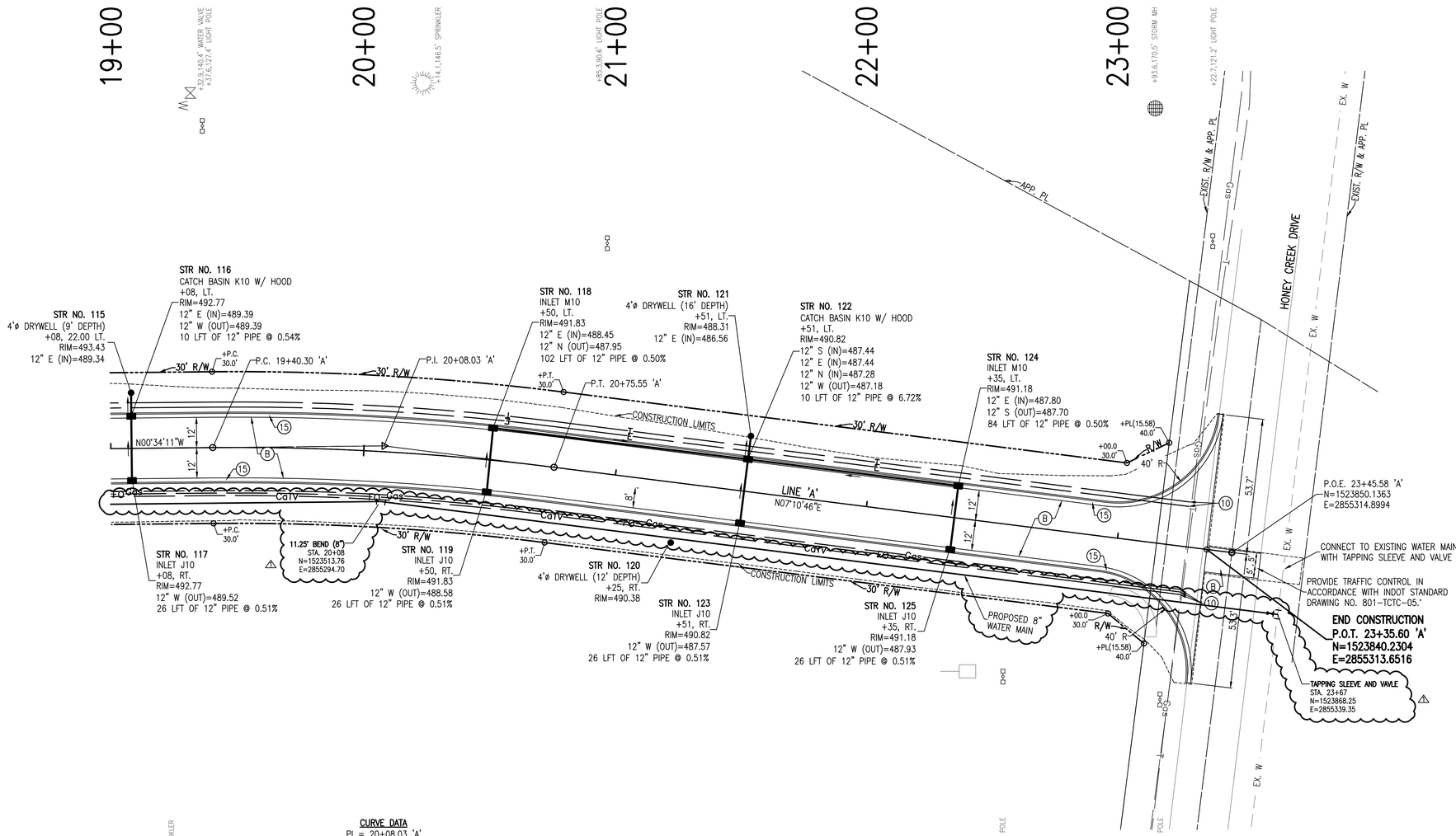
DRAWN: TH CHK'D: PDP
DESIGNED: MDD
APPRV'D: MDD
DATE: SEPTEMBER 6, 2019
PROJECT NUMBER 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

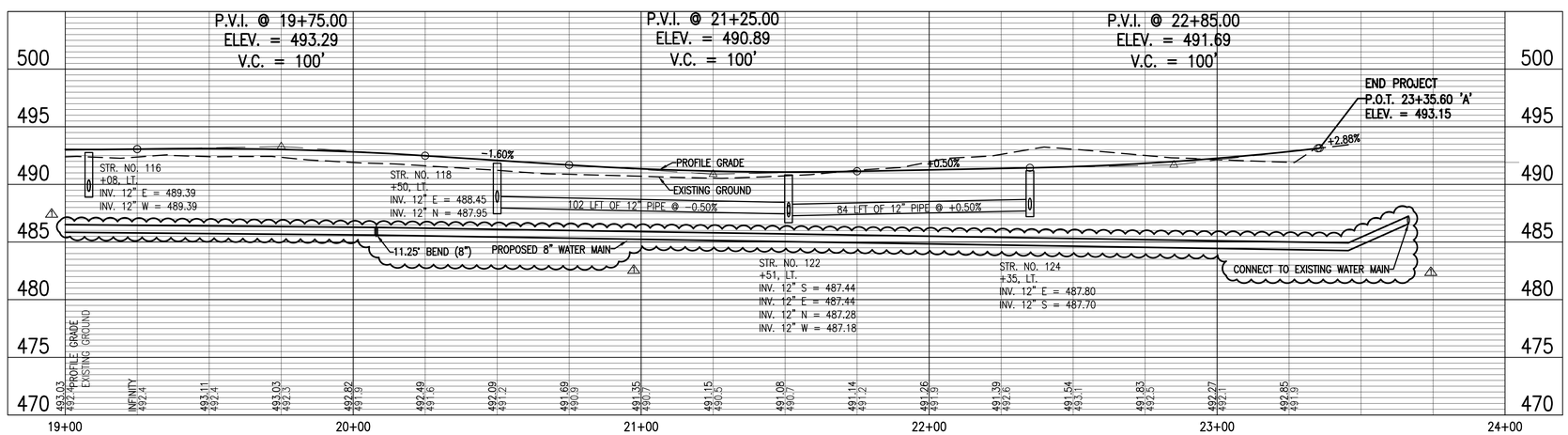
PLAN AND PROFILE

DRAWING NUMBER SD-602

SITE DEVELOPMENT



CURVE DATA
PI = 20+08.03 'A'
Δ = 7° 44' 58" LT.
R = 1000.00'
T = 67.73'
L = 135.25'
E = 2.29'



PLAN AND PROFILE

HORIZ. SCALE – 1" = 20'
VERT. SCALE – 1" = 5'

HORIZ. SCALE IN FEET
20 0 10 20 40

VERT. SCALE IN FEET
5 0 2.5 5 10

WATER UTILITY INSTALLATION NOTES

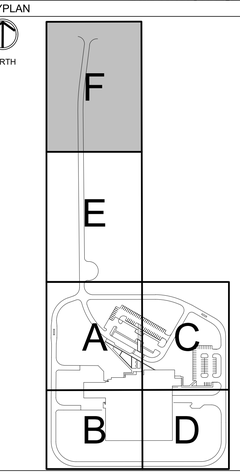
1. INSTALLATION OF WATER MAIN, FITTINGS, VALVES, FIRE HYDRANTS, AND APPURTENANCES SHALL BE IN ACCORDANCE WITH INDIANA AMERICAN WATER STANDARDS AND SPECIFICATIONS, LATEST REVISION.
2. IT IS THE CONTRACTOR'S RESPONSIBILITY TO FIELD VERIFY THE LOCATION, SIZE AND MATERIAL OF THE EXISTING WATER MAIN PRIOR TO CONSTRUCTION.
3. FOR PVC C900 PIPE INSTALLATION: DR14 PIPE IS REQUIRED. DEFLECTION OF PIPE JOINTS AND BENDING OF PIPES ARE NOT PERMITTED. ALL ANGLES SHALL BE MADE WITH PROPER FITTINGS. WHEN RESTRAINT OF PIPE-TO-PIPE JOINTS ARE REQUIRED, ALL JOINTS SHALL BE RESTRAINED WITH EXTERNAL SPLIT SERRATED RESTRAINT HARNESSES. SELECT FILL MATERIAL REQUIRED FOR BEDDING AND EMBEDMENT REGARDLESS OF PIPE'S PROXIMITY TO PAVEMENT.
4. FOR DUCTILE IRON PIPE INSTALLATION: THICKNESS CLASS 52 FOR TYPICAL DISTRIBUTION MAINS 12-INCH NOMINAL SIZE AND SMALLER. WHEN RESTRAINT OF PIPE-TO-PIPE JOINTS ARE REQUIRED, PUSH-ON RESTRAINING GASKETS WITH INTEGRAL STAINLESS STEEL LOCKING SEGMENTS ARE PERMITTED ON PIPE-TO-PIPE CONNECTIONS 12-INCH NOMINAL SIZE AND SMALLER ONLY. PIPE-TO-PIPE CONNECTIONS GREATER THAN 12-INCH NOMINAL SIZE SHALL BE RESTRAINED PER SPECIFICATION SECTION 15105.
5. ENCASE ALL DUCTILE IRON PIPING, DUCTILE IRON FITTINGS, VALVES, HYDRANTS, AND ALL OTHER METALLIC APPURTENANCES IN 12MIL POLYETHYLENE.
6. ALL FIRE HYDRANT LATERALS SHALL BE DUCTILE IRON PIPE.
7. ALL MJ T-BOLTS AND FLANGE BOLTS SHALL HAVE XYLAN OR FLUOROKOTE #1 CORROSION RESISTANT COATING.
8. ALL FITTINGS SHALL BE RESTRAINED USING MJ RETAINER GLANDS OR POURED CONCRETE THRUST BLOCKS.
9. COPPER-CLAD STEEL TRACER WIRE REQUIRED ON INSTALLATION OF ALL PIPE. TRACER WIRE SHALL BE TAPED TO PIPE OR POLYETHYLENE ENCASEMENT AT A MINIMUM SPACING OF 10-FEET. SPLICES SHALL BE ENCASED IN WATERPROOF CONNECTORS. CONTINUITY SHALL BE TESTED AFTER COMPLETION OF BACKFILL.
10. SELECT FILL MATERIAL REQUIRED FOR FINAL BACKFILL WHEN WITHIN 5-FEET OF PAVEMENT PER SPECIFICATION SECTION 02210.
11. MAINTAIN THE REQUIRED 10-FEET OF HORIZONTAL SEPARATION AND 18-INCHES OF VERTICAL SEPARATION FROM SANITARY AND STORM SEWERS. MAINTAIN 8-FEET OF HORIZONTAL SEPARATION FROM SANITARY AND STORM STRUCTURES. SEE 327 IAC 8-3.2-9 OF THE INDIANA ADMINISTRATIVE CODE FOR MORE INFORMATION.
12. MAINTAIN MINIMUM COVER DEPTH OF 60" AND A MAXIMUM OF 60"+24".

LEGEND

(10) COORDINATE WITH UTILITY COMPANIES FOR CONNECTION
(15) COMBINED CONCRETE CURB AND GUTTER
(B) 165#/SYD HMA, SURFACE, ON
495#/SYD HMA, INTERMEDIATE, ON
6" COMPACTED AGGREGATE, NO. 53, BASE, ON
SUBGRADE TREATMENT TO BE:
10" OF SUBGRADE SCARIFIED AND COMPACTED

Indiana 811 Know what's below. Call before you dig.

KEYPLAN



DLZ
ARCHITECTURE • ENGINEERING • PLANNING
SURVEYING • CONSTRUCTION SERVICES
DLZ INDIANA, LLC

REGISTERED LAND SURVEYOR
FIELD D. DOYLE
No. PE0656380
STATE OF INDIANA
PROFESSIONAL ENGINEER
9/12/19

NO.	REVISION	DATE
1	ADDENDUM NO. 1	9/12/19

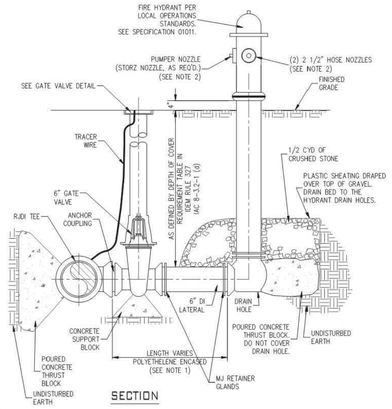
DRAWN: TH CHK'D: PDF
DESIGNED: MDD
APPRV'D: MDD
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

PLAN AND PROFILE

DRAWING NUMBER SD-603

SITE DEVELOPMENT



SECTION

NOTE:
1. THE FIRE HYDRANT LATERAL, GATE VALVE, AND FIRE HYDRANT BARREL SHALL BE ENCASED IN POLYETHYLENE ENCASEMENT UP TO FINISHED GRADE PER SPECIFICATION 15130 PRIOR TO BACKFILL. THE POLYETHYLENE ENCASEMENT SHALL NOT INTERFERE WITH THE DRAIN HOLE.
2. WHEN INSTALLED BEHIND CURB, PUMPER AND HOSE NOZZLES TO BE AT LEAST 18"-24", DEPENDING ON LOCAL REQUIREMENTS, FROM FACE OF CURB.

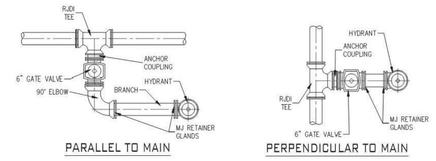
FIRE HYDRANT DETAILS
N.T.S.

INDIANA AMERICAN WATER
ENGINEERING DEPARTMENT
153 N. EMERSON AVENUE
GREENWOOD, INDIANA 46143

STANDARD DETAIL

FIRE HYDRANT DETAIL

DATE: JANUARY, 2018	DRAWN BY: S. FORD
LATEST REV: JULY, 2018	APP'D BY: E.N.

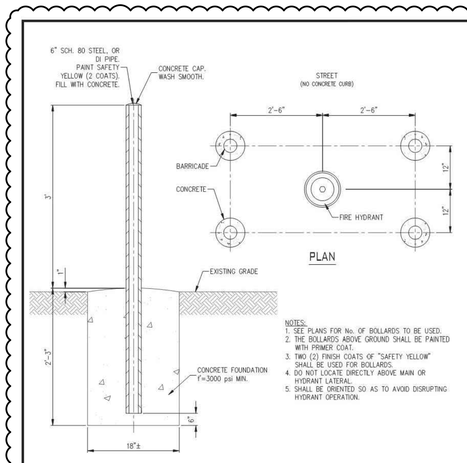


INDIANA AMERICAN WATER
ENGINEERING DEPARTMENT
153 N. EMERSON AVENUE
GREENWOOD, INDIANA 46143

STANDARD DETAIL

FIRE HYDRANT INSTALLATION DETAILS

DATE: JANUARY, 2018	DRAWN BY: S. FORD
LATEST REV: JULY, 2018	APP'D BY: E.N.



NOTES:
1. SEE PLANS FOR No. OF BOLLARDS TO BE USED.
2. THE BOLLARDS ABOVE GROUND SHALL BE PAINTED WITH PRIMER COAT.
3. TWO (2) FINISH COATS OF "SAFETY YELLOW" SHALL BE USED FOR BOLLARDS.
4. DO NOT LOCATE DIRECTLY ABOVE MAIN OR HYDRANT LATERAL.
5. SHALL BE ORIENTED SO AS TO AVOID DISRUPTING HYDRANT OPERATION.

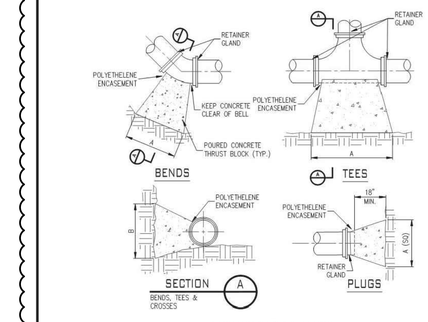
FIRE HYDRANT PROTECTION-PIPE BOLLARD DETAIL
N.T.S.

INDIANA AMERICAN WATER
ENGINEERING DEPARTMENT
153 N. EMERSON AVENUE
GREENWOOD, INDIANA 46143

STANDARD DETAIL

FIRE HYDRANT PROTECTION-PIPE BOLLARD DETAIL

DATE: JANUARY, 2018	DRAWN BY: S. FORD
LATEST REV: JULY, 2018	APP'D BY: E.N.



THRUST BLOCK DETAIL
N.T.S.

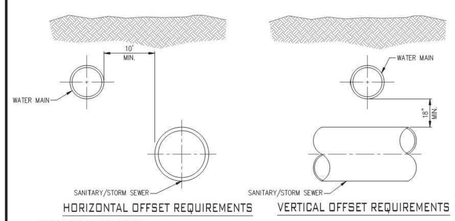
NOTES:
1. THRUST BLOCK DIMENSIONS SHALL BE PROVIDED BY THE DESIGN ENGINEER.
2. THRUST BLOCKS SHALL BE INSTALLED AGAINST UNDISTURBED SOIL WITH ADEQUATE BEARING TO PREVENT MOVEMENT OF FITTING.
3. NO THRUST BLOCKS TO BE PLACED IN SEWER LATERAL DITCHES.
4. THRUST BLOCKING MUST FIT IN EASEMENT, IN SOME CASES ADDITIONAL RESTRAINT MAY BE REQUIRED.
5. DESIGN TO BE BASED ON 200 PSI HYDROSTATIC WATER PRESSURE (150 PSI STATIC PRESSURE PLUS 50 PSI WATER HAMMER).
6. INSTALL POLYETHYLENE ENCASEMENT ON ALL D.I. PIPE AND FITTINGS PRIOR TO POURING CONCRETE.
7. PIPE JOINTS AND BOLTS MUST BE ACCESSIBLE.
8. ALLOW SUFFICIENT CLEARANCE BETWEEN CONCRETE AND BOLTS FOR FUTURE MAINTENANCE.
9. ALL ANCHOR BOLTS SHALL BE CORROSION RESISTANT, AND SIZED PER SPECIFICATION.
10. THRUST BLOCKING DETAILS ARE SHOWN HERE FOR TYPICAL INSTALLATIONS. IN SOME CASES, ADDITIONAL RESTRAINT MAY BE REQUIRED.
11. CONCRETE USED FOR THRUST BLOCKS SHALL BE MIN 3000 PSI CONCRETE.
12. FOR UNSTABLE SOIL CONDITIONS, THE ENGINEER SHALL VERIFY THRUST BLOCK DIMENSIONS.

INDIANA AMERICAN WATER
ENGINEERING DEPARTMENT
153 N. EMERSON AVENUE
GREENWOOD, INDIANA 46143

STANDARD DETAIL

THRUST BLOCKS

DATE: JANUARY, 2018	DRAWN BY: S. FORD
LATEST REV: JANUARY, 2018	APP'D BY: E.N.



BASIC SEPARATION REQUIREMENTS:
1. WATER MAINS AND SEWERS SHOULD BE SEPARATED AS FAR AS IS REASONABLE IN BOTH THE HORIZONTAL AND VERTICAL DIRECTIONS. THE STANDARD DEPTH OF COVER REQUIREMENTS PER COUNTY, AS SPECIFIED IN 327 IAC 8, SHALL BE MAINTAINED FOR ALL WATER MAIN CROSSINGS.
2. PARALLEL CONSTRUCTION: THE HORIZONTAL DISTANCE BETWEEN PRESSURE WATER MAINS AND SEWERS SHALL BE AT LEAST 10 FEET.
3. PERPENDICULAR CONSTRUCTION (CROSSING): PRESSURE WATER MAINS SHALL BE AT LEAST 18" ABOVE SANITARY/STORM SEWERS WHERE THESE LINES MUST CROSS. THE CROSSING MUST BE AT A MINIMUM ANGLE OF 45 DEGREES.

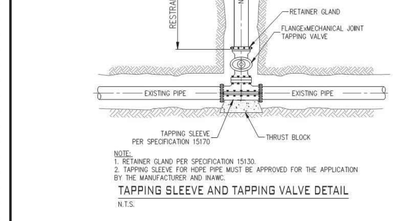
REQUIRED SEPARATION BETWEEN WATER MAINS AND SANITARY/STORM SEWERS & STRUCTURES

INDIANA AMERICAN WATER
ENGINEERING DEPARTMENT
153 N. EMERSON AVENUE
GREENWOOD, INDIANA 46143

STANDARD DETAIL

SEWER SEPARATION

DATE: JANUARY, 2018	DRAWN BY: S. FORD
LATEST REV: JULY, 2018	APP'D BY: E.N.



NOTE:
1. RETAINER GLAND PER SPECIFICATION 15130.
2. TAPPING SLEEVE FOR HOPE PIPE MUST BE APPROVED FOR THE APPLICATION BY THE MANUFACTURER AND INAWC.

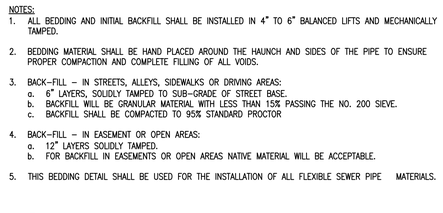
TAPPING SLEEVE AND TAPPING VALVE DETAIL
N.T.S.

INDIANA AMERICAN WATER
ENGINEERING DEPARTMENT
153 N. EMERSON AVENUE
GREENWOOD, INDIANA 46143

STANDARD DETAIL

TAPPING SLEEVE AND TAPPING VALVE

DATE: JANUARY, 2018	DRAWN BY: S. FORD
LATEST REV: JANUARY, 2018	APP'D BY: E.N.

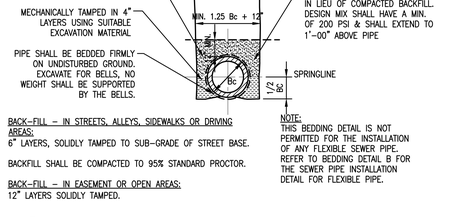


GEOTEXTILE OVERLAP	
D, PIPE SIZE (IN)	X (IN)
12	12
15	15
18	18
24	24

LEGEND
Bc=OUTSIDE DIAMETER OF PIPE

NOTES:
1. ALL BEDDING AND INITIAL BACKFILL SHALL BE INSTALLED IN 4" TO 6" BALANCED LIFTS AND MECHANICALLY TAMPED.
2. BEDDING MATERIAL SHALL BE HAND PLACED AROUND THE HAUNCH AND SIDES OF THE PIPE TO ENSURE PROPER COMPACTION AND COMPLETE FILLING OF ALL VOIDS.
3. BACK-FILL – IN STREETS, ALLEYS, SIDEWALKS OR DRIVING AREAS:
   a. 6" LAYERS, SOLIDLY TAMPED TO SUB-GRADE OF STREET BASE.
   b. BACKFILL WILL BE GRANULAR MATERIAL WITH LESS THAN 15% PASSING THE NO. 200 SIEVE.
   c. BACKFILL SHALL BE COMPACTED TO 95% STANDARD PROCTOR
4. BACK-FILL – IN EASEMENT OR OPEN AREAS:
   a. 12" LAYERS SOLIDLY TAMPED.
   b. FOR BACKFILL IN EASEMENTS OR OPEN AREAS NATIVE MATERIAL WILL BE ACCEPTABLE.
5. THIS BEDDING DETAIL SHALL BE USED FOR THE INSTALLATION OF ALL FLEXIBLE SEWER PIPE MATERIALS.

2 SD-806 BEDDING DETAIL B
SCALE – N.T.S. P-CO-VIG-76



NOTE:
IF NATIVE MATERIAL IS GREATER THAN 15% PASSING THE NO. 200 SIEVE THEN BEDDING DETAIL 'B' WILL BE USED EXCLUSIVELY.

LEGEND
Bc=OUTSIDE DIAMETER

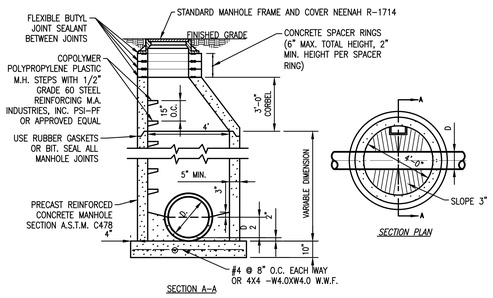
BACK-FILL – IN STREETS, ALLEYS, SIDEWALKS OR DRIVING AREAS:
6" LAYERS, SOLIDLY TAMPED TO SUB-GRADE OF STREET BASE.

BACKFILL SHALL BE COMPACTED TO 95% STANDARD PROCTOR.

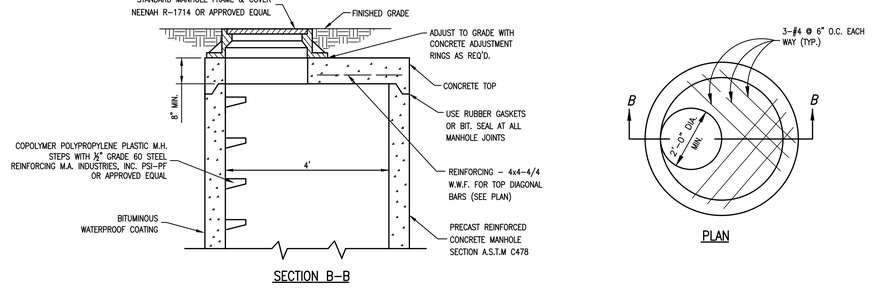
BACK-FILL – IN EASEMENT OR OPEN AREAS:
12" LAYERS SOLIDLY TAMPED.

NOTE:
THIS BEDDING DETAIL IS NOT PERMITTED FOR THE INSTALLATION OF ANY FLEXIBLE SEWER PIPE. REFER TO BEDDING DETAIL B FOR THE SEWER PIPE INSTALLATION DETAIL FOR FLEXIBLE PIPE.

3 SD-806 BEDDING DETAIL A
SCALE – N.T.S. P-CO-VIG-74



5 SD-806 MANHOLE DETAIL
SCALE – N.T.S. P-CO-VIG-72



6 SD-806 RESTRICTED HEADROOM MANHOLE DETAIL
SCALE – N.T.S. P-CO-VIG-73

DLZ
ARCHITECTURE • ENGINEERING • PLANNING
SURVEYING • CONSTRUCTION SERVICES

LAURIE A. POLCZYKAY — REGISTERED PROFESSIONAL ENGINEER — STATE OF INDIANA — 19900533 — 9/12/19

NO.	REVISION	DATE
1	ADDENDUM NO. 1	9/12/19

DRAWN:
CHK'D:
DESIGNED:
APPR'D:
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

SITE DETAILS - 6

DRAWING NUMBER
SD-806
SITE DEVELOPMENT

1. GENERAL

A. THE INFORMATION ON THIS SHEET SHALL APPLY TO ALL STRUCTURAL DRAWINGS.
B. INFORMATION ON THIS SHEET SUPPLEMENTS THE PROJECT SPECIFICATIONS. REFER TO PROJECT SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
C. NUMEROUS OPENINGS ARE REQUIRED THROUGH THE ROOF WALLS AND FLOORS. SEE ALL OTHER TRADES' DRAWINGS FOR SIZE AND EXACT LOCATION OF ALL PENETRATIONS. PENETRATIONS LESS THAN 12" MAY NOT ALL BE INDICATED ON STRUCTURAL DRAWINGS. PENETRATIONS LESS THAN 12" SHALL HAVE AT LEAST 1'-0" CLEAR BETWEEN OPENINGS, UNLESS APPROVED IN WRITING BY THE SER.
D. UNLESS OTHERWISE NOTED, ALL DETAILS, SECTIONS AND NOTES ON THE DRAWINGS ARE INTENDED TO INDICATE DESIGN INTENT AND ARE TO BE TYPICAL FOR SIMILAR SITUATIONS ELSEWHERE.
E. THESE DRAWINGS ARE NOT TO BE USED FOR SHOP DETAILING UNLESS SPECIFICALLY STAMPED BY THE STRUCTURAL ENGINEER ON THE DRAWINGS "FOR DETAILING". THESE DRAWINGS ARE NOT TO BE REPRODUCED FOR THE PURPOSE OF USING THEM AS SHOP DRAWINGS. ANY SHOP DRAWINGS SUBMITTED WITH COPIES OF THESE DRAWINGS WITHOUT PRIOR APPROVAL BY THE STRUCTURAL ENGINEER OF RECORD WILL BE REJECTED AND RESUBMITTAL WILL BE REQUIRED.
F. THE INFORMATION CONTAINED ON THE STRUCTURAL DRAWINGS IS IN ITSELF INCOMPLETE AND VOID UNLESS USED IN CONJUNCTION WITH ALL OTHER DISCIPLINE DRAWINGS, THE SPECIFICATIONS, TRADE PRACTICES, OR APPLICABLE STANDARDS, CODES, ETC.
G. CONTRACTOR IS TO ASSUME FULL RESPONSIBILITY, UNRELIEVED BY REVIEW OF SHOP DRAWINGS OR PERIODIC OBSERVATION OF CONSTRUCTION, FOR COMPLIANCE WITH THE CONTRACT DOCUMENTS, FOR DIMENSIONS TO BE CONFIRMED AND CORRELATED ON THE JOB SITE AND BETWEEN INDIVIDUAL DRAWINGS OR SETS OF DRAWINGS FOR FABRICATION PROCESSES AND CONSTRUCTION TECHNIQUES (INCLUDING EXCAVATION, SHORING, SCAFFOLDING, BRACING, ERECTION, FORMWORK, ETC.), FOR COORDINATION OF THE VARIOUS TRADES, AND FOR SAFE CONDITIONS ON THE JOB SITE. VARIATIONS IN FIELD CONDITIONS RELATIVE TO THE CONTRACT DOCUMENTS SHALL BE REPORTED TO THE ENGINEER AS SOON AS THEY ARE FOUND. WORK SHALL NOT PROGRESS UNTIL WRITTEN PERMISSION FROM THE ENGINEER IS OBTAINED.
H. ELEVATION 494.33' AS SHOWN ON THE SITE DRAWINGS IS EQUAL TO 100'-0" AS USED IN THE STRUCTURAL DRAWINGS.
I. WHERE CONFLICTS OR DISCREPANCIES BETWEEN DRAWINGS AND SPECIFICATIONS EXIST THE CONTRACTOR SHALL NOTIFY THE ENGINEER IMMEDIATELY FOR CLARIFICATION. THE CONTRACTOR SHALL NOT ASSUME ANY ITEM TAKES PRECEDENCE OVER THE OTHER. ANY ACTION THE CONTRACTOR MAKES PRIOR TO NOTIFICATION SHALL BE AT THE CONTRACTOR'S RISK.
J. THESE DRAWINGS SHALL NOT BE SCALED TO OBTAIN DIMENSIONS. IF THE DIMENSIONS CANNOT BE DETERMINED BY THE INFORMATION GIVEN, CONTRACTOR SHALL CONTACT ENGINEER FOR REQUIRED INFORMATION.
K. SITE OBSERVATION BY THE ENGINEER IS SOLELY FOR THE PURPOSE OF DETERMINING IF THE WORK OF THE CONTRACTOR IS PROCEEDING IN ACCORDANCE WITH THE STRUCTURAL CONTRACT DOCUMENTS. THIS LIMITED SITE OBSERVATION SHOULD NOT BE CONSTRUED AS EXHAUSTIVE OR CONTINUOUS TO CHECK THE QUALITY OR QUANTITY OF THE WORK, BUT RATHER PERIODIC IN AN EFFORT TO GUARD THE OWNER AGAINST DEFECTS OR DEFICIENCIES IN THE WORK OF THE CONTRACTOR.
L. THE DRAWINGS, SPECIFICATIONS, BIM MODEL AND OTHER DOCUMENTS PREPARED BY DLZ INDIANA, LLC (DLZ) FOR THIS PROJECT ARE INSTRUMENTS OF THE ENGINEER'S SERVICE, AND MAY BE USED SOLELY WITH RESPECT TO THE PROJECT AND, UNLESS OTHERWISE PROVIDED, THE ENGINEER SHALL BE DEEMED THE AUTHOR OF THESE PLANS AND RETAINS ALL COMMON LAW RIGHTS, TITLES AND INTEREST THEREIN. THE OWNER SHALL BE PERMITTED TO RETAIN COPIES, INCLUDING REPRODUCIBLE COPIES, OF THE ENGINEER'S DRAWINGS, SPECIFICATIONS OTHER DOCUMENTS FOR INFORMATION AND REFERENCE IN CONNECTION WITH THE OWNER'S USE AND OCCUPANCY OF THE PROJECT. DLZ SHALL NOT BE LIABLE FOR ANY HARM OR DAMAGE SUFFERED BY ANY PARTY BY REASON OF THE UNAUTHORIZED USE OF THESE PLANS. DLZ EXPRESSLY RESERVES ITS COPYRIGHTS IN THESE PLANS. THESE PLANS MAY NOT BE REPRODUCED, CHANGED, OR COPIED IN ANY FORM OR MANNER WHATSOEVER, NOR MAY THEY BE ASSIGNED OR OTHERWISE MADE AVAILABLE TO ANY THIRD PARTY WITHOUT FIRST OBTAINING THE EXPRESS WRITTEN CONSENT OF DLZ.
M. DO NOT INSTALL CONDUIT IN SUPPORTED SLABS, SLABS ON GRADE OR CONCRETE WALLS UNLESS EXPLICITLY SHOWN OR NOTED ON THE STRUCTURAL DRAWINGS.
N. DO NOT SUSPEND ANY ITEMS, SUCH AS DUCTWORK, MECHANICAL OR ELECTRICAL FIXTURES, CEILINGS, ETC. FROM STEEL ROOF DECK.
O. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR THE DESIGN, INSTALLATION, AND REMOVAL OF ALL TEMPORARY BRACING AND CONSTRUCTION SUPPORTS, FOR NEW AND EXISTING STRUCTURES, AS NECESSARY TO COMPLETE THE PROJECT. NO PORTION OF THE PROJECT, WHILE UNDER CONSTRUCTION, IS INTENDED TO BE STABLE IN THE ABSENCE OF THE CONTRACTOR'S TEMPORARY BRACES AND SUPPORTS UNTIL ALL OF THE STRUCTURAL ELEMENTS, INCLUDING THE MASONRY/CONCRETE/PRECAST WALLS, METAL ROOF DECK, SLABS-ON-STEEL DECK, ELEVATED CONCRETE SLABS AND SLABS-ON-GRADE ARE IN PLACE AND FULLY CONNECTED AS INDICATED ON THESE DRAWINGS. CONTRACTOR SHALL RETAIN A LICENSED PROFESSIONAL ENGINEER TO DESIGN ALL TEMPORARY BRACING AND CONSTRUCTION SUPPORTS.

2. DESIGN DATA

A. DESIGN CODE:
1) ALL DESIGN IS IN CONFORMANCE WITH THE 2014 INDIANA BUILDING CODE (2012 INTERNATIONAL BUILDING CODE AS AMENDED BY THE INDIANA ADMINISTRATIVE CODE) (IBC). RISK CATEGORY IS TYPE III.

B. DESIGN DEAD LOADS: WEIGHT OF ALL MATERIALS OF CONSTRUCTION INCORPORATED INTO THE BUILDING INCLUDING BUT NOT LIMITED TO WALLS, FLOORS, ROOFS, FIREPROOFING, CEILINGS, STAIRWAYS, BUILT IN PARTITIONS, FINISHES, CLADDING, EQUIPMENT AND OTHER SIMILARLY INCORPORATED ITEMS AND EQUIPMENT.
1) ROOF JOIST TOP CHORD - 10 PSF
2) ROOF JOIST BOTTOM CHORD - 10 PSF
3) FLOOR DEAD LOAD:
A) 8" PRECAST FLOOR -66 PSF
B) 10+2 PRECAST FLOOR 101 PSF

C. DESIGN LIVE LOADS

1) LOAD TYPE	UNIFORM (PSF)	CONCENTRATED (POUNDS)
2) ROOF LIVE LOAD	20	300
3) FLOOR LIVE LOAD	100	2000
4) CORRIDORS AT FIRST FLOOR	100	
5) PRECAST SECURITY LID	20	300
6) STAIRWAYS	100	300 (ON AREA OF 4 SQUARE INCHES)
7) MECHANICAL AREAS	125	
8) CELL LIVING AREAS	40	
9) CELL MEZZANINE	100	
10) LIVE LOAD REDUCTION NOT USED		

D. WIND LOADING CRITERIA
1) ULTIMATE 3-SECOND WIND SPEED V=120 MPH
2) EXPOSURE C
3) GCPI=±0.18 (ENCLOSED STRUCTURES)
4) COMPONENT AND CLADDING WIND LOADING PER S-701.

E. SNOW LOADING CRITERIA
1) PG=20 PSF
2) PF=15.5 PSF
3) I=1.10
4) CE=1.0
5) CT=1.0
6) DRIFT LOADS ARE IN ADDITION TO FLAT ROOF SNOW LOAD, PER S-701.

F. SEISMIC DESIGN CRITERIA
1) I=1.25
2) SS =0.27
3) S1 =0.117
4) SDS=0.285
5) SD1=0.182
6) SITE CLASS D
7) SEISMIC DESIGN CATEGORY C
8) BASIC SEISMIC FORCE RESISTING SYSTEM - INTERMEDIATE PRECAST SHEAR WALLS, INTERMEDIATE REINFORCED MASONRY SHEAR WALLS, AND STEEL SYSTEMS NOT SPECIFICALLY DETAILED FOR SEISMIC RESISTANCE
9) SEISMIC RESPONSE COEFFICIENT - CS = 0.1118
10) RESPONSE MODIFICATION FACTOR - R = 3
11) DESIGN BASE SHEAR - V = 1585 KIPS
12) ANALYSIS PROCEDURE-EQUIVALENT LATERAL FORCE

G. SOIL INFORMATION:

1) REFER TO GEOTECHNICAL INVESTIGATION REPORT BY PATRIOT ENGINEERING DATED APRIL 17, 2019 AND ADDENDUM TO THE REPORT DATED JUNE 2, 2019.
2) NET ALLOWABLE SOIL BEARING PRESSURE BELOW FOOTINGS ON IMPROVED SOILS (RAMMED AGGREGATE PIERS) SHALL BE A MINIMUM OF 5000 PSF. THE QUANTITY AND SIZE OF RAMMED AGGREGATE PIERS UNDER FOOTINGS SHALL BE DETERMINED BY THE RAMMED AGGREGATE PIER SSE AND INSTALLED BY A CERTIFIED CONTRACTOR.
3) OVEREXCAVATE PER 3/S-530 FOR INSTALLATION OF THICKENED SLABS.
4) BASEMENT WALLS (I.E., THOSE THAT ARE HELD RIGIDLY AGAINST HORIZONTAL MOVEMENT SUCH THAT THEY DEVELOP AN "AT-REST" EARTH PRESSURE CONDITION) ARE DESIGNED USING AN "AT-REST" LATERAL EARTH PRESSURE AND AS FOLLOWS:
A) SOIL BACKFILL SHALL BE A WELL-GRADED, FREE-DRAINING GRANULAR MATERIAL BEHIND WALLS WITHIN A ZONE DEFINED BY A PLANE EXTENDING UPWARD AND OUTWARD ON A 1:1 SLOPE FROM THE BASE OF THE FOOTING.
B) DESIGN "AT-REST" LATERAL EARTH PRESSURE COEFFICIENT, Ko=0.5.
C) WALL DESIGNED FOR LIVE LOAD SURCHARGE OF 2'-0" OF FILL OR 250 POUNDS PER SQUARE FOOT, WHICHEVER IS GREATER.

H. MATERIALS:
1) CAST-IN-PLACE CONCRETE F'C=4000 PSI
2) REINFORCING STEEL FY=60 KSI (ASTM A615 U.N.O.)
3) WELDED WIRE FABRIC - ASTM A1064
4) CMU F'M=2500 PSI (NET AREA COMPRESSIVE STRENGTH OF UNITS = 3750 PSI) ASTM C-90
5) MORTAR - ASTM C270 - TYPE S
6) GROUT - ASTM C476 - COMPRESSIVE STRENGTH 3000 PSI (MIN)
7) GALVANIZED STEEL ROOF DECK, ASTM A653, STRUCTURAL QUALITY GRADE S533
8) STRUCTURAL STEEL:
A) W-SECTIONS - ASTM A992
B) PLATES, BARS, RODS, ANGLES AND CHANNELS - A36
C) HOLLOW STRUCTURAL STEEL (HSS) - ASTM A500 GRADE B
D) ANCHOR RODS - ASTM F1554, GRADE 36
E) HIGH STRENGTH BOLTS:

AA) GROUP A AS DEFINED BY AISC 360-10 "SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS" SECTION J3.1
AB) SNUG TIGHT CONNECTIONS SHALL BE PERMITTED FOR ALL CONNECTIONS.

9) FILLER METAL FOR WELDING: SHIELDED METAL ARC WELDING - AWS A5.1 OR A5.5 OR E70XX.

I. DESIGN STANDARDS:
1) ACI 318-11 "BUILDING CODE REQUIREMENTS FOR CONCRETE"
2) TMS 402-11 "BUILDING CODE REQUIREMENTS FOR MASONRY STRUCTURES" - ASD
3) ANSI/AISC 360-10 "SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS" - ASD
4) AISI 2012 "SPECIFICATION FOR THE DESIGN OF COLD-FORMED STEEL STRUCTURAL MEMBERS" - ASD

3. CONCRETE AND REINFORCING STEEL

A. ALL REINFORCEMENT LAP AND DEVELOPMENT LENGTHS SHALL SATISFY THE MINIMUM REQUIREMENTS INDICATED IN DETAIL 1/S-530.
B. WHERE BARS OF TWO DIFFERENT SIZES ARE SPLICED, THE SPLICE LENGTH SHALL BE THE REQUIRED LAP LENGTH FOR THE SMALLER BAR, BUT NOT LESS THAN THE DEVELOPMENT LENGTH FOR THE LARGER BAR.
C. CONTRACTOR MAY ELECT TO USE MECHANICAL BAR SPLICE, WHICH DEVELOPS 125% OF THE BAR STRENGTH, IN LIEU OF LAPPING REINFORCEMENT.
D. ALL REINFORCING BARS SHALL BE CONTINUOUS AT CORNERS. PROVIDE DOWELS OR CORNER BARS AS REQUIRED AND INSTALL PRIOR TO PLACING CONCRETE.
E. CONCRETE REINFORCEMENT SHOWN IS DIAGRAMMATIC AND ONLY INTENDED TO SHOW THE GENERAL CONFIGURATION, SIZE AND QUANTITY OF REINFORCEMENT. CONTRACTOR/FABRICATOR SHALL FOLLOW THE LAP AND EMBEDMENT LENGTHS PROVIDED AND ACI 315 "ACI DETAILING MANUAL" FOR PROPER DETAILING REQUIREMENTS AND THE CONCRETE REINFORCING STEEL INSTITUTE'S (CRSI) "MANUAL OF STANDARD PRACTICE"
F. ALL CONTROL OR CONSTRUCTION JOINTS IN CONCRETE SLABS-ON-GRADE TO BE PLACED AT A MAXIMUM OF 12 FEET ANY DIRECTION. IN NO CASE SHALL LENGTH-TO-WIDTH RATIO OF CONCRETE SLAB ON GRADE EXCEED 1.5 ALL CONTROL JOINTS TO BE SAW CUT WITHIN 6 HOURS AFTER PLACING CONCRETE.
G. SLABS-ON-GRADE: (FINISH EXPOSED) FIBER REINFORCED WITH POLYPROPYLENE MICRO-FIBERS AT THE RATE OF 1.5 POUNDS PER CUBIC YARD OF CONCRETE. FIBER REINFORCEMENT IS IN ADDITION TO THE REQUIRED 6X6-W2.1 WELDED WIRE FABRIC. THE FIBERS THAT PENETRATE THE SURFACE IN AREAS OF SLAB-ON-GRADE THAT ARE EXPOSED TO VIEW AND DO NOT RECEIVE ANY FLOOR COVERING SHALL BE TORCHED LIGHTLY. CONTRACTOR SHALL TAKE CARE TO NOT BURN OR SCORCH THE EXPOSED CONCRETE. DO NOT USE FIBERS IN POLISHED CONCRETE.
H. SLABS-ON-GRADE: (FINISH NOT EXPOSED) FIBER REINFORCED WITH POLYPROPYLENE MICRO-FIBERS AT THE RATE OF 1.5 POUNDS PER CUBIC YARD OF CONCRETE. FIBER REINFORCEMENT IS IN ADDITION TO THE REQUIRED 6X6-W2.1XW2.1 WELDED WIRE FABRIC. THE FIBERS THAT PENETRATE THE SURFACE SHALL BE TORCHED AS REQUIRED TO INSTALL THE FLOOR COVERING.
I. CONCRETE CONSTRUCTION SHALL CONFORM TO ACI 301 "SPECIFICATIONS FOR STRUCTURAL CONCRETE". CONTRACTOR SHALL MAINTAIN A COPY OF THIS SPECIFICATION ON SITE DURING CONSTRUCTION.
J. CHAMFER EXPOSED CONCRETE EDGES 3/4" U.N.O.
K. ALL WELDED WIRE FABRIC INDICATED ON DRAWINGS SHALL BE FLAT SHEETS AND SHALL BE PLACED 1 1/2" FROM THE TOP OF THE SLAB AND SUPPORTED ON CONCRETE BRICKS, WIRE, OR CHAIRS. WELDED WIRE FABRIC SHALL NOT BE LIFTED INTO PLACE DURING CONCRETE PLACEMENT. WELDED WIRE FABRIC SHALL BE LAPPED SUCH THAT THE OVERLAP IS EQUAL TO THE CROSSWIRE SPACING PLUS 2 INCHES.
L. CORING OR CUTTING CONCRETE SHALL NOT BE PERMITTED UNLESS APPROVED BY THE SER.
M. REINFORCEMENT SHALL BE SUPPORTED IN ITS SPECIFIED AND PROPER POSITION BY USE OF BRICKS, WIRES, OR CHAIRS. SUCH DEVICES SHALL BE SUFFICIENTLY STRONG AND PROPERLY PLACED AT FREQUENT INTERVALS SO AS TO MAINTAIN THE COVER BETWEEN THE REINFORCING AND THE SURFACE OF THE CONCRETE. THE REINFORCEMENT SHALL BE PLACED AS SHOWN ON THE PLANS WITHIN ±1/4". PLATFORMS FOR THE SUPPORT OF WORKERS AND EQUIPMENT DURING CONCRETE PLACEMENT SHALL BE SUPPORTED DIRECTLY ON THE GRADE AND NOT ON THE REINFORCING STEEL.
N. FIELD BENDING OF REINFORCING BARS IS NOT PERMITTED.
O. WET STICKING (MUCKING IN) OF REINFORCEMENT IS NOT ACCEPTABLE AND SHALL BE CAUSE FOR REJECTION REQUIRING REPLACEMENT OF WORK.

4. PRECAST CONCRETE UNITS

A. THE CONTRACTOR SHALL VERIFY FINAL EQUIPMENT SIZE, WEIGHT, OPENING SIZES AND LOCATIONS, AS WELL AS ALL PENETRATIONS REQUIRED BY ALL TRADES AND THEIR SUPPORT REQUIREMENTS PRIOR TO SUBMISSION OF PRECAST STRUCTURAL CONCRETE SHOP DRAWINGS. PROVIDE DOCUMENTATION WITH SHOP DRAWING SUBMITTAL INDICATING THAT ALL TRADES HAVE SIGNED OFF ON ALL AFOREMENTIONED COORDINATION. PLAN OPENINGS OF 12"x12" OR SMALLER MAY NOT ALL BE SHOWN ON THE STRUCTURAL DRAWINGS. SHOP DRAWINGS MUST BE SUBMITTED AT THE SAME TIME AS DETAILED ENGINEERING ANALYSIS PREPARED BY A QUALIFIED PROFESSIONAL ENGINEER LICENSED IN THE STATE WHERE THE PROJECT IS TO BE BUILT. SHOP DRAWINGS WILL NOT BE REVIEWED PRIOR TO RECEIPT OF DETAILED ENGINEERING ANALYSIS AND DOCUMENTATION OF TRADE COORDINATION.
B. DESIGN PRECAST STRUCTURAL CONCRETE , INCLUDING COMPREHENSIVE ENGINEERING ANALYSIS, BY A QUALIFIED PROFESSIONAL ENGINEER LICENSED IN THE STATE WHERE THE PROJECT IS TO BE BUILT, USING PERFORMANCE REQUIREMENTS AND DESIGN DATA INDICATED.
C. PRECAST STRUCTURAL CONCRETE SHALL BE DESIGNED TO SUPPORT THE SUPERIMPOSED DEAD, FLOOR LIVE, ROOF LIVE, WIND, SNOW, AND SEISMIC LOADS INDICATED IN ADDITION TO THEIR SELF-WEIGHT.
D. THE LOADS SPECIFIED ON S-701 ARE SERVICE LEVEL LOADS.
E. THE UNITS SHALL NOT BE ERECTED UNTIL 21 DAYS (MIN) AFTER FORM REMOVAL.
F. ALL PRECAST STRUCTURAL CONCRETE MEMBERS AND THEIR CONNECTIONS SHALL BE IN ACCORDANCE WITH PCI MANUALS.

G. HOLLOWCORE PRECAST FLOOR:

1) NUMEROUS OPENINGS ARE REQUIRED IN THE FLOOR HOLLOWCORE PRECAST UNITS. COORDINATE WITH ALL TRADES FOR PENETRATIONS AND CONSTRUCTION THROUGH OR ATTACHED TO PRECAST CONCRETE CONSTRUCTION. PRECAST STRUCTURAL CONCRETE FABRICATOR SHALL PROVIDE ADEQUATE SUPPORT FRAMES FOR SUCH OPENINGS. REFER TO 4/S-550 FOR TYPICAL DETAIL.;
2) NO PRESTRESSING STRANDS, FIELD HOLES, OR REINFORCING BARS MAY BE CUT WITHOUT WRITTEN APPROVAL BY THE PRECAST SSE. FIELD HOLES REQUIRED IN THE PRECAST FOR MISCELLANEOUS ITEMS SHALL BE CAREFULLY LOCATED TO AVOID CUTTING PRESTRESSING STRANDS OR REINFORCING BARS. CUT STRANDS OR REINFORCEMENT SHALL BE CAUSE FOR REJECTION OF PRECAST UNIT.
3) PROVIDE 1/2" DIA. DRAIN HOLE IN THE BOTTOM OF EACH CELL 10" FROM EACH END OF HOLLOWCORE PRECAST UNITS. ALL UNITS EXPOSED IN THEIR FINAL CONDITION SHALL BE PATCHED TO PROVIDE A UNIFORM APPEARANCE.

H. ARCHITECTURAL AND LOAD BEARING PRECAST WALL PANELS:

1) REFER TO ARCHITECTURAL DRAWINGS, ELEVATIONS, SPECIFICATIONS FOR PANEL LAYOUT, FINISH, AND SECURITY REQUIREMENTS OF PRECAST WALL PANELS
2) ALL WELD PLATES, COIL INSERTS, ANCHOR BOLTS/RODS ETC. AS REQUIRED FOR THE SUPPORT OF, OR CONNECTION TO THE STRUCTURE, IDENTIFIED ON THE PRECAST SHOP DRAWINGS TO BE INSTALLED BY OTHER TRADES, SHALL BE DESGINED AND FURNISHED BY THE PRECAST MANUFACTURER.
3) ALL CONNECTIONS EXPOSED TO THE WEATHER SHALL BE HOT-DIPPED GALVANIZED IN ACCORDANCE WITH ASTM A153.
4) THE PRECAST STRUCTURE MUST BE TEMPORARILY BRACED AGAINST LATERAL LOADING, UNBALANCED GRAVITY LOAD AND ECCENTRICITY DUE TO INCOMPLETE STRUCTURE UNTIL BRACING ELEMENTS (I.E. SHEAR WALLS, FRAMES, ETC.) ARE COMPLETE AND HAVE ATTAINED THEIR DESIGN STRENGTH.

I. EMBED PLATES INDICATED ARE THE MINIMUM REQUIRED AND SHALL BE DESIGNED BY THE PC SSE FOR THE IMPOSED LOADS.

5. MASONRY

A. MASONRY CONSTRUCTION SHALL CONFORM TO TMS602/ACI530.1/ASCE6 "SPECIFICATION FOR MASONRY STRUCTURES AND COMMENTARY". CONTRACTOR SHALL MAINTAIN A COPY OF THIS REFERENCED SPECIFICATION ON SITE DURING CONSTRUCTION OF ALL MASONRY WALLS.
B. ALL MASONRY JOINTS SHALL HAVE CONCAVE JOINTS.
C. JOINT REINFORCEMENT SHALL BE PLACED IN HORIZONTAL MORTAR JOINTS AT 16" O.C. VERTICAL SPACING, AND AT TOP AND BOTTOM OF WALL OPENINGS (EXTEND 2 FEET PAST OPENING). JOINT REINFORCEMENT SHALL BE PLACED AT 8 INCH O.C. IN PARAPETS.
D. COORDINATE REQUIRED OPENINGS WITH ALL TRADES AND PROVIDE MASONRY OR STEEL LINTELS FOR ALL OPENING GREATER THAN 1'-0" IN ACCORDANCE WITH THE LINTEL SCHEDULES.
E. VERTICAL CONTROL JOINTS IN CMU WALLS SHALL BE LOCATED AT MAX. SPACING OF 20'-0" PROVIDED THAT THE LENGTH TO HEIGHT RATIO OF WALL BETWEEN ADJACENT JOINTS DOES NOT EXCEED 1.5. IN ADDITION, CONTROL JOINTS SHALL BE LOCATED AT THE FOLLOWING LOCATIONS: CHANGES IN WALL THICKNESS, ABOVE CONTROL JOINTS IN FOUNDATION OR CONCRETE WALLS, AT LOCATIONS AS SHOWN ON ARCHITECTURAL DRAWINGS, AT INTERSECTION OF EXTERIOR (OR MAIN) WALL WITH INTERIOR WALL, SEE DETAIL 2/S-540.
F. ALL GROUTING TO BE PLACED USING LOW LIFT METHOD. MAXIMUM HEIGHT OF LIFT SHALL BE 5 FEET.
G. ALL WALLS SHALL BE REINFORCED WITH #4 BARS SPACED AT 48" U.N.O. REINFORCEMENT SHALL BE PROPERLY EMBED AND TIED OFF INTO THE SLAB OR FOUNDATION PRIOR TO CONCRETE PLACEMENT. CONTRACTOR MAY PLACE REINFORCEMENT AFTER THE CONCRETE HAS BEEN POURED BY FIELD DRILLING HOLES AND EPOXY EMBEDDING THE REINFORCEMENT. MINIMUM DEPTH OF EPOXY EMBEDMENT SHALL BE EQUAL TO THE BAR DEVELOPMENT LENGTH.
H. REINFORCEMENT SHALL BE PROPERLY POSITIONED AND TIED OFF WITHIN MASONRY PRIOR TO GROUTING AND SHALL HAVE THE DEVELOPMENT AND LAP LENGTH INDICATED ON DETAIL 1/S-541.
I. WET STICKING (MUCKING IN) OF REINFORCEMENT IS NOT ACCEPTABLE AND SHALL BE CAUSE FOR REJECTION.
J. IN LIEU OF LAP SPLICING REINFORCEMENT, CONTRACTOR MAY USE MECHANICAL SPLICES IN ACCORDANCE WITH ACI 530. MECHANICAL SPLICES MUST BE USED FOR ALL BARS #9 OR LARGER.
K. CMU BOND BEAMS SHALL BE PLACED AS INDICATED IN THE DRAWINGS. IN ADDITION THEY SHALL BE LOCATED AT THE TOP OF ALL WALLS AND PARAPETS, AT A MAXIMUM VERTICAL SPACING OF 8'-0" AND AT THE BOTTOM OF WALLS SUPPORTED BY ELEVATED SLABS.
L. REINFORCEMENT SHALL BE GROUTED WITHIN MASONRY AND SHALL BE DETAILED TO HAVE THE DEVELOPMENT AND LAP LENGTH INDICATED IN THE CMU REINFORCEMENT LAP AND DEVELOPMENT LENGTH SCHEDULE.
M. ADDITIONAL CONCRETE MASONRY UNIT TYPICAL DETAILS, SECTIONS AND REQUIREMENTS ARE LOCATED ON DRAWING S-540 AND S-541.

6. STRUCTURAL AND MISCELLANEOUS STEEL

A. ALL EXPOSED STEEL AT MAIN LOBBY AND VESTIBULE SHALL BE AESS CATEGORY 1.
B. DO NOT PRIME STEEL INDICATED TO RECEIEVE FIREPROOFING OR INTUMESCENT PAINT.
C. THE STRUCTURAL STEEL FOR THIS STRUCTURE AS SHOWN ON THE STRUCTURAL DOCUMENTS WITH ALL RELATED DETAILS ARE NON-SELF SUPPORTING AS DEFINED BY THE A.I.S.C. CODE OF STANDARD PRACTICE AND REMAIN SO UNTIL ALL OF THE STRUCTURAL ELEMENTS, INCLUDING ANY MASONRY WALLS, CONCRETE FLOORS AND SLABS-ON-GRADE ARE IN PLACE AND FULLY CONNECTED AS INDICATED IN THESE DOCUMENTS. THE STRUCTURE IS LATERALLY UNSTABLE UNTIL ALL ELEMENTS ARE IN PLACE, HAVE ATTAINED DESIGN STRENGTH, AND ARE FULLY SECURED TO THE BUILDING, INCLUDING COMPLETION OF FLOOR AND ROOF CONSTRUCTION. ADEQUATE TEMPORARY BRACING IS THE RESPONSIBILITY OF THE CONTRACTOR, AND CONTRACTOR SHALL SEQUENCE CONSTRUCTION OPERATIONS AS REQUIRED, UNTIL THE PERMANENT SYSTEMS ARE EFFECTIVE.
D. CONTRACTOR SHALL PROVIDE 3/8" (MIN.) PLATE WELDED TO BOTTOM FLANGE (U.N.O.) OF STEEL BEAM SUPPORTING MASONRY CONSTRUCTION. WIDTH OF PLATE SHALL BE 1/2" LESS THAN THICKNESS OF THE SUPPORTED WALL.
E. AT ALL STEEL BEAMS AND LINTELS SUPPORTING MASONRY WALLS, PROVIDE STUD 1/2" DIA. X 6" LONG HEADED STUDS SPACED @ 16" O.C. WELD TO STEEL BEAM AND STEEL LINTELS.
F. ALL EXTERIOR STEEL, STEEL LINTELS AND RELIEF ANGLES SHALL BE HOT-DIP GALVANIZED AND PAINTED. REPAIR ANY DAMAGE TO THESE COATINGS THAT MAY OCCUR DURING CONSTRUCTION ACTIVITIES.
G. WELD CERTIFICATES FOR REQUIRED WELD POSITIONS SHALL BE SUBMITTED AND APPROVED PRIOR TO ANY STEEL BEING ERECTED.
H. BEAM CONNECTIONS WHICH ARE NOT DETAILED ON THE DRAWINGS SHALL BE DESIGNED BY A QUALIFIED PROFESSIONAL ENGINEER (LICENSED IN THE STATE WHERE PROJECT IS BUILT) FOR THE SERVICE LEVEL BEAM REACTIONS INDICATED ON THE DRAWINGS AND AS FOLLOWS:

1) CONNECTIONS NOT COMPLETELY DETAILED ON THE DRAWINGS INCLUDING MATERIAL AND SIZES, WELD SIZES AND NUMBER OF BOLTS SHALL BE DESIGNED AND DETAILED IN SHOP DRAWINGS BY THE CONTRACTOR PER THE SPECIFICATIONS.
3) REACTIONS SHOWN ARE SERVICE LEVEL LOAD REACTIONS AND SHALL BE DESIGNED IN ACCORDANCE WITH AISC MANUAL OF STEEL CONSTRUCTION ALLOWABLE STRESS DESIGN.
4) REFERENCE TYPICAL STEEL DETAILS ON SHEET S-530 THRU S-534.

I. PROVIDE FOR 5 TONS OF STEEL FOR USE AS DIRECTED BY THE SER, TO INCLUDE BUT NOT LIMITED TO WIDE FLANGES, CHANNELS, ANGLES, PIPES, HSS, PLATES AND BARS AS WELL AS ANY AND ALL RELATED BOLTED OR WELDED CONNECTIONS. THIS TONNAGE IS TO INCLUDE ALL REQUIRED DETAILING, FABRICATION, DELIVERY, FINISHES AND ERECTION OF STEEL IN PLACE AS ASSOCIATED WITH DIVISION 05 SPECIFICATIONS. THE DIRECTED USE OF STEEL BY THE SER WILL BE BASED ON THE ERECTED WEIGHT OF THE VARIOUS COMPLETED STEEL COMPONENTS, NO OVERRUN IN SCALE WEIGHTS, EXCESS BOLTS OR SIMILAR ITEMS SUCH AS THE WEIGHT OF ANY PAINT, GALVANIZING OR WELD MATERIAL WILL BE ALLOWED TO BE ADDED TO THE ERECTED WEIGHT. DEDUCTION WILL NOT BE MADE FOR BOLT HOLES IN THE MATERIAL.
J. ALL TUBE STEEL, HOLLOW STRUCTURAL STEEL AND PIPE SECTIONS IN EXTERIOR APPLICATIONS SHALL BE DETAILED TO KEEP WATER FROM ENTERING THE CLOSED SECTION.
K. PROVIDE MISCELLANEOUS LOOSE L9X4X$\frac{3}{8}$ (LLH) LINTEL WITH A MINIMUM 8" BEARING AT EACH END ABOVE OPENINGS IN BRICK/STONE FACADE WHERE OTHER SUPPORT IS NOT SHOWN.
L. SHIM BETWEEN PARALLEL ROOF BEAMS AND JOISTS WITH DIFFERENTIAL MILL AND INDUCED CAMBERS FOR LEVEL DECK BEARING.
M. INSTALLATION HOLES SHALL BE SEALED WITH A CLOSURE PLATE 2 GAUGES THICKER THAN DECK AND MECHANICALLY FASTENED TO DECK. STEEL DECK HOLES VISIBLE FROM BELOW WILL BE REJECTED.
N. DECK UNITS THAT ARE BENT, WARPED, OR DAMAGED IN ANY WAY WHICH WOULD IMPAIR THE STRENGTH AND OR APPEARANCE OF THE DECK SHALL BE REJECTED AND REMOVED.
O. ALL COMPONENTS SUPPORTED BY STEEL JOISTS SHALL BE HUNG CONCENTRICALLY AND AT A PANEL POINT (HANGER WITHIN 3" OF A PANEL POINT SHALL BE CONSIDERED TO BE MADE AT THE PANEL POINT). WHERE SUPPORT CANNOT BE MADE AT A PANEL POINT THE CONTRACTOR SHALL FIELD INSTALL ADDITIONAL WEB MEMBERS PER DETAIL 8/S-552. ADDITIONAL WEB MEMBERS SHALL NOT BE REQUIRED WHERE THE SUM OF ALL CONCENTRATED LOADS BETWEEN PANEL POINTS IS LESS THAN 100 LBS.
P. STEEL JOISTS:

1) STEEL JOIST CONSTRUCTION SHALL CONFORM TO THE STEEL JOIST INSTITUTE (SJI) "STANDARD SPECIFICATIONS, LOAD TABLES AND WEIGHT TABLES".
2) THE JOIST SUPPLIER'S SSE SHALL DESIGN THE ADEQUACY OF SPECIAL JOISTS FOR LOADING INDICATED.
3) ANCHOR ENDS OF STEEL JOISTS AS REQUIRED FOR STABILITY DURING CONSTRUCTION AND CONSTRUCTION DETAILS HEREIN.
4) THE JOIST SUPPLIER SHALL PROVIDE ALL BRIDGING COMPLYING WITH SJI SPECIFICATIONS. PROVIDE UPLIFT BRIDGING AS REQUIRED FOR ROOF NET UPLIFT SHOWN ON S-701.
5) DO NOT WELD ACROSS PERPENDICULAR TO JOIST CHORD MEMBERS.

7. COLD FORMED STEEL

A. THE MINIMUM YIELD STRENGTH OF MEMBERS SHALL BE AS FOLLOWS:

1) 54 MILS (16 GA.), AND THICKER FY = 50KSI ASTM A653
2) 43 MILS (18 GA.), AND THINNER FY = 33KSI ASTM A653

B. PROVIDE MEANS TO KEEP DISSIMILAR METALS FROM COMING INTO CONTACT WITH COLD FORM STEEL MEMBERS (I.E. BRASS, COPPER, ETC.).
C. FABRICATE COLD FORMED STEEL FRAMING AND ACCESSORIES PLUMB, SQUARE AND TRUE TO LINE WITH CONNECTIONS SECURELY FASTENED ACCORDING TO REFERENCED AISI SPECIFICATIONS, STANDARDS AND MANUFACTURER'S WRITTEN INSTRUCTIONS.
D. PROVIDE COLD-FORMED METAL FRAMING WITH A MINIMUM MATERIAL THICKNESS AS FOLLOWS:

1) 43 MILS (18 GA.) - NON-BEARING PARTITIONS (EXTERIOR)

E. PROVIDE ALL HANGERS AND CONNECTORS AS NECESSARY TO SUPPORT AND TRANSFER INDUCED LOADS TO THE CONNECTED STRUCTURE. PROVIDE DRIFT OR DEFLECTION CLIPS AS NECESSARY TO ACCOMMODATE STRUCTURAL MOVEMENT.
F. WHERE MEMBER SIZES ARE GIVEN THEY SHALL BE NOMINAL UNLESS SPECIFICALLY DESIGNATED AS ACTUAL DIMENSIONS.
G. FRAMING DEFLECTION LIMITS SHALL BE AS FOLLOWS FOR TOTAL LOAD:

1) EXTERIOR WALL BEHIND BRICK/STONE - L/600
2) MISCELLANEOUS FRAMING - L/360

H. ALL COLD-FORMED STEEL FRAMING SIZES, GAGES AND CONNECTION DETAILS SHOWN ON THE CONSTRUCTION DOCUMENTS SHALL BE CONSIDERED THE MINIMUM ALLOWED. THE CONTRACTOR SHALL CONSTRUCT AND ASSURE THE PROPER PERFORMANCE OF THE COMPLETED COLD-FORMED STEEL FRAMING ASSEMBLY.
I. ALL COLD-FORMED METAL FRAMING LOADS SHALL BE DETERMINED BY THE COLD-FORMED METAL DESIGNER AS DETERMINED BY THE DESIGN DATA PROVIDED IN THE CONTRACT DOCUMENTS. COLD-FORMED METAL CONTRACTOR SHALL PROVIDE A COMPLETE GRAVITY AND LATERAL SYSTEM CONFORMING TO THE REQUIREMENTS OF THE IBC, SIGNED AND SEALED BY A QUALIFIED PROFESSIONAL ENGINEER LICENSED IN THE STATE WHERE THE PROJECT IS TO BE BUILT.

8. SOILS AND FOUNDATIONS

A. REMOVE TOPSOIL, ORGANIC MATERIAL, FILL, ASPHALT, CONCRETE, ANY DEBRIS FOUND AND ANY LOOSE MATERIAL OR SOILS INDICATED IN THE SOILS REPORT. THE EXPOSED SUBGRADE SHALL BE PROOF ROLLED WITH A MEDIUM-WEIGHT ROLLER TO CHECK FOR SOFT MATERIAL AS DIRECTED BY THE GEOTECHNICAL ENGINEER. BACKFILL SHALL BE ENGINEERED FILL COMPACTED TO 100% OF STANDARD PROCTOR ASTM D-698 MAXIMUM DRY DENSITY.
B. SLAB-ON-GRADE: REFER TO DETAIL 4/S-530
C. CONSTRUCTION JOINTS IN STRIP FOOTINGS AND WALLS MAY BE LOCATED AT THE DISCRETION OF THE CONTRACTOR SUBJECT TO REVIEW BY THE ENGINEER. UNLESS SPECIFICALLY NOTED OTHERWISE REINFORCING SHALL BE CONTINUOUS ACROSS JOINTS. SEE TYPICAL CONCRETE WALL AND FOOTING CONSTRUCTION JOINT DETAIL 14/S-530.
D. FOUNDATION PLANS INDICATE THE GENERAL LOCATION OF PENETRATIONS. COORDINATE WITH ALL TRADES FOR THE INSTALLATION OF ALL REQUIRED SLEEVES AND INSERTS.
E. AFTER FOUNDATION CONSTRUCTION IS COMPLETE, PROPERLY PLACE AND COMPACT BACKFILL MATERIAL. WALLS BACKFILLED ON BOTH SIDES SHALL HAVE BACKFILL PLACED AGAINST BOTH FACES SIMULTANEOUSLY. WALLS BACKFILLED ON ONE SIDE ONLY SHALL BE BRACED (TEMPORARY BY CONTRACTOR OR BY FINAL CONSTRUCTION) SO THAT BACKFILL CAN BE PROPERLY PLACED AND COMPACTED WITHOUT DISPLACEMENT OF WALLS.

1) BASEMENT WALLS HAVE BEEN DESIGNED ASSUMING THE ELEVATED FLOOR AND SLAB-ON-GRADE BRACE THE WALL. ELEVATED FLOOR AND SLAB-ON-GRADE MUST BE INSTALLED AND HAVE ACHIEVED 100% OF ITS DESIGN STRENGTH PRIOR TO PLACEMENT AND COMPACTION OF BACKFILL.

F. FOR BELOW GRADE WALLS PLAN AREA OF EXCAVATION SHOULD EXTEND OUTWARD FROM THE OUTSIDE EDGE OF THE STRUCTURES FOUNDATION A DISTANCE EQUAL TO THE DEPTH OF EXCAVATION (INCLUDING OVER EXCAVATION IF APPLICABLE) PLUS 3 FEET. THE SIDE OF THE EXCAVATION SHOULD BE SLOPED OR BRACED AS REQUIRED PER LOCAL, STATE AND FEDERAL SAFETY REGULATIONS.
G. PLACE AND COMPACT SOIL ADJACENT TO BELOW GRADE WALLS AND FOUNDATIONS IN 8 INCH LOOSE LIFTS AND COMPACT TO 100% OF STANDARD PROCTOR ASTM D-698 MAXIMUM DRY DENSITY.
H. AT ALL DOORS DEPRESS FOUNDATION WALLS 8 INCHES BELOW TOP OF SLABS, U.N.O.
I. PROVIDE EITHER ROUGHENED SURFACE OR 3 1/2"X1 1/2" KEYWAY AT HORIZONTAL CONSTRUCTION JOINTS, I.E. BETWEEN FOOTING AND FOUNDATION WALL, FOOTING AND PIER OR SIMILAR LOCATIONS, AT THE CONTRACTOR'S OPTION.

9. SPECIALTY STRUCTURAL ENGINEERING

A. THE SPECIALTY STRUCTURAL ENGINEER (SSE) IS DEFINED AS A PROFESSIONAL ENGINEER LICENSED IN THE STATE WHERE THE PROJECT IS TO BE BUILT, WHO IS NOT THE STRUCTURAL ENGINEER OF RECORD (SER), WHO PERFORMS DELEGATED DESIGN FUNCTIONS NECESSARY FOR THE SPECIALTY SYSTEM COMPONENTS OF THE STRUCTURE TO BE COMPLETED, AND WHO HAS SHOWN EXPERIENCE AND/OR TRAINING IN THE SPECIFIC SPECIALTY.
B. THE SSE AND CONTRACTOR SHALL REVIEW THE CONSTRUCTION DOCUMENTS TO DETERMINE THE APPROPRIATE SCOPE OF ENGINEERING.
C. THE INTENT OF THE CONSTRUCTION DOCUMENTS IS TO PROVIDE SUFFICIENT INFORMATION FOR THE SSE TO PERFORM THE ANALYSIS, DESIGN, AND ASSEMBLY OF SHOP DRAWINGS. IN THE EVENT THE SSE DETERMINES THERE IS INSUFFICIENT INFORMATION PROVIDED IN CONTRACT DOCUMENTS, THE SSE SHALL, IN A TIMELY MANNER, CONTACT THE SER IN WRITING FOR CLARIFICATION. THE CONTRACTOR AND SSE SHALL PROVIDE A COMPLETE SYSTEM.
D. ALL DOCUMENTS PREPARED BY THE SSE SHALL BE SIGNED AND SEALED BY A REGISTERED DESIGN PROFESSIONAL.
E. EXAMPLES OF COMPONENTS REQUIRING SSE INCLUDE, BUT ARE NOT LIMITED TO:

1) PRECAST HOLLOW CORE SLABS;
2) PRECAST CONCRETE FRAMING SYSTEMS;
3) STRUCTURAL STEEL CONNECTIONS;
4) SPECIAL STEEL JOISTS AND JOIST GIRDER SYSTEMS;
5) STEEL STAIRS;
6) PIPE AND TUBE RAILINGS;
7) CURTAIN WALL SYSTEMS;
8) SKYLIGHTS;
9) RAMMED AGGREGATE PIERS;
10) COLD FORMED STUD FRAMING;
11) TEMPORARY EXCAATION SUPPORT;
12) SHORING AND BRACING SYSTEMS;
13) WINDOWS;
14) OVERHEAD DOORS;
15) MECHANICAL, ELECTRICAL, PLUMBING AND SECURITY ELECTRONICS, HANGERS AND SUPPORTS;
16) STEEL CELL PREFABRICATED UNITS;
17) ROOFING;

F. WHEN MODIFICATIONS ARE PROPOSED TO COMPONENTS UNDER THE DESIGN AND CERTIFICATION OF AN SSE, WRITTEN AUTHORIZATION BY THE SSE MUST BE OBTAINED AND SUBMITTED TO THE SER FOR REVIEW, PRIOR TO PERFORMING THE PROPOSED MODIFICATION.
G. ALL SUBMITTALS GENERATED BY THE DESIGN OF THE SSE MUST BE REVIEWED AND APPROVED BY THE SSE PRIOR TO REVIEW BY THE SER. SUBMITTALS RECEIVED WITHOUT THE APPROVAL OF THE SSE WILL BE REJECTED WITHOUT FURTHER REVIEW.
H. THE CONTRACT DOCUMENTS ONLY DISPLAY THE DESIGN INTENT OF THE SPECIALTY SYSTEM COMPONENTS. FINAL ANALYSIS, DESIGN, AND ASSEMBLY OF SHOP DRAWINGS IS THE RESPONSIBILITY OF THE SSE.
I. THE SSE SHALL SUBMIT CALCULATIONS AND SUPPORT REACTIONS FOR THEIR SYSTEM 15 DAYS (MIN.) PRIOR TO THE REVIEW OF ANY SHOP DRAWINGS FOR THE DEPENDENT SYSTEMS. THE SHOP DRAWINGS FOR THE DEPENDENT SYSTEMS WILL NOT BE REVIEWED UNTIL THE SSE APPROVED, SIGNED, AND SEALED SHOP DRAWINGS AND CALCULATIONS FOR THE SPECIALTY SYSTEM(S) HAVE BEEN SUBMITTED AND REVIEWED. COSTS FOR ANY CHANGES RELATED TO THE CALCULATIONS AND SHOP DRAWINGS SUBMITTED BY THE SSE SHALL BE BORNE BY THE CONTRACTOR.

10. STRUCTURAL INSPECTIONS AND TESTING

A. STRUCTURAL INSPECTIONS AND TESTING FOR THIS PROJECT SHALL BE IN ACCORDANCE WITH CHAPTER 17 OF THE IBC AND THE SPECIFIC MATERIAL SPECIFICATIONS.
B. THE OWNER WILL ENGAGE AN INDEPENDENT TESTING FIRM (ITF) TO CONDUCT INSPECTIONS AND TESTING AS REQUIRED BY THE IBC AND THESE DOCUMENTS. THE ITF SHALL PERFORM THEIR DUTIES INDEPENDENT FROM THE CONSTRUCTION QUALITY CONTROL STAFF EMPLOYED BY THE CONTRACTOR.
C. ITF SHALL DOCUMENT AND KEEP RECORDS OF ALL INSPECTIONS. FOR SAMPLE FORMS AND EXAMPLES SHOWING THE MINIMUM REQUIRED INFORMATION TO BE SUBMITTED WITH THE INSPECTIONS AND TESTS REFER TO THE INDIANA STRUCTURAL ENGINEER'S ASSOCIATION DOCUMENT "STRUCTURAL TESTS AND INSPECTIONS: A GUIDELINE FOR INDIANA PROFESSIONAL ENGINEERS".

1) CONTINUOUS INSPECTIONS: CONTINUOUS INSPECTIONS ARE THE FULL TIME OBSERVATION OF THE WORK BY THE ITF, OR THEIR AGENT, PRESENT IN THE WORK AREA WHILE WORK IS BEING PERFORMED.
2) PERIODIC INSPECTIONS: PERIODIC INSPECTIONS ARE THE INTERMITTENT OBSERVATION OF THE WORK BY THE ITF, OR THEIR AGENT, PRESENT IN THE WORK AREA WHILE WORK IS BEING PERFORMED. THE INTERMITTENT OBSERVATION PERIODS SHALL BE AT TIMES OF SIGNIFICANT WORK, SHALL BE RECURRENT OVER THE COMPLETE WORK PERIODS, AND SHALL EQUAL AT LEAST 25 PERCENT OF THE TOTAL WORK TIME.

D. THE ITF'S REPORTS SHALL BE SUBMITTED WEEKLY TO THE OWNER, SER AND LOCAL BUILDING OFFICIAL.
E. A FINAL REPORT OF ALL STRUCTURAL INSPECTIONS DOCUMENTING COMPLETION OF ALL REQUIRED INSPECTIONS AND CORRECTION OF DISCREPANCIES NOTED IN THE INSPECTIONS (IF ANY) SHALL BE SUBMITTED BY THE CONTRACTOR TO THE OWNER AND SER PRIOR TO THE ISSUANCE OF A CERTIFICATE OF OCCUPANCY.
F. STEEL CONSTRUCTION:

1) INSPECTIONS SHALL BE IN ACCORDANCE WITH IBC SECTION 1705.2.
2) CONTINUOUS AND PERIODIC INSPECTIONS SHALL BE IN ACCORDANCE WITH IBC TABLE 1705.2.2.
3) INSPECTION OF STRUCTURAL STEEL SEISMIC FORCE RESISTING SYSTEM SHALL BE CONTINUOUS IN ACCORDANCE WITH IBC SECTION 1705.11. THE SEISMIC FORCE RESISTING SYSTEM CONSISTS OF THE ROOF DECK, FLOOR DECK, LATERAL BRACES, MOMENT FRAMES AND THE BEAMS & COLUMNS THE BRACES OR MOMENT FRAMES ARE CONNECTED TO, OR ANY OTHER STEEL LATERAL FORCE RESISTING SYSTEM ELEMENT.
4) ADDITIONAL TESTING REQUIREMENTS OF STEEL MATERIALS AND CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS.

G. CONCRETE CONSTRUCTION:

1) INSPECTIONS SHALL BE IN ACCORDANCE WITH IBC SECTION 1705.3. INSPECT MATERIALS, INSTALLATION OF FORM WORK, REINFORCING STEEL AND CONCRETE OPERATIONS
2) INSPECT FOR PROPER MIX USE, PLACEMENT AND APPLICATION TECHNIQUES AND FOR SPECIFIED CURING, TEMPERATURES AND TECHNIQUES.
3) CONTINUOUS AND PERIODIC INSPECTIONS SHALL BE IN ACCORDANCE WITH IBC TABLE 1705.3.
4) ADDITIONAL TESTING REQUIREMENTS OF CONCRETE MATERIALS AND CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS.

H. MASONRY CONSTRUCTION:

1) CONTINUOUS AND PERIODIC INSPECTIONS SHALL CONFORM TO LEVEL B QUALITY ASSURANCE IN ACCORDANCE WITH TMS SPECIFICATION SECTION 1.6.
2) ADDITIONAL TESTING REQUIREMENTS OF MASONRY MATERIALS AND CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS.

I. SOILS:

1) INSPECTION OF SOILS SHALL BE IN ACCORDANCE WITH IBC SECTION 1705.6.
2) ADDITIONAL TESTING REQUIREMENTS OF SOILS SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS AND REPORT OF GEOTECHNICAL EXPLORATION.

J. RAMMED AGGREGATE PIERS:

1) CONTINUOUS INSPECTION SHALL BE IN ACCORDANCE WITH IBC 1705.9.
2) IN ADDITION, TESTING AND INSPECTION SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS.

ABBREVIATION	DESCRIPTION
ADD.	ADDENDUM
ADDL	ADDITIONAL
ADJ	ADJACENT
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AGGR.	AGGREGATE
ALT.	ALTERNATE
APPROX.	APPROXIMATE
ARCH	ARCHITECT OR ARCHITECHTURAL
BLDG	BUILDING
BM	BEAM
BOT OR B/	BOTTOM
BRDG	BRIDGING
BRG.	BEARING
BTWN	BETWEEN
C	COMPRESSION
C.J.	CONTROL JOINT/ CONSTRUCTION JOINT
CIP	CAST-IN-PLACE
CL	CONSTRUCTION LINE/ CENTER LINE
CLR.	CLEAR
CMU	CONCRETE MASONRY UNIT
COL.	COLUMN
CONC.	CONCRETE
CONN	CONNECTION
CONST.	CONSTRUCTION
CONT	CONTINUOUS
COORD.	COORDINATE
CTR	CENTER OR CENTERING
DIA.	DIAMETER
DIAG	DIAGONAL
DIM(S)	DIMENSION(S)
DL	DEAD LOAD
DWG.	DRAWING
DWLS.	DOWELS
E.F.	EACH FACE
E.O.D.	EDGE OF DECK
E.W.	EACH WAY
EA	EACH
ECC	ECCENTRICITY
EL.	ELEVATION
ELEC	ELECTRICAL
EQ.	EQUAL
EQUIP	EQUIPMENT
ETC.	ETCETERA
EXIST.	EXISTING
EXP.	EXPANSION
EXT	EXTERIOR
F.V.	FIELD VERIFY
FD	FLOOR DRAIN
FDN.	FOUNDATION
FIN	FINISH(ED)
FL	FLOOR
FP	FIREPROOF(ING)
FS	FAR SIDE
FT.	FOOT - FEET
FTG.	FOOTING
GA.	GAUGE
GALV.	GALVANIZED
GEN	GENERAL
GR	GRADE
HORIZ.	HORIZONTAL
HT	HEIGHT
ID	INSIDE DIAMETER
IF	INSIDE FACE
IN.	INCH
INT	INTERIOR
KIP	1,000 POUNDS
KLF	KIP PER LINEAR FOOT
KSF	KIP PER SQUARE FOOT
KSI	KIPS PER SQUARE INCH
LBS.	POUNDS
LL	LIVE LOAD
LLH	LONG LEG HORIZONTAL
LLV	LONG LEG VERTICAL
LONG	LONGITUDINAL
LWC	LIGHT WEIGHT CONCRETE
LWT	LIGHTWEIGHT
MAX.	MAXIMUM
MC	MOMENT CONNECTION(S)
MECH.	MECHANICAL
MEZZ.	MEZZANINE
MFGR	MANUFACTURER
MID	MIDDLE
MIN.	MINIMUM
MISC.	MISCELLANEOUS
N.T.S.	NOT TO SCALE
NA OR N/A	NOT APPLICABLE
NIC	NOT IN CONTRACT
NO	NUMBER
NOM	NOMINAL
NS	NEAR SIDE
NWC	NORMAL WEIGHT CONCRETE
NWT	NORMAL WEIGHT
O.C.	ON CENTER
O.D.	OUTSIDE DIAMETER
O.F.	OUTSIDE FACE
O.H.	OPPOSITE HAND
OPNG.	OPENING
OPP.	OPPOSITE
PCY	POUNDS PER CUBIC YARD
PERP.	PERPENDICULAR
PJF	PREMOLDED JOINT FILLER
PL	PLATE
PLF	POUNDS PER LINEAR FOOT
PROJ.	PROJECT
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
QTY.	QUANTITY
RAD.	RADIUS
RD	ROOF DRAIN
REF	REFERENCE
REINF.	REINFORCING
REQ'D.	REQUIRED
RT	RIGHT
SCHED.	SCHEDULE
SDL	SUPERIMPOSED DEAD LOAD
SECT.	SECTION
SER	STRUCTURAL ENGINEER OF RECORD
SF	SQUARE FOOT (FEET)
SIM.	SIMILAR
SOG	SLAB ON GRADE
SPA.	SPACING
SPEC(S)	SPECIFICATION(S)
SQ.	SQUARE
STD.	STANDARD
STL.	STEEL
STR	STRUCTURE
STRUCT.	STRUCTURAL
SYM	SYMMETRICAL
T	TENSION
T & B	TOP AND BOTTOM
T.O.S.	TOP OF STEEL
T/	TOP OF
T/FTG	TOP OF FOOTING
T/SLAB	TOP OF SLAB
TYP.	TYPICAL
U.N.O.	UNLESS NOTED OTHERWISE
VERT.	VERTICAL
W/	WITH
W/O	WITHOUT
WD	WOOD
WP	WORK POINT
WWF	WELDED WIRE FABRIC
YD	YARD

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DLZ INDIANA, LLC

VANESSA M. REDNOUR
REGISTERED No. PE11800346
State of INDIANA
PROFESSIONAL ENGINEER

NO.	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: VMR CHK'D: CVAN
DESIGNED: VMR
APPRV'D: CVAN
DATE: September 5, 2019
PROJECT NUMBER
1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

GENERAL NOTES AND ABBREVIATIONS

DRAWING NUMBER
S-001
STRUCTURAL

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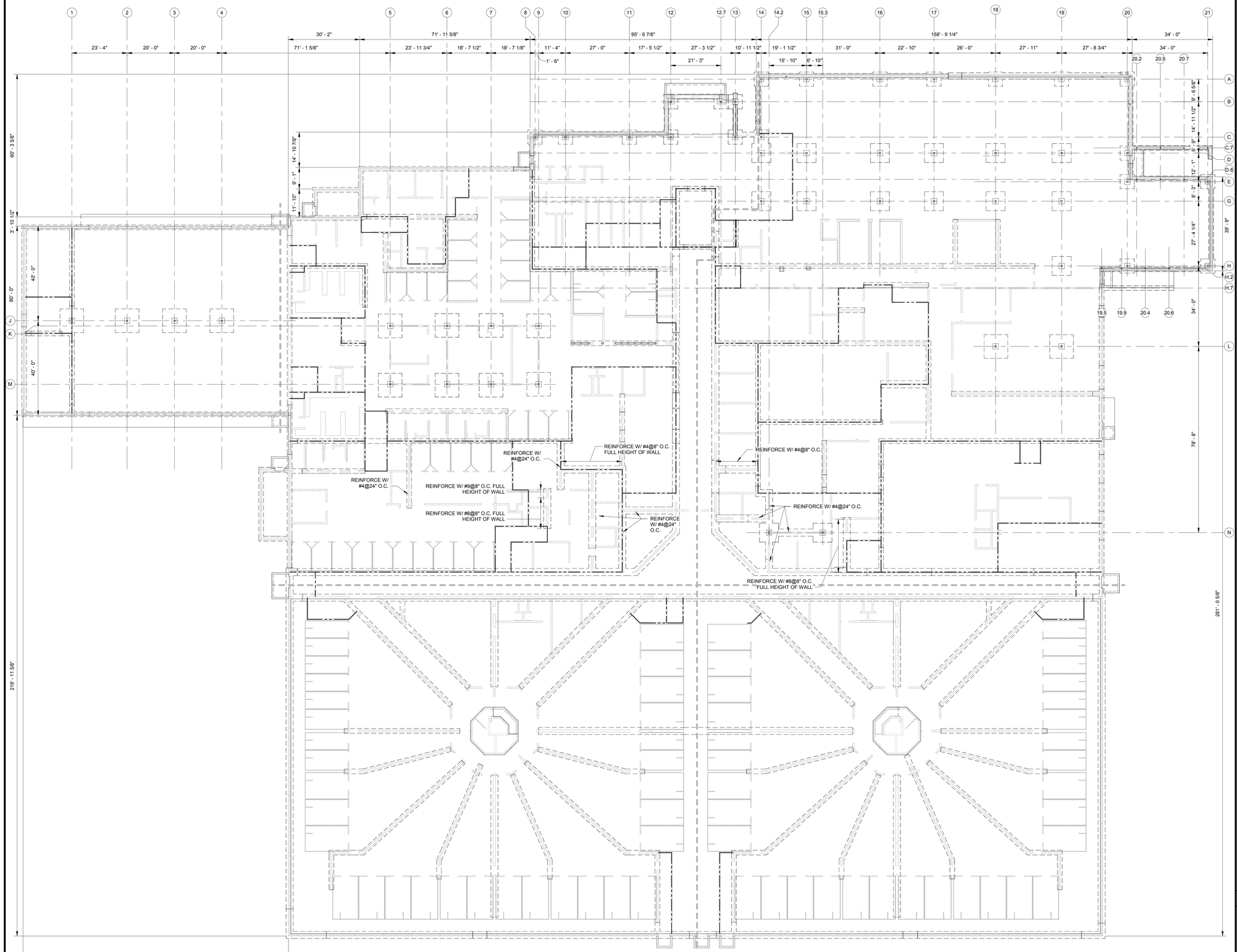


1 S-101 **FOUNDATION PLAN - OVERALL**
SCALE: 1/16" = 1'-0"
NORTH

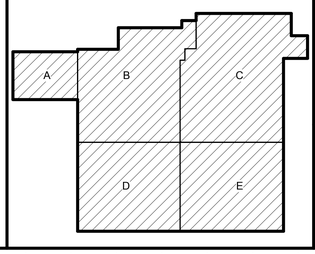
PLAN NOTES:

A. REFER TO G-001 FOR ADDITIONAL GENERAL NOTES AND INFORMATION AND S-001 FOR ADDITIONAL STRUCTURAL GENERAL NOTES.
B. FOOTINGS SHALL BE SUPPORTED ON NATURAL SOILS IMPROVED BY USING A RAMMED AGGREGATE PIER FOUNDATION SYSTEM. THE QUANTITY AND SIZE OF RAMMED AGGREGATE PIERS UNDER FOOTINGS SHALL BE DETERMINED BY THE RAMMED AGGREGATE PIER SSE AND INSTALLED BY A CERTIFIED CONTRACTOR.
C. OVEREXCAVATE UNDER THICKENED SLABS PER DETAILS ON S-531.
D. ALL CMU WALLS SHALL BE REINFORCED W/ #4@48" U.N.O.
E. MEZZANINE EXTERIOR WALLS ABOVE ELEVATION 116'-4" SHALL BE REINFORCED WITH #6@24" O.C. U.N.O.
F. PARTIAL HEIGHT CMU WALLS MUST UTILIZE CAST IN DOWEL IN LIEU OF EPOXY EMBED DOWEL INTO THICKENED SLAB.

LEGEND:

SECURITY WALL. PROVIDE ADDITIONAL REINFORCING SUCH THAT THERE IS #4@8" O.C. OR GREATER. BARS REQUIRED FOR SECURITY ARE NOT REQUIRED TO BE DOWELED INTO FOUNDATION OR BE LAPPED. THESE WALLS SHALL BE GROUTED SOLID.

KEY PLAN



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VANNA M. REDNOUR REGISTERED PROFESSIONAL ENGINEER PE11800046 STATE OF INDIANA
Vanna Rednour

NO.	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: VMR | CHK'D: CVAN
DESIGNED: VMR
APPRV'D: CVAN
DATE: September 5, 2019
PROJECT NUMBER: 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

FOUNDATION PLAN - OVERALL

DRAWING NUMBER: S-101
STRUCTURAL

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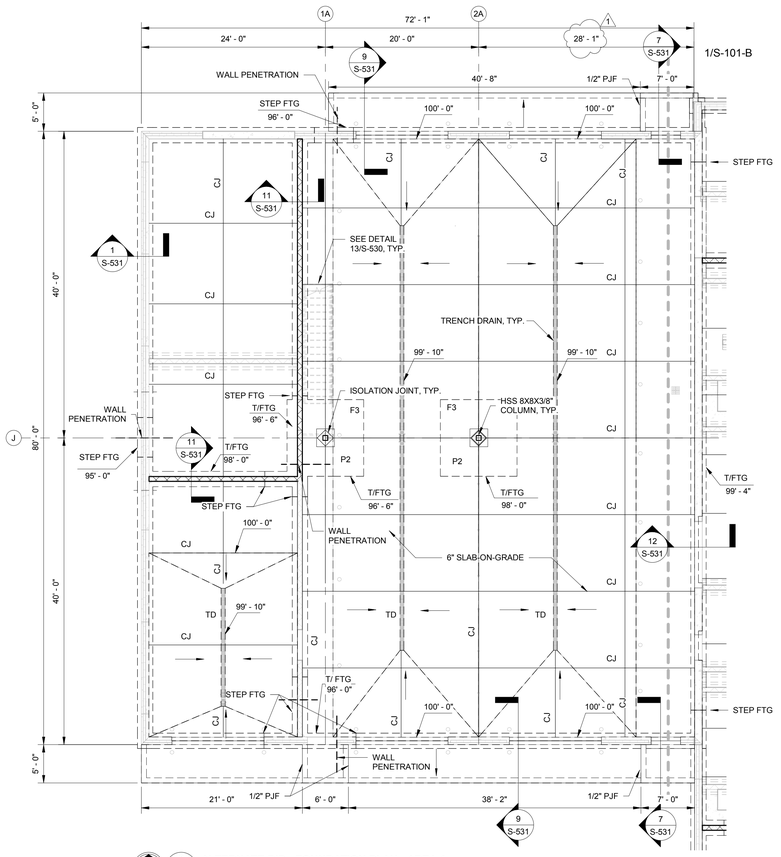
PLAN NOTES:

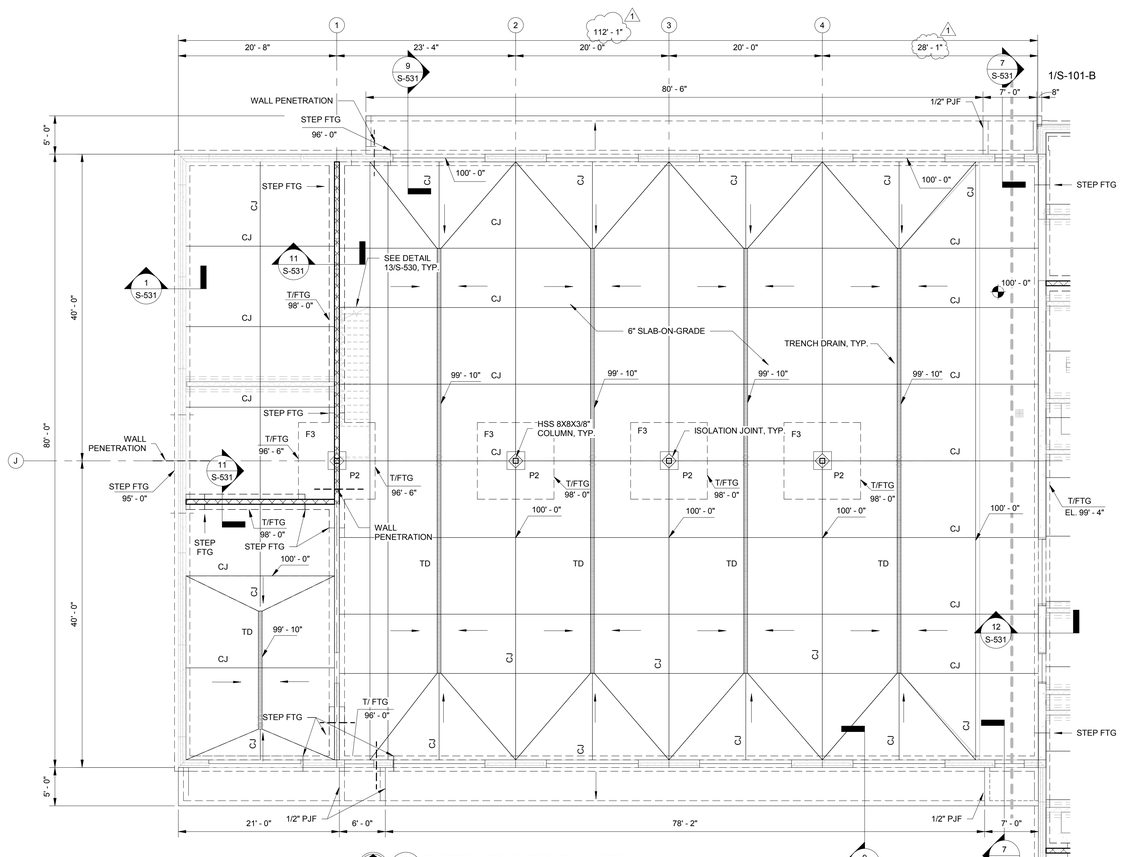
A. REFER TO G-001 FOR ADDITIONAL GENERAL NOTES AND INFORMATION AND S-001 FOR ADDITIONAL STRUCTURAL GENERAL NOTES.
B. FOOTINGS SHALL BE SUPPORTED ON NATURAL SOILS IMPROVED BY USING A RAMMED AGGREGATE PIER FOUNDATION SYSTEM. THE QUANTITY AND SIZE OF RAMMED AGGREGATE PIERS UNDER FOOTINGS SHALL BE DETERMINED BY THE RAMMED AGGREGATE PIER SSE AND INSTALLED BY A CERTIFIED CONTRACTOR.
C. TOP OF FOUNDATION WALL ELEVATION IS 100'-0" UNO
D. TOP OF PIER ELEVATION IS 99'-4" UNO
E. TOP OF EXTERIOR FOOTING ELEVATION IS 98'-0" UNO
F. TOP OF INTERIOR FOOTING ELEVATION IS 99'-4" UNO
G. PROVIDE THICKENED SLAB UNDER ALL CMU WALLS WITHOUT FOUNDATIONS.
H. OVEREXCAVATE UNDER THICKENED SLABS PER DETAILS ON S-531.
I. SLAB-ON-GRADE SHALL BE 4" THICK UNO
J. PROVIDE F4 FOR ALL STRIP FOOTINGS UNO.

LEGEND:

- 100'-0" — TOP OF FLAT SLAB ELEVATION
- SLAB SLOPE DIRECTION
- 100'-0" — SLAB ELEVATION ALONG A LINE OR AT A POINT
- FD — FLOOR DRAIN OR FLOOR SINK, SET 1/2" BELOW FFE (MIN) FINAL ELEVATION TO BE COORDINATED WITH DRAINAGE REQUIREMENTS
- F# — FOOTING MARK, SEE SCHEDULE ON S-601.
- P# — PIER MARK, SEE DETAIL 4/S-532.
- THICKENED SLAB. SEE S-530 FOR DETAILS.
- HIGH DENSITY STORAGE. SEE DETAIL 15/S-531.
- TD — TRENCH DRAIN. SEE 7/S-530.
- CS — SPAN OF 8" THICK CAST-IN-PLACE ELEVATED CONCRETE SLAB REINFORCED W/ #5@8" O.C. (E.W. T&B)
- LIMITS OF STRUCTURAL LOAD BEARING OR SHEAR WALL. SEE REQUIRED REINFORCING ON PAGE S-101.
- LIMITS OF FREEZER

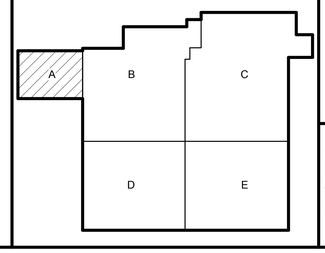


2 S-101-A **ALTERNATE BID - FOUNDATION PLAN - AREA A**
SCALE: 1/8" = 1'-0"
NORTH



1 S-101-A **BASE BID - FOUNDATION PLAN - AREA A**
SCALE: 1/8" = 1'-0"
NORTH

KEY PLAN



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DLZ INDIANA, LLC

VANESSA M. REDMOUR — REGISTERED — PE11800246 — State of INDIANA — PROFESSIONAL ENGINEER
Vanessa Redmour

NO.	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: VMR CHKD: CVAN
DESIGNED: VMR
APPRVD: CVAN
DATE: September 5, 2019
PROJECT NUMBER: 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

FOUNDATION PLAN - AREA A

DRAWING NUMBER: S-101-A
STRUCTURAL

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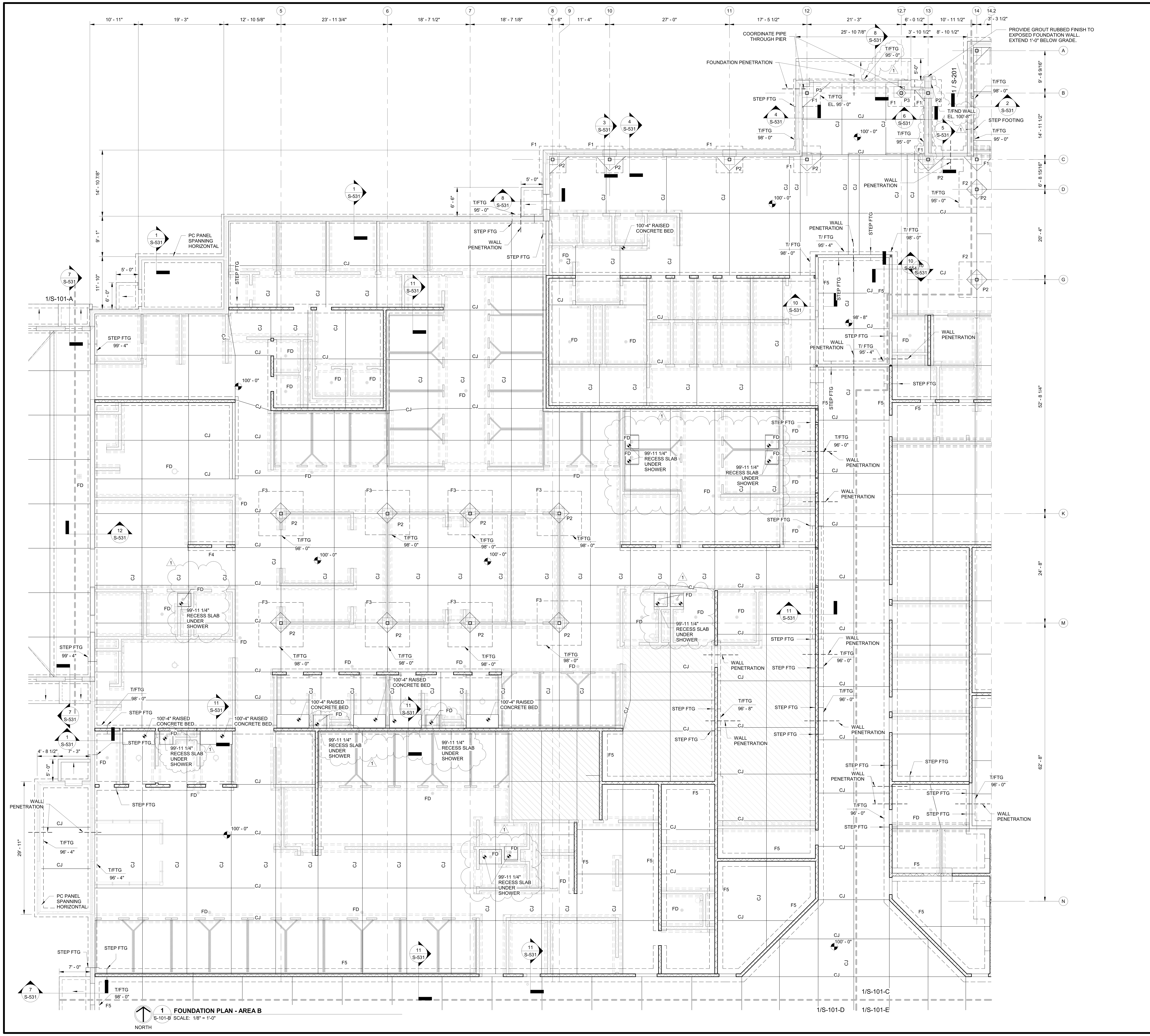


1 FOUNDATION PLAN - AREA B
S-101-B SCALE: 1/8" = 1'-0"

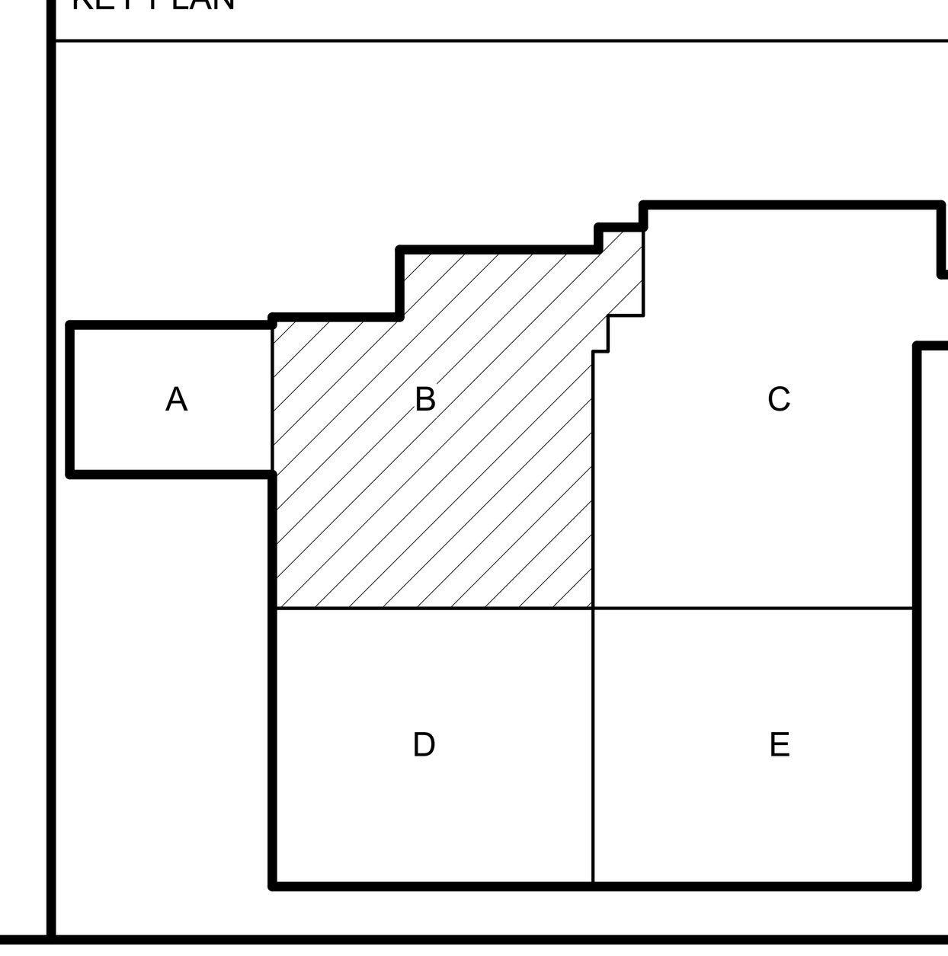
PLAN NOTES:

A. REFER TO G-001 FOR ADDITIONAL GENERAL NOTES AND INFORMATION AND S-001 FOR ADDITIONAL STRUCTURAL GENERAL NOTES.
B. FOOTINGS SHALL BE SUPPORTED ON NATURAL SOILS IMPROVED BY USING A RAMMED AGGREGATE PIER FOUNDATION SYSTEM. THE QUANTITY AND SIZE OF RAMMED AGGREGATE PIERS UNDER FOOTINGS SHALL BE DETERMINED BY THE RAMMED AGGREGATE PIER SSE AND INSTALLED BY A CERTIFIED CONTRACTOR.
C. TOP OF FOUNDATION WALL ELEVATION IS 100'-0" UNO
D. TOP OF PIER ELEVATION IS 99'-4" UNO
E. TOP OF EXTERIOR FOOTING ELEVATION IS 98'-0" UNO
F. TOP OF INTERIOR FOOTING ELEVATION IS 99'-4" UNO
G. PROVIDE THICKENED SLAB UNDER ALL CMU WALLS WITHOUT FOUNDATIONS.
H. OVEREXCAVATE UNDER THICKENED SLABS PER DETAILS ON S-531.
I. SLAB-ON-GRADE SHALL BE 4" THICK UNO
J. PROVIDE F4 FOR ALL STRIP FOOTINGS UNO.

LEGEND:

Symbol	Description
100'-0"	TOP OF FLAT SLAB ELEVATION
	SLAB SLOPE DIRECTION
100'-0"	SLAB ELEVATION ALONG A LINE OR AT A POINT
FD	FLOOR DRAIN OR FLOOR SINK, SET 1/2" BELOW FFE (MIN) FINAL ELEVATION TO BE COORDINATED WITH DRAINAGE REQUIREMENTS
F#	FOOTING MARK, SEE SCHEDULE ON S-601.
P#	PIER MARK, SEE DETAIL 4/S-532.
	THICKENED SLAB. SEE S-530 FOR DETAILS.
	HIGH DENSITY STORAGE. SEE DETAIL 15/S-531.
TD	TRENCH DRAIN. SEE 7/S-530.
CS	SPAN OF 8" THICK CAST-IN-PLACE ELEVATED CONCRETE SLAB REINFORCED W/ #5@8" O.C. (E.W. T&B)
	LIMITS OF STRUCTURAL LOAD BEARING OR SHEAR WALL. SEE REQUIRED REINFORCING ON PAGE S-101.
	LIMITS OF FREEZER

KEY PLAN



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DRAWN: VMR CHK'D: CVAN
DESIGNED: VMR
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A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

FOUNDATION PLAN - AREA B

DRAWING NUMBER
S-101-B
STRUCTURAL

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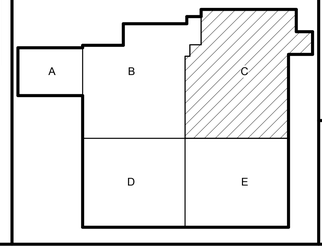
PLAN NOTES:

A. REFER TO G-001 FOR ADDITIONAL GENERAL NOTES AND INFORMATION AND S-001 FOR ADDITIONAL STRUCTURAL GENERAL NOTES.
B. FOOTINGS SHALL BE SUPPORTED ON NATURAL SOILS IMPROVED BY USING A RAMMED AGGREGATE PIER FOUNDATION SYSTEM. THE QUANTITY AND SIZE OF RAMMED AGGREGATE PIERS UNDER FOOTINGS SHALL BE DETERMINED BY THE RAMMED AGGREGATE PIER SSE AND INSTALLED BY A CERTIFIED CONTRACTOR.
C. TOP OF FOUNDATION WALL ELEVATION IS 100'-0" UNO
D. TOP OF PIER ELEVATION IS 99'-4" UNO
E. TOP OF EXTERIOR FOOTING ELEVATION IS 98'-0" UNO
F. TOP OF INTERIOR FOOTING ELEVATION IS 99'-4" UNO
G. PROVIDE THICKENED SLAB UNDER ALL CMU WALLS WITHOUT FOUNDATIONS.
H. OVEREXCAVATE UNDER THICKENED SLABS PER DETAILS ON S-531.
I. SLAB-ON-GRADE SHALL BE 4" THICK UNO
J. PROVIDE F4 FOR ALL STRIP FOOTINGS UNO.

LEGEND:

- 100'-0" — TOP OF FLAT SLAB ELEVATION
- SLAB SLOPE DIRECTION
- 100'-0" — SLAB ELEVATION ALONG A LINE OR AT A POINT
- FD — FLOOR DRAIN OR FLOOR SINK, SET 1/2" BELOW FFE (MIN) FINAL ELEVATION TO BE COORDINATED WITH DRAINAGE REQUIREMENTS
- F# — FOOTING MARK, SEE SCHEDULE ON S-601.
- P# — PIER MARK, SEE DETAIL 4/S-532.
- THICKENED SLAB. SEE S-530 FOR DETAILS.
- HIGH DENSITY STORAGE. SEE DETAIL 15/S-531.
- TD — TRENCH DRAIN. SEE 7/S-530.
- CS — SPAN OF 8" THICK CAST-IN-PLACE ELEVATED CONCRETE SLAB REINFORCED W/ #5@8" O.C. (E.W. T&B)
- LIMITS OF STRUCTURAL LOAD BEARING OR SHEAR WALL. SEE REQUIRED REINFORCING ON PAGE S-101.
- LIMITS OF FREEZER

KEY PLAN



1 S-101-C **FOUNDATION PLAN - AREA C**
SCALE: 1/8" = 1'-0"

NORTH

1/S-101-B
1/S-101-D
1/S-101-E

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DLZ INDIANA, LLC

VANESSA M. REDNOUR — REGISTERED — PE11800246 — STATE OF INDIANA — PROFESSIONAL ENGINEER
Vanessa Rednour

NO.	REVISION	DATE
1	Addendum #01	09/12/19

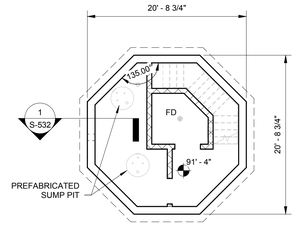
DRAWN: VMR CHK'D: CVAN
DESIGNED: VMR
APPRV'D: CVAN
DATE: September 5, 2019
PROJECT NUMBER 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

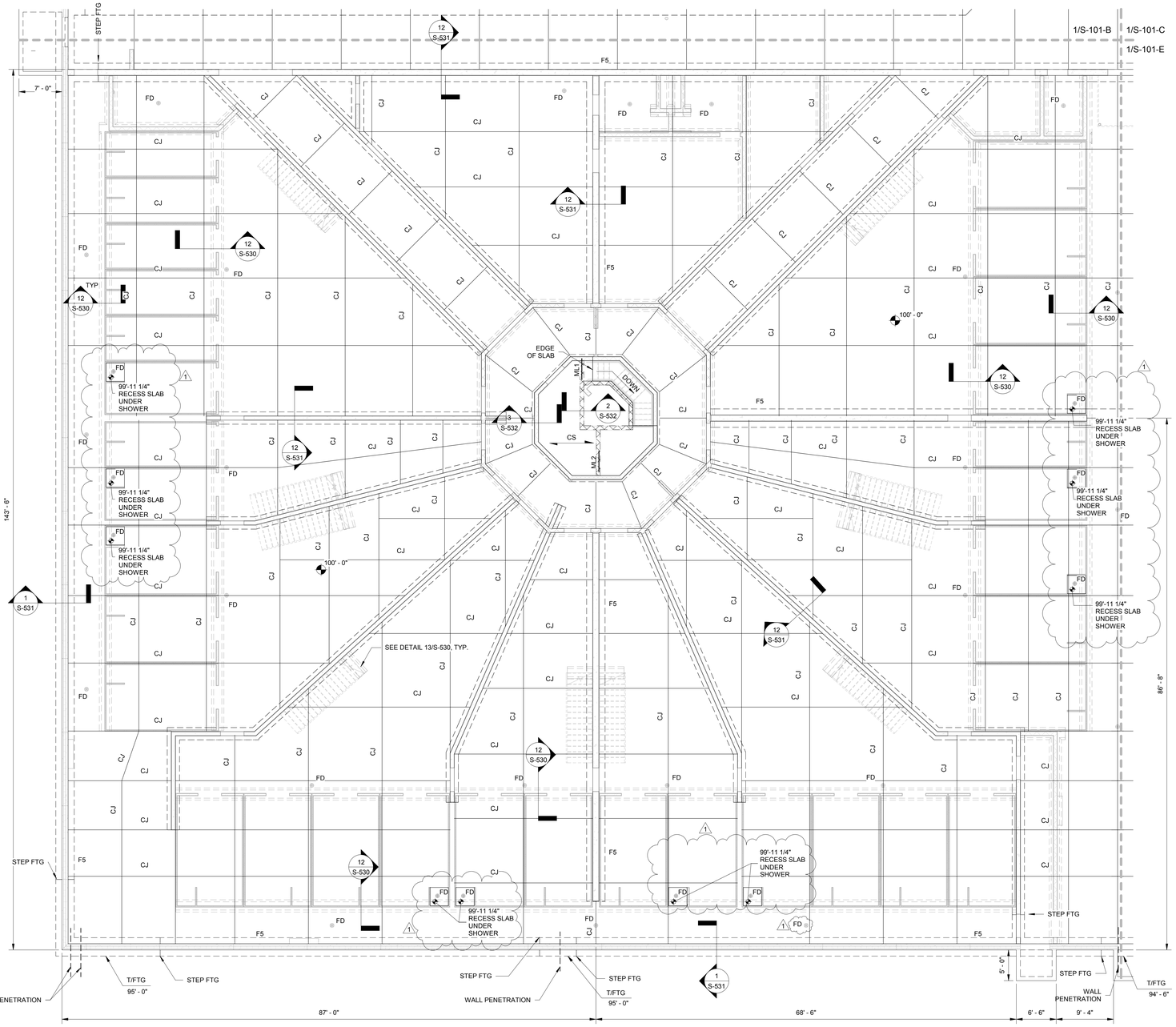
FOUNDATION PLAN - AREA C

DRAWING NUMBER S-101-C

STRUCTURAL



2 S-101-D **LOWER LEVEL PLAN - D**
SCALE: 1/8" = 1'-0"
NORTH



1 S-101-D **FOUNDATION PLAN - AREA D**
SCALE: 1/8" = 1'-0"
NORTH

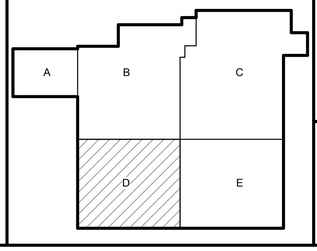
PLAN NOTES:

A. REFER TO G-001 FOR ADDITIONAL GENERAL NOTES AND INFORMATION AND S-001 FOR ADDITIONAL STRUCTURAL GENERAL NOTES.
B. FOOTINGS SHALL BE SUPPORTED ON NATURAL SOILS IMPROVED BY USING A RAMMED AGGREGATE PIER FOUNDATION SYSTEM. THE QUANTITY AND SIZE OF RAMMED AGGREGATE PIERS UNDER FOOTINGS SHALL BE DETERMINED BY THE RAMMED AGGREGATE PIER SSE AND INSTALLED BY A CERTIFIED CONTRACTOR.
C. TOP OF FOUNDATION WALL ELEVATION IS 100'-0" UNO
D. TOP OF PIER ELEVATION IS 99'-4" UNO
E. TOP OF EXTERIOR FOOTING ELEVATION IS 98'-0" UNO
F. TOP OF INTERIOR FOOTING ELEVATION IS 99'-4" UNO
G. PROVIDE THICKENED SLAB UNDER ALL CMU WALLS WITHOUT FOUNDATIONS.
H. OVEREXCAVATE UNDER THICKENED SLABS PER DETAILS ON S-531.
I. SLAB-ON-GRADE SHALL BE 4" THICK UNO
J. PROVIDE F4 FOR ALL STRIP FOOTINGS UNO.

LEGEND:

- 100'-0" — TOP OF FLAT SLAB ELEVATION
- SLAB SLOPE DIRECTION
- 100'-0" — SLAB ELEVATION ALONG A LINE OR AT A POINT
- FD — FLOOR DRAIN OR FLOOR SINK. SET 1/2" BELOW FFE (MIN) FINAL ELEVATION TO BE COORDINATED WITH DRAINAGE REQUIREMENTS
- F# — FOOTING MARK, SEE SCHEDULE ON S-601.
- P# — PIER MARK, SEE DETAIL 4/S-532.
- THICKENED SLAB. SEE S-530 FOR DETAILS.
- HIGH DENSITY STORAGE. SEE DETAIL 15/S-531.
- TD — TRENCH DRAIN. SEE 7/S-530.
- CS — SPAN OF 8" THICK CAST-IN-PLACE ELEVATED CONCRETE SLAB REINFORCED W/ #5@8" O.C. (E.W. T&B)
- LIMITS OF STRUCTURAL LOAD BEARING OR SHEAR WALL. SEE REQUIRED REINFORCING ON PAGE S-101.
- LIMITS OF FREEZER

KEY PLAN



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VANESSA M. REDNOUR — REGISTERED — PE11800646 — STATE OF INDIANA — PROFESSIONAL ENGINEER
Vanessa Rednour

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APPRV'D: CVAN
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PROJECT NUMBER 1663-1190-90

A NEW
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TERRE HAUTE, INDIANA
FOUNDATION PLAN - AREA D

DRAWING NUMBER S-101-D STRUCTURAL

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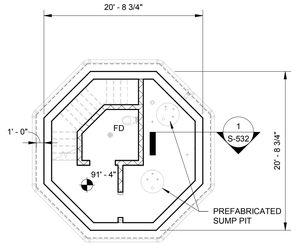
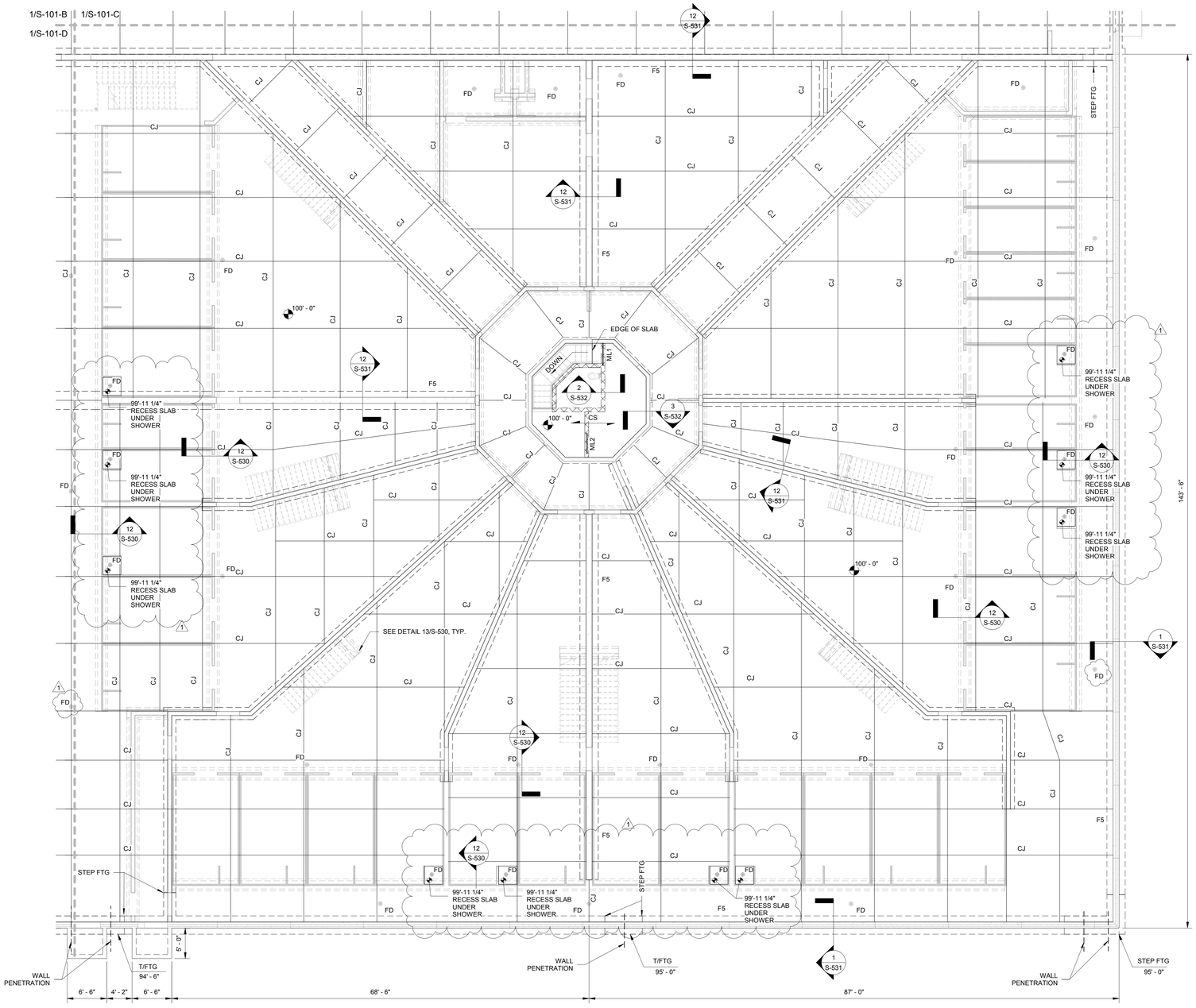


2 **LOWER LEVEL PLAN - E**
S-101-E SCALE: 1/8" = 1'-0"
NORTH



1 **FOUNDATION PLAN - AREA E**
S-101-E SCALE: 1/8" = 1'-0"
NORTH

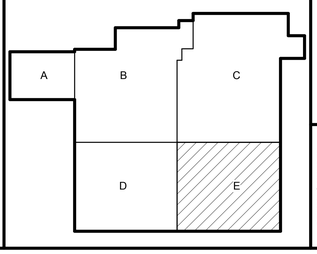
PLAN NOTES:

A. REFER TO G-001 FOR ADDITIONAL GENERAL NOTES AND INFORMATION AND S-001 FOR ADDITIONAL STRUCTURAL GENERAL NOTES.
B. FOOTINGS SHALL BE SUPPORTED ON NATURAL SOILS IMPROVED BY USING A RAMMED AGGREGATE PIER FOUNDATION SYSTEM. THE QUANTITY AND SIZE OF RAMMED AGGREGATE PIERS UNDER FOOTINGS SHALL BE DETERMINED BY THE RAMMED AGGREGATE PIER SSE AND INSTALLED BY A CERTIFIED CONTRACTOR.
C. TOP OF FOUNDATION WALL ELEVATION IS 100'-0" UNO
D. TOP OF PIER ELEVATION IS 99'-4" UNO
E. TOP OF EXTERIOR FOOTING ELEVATION IS 98'-0" UNO
F. TOP OF INTERIOR FOOTING ELEVATION IS 99'-4" UNO
G. PROVIDE THICKENED SLAB UNDER ALL CMU WALLS WITHOUT FOUNDATIONS.
H. OVEREXCAVATE UNDER THICKENED SLABS PER DETAILS ON S-531.
I. SLAB-ON-GRADE SHALL BE 4" THICK UNO
J. PROVIDE F4 FOR ALL STRIP FOOTINGS UNO.

LEGEND:

100'-0"	TOP OF FLAT SLAB ELEVATION
	SLAB SLOPE DIRECTION
100'-0"	SLAB ELEVATION ALONG A LINE OR AT A POINT
FD	FLOOR DRAIN OR FLOOR SINK, SET 1/2" BELOW FFE (MIN) FINAL ELEVATION TO BE COORDINATED WITH DRAINAGE REQUIREMENTS
F#	FOOTING MARK, SEE SCHEDULE ON S-601.
P#	PIER MARK, SEE DETAIL 4/S-532.
	THICKENED SLAB. SEE S-530 FOR DETAILS.
	HIGH DENSITY STORAGE. SEE DETAIL 15/S-531.
TD	TRENCH DRAIN. SEE 7/S-530.
CS	SPAN OF 8" THICK CAST-IN-PLACE ELEVATED CONCRETE SLAB REINFORCED W/ #5@8" O.C. (E.W. T&B)
	LIMITS OF STRUCTURAL LOAD BEARING OR SHEAR WALL. SEE REQUIRED REINFORCING ON PAGE S-101.
	LIMITS OF FREEZER

KEY PLAN



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VANESSA M. REDNOUR — REGISTERED — PE11800246 — State of INDIANA — PROFESSIONAL ENGINEER
Vanessa Rednour

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DATE: September 5, 2019
PROJECT NUMBER 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

FOUNDATION PLAN - AREA E

DRAWING NUMBER S-101-E STRUCTURAL

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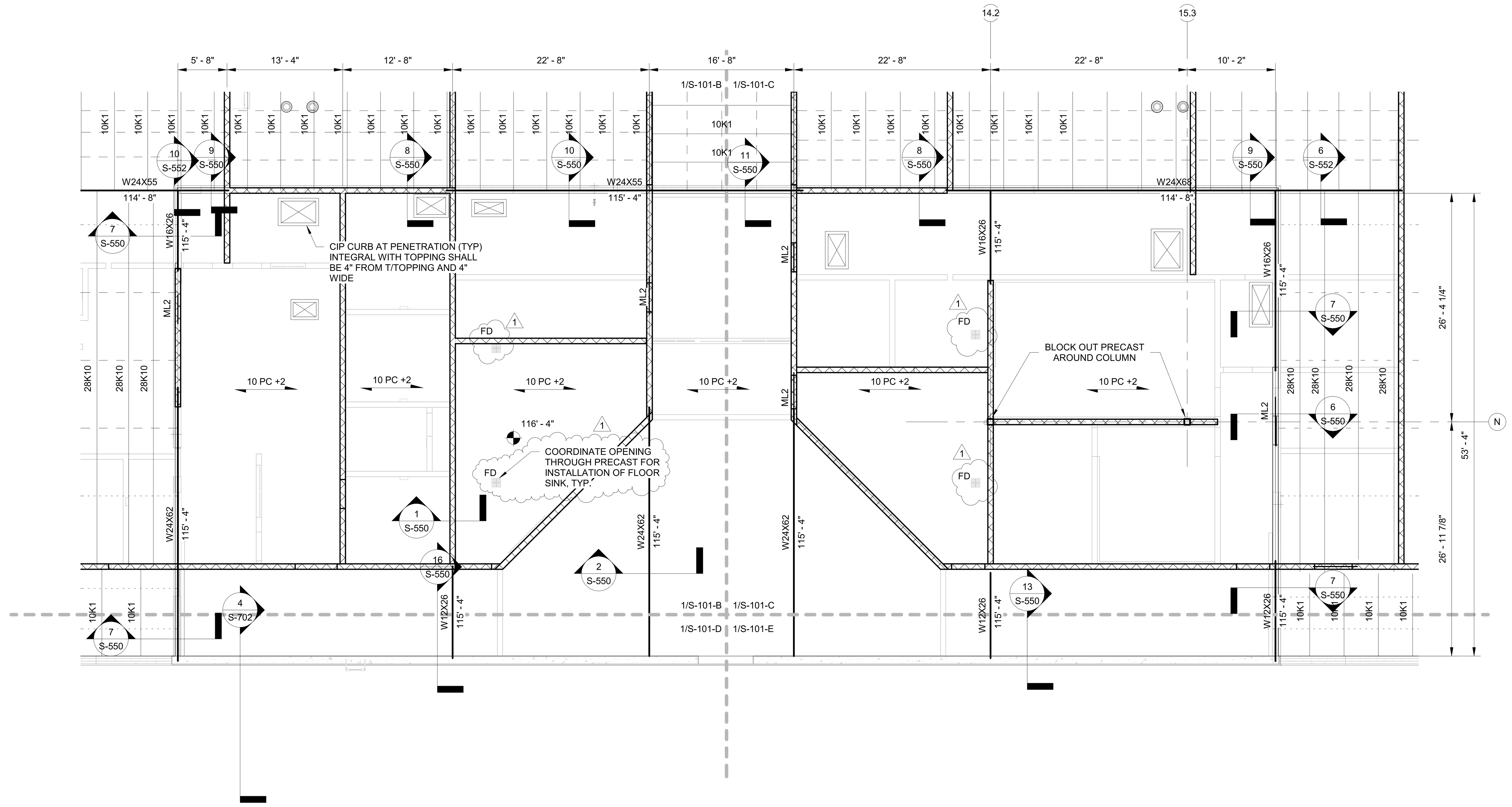
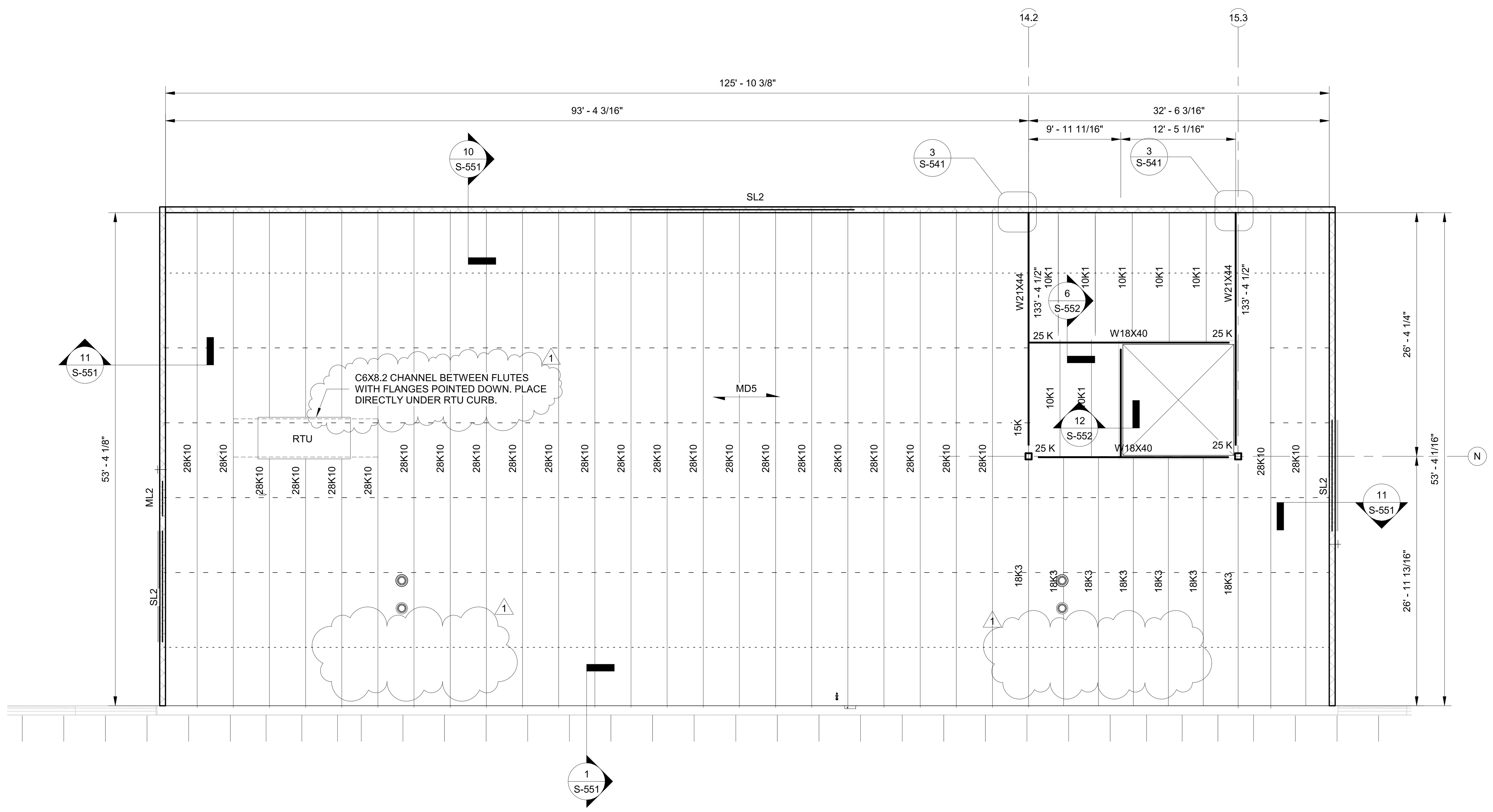


1 MEZZANINE FLOOR FRAMING PLAN
S-102 SCALE: 1/8" = 1'-0"
NORTH



2 MEZZANINE ROOF FRAMING PLAN
S-102 SCALE: 1/8" = 1'-0"
NORTH

PLAN NOTES:

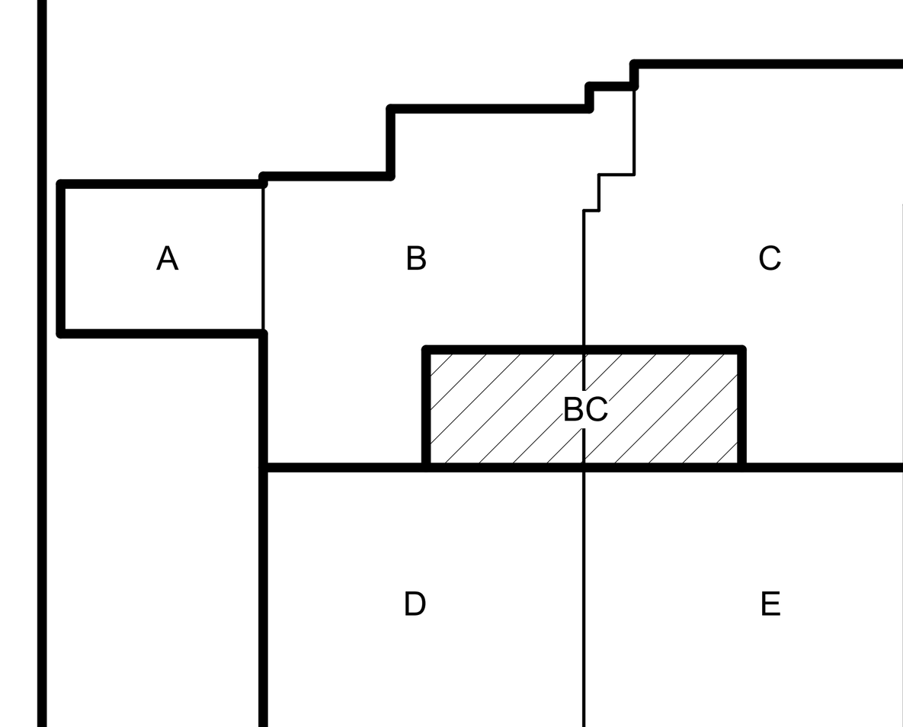
A. REFER TO G-001 FOR ADDITIONAL GENERAL NOTES AND INFORMATION AND S-001 FOR ADDITIONAL STRUCTURAL GENERAL NOTES.
B. JOIST SHOE DEPTHS SHALL BE 2 1/2" FOR K-SERIES JOISTS AND 5" FOR LH-SERIES JOIST UNO.
C. JOIST BEARING ELEVATION IS 133-2" FOR MEZZANINE ROOF.
D. JOIST SPACING SHALL BE 4'-0" MAX UNO.
E. JOIST BRIDGING INDICATED IS DIAGRAMMATIC IN NATURE. JOIST SSE AND CONTRACTOR TO COORDINATE FINAL NUMBER AND LOCATION OF BRIDGING PER SJI REQUIREMENTS.
F. WHERE SPECIAL LINTELS ARE NOT INDICATED, PROVIDE LINTELS IN MASONRY WALLS IN ACCORDANCE WITH 7/S-540.
G. FOR BEAMS WITHOUT END REACTIONS INDICATED, USE 10 KIPS SHEAR.

LEGEND:

100'-0"	TOP OF FLAT SLAB ELEVATION
FD	FLOOR DRAIN OR FLOOR SINK, SET 1/2" BELOW FFE (MIN) FINAL ELEVATION TO BE COORDINATED WITH PLUMBING REQUIREMENTS
MLX	MASONRY LINTEL, REFER TO SCHEDULE ON 7/S-540.
SLX	STEEL LINTEL W/ 3/8" BOTTOM PLATE, REFER TO SCHEDULE ON 7/S-540.
10 PC +2	SPAN OF 10" HOLLOWCORE PRECAST CONCRETE SLAB W/ 2" COMPOSITE TOPPING
MD#	SPAN OF METAL DECK. SEE SCHEDULE ON S-701.
	JOIST UPLIFT BRIDGING, PER SJI SPECIFICATIONS
	JOIST BRIDGING, PER SJI SPECIFICATIONS
	LIMITS OF STRUCTURAL LOAD BEARING OR SHEAR WALL. SEE REQUIRED REINFORCING ON PAGE S-101.
	ROOF/OVERFLOW DRAIN. PROVIDE FRAMING PER 4/S-552

BEAM SIZE
15K TOP OF BEAM ELEVATION 15K
BEAM REACTION
A = REQUIRED AXIAL LOAD IN ADDITION TO BEAM REACTION SHEAR FORCE.

KEY PLAN



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A NEW
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TERRE HAUTE, INDIANA

MEZZANINE FLOOR AND ROOF FRAMING PLANS - AREA BC

DRAWING NUMBER
S-102
STRUCTURAL

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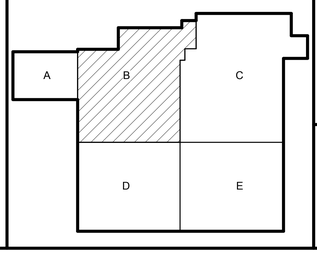
PLAN NOTES:

A. REFER TO G-001 FOR ADDITIONAL GENERAL NOTES AND INFORMATION AND S-001 FOR ADDITIONAL STRUCTURAL GENERAL NOTES.
B. JOIST SHOE DEPTHS SHALL BE 2 1/2" FOR K-SERIES JOISTS AND 5" FOR LH-SERIES JOISTS UNO.
C. AT AREA D AND E ROOF FRAMMING, PROVIDE 5" JOIST SHOE FOR K-SERIES JOIST.
D. JOIST BEARING ELEVATION IS 114'-8" UNO.
E. JOIST SPACING SHALL BE 4'-0" O.C. MAX UNO.
F. JOIST BRIDGING INDICATED IS DIAGRAMMATIC IN NATURE. JOIST SSE AND CONTRACTOR TO COORDINATE FINAL NUMBER AND LOCATION OF BRIDGING PER SJI REQUIREMENTS.
G. FOR BEAMS WITHOUT END REACTIONS INDICATED, USE 10 KIPS SHEAR.

LEGEND:

MLX	MASONRY LINTEL, REFER TO SCHEDULE ON 7/S-540.
SLX	STEEL LINTEL W/ 3/8" BOTTOM PLATE, REFER TO SCHEDULE ON 7/S-540.
8 PC	SPAN OF 8" HOLLOWCORE PRECAST CONCRETE SLAB
10 PC +2	SPAN OF 10" HOLLOWCORE PRECAST CONCRETE SLAB W/ 2" COMPOSITE TOPPING
MD#	SPAN OF METAL DECK. SEE SCHEDULE ON S-701.
	INDICATES ROOF DECK PENETRATION, COORDINATE EXACT SIZE AND LOCATION. PROVIDE TYPICAL ROOF PENETRATION FRAMING PER DETAIL 4/S-552.
	LIMITS OF STRUCTURAL LOAD BEARING OR SHEAR WALL. SEE REQUIRED REINFORCING ON PAGE S-101.
	JOIST UPLIFT BRIDGING, PER SJI SPECIFICATIONS
	JOIST BRIDGING, PER SJI SPECIFICATIONS
	MOMENT CONNECTION
	CANTILEVER MOMENT CONNECTION
	ROOF/OVERFLOW DRAIN. PROVIDE FRAMING PER 4/S-552
15K TOP OF BEAM ELEVATION 15K	BEAM SIZE
A = REQUIRED AXIAL LOAD IN ADDITION TO BEAM REACTION SHEAR FORCE.	BEAM REACTION

KEY PLAN



1 ROOF FRAMING PLAN - AREA B
S-103-B SCALE: 1/8" = 1'-0"

NORTH

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PROJECT NUMBER 1663-1190-90

A NEW
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TERRE HAUTE, INDIANA

ROOF FRAMING PLAN - AREA B

DRAWING NUMBER S-103-B STRUCTURAL

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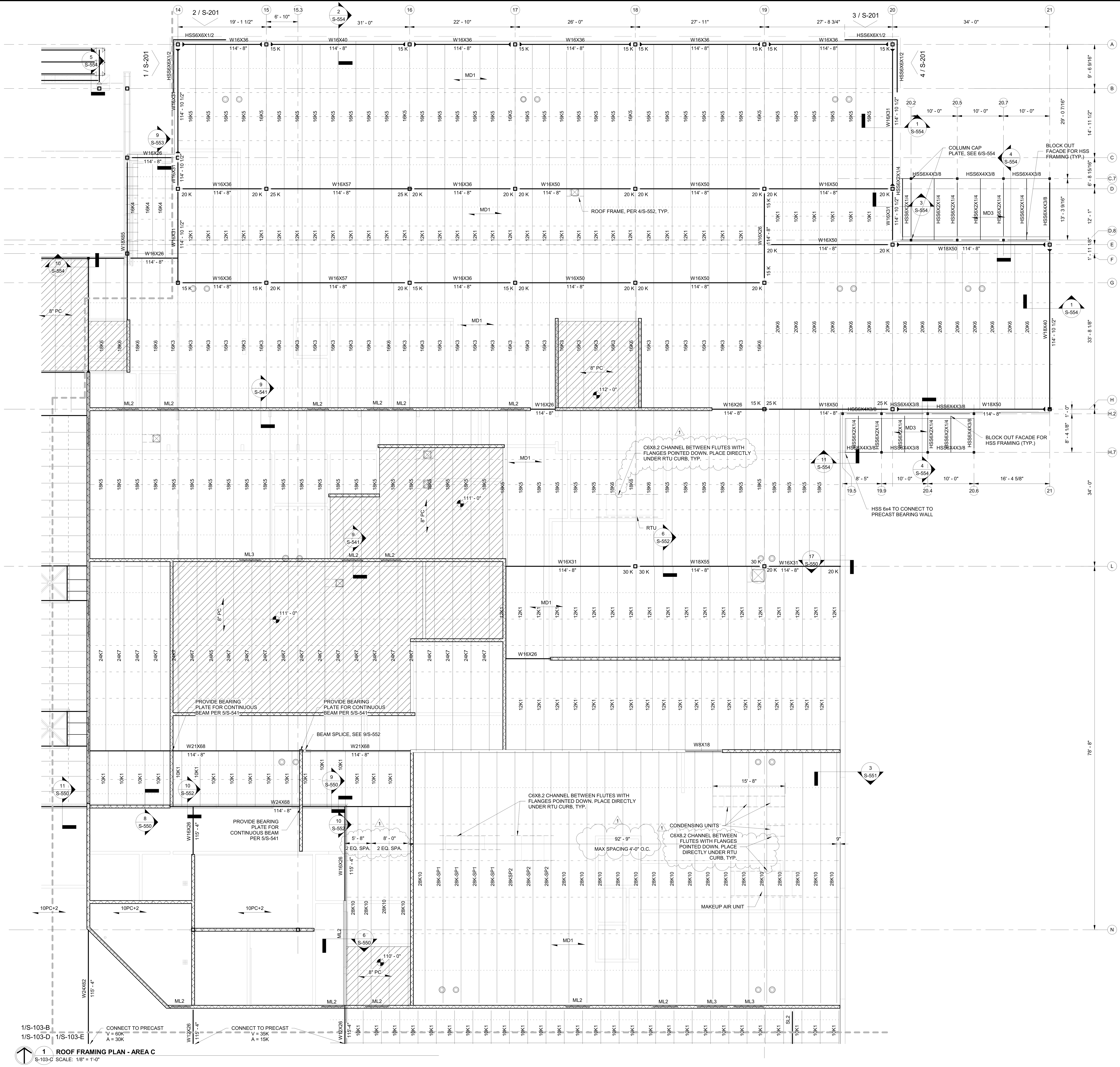


1 ROOF FRAMING PLAN - AREA C
S-103-C SCALE: 1/8" = 1'-0"

PLAN NOTES:

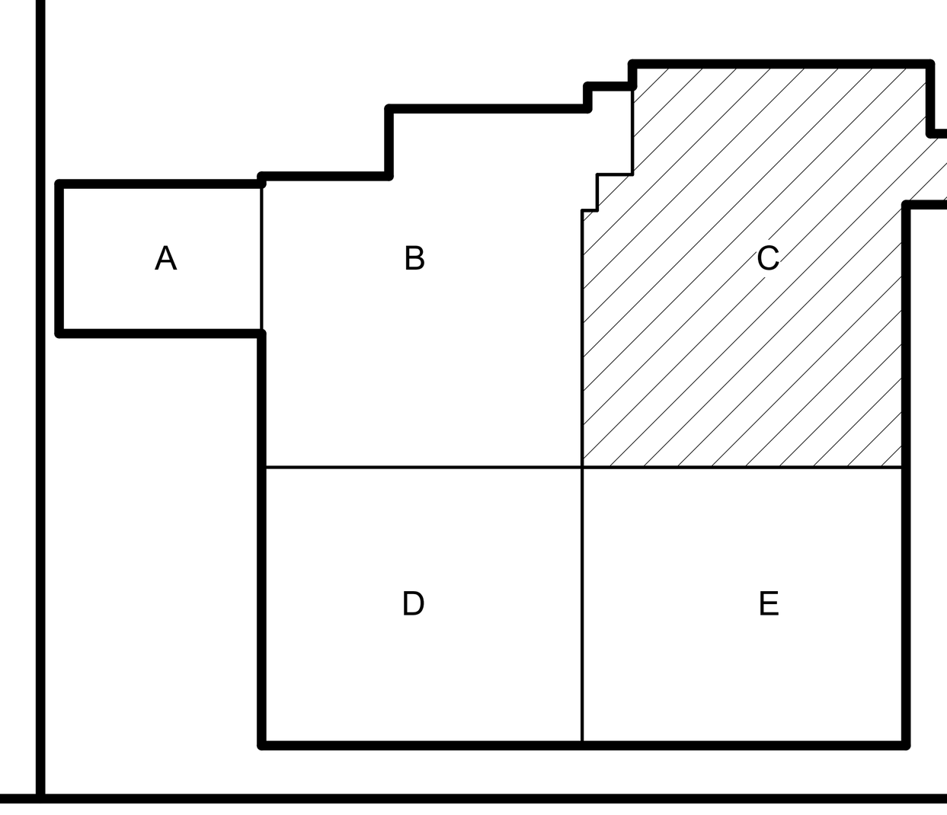
A. REFER TO G-001 FOR ADDITIONAL GENERAL NOTES AND INFORMATION AND S-001 FOR ADDITIONAL STRUCTURAL GENERAL NOTES.
B. JOIST SHOE DEPTHS SHALL BE 2 1/2" FOR K-SERIES JOISTS AND 5" FOR LH-SERIES JOISTS UNO.
C. AT AREA D AND E ROOF FRAMMING, PROVIDE 5" JOIST SHOE FOR K-SERIES JOIST.
D. JOIST BEARING ELEVATION IS 114'-8" UNO.
E. JOIST SPACING SHALL BE 4'-0" O.C. MAX UNO.
F. JOIST BRIDGING INDICATED IS DIAGRAMMATIC IN NATURE. JOIST SSE AND CONTRACTOR TO COORDINATE FINAL NUMBER AND LOCATION OF BRIDGING PER SJI REQUIREMENTS.
G. FOR BEAMS WITHOUT END REACTIONS INDICATED, USE 10 KIPS SHEAR.

LEGEND:

MLX	MASONRY LINTEL, REFER TO SCHEDULE ON 7/S-540.
SLX	STEEL LINTEL W/ 3/8" BOTTOM PLATE, REFER TO SCHEDULE ON 7/S-540.
8 PC	SPAN OF 8" HOLLOWCORE PRECAST CONCRETE SLAB
10 PC +2	SPAN OF 10" HOLLOWCORE PRECAST CONCRETE SLAB W/ 2" COMPOSITE TOPPING
MD#	SPAN OF METAL DECK. SEE SCHEDULE ON S-701.
	INDICATES ROOF DECK PENETRATION, COORDINATE EXACT SIZE AND LOCATION. PROVIDE TYPICAL ROOF PENETRATION FRAMING PER DETAIL 4/S-552.
	LIMITS OF STRUCTURAL LOAD BEARING OR SHEAR WALL. SEE REQUIRED REINFORCING ON PAGE S-101.
	JOIST UPLIFT BRIDGING, PER SJI SPECIFICATIONS
	JOIST BRIDGING, PER SJI SPECIFICATIONS
	MOMENT CONNECTION
	CANTILEVER MOMENT CONNECTION
	ROOF/OVERFLOW DRAIN. PROVIDE FRAMING PER 4/S-552

BEAM SIZE
15K TOP OF BEAM ELEVATION 15K
BEAM REACTION
A = REQUIRED AXIAL LOAD IN ADDITION TO BEAM REACTION SHEAR FORCE.

KEY PLAN



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DESIGNED: VMR
APPRV'D: CVAN
DATE: September 5, 2019
PROJECT NUMBER
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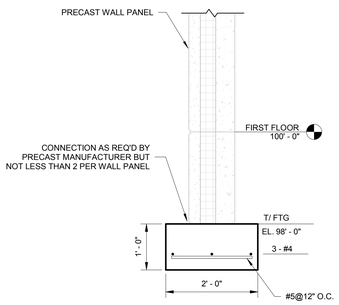
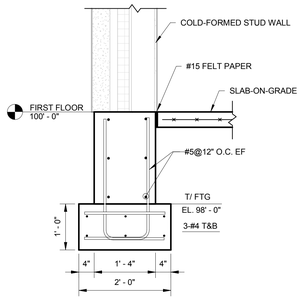
A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

ROOF FRAMING PLAN - AREA C

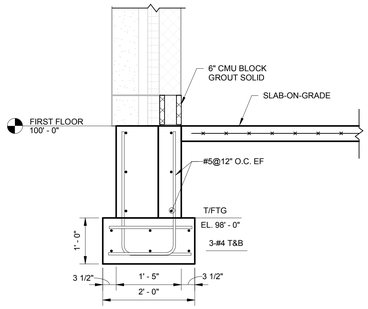
DRAWING NUMBER
S-103-C
STRUCTURAL



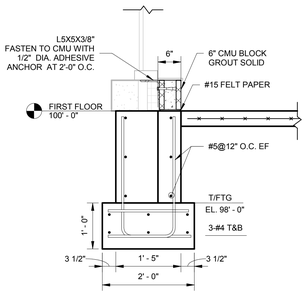
1 S-531 **EXTERIOR WALL FOUNDATION SECTION - PRECAST**
SCALE: 3/4" = 1'-0"



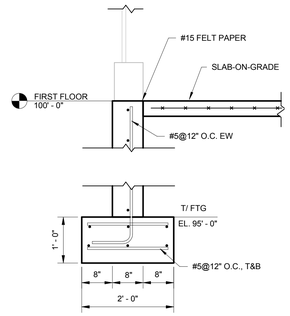
2 S-531 **EXTERIOR WALL FOUNDATION SECTION - STUD WALL**
SCALE: 3/4" = 1'-0"



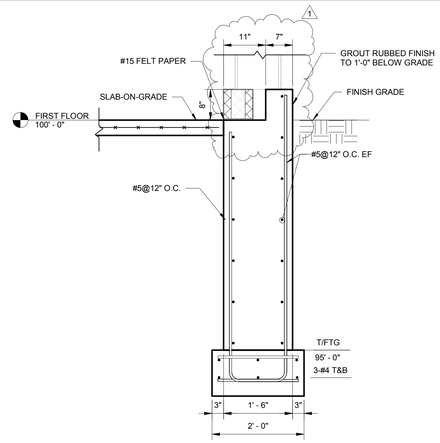
3 S-531 **EXTERIOR FOUNDATION SECTION - ARCHITECTURAL PRECAST**
SCALE: 3/4" = 1'-0"



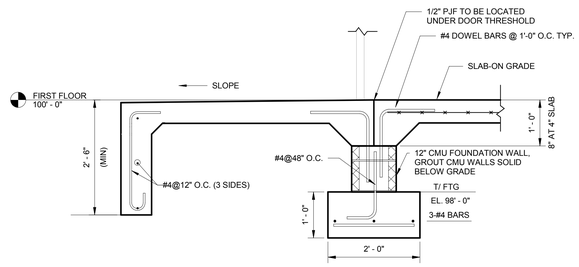
4 S-531 **EXTERIOR FOUNDATION SECTION - ARCHITECTURAL PRECAST AT WINDOW**
SCALE: 3/4" = 1'-0"



5 S-531 **SECTION**
SCALE: 3/4" = 1'-0"

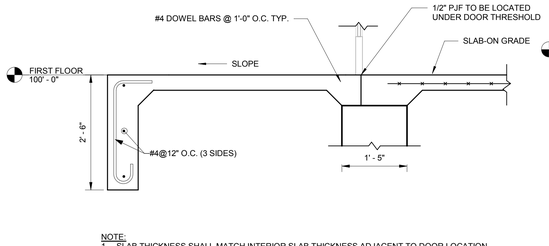


6 S-531 **VESTIBULE WALL FOUNDATION**
SCALE: 3/4" = 1'-0"



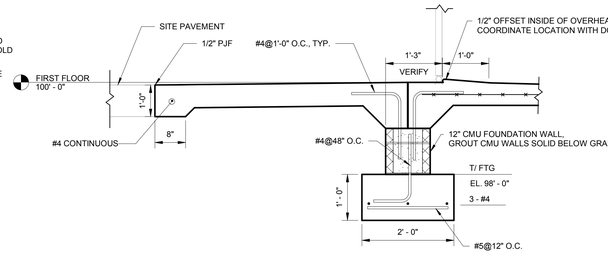
NOTE:
1. SLAB THICKNESS SHALL MATCH INTERIOR SLAB THICKNESS ADJACENT TO DOOR LOCATION.
2. HORIZONTAL BARS TO TIE INTO FOUNDATION WALLS.

7 S-531 **MANDOOR STOOP SECTION - 1**
SCALE: 3/4" = 1'-0"



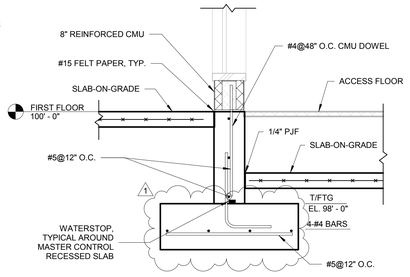
NOTE:
1. SLAB THICKNESS SHALL MATCH INTERIOR SLAB THICKNESS ADJACENT TO DOOR LOCATION.
2. HORIZONTAL BARS TO TIE INTO FOUNDATION WALLS.

8 S-531 **MANDOOR STOOP SECTION - 2**
SCALE: 3/4" = 1'-0"

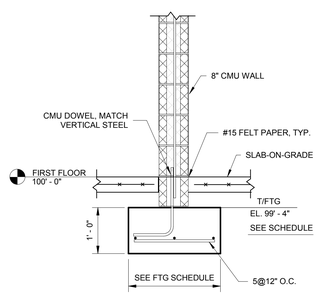


NOTE:
1. PROVIDE CONCRETE FOUNDATION WALL AT SIM REINFORCED WITH #4@12" EF EW
2. PROVIDE CONTROL JOINTS IN APRON PER SITE LAYOUT PLANS.

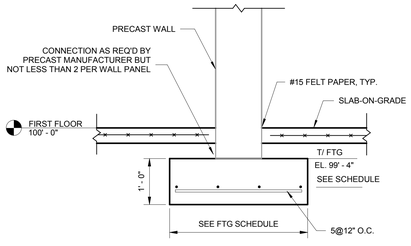
9 S-531 **OVERHEAD DOOR SECTION**
SCALE: 3/4" = 1'-0"



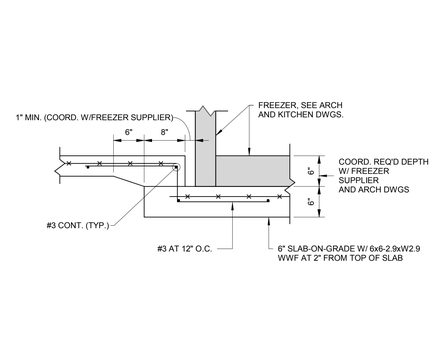
10 S-531 **SLAB AT MASTER CONTROL**
SCALE: 3/4" = 1'-0"



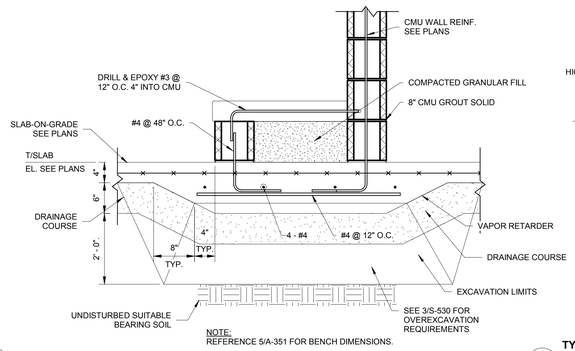
11 S-531 **TYPICAL INTERIOR CMU WALL**
SCALE: 3/4" = 1'-0"



12 S-531 **TYPICAL INTERIOR PRECAST WALL**
SCALE: 3/4" = 1'-0"

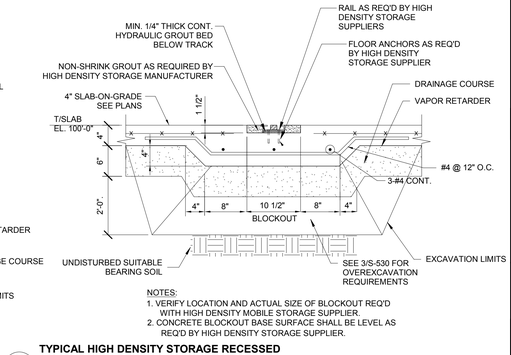


13 S-531 **TYPICAL SECTION AT FREEZER**
SCALE: 1" = 1'-0"



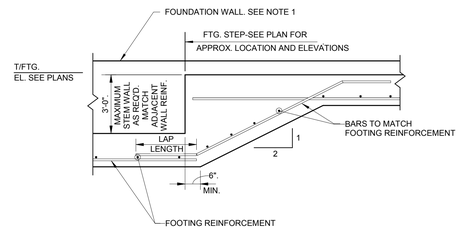
NOTE:
REFERENCE 5/A-351 FOR BENCH DIMENSIONS.

14 S-531 **TYPICAL BENCH DETAIL**
SCALE: NTS



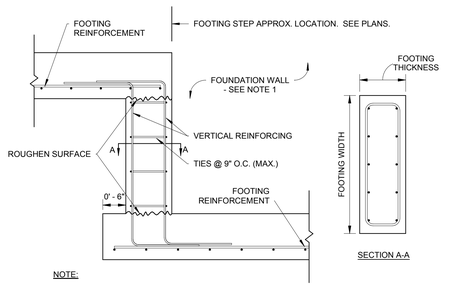
NOTES:
1. VERIFY LOCATION AND ACTUAL SIZE OF BLOCKOUT REQ'D WITH HIGH DENSITY MOBILE STORAGE SUPPLIER.
2. CONCRETE BLOCKOUT BASE SURFACE SHALL BE LEVEL AS REQ'D BY HIGH DENSITY STORAGE SUPPLIER.

15 S-531 **TYPICAL HIGH DENSITY STORAGE RECESSED TRACK DETAIL**
SCALE: N.T.S.



NOTE:
1. COORDINATE LOCATION OF STEPPED FOOTING WITH PC SUPPLIER.
2. REINFORCING THROUGH FOUNDATION WALL SHALL MATCH ADJACENT FOUNDATION WALL REINFORCING. WHEN ADJACENT FOUNDATION WALL DOES NOT EXIST, I.E. INTERIOR FOOTING LOCATIONS AS NOTED, PROVIDE MINIMUM OF #5@12" O.C. EACH FACE VERTICALLY AND HORIZONTALLY WITH THE FOUNDATION WALL BETWEEN STEPS EQUAL IN THICKNESS TO THE SUPPORTED WALL THICKNESS. HOOK BAR ENDS WITH 90° ACI STD HOOKS.

16 S-531 **STEPPED FOOTING DETAIL (3' MAX)**
SCALE: NTS



NOTE:
1. COORDINATE LOCATION OF STEPPED FOOTING WITH PC SUPPLIER.
2. REINFORCING THROUGH FOUNDATION WALL SHALL MATCH ADJACENT FOUNDATION WALL REINFORCING. WHEN ADJACENT FOUNDATION WALL DOES NOT EXIST, I.E. INTERIOR FOOTING LOCATIONS AS NOTED, PROVIDE MINIMUM OF #5@10" O.C. EACH FACE VERTICALLY AND HORIZONTALLY WITH THE FOUNDATION WALL BETWEEN STEPS EQUAL IN THICKNESS TO THE SUPPORTED WALL THICKNESS. HOOK BAR ENDS WITH 90 DEG. ACI STD HOOKS.

17 S-531 **STEPPED FOOTING DETAIL (3' MIN)**
SCALE: NTS

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ARCHITECTURE • ENGINEERING • PLANNING
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DLZ INDIANA, LLC

VANESSA M. REDNOUR
REGISTERED
PROFESSIONAL ENGINEER
PE11800246
STATE OF
INDIANA
PROFESSIONAL ENGINEER
Vanessa Rednour

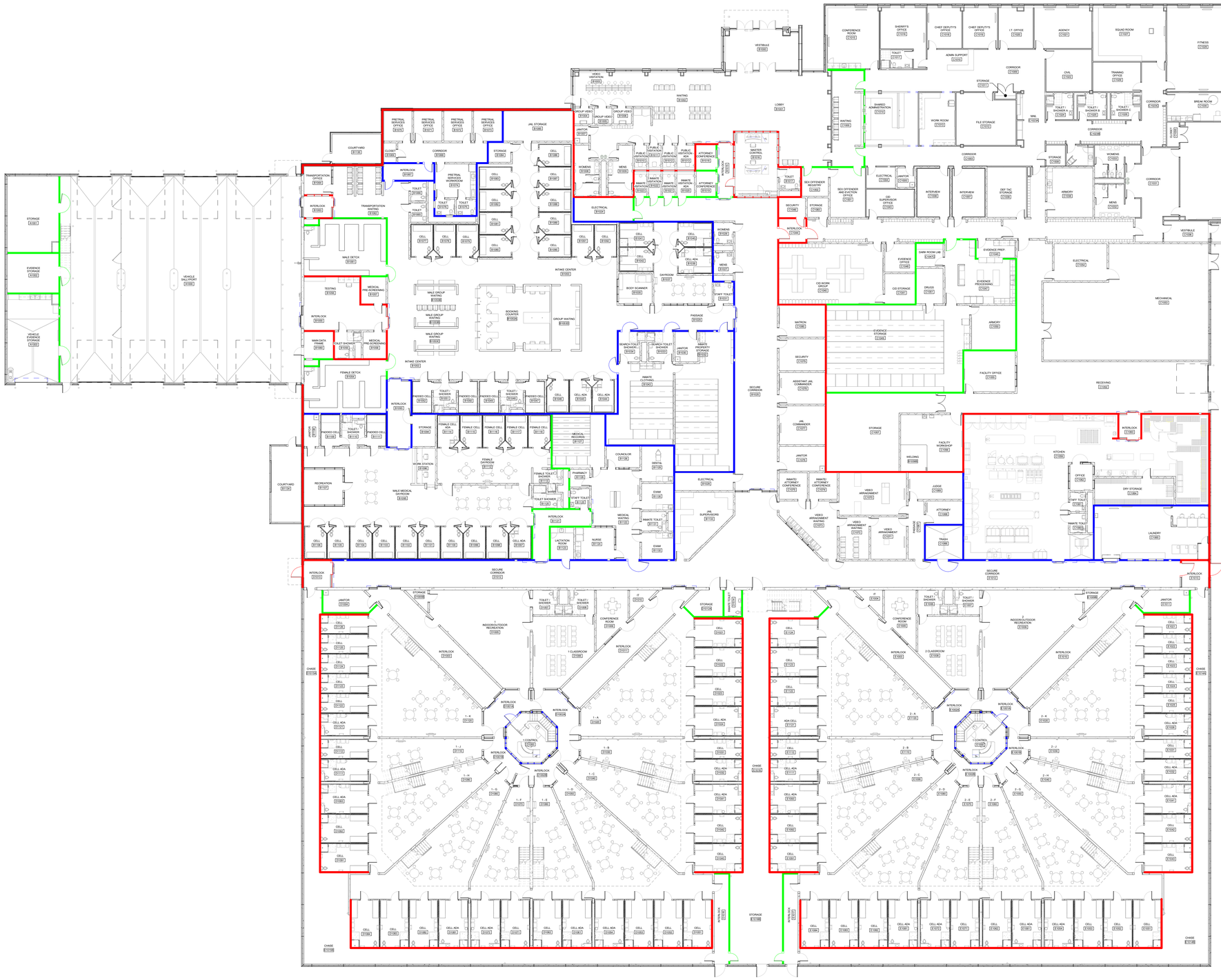
NO.	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: VMR
DESIGNED: VMR
APPRVD: CVAN
DATE: September 5, 2019
CHK'D: CVAN
PROJECT NUMBER 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

TYPICAL FOUNDATION DETAILS AND SECTIONS - 2

DRAWING NUMBER S-531
STRUCTURAL



1 A-070 **FIRST FLOOR - SECURITY PLAN**
SCALE: 1/16" = 1'-0"
NORTH

2 A-070 **LOWER LEVEL - SECURITY PLAN**
SCALE: 1/16" = 1'-0"
NORTH

GENERAL SHEET NOTES: SECURITY PLAN

1. SECURITY BARRIERS AT HVAC PENETRATIONS. PROVIDE A SECURITY BARRIER AT ALL OPENINGS GREATER THAN 8" x 8" LOCATED IN SECURITY WALLS, FLOORS AND ROOF ASSEMBLIES ENCLOSING SECURE AREAS.
   a. OPENINGS GREATER THAN 8" X 8" SHALL HAVE A MAXIMUM DIMENSION OF 5" IN ONE DIRECTION.
   b. REFER TO MECHANICAL DRAWINGS FOR LOCATION AND SIZE OF DUCTS AND OTHER HVAC PENETRATIONS.
   c. SECURITY BARRIERS ARE NOT REQUIRED BEHIND SECURITY AIR GRILLES AND/OR SECURITY DIFFUSERS UNLESS SPECIFICALLY NOTED.
   d. SECURITY BARS AT DUCT PENETRATIONS ARE SPECIFIED IN SECTION 233300 "AIR DUCT ACCESSORIES".
   e. SECURITY BARS AT LOUVERS PENETRATIONS ARE SPECIFIED IN SECTION 089119 "FIXED LOUVERS".

2. PROVIDE SECURITY ACCESS DOORS WHERE MECHANICAL OR ELECTRICAL DEVICES REQUIRE ACCESS THROUGH NON-ACCESSIBLE SECURITY WALLS, FLOORS OR CEILINGS WHETHER SHOWN OR NOT SHOWN ON DRAWINGS . FINAL QUANTITY AND LOCATION WILL BE AS REQUIRED FOR ACCESS TO EQUIPMENT PROVIDED BY MECHANICAL OR ELECTRICAL TRADES.

3. GLAZING IN DOORS AND WINDOWS SHALL BE CONSISTENT WITH THE SECURITY GRADE RATING OF THE WALLS IN WHICH THEY ARE LOCATED.

4. PROVIDE SECURITY SEALANT AT ALL JOINTS RECEIVING JOINT SEALANTS INSIDE THE GRADE 1 SECURE PERIMETER OF THE FACILITY. SECURITY SEALANTS ARE SPECIFIED IN SECTION 079200 "JOINT SEALANTS".

5. SECURITY WALLS LISTED BELOW ARE FOR MINIMUM SECURITY REQUIREMENTS ONLY TO MEET THE SECURITY GRADES LISTED.

6. REFER TO WALL TYPES ON DRAWING G-003 FOR WALL MATERIALS AND WALL THICKNESS.

7. REFER TO STRUCTURAL DRAWINGS FOR MINIMUM MASONRY REINFORCEMENT REQUIREMENTS FOR STRUCTURAL DESIGN.

8. IF CONTRACTOR SHOULD DISCOVER THAT MINIMUM REINFORCEMENT FOR SECURITY REQUIREMENTS AND MINIMUM REINFORCEMENT FOR STRUCTURAL REQUIREMENTS DO NOT MATCH; CONTACT THE ARCHITECT FOR CLARIFICATION.

SECURITY PLAN LEGEND

GRADE 1 - SECURE PERIMETER OF THE FACILITY

A. MASONRY WALLS. WALLS SHALL BE MINIMUM 8" THICK. MINIMUM SECURITY REINFORCEMENT SHALL BE #4 VERTICAL AND HORIZONTAL BARS @ 8" ON CENTER EACH WAY. FILL ALL CORES WITH 3000 PSI MINIMUM COMPRESSIVE STRENGTH GROUT.

B. REINFORCED CAST-IN-PLACE CONCRETE WALLS. WALLS SHALL BE MINIMUM 12" THICK. MINIMUM SECURITY REINFORCEMENT SHALL NOT BE LESS THAN STRUCTURAL REINFORCEMENT NOTED ON STRUCTURAL DRAWINGS.

C. PREFABRICATED MODULAR STEEL CELL WALLS SHALL BE MINIMUM 2" THICK WITH 12 GAGE FACE SHEETS BOTH SIDES. SECURITY METAL WALL PANELS SHALL BE MINIMUM 2" THICK WITH 12 GAGE FACE SHEETS BOTH SIDES, GROUTED SOLID. WALLS SHALL TERMINATE AT TOP OF STEEL CELL ENCLOSURE.

D. INSULATED PRECAST CONCRETE WALLS. WALLS SHALL BE MINIMUM 12" TOTAL THICKNESS CONSISTING OF 5" INTERIOR WITHE, 4" INSULATION AND 3" EXTERIOR WITHE. MINIMUM SECURITY REINFORCEMENT FOR THE INTERIOR WITHE SHALL BE W4.0 (MW 26) WWF @ 4" ON CENTER IN BOTH DIRECTIONS, CONFORMING TO ASTM A185. MINIMUM COMPRESSIVE STRENGTH OF CONCRETE SHALL BE 5,000 PSI.

E. INTERIOR SECURITY WALL SHALL EXTEND FROM FLOOR TO UNDERSIDE OF FLOOR/ROOF DECK ABOVE.

GRADE 2 - SECURITY WALL

A. MASONRY WALLS. WALLS SHALL BE MINIMUM 8" THICK. MINIMUM SECURITY REINFORCEMENT SHALL BE # 4 VERTICAL BARS @ 8" ON CENTER AND HORIZONTAL LADDER TYPE JOINT REINFORCEMENT @ 16" ON CENTER. FILL ALL CORES WITH 3000 PSI MINIMUM COMPRESSIVE STRENGTH GROUT.

B. REINFORCED CAST-IN-PLACE CONCRETE WALLS. WALLS SHALL BE MINIMUM 8" THICK. MINIMUM SECURITY REINFORCEMENT SHALL NOT BE LESS THAN STRUCTURAL REINFORCEMENT NOTED ON STRUCTURAL DRAWINGS.

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D. 6" METAL STUD FRAMING @ 16" ON CENTER WITH 5/8" HIGH IMPACT GYPSUM BOARD ON EACH SIDE. PROVIDE SECURITY MESH BETWEEN GYPSUM BOARD AND STUD.

E. SECURITY WALL SHALL EXTEND FROM FLOOR TO UNDERSIDE OF FLOOR/ROOF DECK ABOVE.

GRADE 3 - SECURITY WALL

A. MASONRY WALLS. WALLS SHALL BE MINIMUM 8" THICK. MINIMUM SECURITY REINFORCEMENT SHALL BE #4 VERTICAL BARS @ 8" ON CENTER AND HORIZONTAL LADDER TYPE JOINT REINFORCEMENT @ 16" ON CENTER. FILL ALL CORES WITH 3000 PSI MINIMUM COMPRESSIVE STRENGTH GROUT.

B. REINFORCED CAST-IN-PLACE CONCRETE WALLS. WALLS SHALL BE MINIMUM 8" THICK. MINIMUM SECURITY REINFORCEMENT SHALL NOT BE LESS THAN STRUCTURAL REINFORCEMENT NOTED ON STRUCTURAL DRAWINGS.

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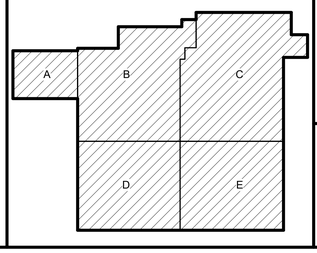
D. SECURITY WALL MAY TERMINATE 8" ABOVE THE HIGHER CEILING ASSEMBLY.

NOTE:
ELEMENTS ON THIS DRAWING ARE IDENTIFIED BY VARIOUS COLORS; IF THIS NOTE IS NOT RED, THIS DRAWING IS NOT IN COLOR AND NEEDS TO BE REPRINTED IN COLOR.

KEY PLAN



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DLZ INDIANA, LLC

JACOB B. RATTS — REGISTERED — No. AR19500134 — STATE OF INDIANA — REGISTERED ARCHITECT

NO.	REVISION	DATE

DRAWN: CAG CHK'D: SAC
DESIGNED: EBR
APPR'D: EBR
DATE: September 5, 2019
PROJECT NUMBER: 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

FIRST FLOOR - SECURITY WALL PLAN

DRAWING NUMBER: A-070 ARCHITECTURE

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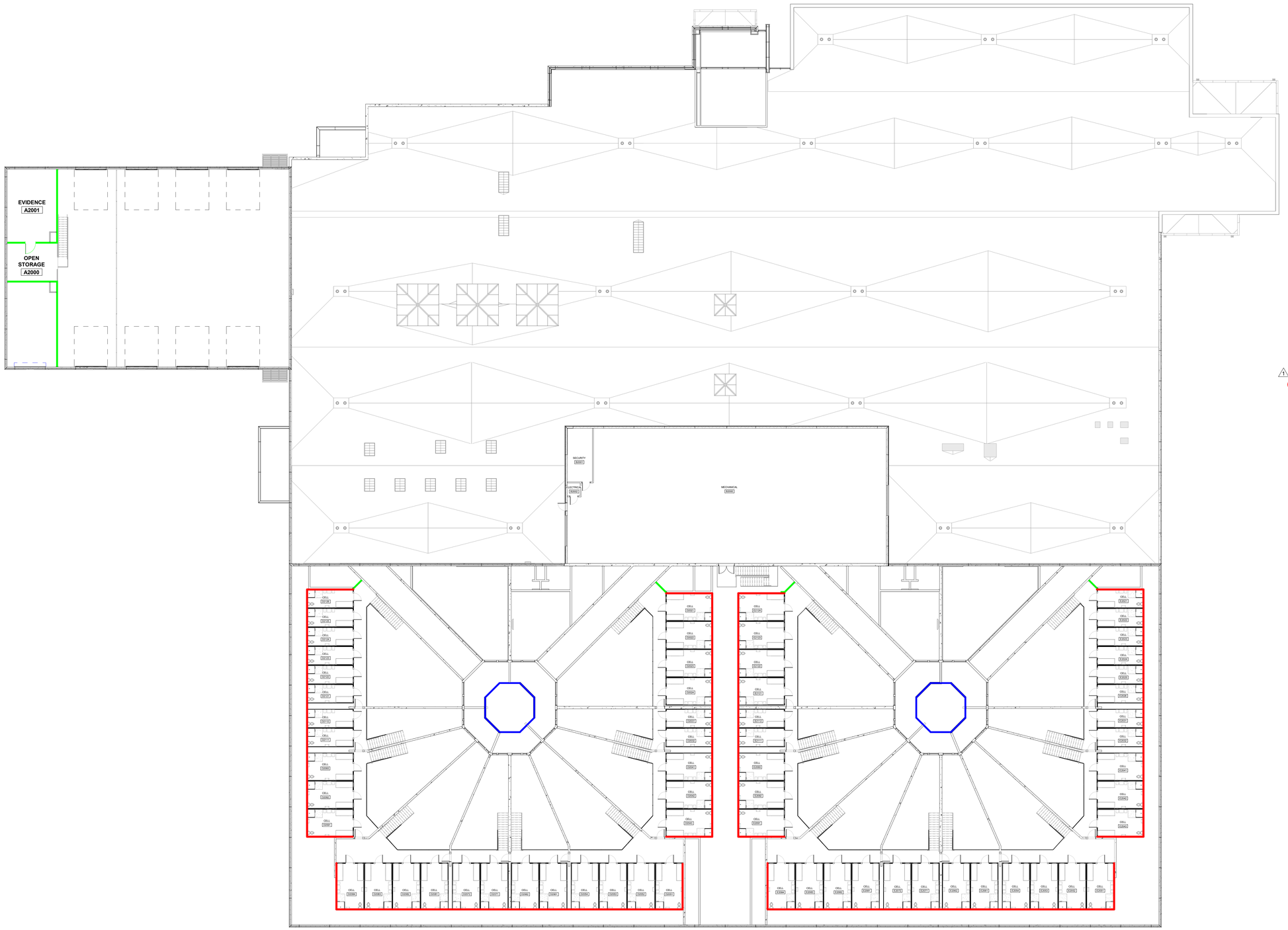

1 A-071 **MEZZANINE - SECURITY PLAN**
SCALE: 1/16" = 1'-0"

NORTH

GENERAL SHEET NOTES: SECURITY PLAN

1. SECURITY BARRIERS AT HVAC PENETRATIONS. PROVIDE A SECURITY BARRIER AT ALL OPENINGS GREATER THAN 8" x 8" LOCATED IN SECURITY WALLS, FLOORS AND ROOF ASSEMBLIES ENCLOSING SECURE AREAS.
   a. OPENINGS GREATER THAN 8" X 8" SHALL HAVE A MAXIMUM DIMENSION OF 5" IN ONE DIRECTION.
   b. REFER TO MECHANICAL DRAWINGS FOR LOCATION AND SIZE OF DUCTS AND OTHER HVAC PENETRATIONS.
   c. SECURITY BARRIERS ARE NOT REQUIRED BEHIND SECURITY AIR GRILLES AND/OR SECURITY DIFFUSERS UNLESS SPECIFICALLY NOTED.
   d. SECURITY BARS AT DUCT PENETRATIONS ARE SPECIFIED IN SECTION 233300 "AIR DUCT ACCESSORIES'.
   e. SECURITY BARS AT LOUVERS PENETRATIONS ARE SPECIFIED IN SECTION 089119 "FIXED LOUVERS".

2. PROVIDE SECURITY ACCESS DOORS WHERE MECHANICAL OR ELECTRICAL DEVICES REQUIRE ACCESS THROUGH NON-ACCESSIBLE SECURITY WALLS, FLOORS OR CEILINGS WHETHER SHOWN OR NOT SHOWN ON DRAWINGS . FINAL QUANTITY AND LOCATION WILL BE AS REQUIRED FOR ACCESS TO EQUIPMENT PROVIDED BY MECHANICAL OR ELECTRICAL TRADES.

3. GLAZING IN DOORS AND WINDOWS SHALL BE CONSISTENT WITH THE SECURITY GRADE RATING OF THE WALLS IN WHICH THEY ARE LOCATED.

4. PROVIDE SECURITY SEALANT AT ALL JOINTS RECEIVING JOINT SEALANTS INSIDE THE GRADE 1 SECURE PERIMETER OF THE FACILITY. SECURITY SEALANTS ARE SPECIFIED IN SECTION 079200 "JOINT SEALANTS".

5. SECURITY WALLS LISTED BELOW ARE FOR MINIMUM SECURITY REQUIREMENTS ONLY TO MEET THE SECURITY GRADES LISTED.

6. REFER TO WALL TYPES ON DRAWING G-003 FOR WALL MATERIALS AND WALL THICKNESS.

7. REFER TO STRUCTURAL DRAWINGS FOR MINIMUM MASONRY REINFORCEMENT REQUIREMENTS FOR STRUCTURAL DESIGN.

8. IF CONTRACTOR SHOULD DISCOVER THAT MINIMUM REINFORCEMENT FOR SECURITY REQUIREMENTS AND MINIMUM REINFORCEMENT FOR STRUCTURAL REQUIREMENTS DO NOT MATCH; CONTACT THE ARCHITECT FOR CLARIFICATION.

SECURITY PLAN LEGEND

GRADE 1 - SECURE PERIMETER OF THE FACILITY

A. MASONRY WALLS. WALLS SHALL BE MINIMUM 8" THICK. MINIMUM SECURITY REINFORCEMENT SHALL BE #4 VERTICAL AND HORIZONTAL BARS @ 8" ON CENTER EACH WAY. FILL ALL CORES WITH 3000 PSI MINIMUM COMPRESSIVE STRENGTH GROUT.

B. REINFORCED CAST-IN-PLACE CONCRETE WALLS. WALLS SHALL BE MINIMUM 12" THICK. MINIMUM SECURITY REINFORCEMENT SHALL NOT BE LESS THAN STRUCTURAL REINFORCEMENT NOTED ON STRUCTURAL DRAWINGS.

C. PREFABRICATED MODULAR STEEL CELL WALLS SHALL BE MINIMUM 2" THICK WITH 12 GAGE FACE SHEETS BOTH SIDES. SECURITY METAL WALL PANELS SHALL BE MINIMUM 2" THICK WITH 12 GAGE FACE SHEETS BOTH SIDES, GROUTED SOLID. WALLS SHALL TERMINATE AT TOP OF STEEL CELL ENCLOSURE.

D. INSULATED PRECAST CONCRETE WALLS. WALLS SHALL BE MINIMUM 12" TOTAL THICKNESS CONSISTING OF 5" INTERIOR WITHE, 4" INSULATION AND 3" EXTERIOR WITHE. MINIMUM SECURITY REINFORCEMENT FOR THE INTERIOR WITHE SHALL BE W4.0 (MW 26) WWF @ 4" ON CENTER IN BOTH DIRECTIONS, CONFORMING TO ASTM A185. MINIMUM COMPRESSIVE STRENGTH OF CONCRETE SHALL BE 5,000 PSI.

E. INTERIOR SECURITY WALL SHALL EXTEND FROM FLOOR TO UNDERSIDE OF FLOOR/ROOF DECK ABOVE.

GRADE 2 - SECURITY WALL

A. MASONRY WALLS. WALLS SHALL BE MINIMUM 8" THICK. MINIMUM SECURITY REINFORCEMENT SHALL BE # 4 VERTICAL BARS @ 8" ON CENTER AND HORIZONTAL LADDER TYPE JOINT REINFORCEMENT @ 16" ON CENTER. FILL ALL CORES WITH 3000 PSI MINIMUM COMPRESSIVE STRENGTH GROUT.

B. REINFORCED CAST-IN-PLACE CONCRETE WALLS. WALLS SHALL BE MINIMUM 8" THICK. MINIMUM SECURITY REINFORCEMENT SHALL NOT BE LESS THAN STRUCTURAL REINFORCEMENT NOTED ON STRUCTURAL DRAWINGS.

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D. 6" METAL STUD FRAMING @ 16" ON CENTER WITH 5/8" HIGH IMPACT GYPSUM BOARD ON EACH SIDE. PROVIDE SECURITY MESH BETWEEN GYPSUM BOARD AND STUD.

E. SECURITY WALL SHALL EXTEND FROM FLOOR TO UNDERSIDE OF FLOOR/ROOF DECK ABOVE.

GRADE 3 - SECURITY WALL

A. MASONRY WALLS. WALLS SHALL BE MINIMUM 8" THICK. MINIMUM SECURITY REINFORCEMENT SHALL BE #4 VERTICAL BARS @ 8" ON CENTER AND HORIZONTAL LADDER TYPE JOINT REINFORCEMENT @ 16" ON CENTER. FILL ALL CORES WITH 3000 PSI MINIMUM COMPRESSIVE STRENGTH GROUT.

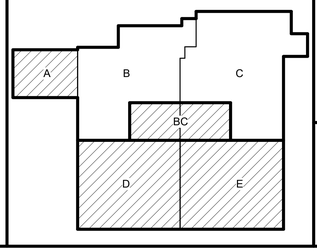
B. REINFORCED CAST-IN-PLACE CONCRETE WALLS. WALLS SHALL BE MINIMUM 8" THICK. MINIMUM SECURITY REINFORCEMENT SHALL NOT BE LESS THAN STRUCTURAL REINFORCEMENT NOTED ON STRUCTURAL DRAWINGS.

C. PREFABRICATED MODULAR STEEL CELL WALLS SHALL BE MINIMUM 2" THICK WITH 12 GAGE FACE SHEETS BOTH SIDES. SECURITY METAL WALL PANELS SHALL BE MINIMUM 2" THICK WITH 12 GAGE FACE SHEETS BOTH SIDES, GROUTED SOLID. WALLS TERMINATE AT TOP OF STEEL CELL ENCLOSURE.

D. SECURITY WALL MAY TERMINATE 8" ABOVE THE HIGHER CEILING ASSEMBLY.

NOTE:
ELEMENTS ON THIS DRAWING ARE IDENTIFIED BY VARIOUS COLORS; IF THIS NOTE IS NOT RED, THIS DRAWING IS NOT IN COLOR AND NEEDS TO BE REPRINTED IN COLOR.

KEY PLAN



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DLZ INDIANA, LLC

BRIC B. RATTS REGISTERED No. AR19500134 STATE OF INDIANA ARCHITECT

NO.	REVISION	DATE

DRAWN: CAG CHK'D: SAC
DESIGNED: EBR
APPR'VD: EBR
DATE: September 5, 2019
PROJECT NUMBER 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA
MEZZANINE - SECURITY WALL PLAN

DRAWING NUMBER A-071 ARCHITECTURE

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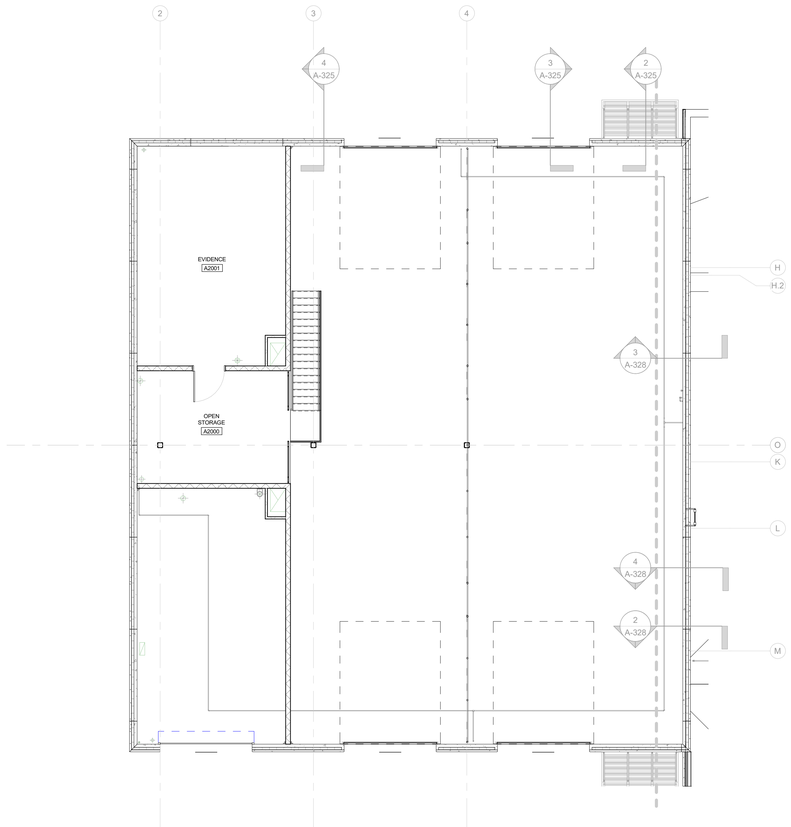
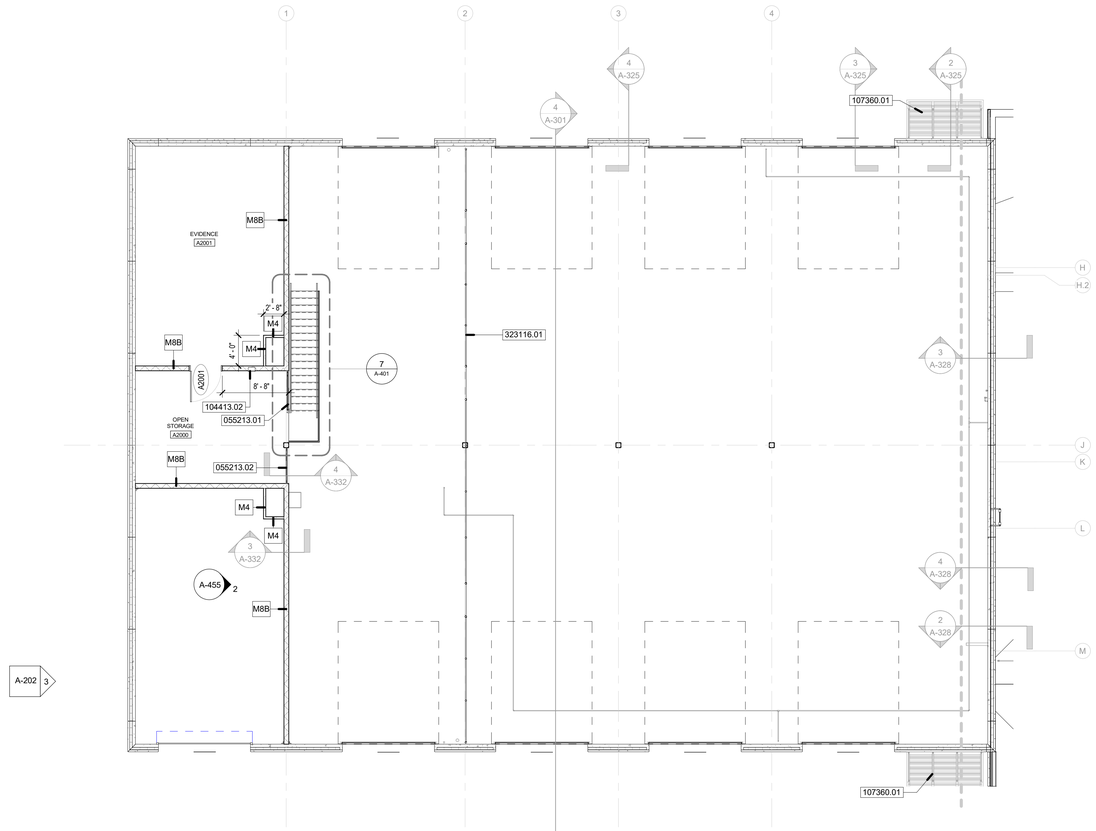
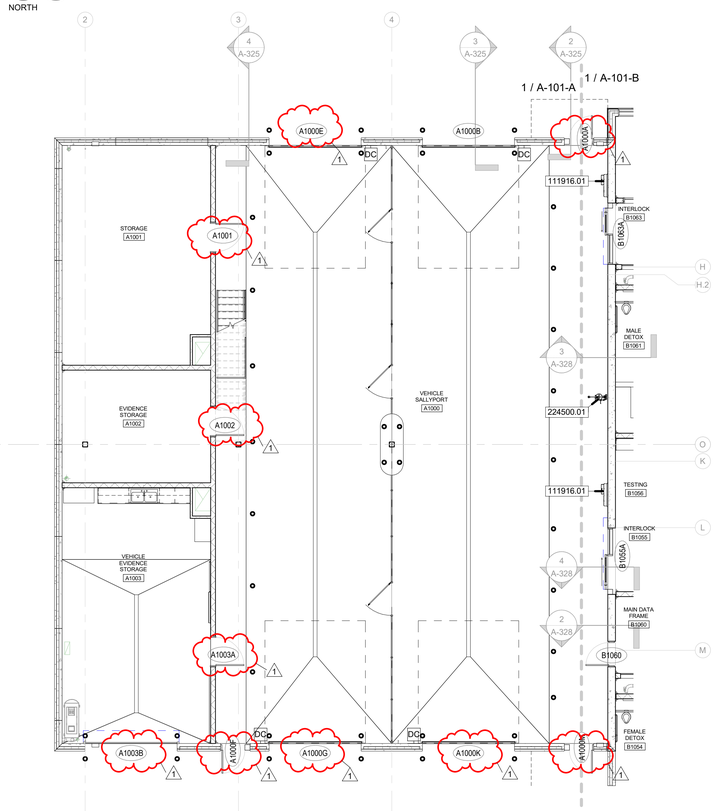


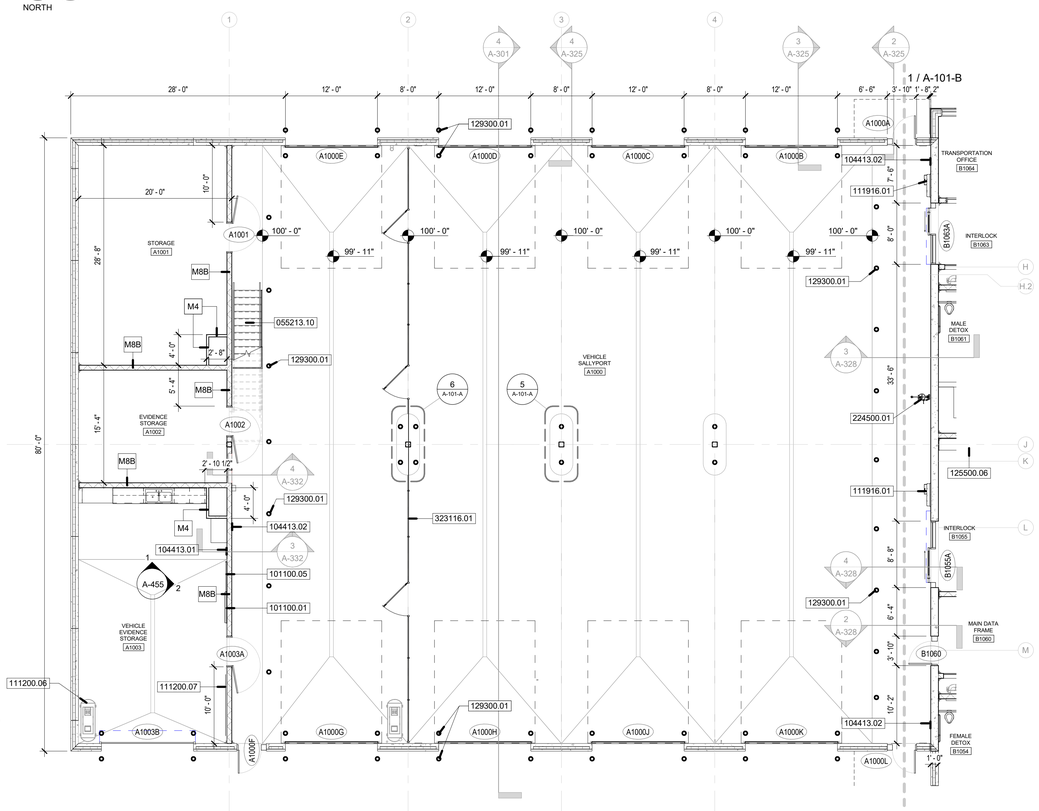
4 A-101-A **ALTERNATE - MEZZANINE PLAN - AREA A**
SCALE: 1/8" = 1'-0"



2 A-101-A **BASE BID - MEZZANINE PLAN - AREA A**
SCALE: 1/8" = 1'-0"



3 A-101-A **ALTERNATE - FIRST FLOOR PLAN - AREA A**
SCALE: 1/8" = 1'-0"



1 A-101-A **BASE BID - FIRST FLOOR PLAN - AREA A**
SCALE: 1/8" = 1'-0"

NORTH

GENERAL NOTES

1. ALL KEYNOTES INDICATE ONE GRAPHIC REPRESENTATION TYPICAL. CONTRACTOR SHALL USE THE GRAPHICAL REPRESENTATIONS FOR COUNTS AND NOT THE KEYNOTES. THE ABSENCE OF A KEYNOTE DOES NOT ABSOLVE THE CONTRACTOR FROM PROVIDING THE FEATURE GRAPHICALLY SHOWN ON THE DRAWINGS.
2. COORDINATE WITH M.E.P. FOR ANY BULKHEADS, POWER, DATA OR EQUIPMENT REQUIREMENTS.
3. SEE SHEETS A-001, A-002, A-070 AND A-071 FOR FIRE RATED AND SECURITY WALL CONSRUCTION.
4. REFER TO G-001 FOR ADDITIONAL GENERAL NOTES AND INFORMATION.
5. DIMENSIONS TO EXTERIOR FACES OF BUILDING ARE TO THE OUTSIDE OF THE MASONRY VENEER AND PRECAST PANELS.
6. DIMENSIONS OF INTERIOR WALLS ARE TO FACE OF METAL STUD, CMU, OR PRECAST.
7. REFER TO PARTITION SCHEDULE ON G-003.
8. PROVIDE CORNER GUARDS AT ALL GYPSUM BOARD CORNER LOCATIONS. SEE SPECIFICATION SECTION 102600.

PLAN NOTES:

A. REFER TO G1.1 FOR ADDITIONAL GENERAL NOTES AND INFORMATION.
B. IN AREAS WHERE THERE ARE GYPSUM WALLS, ADD (X-TYPE) CORNER GUARDS TO ALL OUTSIDE CORNERS

KEYNOTES

051200.02 STEEL COLUMN

055213.01 1 1/2" DIA STEEL PIPE GUARDRAIL; PAINTED

055213.02 REMOVABLE 1 1/2" DIA STEEL PIPE GUARDRAIL; PAINTED

055213.10 METAL PAN STAIR ASSEMBLY WITH CLOSED RISERS; PAINTED

101100.01 MARKER BOARD, 4'

101100.05 TACK BOARD, 48" X 48"

104413.01 FIRE EXTINGUISHER CABINET - ABC

104413.02 FIRE EXTINGUISHER DETENTION CABINET - ABC

107360.01 MANUF. ALUM. CANOPY (10'X5') WITH BUILT-IN DRAINAGE SYSTEM

111200.06 AIR COMPRESSOR, BY OWNER

111200.07 PEG BOARD, BY OWNER

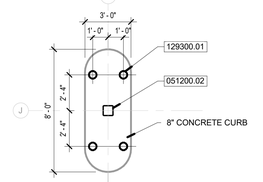
111916.01 PISTOL LOCKERS, SURFACE MOUNTED - 6 COMPARTMENT

125500.06 DETENTION STAINLESS STEEL BENCH WITH CUFFING RINGS; FLOOR MOUNTED, 4'-0" LENGTH

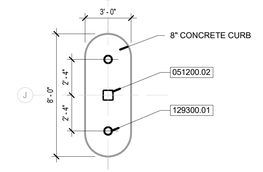
129300.01 PIPE BOLLARD WITH PLASTIC COVER

224500.01 EMERGENCY EYEWASH STATION

323116.01 WELDED WIRE FENCE AND GATE

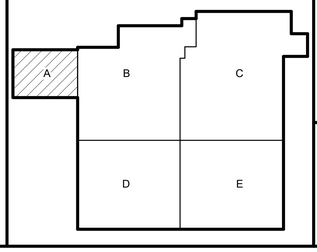


6 A-101-A **COLUMN GUARDS**
SCALE: 1/4" = 1'-0"



5 A-101-A **COLUMN GUARDS**
SCALE: 1/4" = 1'-0"

KEY PLAN



DLZ
ARCHITECTURE • ENGINEERING • PLANNING
SURVEYING • CONSTRUCTION SERVICES
DLZ INDIANA, LLC

BRIC B. RATY'S
REGISTERED
No.
AR19500134
STATE OF
INDIANA
REGISTERED
ARCHITECT

NO.	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: CAG CHK'D: SAC
DESIGNED: EBR
APPRV'D: EBR
DATE: September 5, 2019
PROJECT NUMBER 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

FIRST AND MEZZANINE FLOOR PLANS - AREA A

DRAWING NUMBER A-101-A

ARCHITECTURE

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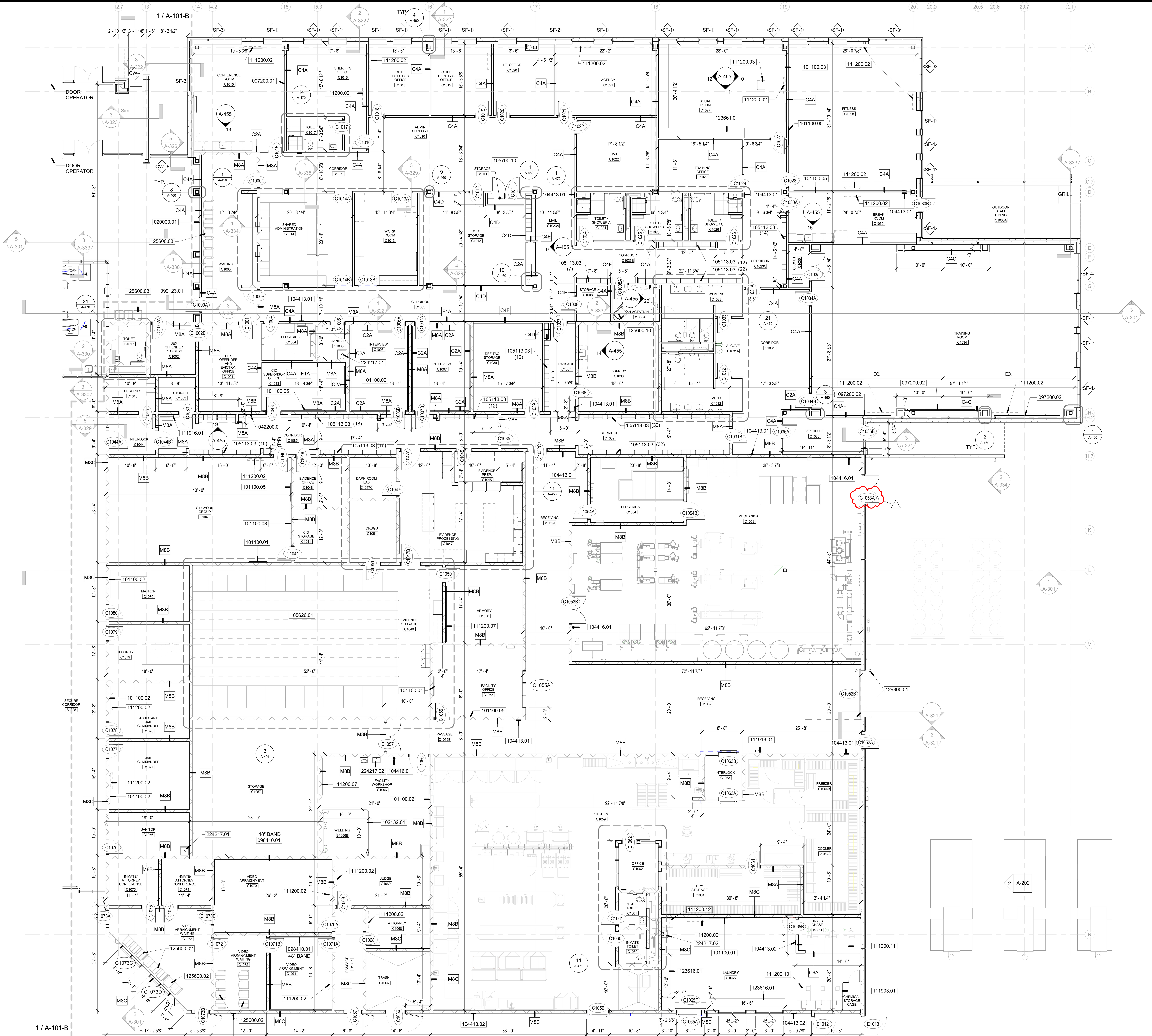


1 FIRST FLOOR PLAN - AREA C
SCALE: 1/8" = 1'-0"

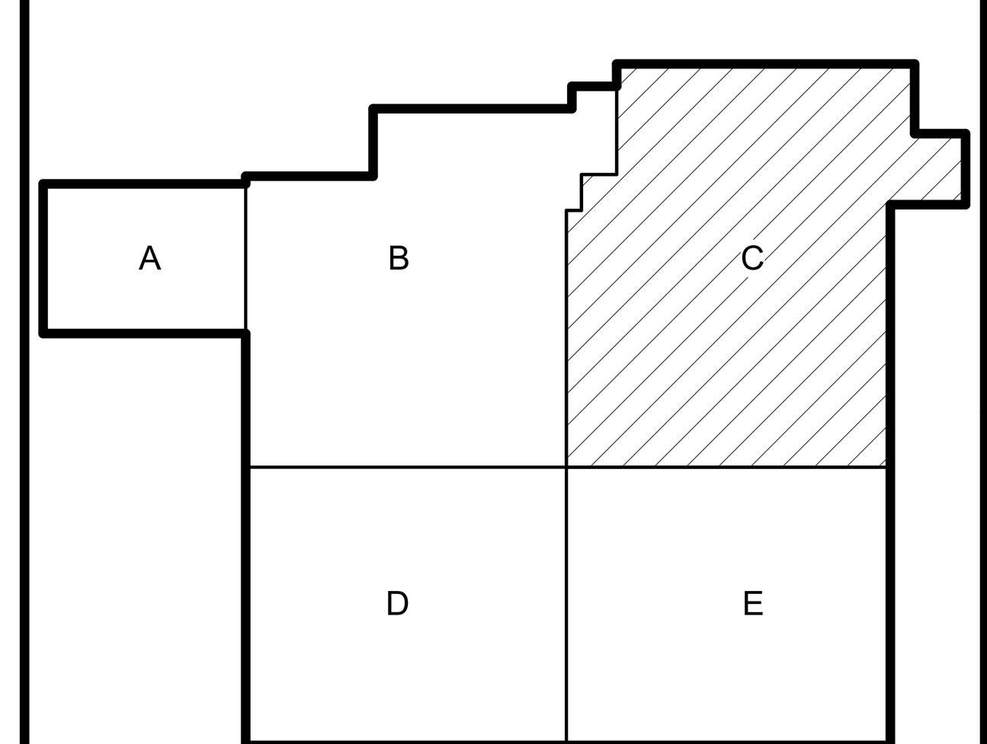
GENERAL NOTES

1. ALL KEYNOTES INDICATE ONE GRAPHIC REPRESENTATION TYPICAL. CONTRACTOR SHALL USE THE GRAPHICAL REPRESENTATIONS FOR COUNTS AND NOT THE KEYNOTES. THE ABSENCE OF A KEYNOTE DOES NOT ABSOLVE THE CONTRACTOR FROM PROVIDING THE FEATURE GRAPHICALLY SHOWN ON THE DRAWINGS.
2. COORDINATE WITH M.E.P. FOR ANY BULKHEADS, POWER, DATA OR EQUIPMENT REQUIREMENTS.
3. SEE SHEETS A-001, A-002, A-070 AND A-071 FOR FIRE RATED AND SECURITY WALL CONSRUCTION.
4. REFER TO G-001 FOR ADDITIONAL GENERAL NOTES AND INFORMATION.
5. DIMENSIONS TO EXTERIOR FACES OF BUILDING ARE TO THE OUTSIDE OF THE MASONRY VENEER AND PRECAST PANELS.
6. DIMENSIONS OF INTERIOR WALLS ARE TO FACE OF METAL STUD, CMU, OR PRECAST.
7. REFER TO PARTITION SCHEDULE ON G-003.
8. PROVIDE CORNER GUARDS AT ALL GYPSUM BOARD CORNER LOCATIONS. SEE SPECIFICATION SECTION 102600.

KEYNOTES

020000.01	FALLEN OFFICER MEMORIAL; RELOCATE FROM EXISTING JAIL AND INSTALL. PROVIDE BLOCKING FOR MOUNTING CONFIGURATION
042200.01	8" CMU
097200.01	PRESENTATION DRY ERASE WALL COVERING; FULL HEIGHT AND WIDTH OF WALL
097200.02	PRESENTATION DRY ERASE WALL COVERING WITH FRAME AND 8' TRAY; 11' WIDE BY 6' HIGH AT 30" AFF
098410.01	FIXED SOUND ABSORBING PANEL
099123.01	PAINT CAMERA BACK-DROP 4' WIDE (FLOOR TO CEILING) WITH COLOR PHOTOGRAPHER'S 17% GRAY
101100.01	MARKER BOARD, 4'
101100.02	MARKER BOARD, 6'
101100.03	MARKER BOARD, 8'
101100.05	TACK BOARD, 48" X 48"
102132.01	WELDING CURTAIN (8'-0") WITH TRACK
104413.01	FIRE EXTINGUISHER CABINET - ABC
104413.02	FIRE EXTINGUISHER DETENTION CABINET - ABC
104416.01	BRACKET-MOUNTED FIRE EXTINGUISHER, TYPE A-B-C
105113.03	METAL LOCKER SYSTEM (TYPE 3) WITH 4" CONCRETE BASE
105626.01	MOBILE STORAGE SHELVING
105700.10	COAT ROD AND SHELF
111200.02	FLAT SCREEN TELEVISION, BY OWNER
111200.03	PODIUM, BY OWNER
111200.07	PEG BOARD, BY OWNER
111200.10	WASHING MACHINE, BY OWNER
111200.11	DRYER, BY OWNER
111200.12	STACKED WASHER/DRYER, BY OWNER
111903.01	FIXED WOVEN ROD SECURITY BARRIER
111916.01	PISTOL LOCKERS, SURFACE MOUNTED - 6 COMPARTMENT
123616.01	STAINLESS STEEL COUNTERTOP
123661.01	SOLID SURFACE MATERIAL COUNTERTOP
125600.02	FIXED BEAM SEATING - FBS-2
125600.03	FIXED BEAM SEATING - FBS-3
125600.10	SECURE ROCKING CHAIR
129300.01	PIPE BOLLARD WITH PLASTIC COVER
224217.01	MOP SINK WITH STAINLESS STEEL BACKSPLASHES AND UTILITY SHELF W/ MOP HANGER
224217.02	UTILITY SERVICE SINK

KEY PLAN



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DLZ INDIANA, LLC

ERIC B. RATTS, REGISTERED ARCHITECT, No. AR19500134, STATE OF INDIANA

NO.	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: CAG CHK'D: SAC
DESIGNED: EBR
APPRV'D: EBR
DATE: September 5, 2019
PROJECT NUMBER
1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

FIRST FLOOR PLAN - AREA C

DRAWING NUMBER
A-101-C
ARCHITECTURE

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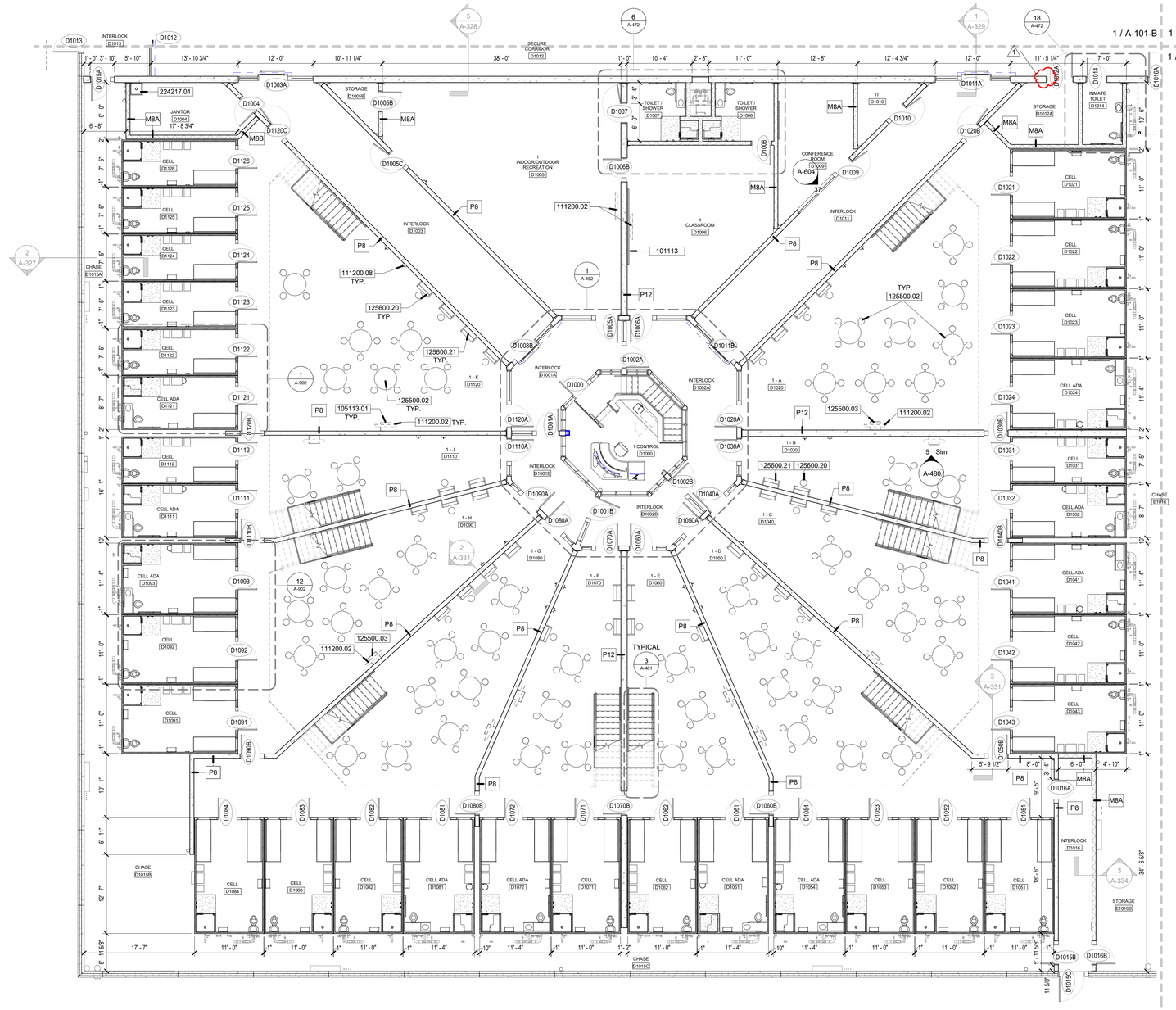

1 A-101-D **FIRST FLOOR PLAN - AREA D**
SCALE: 1/8" = 1'-0"

NORTH

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GENERAL NOTES

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4. REFER TO G-001 FOR ADDITIONAL GENERAL NOTES AND INFORMATION.
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6. DIMENSIONS OF INTERIOR WALLS ARE TO FACE OF METAL STUD, CMU, OR PRECAST.
7. REFER TO PARTITION SCHEDULE ON G-003.
8. PROVIDE CORNER GUARDS AT ALL GYPSUM BOARD CORNER LOCATIONS. SEE SPECIFICATION SECTION 102600.

KEYNOTES

101113

105113.01 METAL LOCKER SYSTEM (TYPE 1) WITH 4" CONCRETE BASE

111200.02 FLAT SCREEN TELEVISION, BY OWNER

111200.08 DAYROOM DETENTION PHONE; BY OWNER

125500.02 DETENTION 4-MAN DAYROOM TABLE

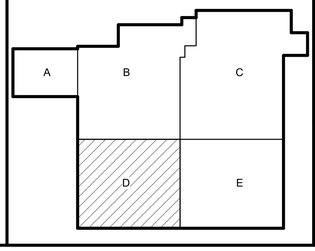
125500.03 DAYROOM WALL SHELF

125600.20 DAYROOM VIDEO VISITATION CABINET

125600.21 DAYROOM VIDEO VISITATION CABINET, ADA

224217.01 MOP SINK WITH STAINLESS STEEL BACKSPLASHES AND UTILITY SHELF W/ MOP HANGER

KEY PLAN



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DLZ INDIANA, LLC

BRIC B. RATY'S REGISTERED No. AR19500134 STATE OF INDIANA REGISTERED ARCHITECT

NO.	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: CAG
DESIGNED: EBR
APPRVD: EBR
DATE: September 5, 2019
PROJECT NUMBER: 1663-1190-90

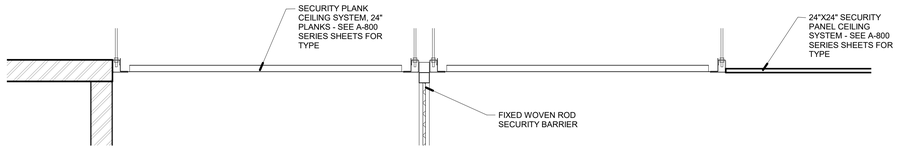
A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

FIRST FLOOR PLAN - AREA D

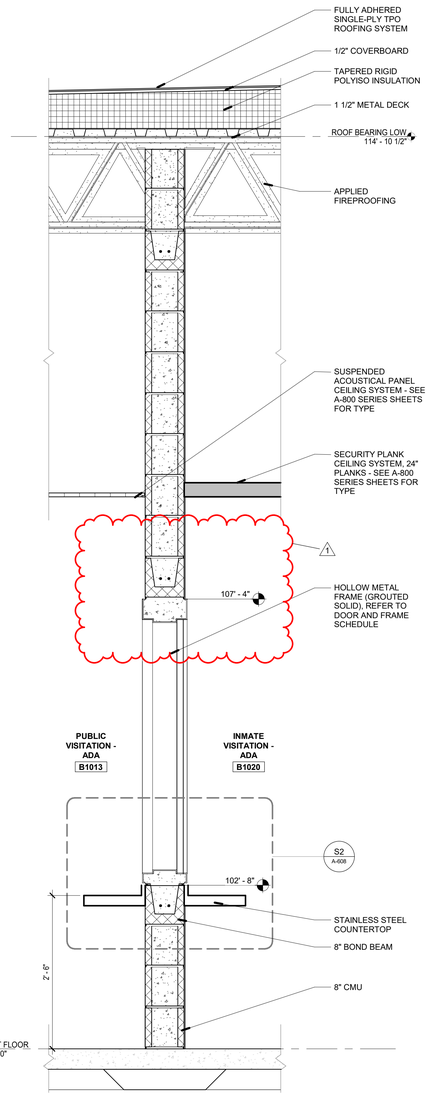
DRAWING NUMBER: A-101-D
ARCHITECTURE

GENERAL NOTES:

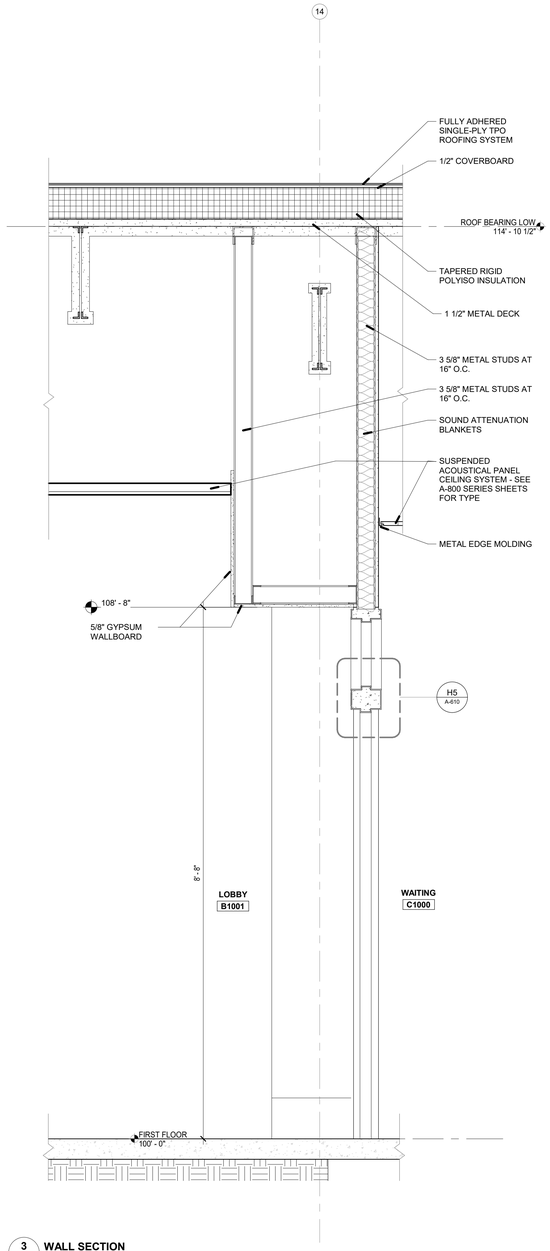
A. REFER TO G-001 FOR ADDITIONAL GENERAL NOTES AND INFORMATION.



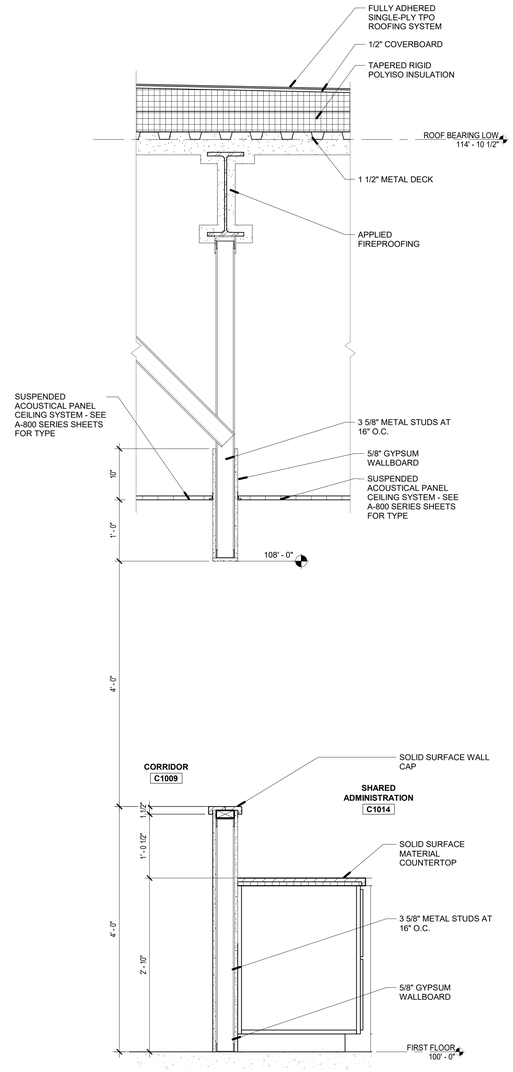
5 A-335 CEILING TRANSITION DETAIL
SCALE: 1" = 1'-0"



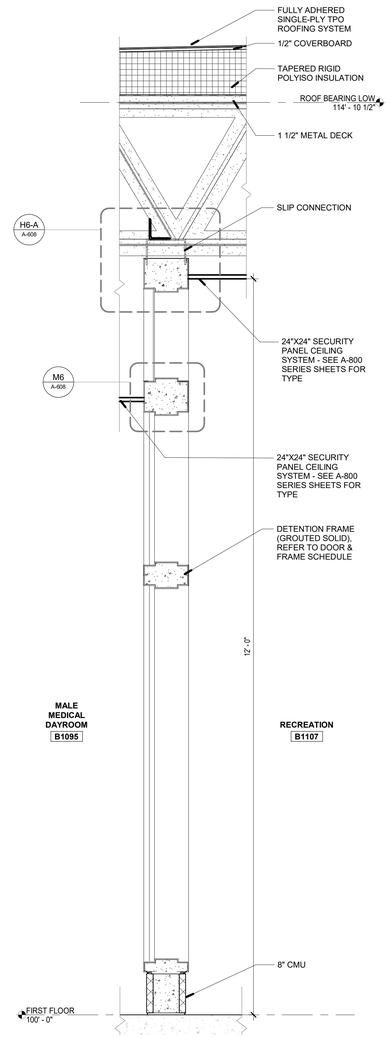
4 A-335 WALL SECTION
SCALE: 1" = 1'-0"



3 A-335 WALL SECTION
SCALE: 1" = 1'-0"



2 A-335 WALL SECTION
SCALE: 1" = 1'-0"



1 A-335 WALL SECTION
SCALE: 1" = 1'-0"

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SURVEYING • CONSTRUCTION SERVICES
DLZ INDIANA, LLC

ERIC B. RATTS — REGISTERED — No. AR19500134 — STATE OF INDIANA — REGISTERED ARCHITECT

NO.	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: ATWS CHK'D: SAC
DESIGNED: EBR/CAG
APPRV'D: EBR
DATE: September 5, 2019
PROJECT NUMBER 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

WALL SECTIONS

DRAWING NUMBER A-335 ARCHITECTURE

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DOOR AND FRAME SCHEDULE - AREAS A, B & C

OPENING NUMBER	DOOR						FRAME							DOOR SIGN	FIRE RATING	HDWR SET	COMMENTS	OPENING NUMBER
	SIZE										DETAILS							
	WIDTH	HEIGHT	THICK	TYPE	MAT'L	GLAZING	TYPE	MAT'L	GLAZING	DEPTH	HEAD	JAMB	SILL					
A1000A	3' - 0"	7' - 0"	2"	A	DHM-G	- - -	F-3	DHM	- - -	8 3/4"	H5/A-606	J5-A,B/A-606	S5-B/A-606	- - -	- - -	S-09	7	A1000A
A1000B	12' - 0"	14' - 0"	2"	OSD	STL	- - -	- - -	STL	- - -	- - -	H2/A-610	J2/A-610	S2/A-610	- - -	- - -	- - -	2	A1000B
A1000C	12' - 0"	14' - 0"	2"	OSD	STL	- - -	- - -	STL	- - -	- - -	H2/A-610	J2/A-610	S2/A-610	- - -	- - -	- - -	2, 11	A1000C
A1000D	12' - 0"	14' - 0"	2"	OSD	STL	- - -	- - -	STL	- - -	- - -	H2/A-610	J2/A-610	S2/A-610	- - -	- - -	- - -	2, 11	A1000D
A1000E	12' - 0"	14' - 0"	2"	OSD	STL	- - -	- - -	STL	- - -	- - -	H2/A-610	J2/A-610	S2/A-610	- - -	- - -	- - -	2	A1000E
A1000F	3' - 0"	7' - 0"	2"	A	DHM-G	- - -	F-3	DHM-G	- - -	8 3/4"	H5/A-606	J5-A,B/A-606	S5-B/A-606	- - -	- - -	S-09	7	A1000F
A1000G	12' - 0"	14' - 0"	2"	OSD	STL	- - -	- - -	STL	- - -	- - -	H2/A-610	J2/A-610	S2/A-610	- - -	- - -	- - -	2	A1000G
A1000H	12' - 0"	14' - 0"	2"	OSD	STL	- - -	- - -	STL	- - -	- - -	H2/A-610	J2/A-610	S2/A-610	- - -	- - -	- - -	2, 11	A1000H
A1000J	12' - 0"	14' - 0"	2"	OSD	STL	- - -	- - -	STL	- - -	- - -	H2/A-610	J2/A-610	S2/A-610	- - -	- - -	- - -	2, 11	A1000J
A1000K	12' - 0"	14' - 0"	2"	OSD	STL	- - -	- - -	STL	- - -	- - -	H2/A-610	J2/A-610	S2/A-610	- - -	- - -	- - -	2	A1000K
A1000L	3' - 0"	7' - 0"	2"	A	DHM-G	- - -	F-3	DHM-G	- - -	8 3/4"	H5/A-606	J5-A,B/A-606	S5-B/A-606	- - -	- - -	S-09	7	A1000L
A1001	3' - 8"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	- - -	BH-47		A1001
A1002	3' - 8"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	- - -	BH-33		A1002
A1003A	3' - 8"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	- - -	BH-33		A1003A
A1003B	12' - 0"	14' - 0"	3/4"	OCD	STL	- - -	- - -	STL	- - -	- - -	H6/A-610	J6/A-610	S6/A-610	- - -	- - -	- - -	3	A1003B
A2001	4' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-3	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	- - -	BH-27		A2001
B1000A	6' - 0"	7' - 0"	1 3/4"	E	AL	IG-1	F-7	AL	IG-1	6"	H1/A-609	J1-A, B/A-609	S1-A,B/A-609	I	- - -	BH-07		B1000A
B1000B	6' - 0"	7' - 0"	1 3/4"	E	AL	IG-1	F-7	AL	IG-1	6"	H1/A-609	J1-A, B/A-609	S1-A,B/A-609	I	- - -	BH-06	1	B1000B
B1000C	6' - 0"	7' - 0"	1 3/4"	E	AL	LG-1	F-8	AL	LG-1	7 1/2"	H2/A-609	J7-A, J8-A/A-607, J2-C,J3/A-609	S7/A-607	G	- - -	BH-56		B1000C
B1000D	6' - 0"	7' - 0"	1 3/4"	E	AL	LG-1	F-8	AL	LG-1	7 1/2"	H2/A-609	J7-A, J8-A/A-607, J2-C,J3/A-609	S7/A-607	G	- - -	BH-57	1	B1000D
B1003	3' - 0"	7' - 0"	1 3/4"	E	AL	IG-1	F-9	AL	IG-1	6"	H3/A-607	J3-A,B/A-607	S3-A,B/A-607	- - -	- - -	BH-55		B1003
B1004	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	C, D	- - -	BH-26		B1004
B1005	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	C, D	- - -	BH-31		B1005
B1006	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	C, D	- - -	BH-31		B1006
B1007	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	- - -	BH-39		B1007
B1008	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	B	- - -	BH-05		B1008
B1009	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	B	- - -	BH-05		B1009
B1010	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	C, D	- - -	BH-31		B1010
B1011	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	8 1/8"	H4/A-606	J4-A/A-606	- - -	C, D	- - -	BH-26		B1011
B1012	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	C, D	- - -	BH-26		B1012
B1013	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	C, D	- - -	BH-26		B1013
B1015A	4' - 0"	7' - 0"	2"	A	DHM	- - -	F-4	DHM	- - -	8 1/8"	H3-A/A-608	J3-B,C/A-608	S3/A-608	H	20	S-05A	4, 7	B1015A
B1015B	4' - 0"	7' - 0"	2"	F	DHM	GCP-2	F-4	DHM	- - -	8 1/8"	H3-A/A-608	J3-B,C/A-608	S3/A-608	H	- - -	S-05	4, 7	B1015B
B1016	3' - 0"	7' - 0"	2"	F	DHM	GCP-1MF	F-13	DHM	GCP-1MF/STL	8 3/4"	H8/A-606	J4-A,B/A-606, J1/A-607	S1/A-607	A	45	S-04	7, 8	B1016
B1017	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	B	- - -	BH-11		B1017
B1018	3' - 0"	7' - 0"	2"	F	DHM	GCP-2F	F-5B	DHM	GCP-2F	8 1/8"	H4/A-608	J4-B,C/A-608	S3/A-608	H	45	S-05A	4, 7	B1018
B1019	3' - 0"	7' - 0"	2"	F	DHM	GCP-2F	F-5B	DHM	GCP-2F	8 1/8"	H4/A-608	J4-B,C/A-608	S3/A-608	H	45	S-05A	4, 7	B1019
B1020	3' - 0"	7' - 0"	2"	D1	DHM	GCP-2F	F-2	DHM	- - -	8 3/4"	H4/A-606	J4-/A-606	- - -	A	20	S-02A		B1020
B1021	3' - 0"	7' - 0"	2"	D1	DHM	GCP-2F	F-2	DHM	- - -	8 3/4"	H4/A-606	J4-/A-606	- - -	A	20	S-02A		B1021
B1022	3' - 0"	7' - 0"	2"	D	DHM	GCP-2F	F-2	DHM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	20	S-02		B1022
B1023	3' - 0"	7' - 0"	2"	D	DHM	GCP-2F	F-2	DHM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	20	S-02		B1023
B1024	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	20	BH-45		B1024
B1025	4' - 0"	7' - 0"	2"	F	DHM	GCP-2	F-18	DHM	GCP-2/STL	8 3/4"	H3-B/A-608	J3-D,E/A-608	S3/A-608	H	- - -	S-05	4, 7, 8	B1025
B1026	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	B	20	BH-10A		B1026
B1027	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	B	20	BH-10A		B1027
B1028	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	20	BH-41		B1028
B1029	4' - 0"	7' - 0"	2"	F	DHM	GCP-2F	F-5D	DHM	GCP-2F	8 1/8"	H3-A/A-608	J3-B,D/A-608	S3/A-608	H	45	S-05	4, 7, 8	B1029
B1030	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	- - -	BH-43A		B1030
B1031	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	B	- - -	BH-54A		B1031
B1032	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	8 3/4"	H4/A-606	J4-A,B/A-606	- - -	A	- - -	S-04	7	B1032
B1033A	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-2	DHM	- - -	8 3/4"	H4/A-606	J4-A,B/A-606	- - -	A	- - -	S-02B		B1033A
B1033B	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	H	- - -	S-04	7	B1033B
B1034A	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-2	DHM	- - -	8 3/4"	H4/A-606	J4-A,B/A-606	- - -	A	- - -	S-02B		B1034A
B1034B	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	H	- - -	S-04	7	B1034B
B1035	3' - 0"	7' - 0"	1 3/4"	D	HM	GCP-3	F-10B	HM	GCP-3	8 3/4"	H4/A-606, H1/A-607	J4-A/A-606, J1/A-607	S1/A-607	A	- - -	BH-20		B1035
B1037	3' - 0"	7' - 0"	2"	F1	DHM	GCP-2M	F-11	DHM	GCP-2M	8 3/4"	H4/A-606, H1/A-607	J4-A,B/A-606, J1/A-607	S1/A-607	A	- - -	S-04	7	B1037
B1039	3' - 0"	7' - 0"	2"	C1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01B	7, 9	B1039
B1040	3' - 0"	7' - 0"	2"	C1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01B	7, 9	B1040
B1040A	1' - 8"	7' - 0"	2"	A	DHM	- - -	F-2	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-03	9	B1040A
B1041	3' - 0"	7' - 0"	2"	C1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01B	7, 9	B1041
B1041A	1' - 8"	7' - 0"	2"	A	DHM	- - -	F-2	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-03	9	B1041A
B1042	3' - 0"	7' - 0"	2"	C1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01B	7, 9	B1042
B1043A	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	8 3/4"	H4/A-606	J4-A,B/A-606	- - -	A	- - -	S-04	7	B1043A
B1043B	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	8 3/4"	H4/A-606	J4-A,B/A-606	- - -	A		S-04	7	B1043B
B1044	3' - 0"	7' - 0"	2"	C1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01B	7, 9	B1044
B1044A	1' - 8"	7' - 0"	2"	A	DHM	- - -	F-2	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-03	9	B1044A
B1045	3' - 0"	7' - 0"	2"	C1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01B	7, 9	B1045
B1046	3' - 0"	7' - 0"	2"	C1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01B	7, 9	B1046
B1046B	1' - 8"	7' - 0"	2"	A	DHM	- - -	F-2	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-03	9	B1046B
B1047	3' - 0"	7' - 0"	2"	C1	DHM	GCP-3F	F-3	DHM	- - -	8 1/8"	H9/A-606	J9-A,B/A-606	S9/A-606	H	45	S-01C	12	B1047
B1048A	3' - 0"	7' - 0"	2"	C1	DHM	LP-3	F-3	DHM	- - -	8 3/4"	H4/A-606	J4-A,B/A-606	- - -	H	- - -	S-01C	7	B1048A
B1048B	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	8 1/8"	H9/A-606	J9-A,B/A-606	S9/A-606	H	45	S-01D	12	B1048B
B1048C	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	8 1/8"	H9/A-606	J9-A,B/A-606	S9/A-606	H	45	S-01D	12	B1048C
B1049	3' - 0"	7' - 0"	2"	C1	DHM	GCP-3F	F-3	DHM	- - -	8 1/8"	H9/A-606	J9-A,B/A-606	S9/A-606	H	45	S-01C	12	B1049
B1050	3' - 0"	7' - 0"	2"	C1	DHM	GCP-3F	F-3	DHM	- - -	8 1/8"	H9/A-606	J9-A,B/A-606	S9/A-606	H	45	S-01C	12	B1050
B1051A	3' - 0"	7' - 0"	2"	C1	DHM	LP-3	F-3	DHM	- - -	8 3/4"	H4/A-606	J4-A,B/A-606	- - -	H	- - -	S-01C	7	B1051A
B1051B	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	8 1/8"	H9/A-606	J9-A,B/A-606	S9/A-606	H	45	S-01D	12	B1051B
B1051C	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	8 1/8"	H9/A-606	J9-A,B/A-606	S9/A-606	H	45	S-01D	12	B1051C
B1052	3' - 0"	7' - 0"	2"	C1	DHM	GCP-3F	F-3	DHM	- - -	8 1/8"	H9/A-606	J9-A,B/A-606	S9/A-606	H	45	S-01C	12	B1052
B1054	3' - 0"	7' - 0"	2"	C1	DHM	LP-3	F-3	DHM	- - -	8 3/4"	H4/A-606	J4-A,B/A-606	- - -	H	- - -	S-01C	7	B1054
B1055A	4' - 0"	7' - 0"	2"	F	DHM	GCP-2	F-5D	DHM	GCP-2	8 1/8"	H4/A-608	J4-B,D/A-608	S3/A-608	E, F	- - -	S-05	4, 7, 8	B1055A
B1055B	4' - 0"	7' - 0"	2"	F	DHM	GCP-2	F-5D	DHM	GCP-2	8 1/8"	H3-A/A-608	J3-B,D/A-608	S3/A-608	E, F	- - -	S-05	4, 7, 8	B1055B
B1057	3' - 0"	7' - 0"	2"	C	DHM	LP-3	F-2	DHM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	E	- - -	S-02C		B1057
B1058	3' - 0"	7' - 0"	2"	C	DHM	LP-3	F-2	DHM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	E	- - -	S-02C		B1058
B1059	3' - 0"	7' - 0"	2"	C	DHM	LP-3	F-2	DHM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	- - -	S-02C		B1059
B1060	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	8 3/4"	H5/A-606	J5-A/A-606	- - -	A	- - -	S-08		B1060
B1061	3' - 0"	7' - 0"	2"	C1	DHM	LP-3	F-3	DHM	- - -	8 3/4"	H4/A-606	J4-A,B/A-606	- - -	H	- - -	S-01C	7	B1061
B1063A	3' - 0"	7' - 0"	2"	F	DHM	GCP-1	F-5C	DHM	GCP-1	8 1/8"	H4/A-608	J4-B,D/A-608	S3/A-608	E, F	- - -	S-05	4, 7, 8	B1063A
B1063B	3' - 0"	7' - 0"	2"	F	DHM	GCP-2	F-5C	DHM	GCP-2	8 1/8"	H3-A/A-608	J3-B,D/A-608	S3/A-608	E, F	- - -	S-05	4, 7, 8	B1063B
B1064	3' - 0"	7' - 0"	1 3/4"	D	HM	LG-1	F-10A	HM	LG-1	8 3/4"	H4/A-606, H1/A-607	J4-A/A-606, J1/A-607	S1/A-607	A	- - -	BH-13A	8	B1064
B1065	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	B	- - -	BH-10		B1065
B1066	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	B	- - -	BH-12		B1066
B1067A	3' - 0"	7' - 0"	2"	F	DHM	GCP-2	F-3	DHM	- - -	8 3/4"	H4/A-606	J4-A,B/A-606	- - -	H	- - -	S-04	7	B1067A
B1067B	3' - 0"	7' - 0"	2"	F	DHM	GCP-2	F-3	DHM	- - -	8 3/4"	H4/A-606	J4-A,B/A-606	- - -	H	- - -	S-04	7	B1067B
B1069	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	- - -	BH-19		B1069
B1070	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	- - -	BH-13		B1070
B1071	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	- - -	BH-13		B1071
B1072	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	- - -	BH-13		B1072
B1073	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	- - -	BH-13		B1073
B1074	3' - 0"	7' - 0"	1 3/4"	B	HM	LG-1	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	- - -	BH-21		B1074
B1075	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	B	- - -	BH-10		B1075
B1076	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	B	- - -	BH-12		B1076
B1077	3' - 0"	7' - 0"	2"	C1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01B	7, 9	B1077
B1077A	1' - 8"	7' - 0"	2"	A	DHM	- - -	F-2	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-03	9	B1077A
B1078	3' - 0"	7' - 0"	2"	C1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01B	7, 9	B1078
B1079	3' - 0"	7' - 0"	2"	C1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01B	7, 9	B1079
B1079A	1' - 8"	7' - 0"	2"	A	DHM	- - -	F-2	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-03	9	B1079A
B1080	3' - 0"	7' - 0"	2"	C1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01B	7, 9	B1080
B1081	3' - 0"	7' - 0"	2"	C1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01B	7, 9	B1081
B1081A	1' - 8"	7' - 0"	2"	A	DHM	- - -	F-2	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-03	9	B1081A
B1082	3' - 0"	7' - 0"	2"	C1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01B	7, 9	B1082
B1083	3' - 0"	7' - 0"	2"	C1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01B	7, 9	B1083
B1083A	1' - 8"	7' - 0"	2"	A	DHM	- - -	F-2	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-03	9	B1083A
B1084	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	- - -	- - -	BH-39		B1084
B1085	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	- - -	- - -	BH-37		B1085
B1086	3' - 0"	7' - 0"	2"	C1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01B	7, 9	B1086
B1086A	1' - 8"	7' - 0"	2"	A	DHM	- - -	F-2	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-03	9	B1086A
B1087	3' - 0"	7' - 0"	2"	C1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01B	7, 9	B1087
B1087A	1' - 8"	7' - 0"	2"	A	DHM	- - -	F-2	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-03	9	B1087A
B1088	3' - 0"	7' - 0"	2"	C1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01B	7, 9	B1088
B1089	3' - 0"	7' - 0"	2"	C1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01B	7, 9	B1089
B1089A	1' - 8"	7' - 0"	2"	A	DHM	- - -	F-2	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-03	9	B1089A
B1090	3' - 0"	7' - 0"	2"	C1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01B	7, 9	B1090
B1091	3' - 0"	7' - 0"	2"	C1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01B	7, 9	B1091
B1091A	1' - 8"	7' - 0"	2"	A	DHM	- - -	F-2	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-03	9	B1091A
B1092	3' - 0"	7' - 0"	2"	C1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01B	7, 9	B1092
B1093A	4' - 0"	7' - 0"	2"	F	DHM	GCP-2	F-5C	DHM	GCP-2	8 1/8"	H3-A/A-608	J3-B,D/A-608	S3/A-608	H	- - -	S-05	4, 7, 8	B1093A
B1093B	4' - 0"	7' - 0"	2"	F	DHM	GCP-2	F-5C	DHM	GCP-2	8 1/8"	H3-A/A-608	J3-B,D/A-608	S3/A-608	H	- - -	S-05	4, 7, 8	B1093B
B1094	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	H	- - -	BH-39		B1094
B1097	3' - 0"	7' - 0"	2"	D	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01B	7, 9	B1097
B1097A	1' - 8"	7' - 0"	2"	A	DHM	- - -	F-2	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-03	9	B1097A
B1098	3' - 0"	7' - 0"	2"	C1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01B	7, 9	B1098
B1099	3' - 0"	7' - 0"	2"	C1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01B	7, 9	B1099
B1099A	1' - 8"	7' - 0"	2"	A	DHM	- - -	F-2	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-03	9	B1099A
B1100	3' - 0"	7' - 0"	2"	C1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01B	7, 9	B1100
B1101	3' - 0"	7' - 0"	2"	C1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01B	7, 9	B1101
B1101A	1' - 8"	7' - 0"	2"	A	DHM	- - -	F-2	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-03	9	B1101A
B1102	3' - 0"	7' - 0"	2"	C1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01B	7, 9	B1102
B1103	3' - 0"	7' - 0"	2"	C1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01B	7, 9	B1103
B1103A	1' - 8"	7' - 0"	2"	A	DHM	- - -	F-2	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-03	9	B1103A
B1104	3' - 0"	7' - 0"	2"	C1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01B	7, 9	B1104
B1105	3' - 0"	7' - 0"	2"	C1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01B	7, 9	B1105
B1105A	1' - 8"	7' - 0"	2"	A	DHM	- - -	F-2	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-03	9	B1105A
B1106	3' - 0"	7' - 0"	2"	C1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01B	7, 9	B1106
B1107	3' - 0"	7' - 0"	2"	F1	DHM	GCP-2	F-14	DHM	GCP-2/STL	8 3/4"	H6-B/A-608	J8, J4-A,B/A-606	S1/A-607	- - -	- - -	S-04	7	B1107
B1108	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	H	- - -	BH-37		B1108
B1109	3' - 0"	7' - 0"	2"	C1	DHM	GCP-3F	F-3	DHM	- - -	8 1/8"	H9/A-606	J9-A,B/A-606	S9/A-606	H	45	S-01C	12	B1109
B1110A	3' - 0"	7' - 0"	2"	C1	DHM	LP-3	F-3	DHM	- - -	8 3/4"	H4/A-606	J4-A,B/A-606	- - -	H	- - -	S-01C	7	B1110A
B1110B	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	8 1/8"	H9/A-606	J9-A,B/A-606	S9/A-606	H	45	S-01D	12	B1110B
B1110C	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	8 1/8"	H9/A-606	J9-A,B/A-606	S9/A-606	H	45	S-01D	12	B1110C
B1111	3' - 0"	7' - 0"	2"	C1	DHM	GCP-3F	F-3	DHM	- - -	8 1/8"	H9/A-606	J9-A,B/A-606	S9/A-606	H	45	S-01C	12	B1111
B1112A	4' - 0"	7' - 0"	2"	C1	DHM	GCP-3	F-3	DHM	- - -	8 3/4"	H4/A-606	J4-A,B/A-606	- - -	H	- - -	S-04A	7	B1112A

DOOR AND FRAME SCHEDULE - AREAS A, B & C

OPENING NUMBER	DOOR						FRAME							DOOR SIGN	FIRE RATING	HDWR SET	COMMENTS	OPENING NUMBER
	SIZE										DETAILS							
	WIDTH	HEIGHT	THICK	TYPE	MAT'L	GLAZING	TYPE	MAT'L	GLAZING	DEPTH	HEAD	JAMB	SILL					
B1112B	4' - 0"	7' - 0"	2"	C1	DHM	GCP-3	F-3	DHM	- - -	8 3/4"	H4/A-606	J4-A,B/A-606	- - -	H	- - -	S-04A	7	B1112B
B1114	3' - 0"	7' - 0"	2"	D	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01B	7, 9	B1114
B1115	3' - 0"	7' - 0"	2"	C1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01B	7, 9	B1115
B1115A	1' - 8"	7' - 0"	2"	A	DHM	- - -	F-2	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-03	9	B1115A
B1116	3' - 0"	7' - 0"	2"	C1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01B	7, 9	B1116
B1116A	1' - 8"	7' - 0"	2"	A	DHM	- - -	F-2	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-03	9	B1116A
B1117	3' - 0"	7' - 0"	2"	C1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01B	7, 9	B1117
B1118	3' - 0"	7' - 0"	2"	C1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01B	7, 9	B1118
B1118A	1' - 8"	7' - 0"	2"	A	DHM	- - -	F-2	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-03	9	B1118A
B1120	3' - 0"	7' - 0"	2"	C1	DHM	LP-3	F-3	DHM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	H	- - -	S-01B		B1120
B1121A	4' - 0"	7' - 0"	2"	F	DHM	GCP-2F	F-4	DHM	- - -	8 1/8"	H3-A/A-608	J3-B,C/A-608	S3/A-608	H	20	S-05A	4, 7	B1121A
B1121B	4' - 0"	7' - 0"	2"	F	DHM	GCP-2	F-4	DHM	- - -	8 1/8"	H3-A/A-608	J3-B,C/A-608	S3/A-608	H	- - -	S-05	4, 7	B1121B
B1121C	4' - 0"	7' - 0"	2"	F	DHM	GCP-2	F-4	DHM	- - -	8 1/8"	H3-A/A-608	J3-B,C/A-608	S3/A-608	H	- - -	S-05	4, 7	B1121C
B1122	4' - 0"	7' - 0"	2"	F	DHM	GCP-2F	F-3	DHM	- - -	8 3/4"	H4/A-606	J4-A,B/A-606	- - -	H	20	S-04A	7	B1122
B1123	3' - 0"	7' - 0"	1 3/4"	D	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A,B/A-606	- - -	H	20	BH-11		B1123
B1124	3' - 0"	7' - 0"	1 3/4"	D	HM	LP-3	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	H	- - -	BH-31	8	B1124
B1125	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	B	- - -	BH-54		B1125
B1126	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	H	- - -	BH-29		B1126
B1127	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	H	- - -	BH-31		B1127
B1128	3' - 0"	7' - 0"	1 3/4"	D	HM	LP-3	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	H	- - -	BH-13	8	B1128
B1129	3' - 0"	7' - 0"	1 3/4"	D	HM	LP-3	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	H	- - -	BH-31		B1129
B1130	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	H	- - -	BH-01		B1130
B1131	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	H	- - -	BH-10		B1131
B1132	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	H	- - -	BH-01		B1132
B1133	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	8 3/4"	H4/A-606	J4-A,B/A-606	- - -	H	20	S-04	7	B1133
B1134	3' - 0"	7' - 0"	2"	A	DHM-G	- - -	F-2	DHM-G	- - -	8 3/4"	H3/A-610	J3-A,B/A-610	- - -	- - -	- - -	S-08		B1134
B1135	3' - 0"	7' - 0"	2"	A	DHM-G	- - -	F-2	DHM-G	- - -	8 3/4"	H3/A-610	J3-A,B/A-610	S3-B/A-610	- - -	- - -	S-08		B1135
B2000A	6' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	8 3/4"	H5/A-606	J5-A/A-606	S13/A-606	A	45	BH-52		B2000A
B2000B	3' - 0"	7' - 0"	1 3/4"	A	HM-G	- - -	F-2	HM-G	- - -	8 3/4"	H7/A-606	J7/A-606	S7/A-606	A	- - -	BH-34A		B2000B
B2001	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	5 7/8"	H1/A-606	J1/A-606	- - -	A	- - -	BH-42		B2001
B2002	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	5 7/8"	H1/A-606	J1/A-606	- - -	A	45	BH-41		B2002
C1000A	3' - 0"	7' - 0"	1 3/4"	F	WD	LG-1	F-16	HM	LG-1	5 7/8"	H5/A-610, H1/A-608	J1/A-606, J1/A-608	- - -	A	- - -	BH-26		C1000A
C1000B	3' - 0"	7' - 0"	1 3/4"	B	WD	LG-1	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	- - -	- - -	BH-32		C1000B
C1000C	3' - 0"	7' - 0"	1 3/4"	B	WD	LG-1	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	- - -	- - -	BH-32		C1000C
C1001	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	- - -	BH-29		C1001
C1002A	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	- - -	BH-29		C1002A
C1002B	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	- - -	BH-25		C1002B
C1004	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	5 7/8"	H1/A-606	J1/A-606	- - -	A	- - -	BH-25		C1004
C1005	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	8 3/4"	H2/A-606	J2/A-606	- - -	A	- - -	BH-25		C1005
C1006A	3' - 0"	7' - 0"	1 3/4"	B	WD	LG-1	F-2	HM	- - -	8 3/4"	H2/A-606	J2/A-606	- - -	A	- - -	BH-29		C1006A
C1006B	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	8 3/4"	H2/A-606	J2/A-606	- - -	A	- - -	BH-26		C1006B
C1007A	3' - 0"	7' - 0"	1 3/4"	B	WD	LG-1	F-2	HM	- - -	8 3/4"	H2/A-606	J2/A-606	- - -	A	- - -	BH-29		C1007A
C1007B	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	8 3/4"	H2/A-606	J2/A-606	- - -	A	- - -	BH-26		C1007B
C1008	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	5 7/8"	H1/A-606	J1/A-606	- - -	A	- - -	BH-24		C1008
C1008A	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	5 7/8"	H1/A-606	J1/A-606	- - -	A	- - -	BH-11		C1008A
C1011	6' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	5 7/8"	H1/A-606	J1/A-606	- - -	A	- - -	BH-48		C1011
C1012	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	5 7/8"	H1/A-606	J1/A-606	- - -	A	- - -	BH-25		C1012
C1013A	4' - 0"	8' - 0"		- - -	- - -	- - -	F-2	HM	- - -	5 7/8"	H3/A-606	J3/A-606	- - -	A	- - -	BH-58	10	C1013A
C1013B	4' - 0"	8' - 0"		- - -	- - -	- - -	F-2	HM	- - -	5 7/8"	H3/A-606	J3/A-606	- - -	A	- - -	BH-58	10	C1013B
C1014A	4' - 0"	8' - 0"		- - -	- - -	- - -	F-2	HM	- - -	5 7/8"	H3/A-606	J3/A-606	- - -	A	- - -	BH-58	10	C1014A
C1014B	4' - 0"	8' - 0"		- - -	- - -	- - -	F-2	HM	- - -	5 7/8"	H3/A-606	J3/A-606	- - -	A	- - -	BH-58	10	C1014B
C1015	3' - 0"	7' - 0"	1 3/4"	B	WD	LG-1	F-2	HM	- - -	5 7/8"	H1/A-606	J1/A-606	- - -	A	- - -	BH-16		C1015
C1016	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	5 7/8"	H1/A-606	J1/A-606	- - -	A	- - -	BH-13		C1016
C1017	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	5 7/8"	H1/A-606	J1/A-606	- - -	B	- - -	BH-09		C1017
C1018	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	5 7/8"	H1/A-606	J1/A-606	- - -	A	- - -	BH-13		C1018
C1019	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	5 7/8"	H1/A-606	J1/A-606	- - -	A	- - -	BH-13		C1019
C1020	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	5 7/8"	H1/A-606	J1/A-606	- - -	A	- - -	BH-13		C1020
C1021	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	5 7/8"	H1/A-606	J1/A-606	- - -	A	- - -	BH-13		C1021
C1022	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	5 7/8"	H1/A-606	J1/A-606	- - -	A	- - -	BH-13		C1022
C1024	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	5 7/8"	H1/A-606	J1/A-606	- - -	B	- - -	BH-11		C1024
C1025	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	5 7/8"	H1/A-606	J1/A-606	- - -	B	- - -	BH-11		C1025
C1026	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	5 7/8"	H1/A-606	J1/A-606	- - -	B	- - -	BH-11		C1026
C1027	3' - 0"	7' - 0"	1 3/4"	B	WD	LG-1	F-2	HM	- - -	5 7/8"	H1/A-606	J1/A-606	- - -	A	- - -	BH-21A		C1027
C1028	3' - 0"	7' - 0"	1 3/4"	B	WD	LG-1	F-2	HM	- - -	5 7/8"	H1/A-606	J1/A-606	- - -	A	- - -	BH-22	SOUND SEALED	C1028
C1029	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	5 7/8"	H1/A-606	J1/A-606	- - -	A	- - -	BH-13		C1029
C1030A	3' - 0"	7' - 0"	1 3/4"	B	WD	LG-1	F-2	HM	- - -	5 7/8"	H1/A-606	J1/A-606	- - -	A	- - -	BH-04		C1030A
C1030B	3' - 0"	7' - 0"	1 3/4"	F	HM-G	LG-1	F-2	HM-G	- - -	8 3/4"	H6-B/A-606	J6-A,B/A-606	S6/A-606	A	- - -	BH-34		C1030B
C1031A	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	5 7/8"	H1/A-606	J1/A-606	- - -	- - -	- - -	BH-31		C1031A
C1031B	3' - 0"	7' - 0"	1 3/4"	B	WD	LG-1	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	- - -	- - -	BH-26		C1031B
C1032	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	5 7/8"	H1/A-606	J1/A-606	- - -	B	- - -	BH-05		C1032
C1033	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	5 7/8"	H1/A-606	J1/A-606	- - -	B	- - -	BH-05		C1033
C1034A	3' - 0"	7' - 0"	1 3/4"	B	WD	LG-1	F-2	HM	- - -	5 7/8"	H1/A-606	J1/A-606	- - -	A	- - -	BH-08		C1034A
C1034B	3' - 0"	7' - 0"	1 3/4"	B	WD	LG-1	F-2	HM	- - -	5 7/8"	H1/A-606	J1/A-606	- - -	A	- - -	BH-08		C1034B
C1035	6' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	5 7/8"	H1/A-606	J1/A-606	- - -	A	- - -	BH-23		C1035
C1036A	3' - 0"	7' - 0 1/4"	1 3/4"	E	AL	LG-1	F-19B	AL	LG-1	4 1/2"	H5/A-609	J5-A,B/A-609	S5/A-609	- - -	- - -	BH-05		C1036A
C1036B	3' - 0"	7' - 0"	1 3/4"	E	AL	IG-1	F-19A	AL	IG-1	6"	H6-A/A-606	J6-A,B,C,D/A-606	S5/A-609	- - -	- - -	BH-35		C1036B
C1037	3' - 0"	7' - 0"	1 3/4"	B	WD	LG-1	F-2	HM	- - -	5 7/8"	H1/A-606	J1/A-606	- - -	- - -	- - -	BH-31		C1037
C1038	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	45	BH-28		C1038
C1039	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	5 7/8"	H4/A-606	J4-A/A-606	- - -	A	- - -	BH-29		C1039
C1040	3' - 0"	7' - 0"	1 3/4"	B	WD	LG-1	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	- - -	BH-29		C1040
C1041	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	- - -	BH-25		C1041
C1043	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	8 3/4"	H2/A-606	J2/A-606	- - -	A	- - -	BH-13		C1043
C1044A	4' - 0"	7' - 0"	2"	F	DHM	GCP-2F	F-3	DHM	- - -	8 3/4"	H4/A-606	J4-A,B/A-606	- - -	H	20	S-04	7	C1044A
C1044B	4' - 0"	7' - 0"	2"	B	DHM	GCP-2	F-3	DHM	- - -	8 3/4"	H4/A-606	J4-A,B/A-606	- - -	A	- - -	S-04	7	C1044B
C1045	3' - 0"	7' - 0"	1 3/4"	B	HM	LG-1	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A,B/A-606	- - -	A	- - -	BH-29		C1045
C1046	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	- - -	BH-17		C1046
C1047A	4' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	- - -	BH-30		C1047A
C1047B	4' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	- - -	BH-33		C1047B
C1047C	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	- - -	BH-13B		C1047C
C1048	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	- - -	BH-29		C1048
C1050	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	- - -	BH-29		C1050
C1051	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	- - -	BH-31		C1051
C1052A	3' - 0"	7' - 0"	2"	B	DHM-G	IG-1	F-3	DHM-G	- - -	8 3/4"	H5/A-606	J5-A,B/A-606	S5-B/A-606	- - -	- - -	S-09	7	C1052A
C1052B	10' - 0"	10' - 0"	2"	OSD	STL	- - -	- - -	STL	- - -	- - -	H2/A-610	J2/A-610	S2/A-610	- - -	- - -	- - -	2	C1052B
C1052C	4' - 0"	7' - 0"	1 3/4"	B	HM	LG-1	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	- - -	BH-30		C1052C
C1053A	6' - 0"	7' - 0"	1 3/4"	A	HM-G	- - -	F-2	HM-G	- - -	8 3/4"	H5/A-606	J5-A/A-606	S5-B/A-606	- - -	- - -	BH-51		C1053A
C1053B	6' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	- - -	BH-50		C1053B
C1054A	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	45	BH-46		C1054A
C1054B	4' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	45	BH-40		C1054B
C1055	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	- - -	BH-29	8	C1055
C1056	4' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	- - -	BH-30		C1056
C1057	6' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	- - -	BH-49		C1057
C1059	4' - 0"	7' - 0"	2"	F	DHM	GCP-2F	F-4	DHM	- - -	8 1/8"	H3-A/A-608	J3-B,C/A-608	S3/A-608	A	20	S-05A	4, 7	C1059
C1060	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	B	- - -	BH-10		C1060
C1061	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	B	- - -	BH-53		C1061
C1062	3' - 0"	7' - 0"	1 3/4"	D	HM	GCP-3	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	- - -	BH-14	8	C1062
C1063A	4' - 0"	7' - 0"	2"	F	DHM	GCP-2	F-5C	DHM	GCP-2	8 1/8"	H3-A/A-608	J3-B,D/A-608	S3/A-608	H	- - -	S-05	4, 7	C1063A
C1063B	4' - 0"	7' - 0"	2"	F	DHM	GCP-2	F-5C	DHM	GCP-2	8 1/8"	H3-A/A-608	J3-B,D/A-608	S3/A-608	A	- - -	S-05	4, 7	C1063B
C1064	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	H	- - -	BH-37		C1064
C1065A	4' - 8"	7' - 8"	2"	F	DHM	GCP-2	F-4	DHM	- - -	8 1/8"	H3-A/A-608	J3-B,C/A-608	S3/A-608	H	- - -	S-05A	4, 7	C1065A
C1065B	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	H	20	BH-45		C1065B
C1065F	6' - 1"	8' - 0"	5/8"	OCD	STL	- - -	- - -	STL	- - -	- - -					20			C1065F
C1066	4' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	45	BH-03		C1066
C1067	3' - 0"	7' - 0"	2"	D	DHM	GCP-2F	F-3	DHM	- - -	8 3/4"	H4/A-606	J4-A,B/A-606	- - -	A	20	S-04	7	C1067
C1068	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	- - -	BH-13		C1068
C1069	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	- - -	BH-13		C1069
C1070A	3' - 0"	7' - 0"	1 3/4"	C	HM	GCP-3	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	- - -	BH-29		C1070A
C1070B	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	H	- - -	BH-31		C1070B
C1071A	3' - 0"	7' - 0"	1 3/4"	C	HM	GCP-3	F-2	HM	- - -	8 3/4"	H2/A-606	J/A-606	- - -	A	- - -	BH-29		C1071A
C1071B	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H2/A-606	J/A-606	- - -	A	- - -	BH-31		C1071B
C1072	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	H	- - -	BH-17		C1072
C1073A	3' - 0"	7' - 0"	2"	F	DHM	GCP-2F	F-3	DHM	- - -	8 3/4"	H4/A-606	J4-A,B/A-606	- - -	A	20	S-04	7	C1073A
C1073B	3' - 0"	7' - 0"	2"	F	DHM	GCP-2F	F-3	DHM	- - -	8 3/4"	H4/A-606	J4-A,B/A-606	- - -	A	20	S-04	7	C1073B
C1074	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	H	- - -	BH-01		C1074
C1075	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	H	- - -	BH-01		C1075
C1076	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	20	BH-43		C1076
C1077	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	20	BH-18	8	C1077
C1078	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	20	BH-18	8	C1078
C1079	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	20	BH-44	8	C1079
C1080	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	20	BH-43	8	C1080
C1083	3' - 0"	7' - 0"	1 3/4"	A	WD	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	- - -	BH-37		C1083
C1085	4' - 0"	7' - 0"	1 3/4"	B	HM	LG-1	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A,B/A-606	- - -	A	- - -	BH-33		C1085

GENERAL NOTES:

A. REFER TO G-001 FOR ADDITIONAL GENERAL NOTES AND INFORMATION.
B. ALL HOLLOW METAL DOORS AND FRAMES ARE TO BE PAINTED.
C. EXTERIOR HOLLOW METAL DOORS AND FRAMES ARE TO BE GALVANIZED AND PAINTED.
D. ALL EXTERIOR DOORS SHALL BE INSULATED.
E. COORDINATE DOORS AND FRAMES WITH ACCESS CONTROL SYSTEM HARDWARE AND ELECTRICAL REQUIREMENTS INCLUDING ALL WIRING AND CONNECTIONS.
F. ALL WOOD DOORS TO BE FACTORY-FINISHED.
G. PROVIDE A ROOM IDENTIFICATION PANEL SIGN FOR EACH INTERIOR DOOR LOCATION OUTSIDE THE SECURE PERIMETER OF THE FACILITY AS SHOWN ON A-070 AND A-071.
H. PROVIDE INCLUDING MALE/FEMALE/UNISEX AND ADA GRAPHICS WHERE APPLICABLE. FINAL ROOM NAMES, ROOM NUMBERS, AND LOCATIONS TO BE DETERMINED PRIOR TO FABRICATION. MOUNTING FOR PANEL SIGNS TO BE ON THE WALL ADJACENT TO THE DOOR APPROXIMATELY 48"-54" A.F.F.
I. REFER TO SECURITY ELECTRONIC DRAWINGS FOR DOOR CONTROLS, MONITORING AND ACCESS CONTROL.
J. OPENING WIDTH SCHEDULED FOR SLIDING DOORS IS CLEAR OPENING WIDTH NOT ACTUAL WIDTH OF DOOR LEAF. CLEAR OPENING WIDTH DOES NOT INCLUDE MECHANICAL RELEASE COLUMN AND RECEIVER.

DOOR AND FRAME SCHEDULE ABBREVIATIONS:

AL	ALUMINUM
DHM	DETENTION HOLLOW METAL
DHM-G	DETENTION HOLLOW METAL - GALVANIZED
HM	HOLLOW METAL
HM-G	HOLLOW METAL - GALVANIZED
OCD	OVERHEAD COILING DOOR
SD	SECTIONAL DOOR
STL	STEEL
WD	WOOD

GLAZING SCHEDULE - COMMERCIAL

IG-1	1" CLEAR INSULATING LOW-E GLAZING
IG-2	1" INSULATED SPANDREL GLASS
LG-1	LAMINATED GLASS
LG-1F	LAMINATED FIRE-RATED GLASS

GLAZING SCHEDULE - DETENTION

BR-3M	MIRRORED (ONE WAY) LAMINATED BULLET-RESISTANT GLAZING
GCP-1	60 MINUTE PHYSICAL ATTACK (SECURE-TEM + POLY SP029)
GCP-1F	60 MINUTE PHYSICAL ATTACK, FIRE-RATED (SECURE-TEM + POLY SP029)
GCP-1M	60 MINUTE PHYSICAL ATTACK; MIRRORED (SECURE-TEM + POLY SP029)
GCP-1MF	60 MINUTE PHYSICAL ATTACK; MIRRORED, FIRE RATED (SECURE-TEM + POLY)
GCP-2	40 MINUTE PHYSICAL ATTACK (SECURE-TEM + POLY SP029)
GCP-2F	40 MINUTE PHYSICAL ATTACK, FIRE-RATED (SECURE-TEM + POLY)
GCP-2M	40 MINUTE PHYSICAL ATTACK; MIRRORED (SECURE-TEM + POLY SP029)
GCP-2MF	40 MINUTE PHYSICAL ATTACK; MIRRORED, FIRE-RATED (SECURE-TEM + POLY SP029)
GCP-3	20 MINUTE PHYSICAL ATTACK (SECURE-TEM + POLY SP029)
GCP-3F	20 MINUTE PHYSICAL ATTACK, FIRE-RATED (SECURE-TEM + POLY)
LP-3	CLEAR LAMINATED POLYCARBONATE
SIG-2	40 MINUTE LOW-E COATED, CLEAR INSULATING GLASS POLYCARBONATE UNIT
STL	7 GAUGE STEEL PANEL INFILL

DOOR AND FRAME SCHEDULE COMMENTS:

1. ADA DOOR OPERATOR WITH ACTUATOR CONTROLS ON BOTH SIDES OF THE DOOR.
2. INSULATED SECTIONAL DOOR WITH ELECTRIC OPERATOR.
3. INSULATED OVERHEAD COILING DOOR, WITH ELECTRIC OPERATOR.
4. SLIDING DOOR WITH ELECTRIC OPERATOR.
5. DUTCH DOOR. LOCK TOP LEAF IN THE OPEN POSITION.
6. NOT USED.
7. INTERCOM(S) TO BE MOUNTED IN DOOR FRAME.
8. DOUBLE RABBET FRAME.
9. DOOR, FRAME AND GLAZING PROVIDED BY MODULAR STEEL CELL MANUFACTURER.
10. CASED OPENING.
11. DOORS DELETED UNDER ALTERNATE NO. 04
12. PADDED CELL DOOR AND FRAME.
13. FOOD PASS WITH THUMB TURN MOUNTED ON CONTROL ROOM SIDE.

DLZ
ARCHITECTURE • ENGINEERING • PLANNING
SURVEYING • CONSTRUCTION SERVICES
DLZ INDIANA, LLC

REGISTERED ERIC B. RATTS No. AR19500134 STATE OF INDIANA ARCHITECT

NO.	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: WS/GT CHK'D: CAG
DESIGNED: EBR
APPRV'D: EBR
DATE: September 5, 2019
PROJECT NUMBER
1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

DOOR AND FRAME SCHEDULE - AREAS A, B, & C

DRAWING NUMBER
A-601
ARCHITECTURE

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DOOR AND FRAME SCHEDULE - AREAS D & E

OPENING NUMBER	DOOR SIZE WIDTH	DOOR SIZE HEIGHT	DOOR SIZE THICK	DOOR TYPE	DOOR MAT'L	DOOR GLAZING	FRAME TYPE	FRAME MAT'L	FRAME GLAZING	FRAME DEPTH	DETAILS HEAD	DETAILS JAMB	DETAILS SILL	DOOR SIGN	FIRE RATING	HDWR SET	COMMENTS	OPENING NUMBER
D0001	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	- - -	BH-12		D0001
D0002	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	- - -	BH-25		D0002
D1000	3' - 0"	7' - 0"	2"	D1	DHM	GCP-1M	F-15	DHM	GCP-1M	8 3/4"	H2/A-611	J4-A,B, J10/A-606	S1/A-607	H	- - -	S-04A	7, 8, 13	D1000
D1001A	3' - 6"	7' - 0"	2"	F	DHM	GCP-2	F-17B	DHM	GCP-2	8 3/4"	H2/A-611	J4-A,B/A-606, J1/A-607, J2/A-611	S1/A-607	H	- - -	S-04A	7, 8	D1001A
D1001B	3' - 6"	7' - 0"	2"	F	DHM	GCP-2	F-17B	DHM	GCP-2/STL	8 3/4"	H2/A-611	J4-A,B, J10/A-606, J1/A-607	S1/A-607	H	- - -	S-04	7, 8	D1001B
D1002A	3' - 6"	7' - 0"	2"	F	DHM	GCP-2F	F-17B	DHM	GCP-2F	8 3/4"	H2/A-611	J4-A,B/A-606, J1/A-607, J2/A-611	S1/A-607	H	45	S-04A	7, 8	D1002A
D1002B	3' - 6"	7' - 0"	2"	F	DHM	GCP-2F	F-17B	DHM	GCP-2F/STL	8 3/4"	H2/A-611	J4-A,B/A-606, J1/A-607, J2/A-611	S1/A-607	H	45	S-04A	7, 8	D1002B
D1003A	4' - 0"	7' - 0"	2"	F	DHM	GCP-2F	F-6	DHM	GCP-2F	8 3/4"	H4/A-608	J4-A,B/A-608	S3/A-608	H	45	S-05A	4, 7, 8	D1003A
D1003B	4' - 0"	7' - 0"	2"	F	DHM	GCP-2	F-5D	DHM	GCP-2	8 1/8"	H3-A/A-608	J3-B,D/A-608	S3/A-608	H	- - -	S-05	4, 7, 8	D1003B
D1004	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	9"	H3/A-610	J3-A/A-610	- - -	H	20	BH-43		D1004
D1005A	3' - 6"	7' - 0"	2"	F1	DHM	GCP-2MF	F-17	DHM	GCP-2MF	8 3/4"	H1/A-607	J4-A,B/A-606, J1/A-607	S1/A-607	H	45	S-04A	7	D1005A
D1005B	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-2	DHM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	H	- - -	S-07		D1005B
D1005C	3' - 0"	7' - 0"	2"	B	DHM	GCP-2F	F-3	DHM	- - -	9"	H3/A-610	J3-A,B/A-610	S3-B/A-610	H	20	S-06	7	D1005C
D1005D	12' - 0"	5' - 7"	1/2"	OCD	STL	- - -	- - -	STL	- - -	- - -	H1/A-610	J1/A-610	S1/A-610	H	- - -	- - -	3	D1005D
D1006A	3' - 6"	7' - 0"	2"	F1	DHM	GCP-2MF	F-17	DHM	GCP-2MF/STL	8 3/4"	H1/A-607	J4-A,B/A-606, J1/A-607	S1/A-607	H	45	S-04A	7	D1006A
D1006B	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	8 3/4"	H5/A-606	J5-A,B/A-606	S5-B/A-606	H	- - -	S-06	7	D1006B
D1007	3' - 0"	7' - 0"	2"	G	DHM	- - -	F-2	DHM	- - -	8 3/4"	H5/A-606	J5-A/A-606	- - -	H	- - -	S-08A	5	D1007
D1008	3' - 0"	7' - 0"	2"	G	DHM	- - -	F-2	DHM	- - -	8 3/4"	H4/A-606	J4-A,B/A-606	- - -	H	- - -	S-08A	5	D1008
D1009	3' - 0"	7' - 0"	2"	D	DHM	GCP-2F	F-12	DHM	GCP-2F	9"	H3,H4/A-610	J3-A,B, J4/A-610	S3-B,S4/A-610	H	45	S-04	7	D1009
D1010	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	9"	H3/A-610	J3-A/A-610	- - -	H	20	S-08		D1010
D1011A	4' - 0"	7' - 0"	2"	F	DHM	GCP-2F	F-6	DHM	GCP-2F	8 3/4"	H4/A-608	J4-A,B/A-608	S3/A-608	H	45	S-05A	4, 7, 8	D1011A
D1011B	4' - 0"	7' - 0"	2"	F	DHM	GCP-2	F-5D	DHM	GCP-2	8 1/8"	H3-A/A-608	J3-B,D/A-608	S3/A-608	H	- - -	S-05	4, 7, 8	D1011B
D1012	4' - 0"	7' - 0"	2"	F	DHM	GCP-2	F-5A	DHM	GCP-2	8 1/8"	H3-A/A-608	J1-A,B/A-611	S3/A-608	H	- - -	S-05	4, 7	D1012
D1012A	4' - 0"	7' - 0"	2"	A	DHM	- - -	F-2	DHM	- - -	8 3/4"	H5/A-606	J5-A,B/A-606	- - -	H	20	S-07		D1012A
D1013	4' - 0"	7' - 0"	2"	A	DHM-G	- - -	F-3	DHM-G	- - -	8 3/4"	H5/A-606	J5-A,B/A-606	S5-B/A-606	- - -	- - -	S-09	7	D1013
D1014	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-2	DHM	- - -	8 3/4"	H5/A-606	J5-A,B/A-606	- - -	H	20	S-08B		D1014
D1015A	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	8 3/4"	H5/A-606	J5-A,B/A-606	- - -	H	20	S-04	7	D1015A
D1015B	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	9"	H3/A-610	J3-A,B/A-610	S3-B/A-610	H	20	S-08		D1015B
D1015C	4' - 0"	7' - 0"	2"	A	DHM-G	- - -	F-3	DHM-G	- - -	8 3/4"	H5/A-606	J5-A,B/A-606	S5-B/A-606	H	- - -	S-09	7	D1015C
D1016A	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	9"	H3/A-610	J3-A,B/A-610	S3-B/A-610	H	20	S-06	7	D1016A
D1016B	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	8 3/4"	H4/A-606	J4-A,B/A-606	- - -	H	- - -	S-08		D1016B
D1020A	3' - 6"	7' - 0"	2"	F1	DHM	GCP-2MF	F-17	DHM	GCP-2MF/STL	8 3/4"	H1/A-607	J4-A,B/A-606, J1/A-607	S1/A-607	H	45	S-04A	7	D1020A
D1020B	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	9"	H3/A-610	J3-A,B/A-610	S3-B/A-610	H	20	S-06	7	D1020B
D1021	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D1021
D1022	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D1022
D1023	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D1023
D1024	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D1024
D1030A	3' - 6"	7' - 0"	2"	F1	DHM	GCP-2MF	F-17A	DHM	GCP-2MF/STL	8 3/4"	H1/A-607	J4-A,B/A-606, J1/A-607	S1/A-607	H	45	S-04A	7	D1030A
D1030B	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	8 3/4"	H5/A-606	J5-A,B/A-606	S5-B/A-606	H	ST	S-06	7	D1030B
D1031	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D1031
D1032	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D1032
D1040A	3' - 6"	7' - 0"	2"	F1	DHM	GCP-2MF	F-17A	DHM	GCP-2MF/STL	8 3/4"	H1/A-607	J4-A,B/A-606, J1/A-607	S1/A-607	H	45	S-04A	7	D1040A
D1040B	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	9"	H3/A-610	J3-A,B/A-610	S3-B/A-610	H	ST	S-06	7	D1040B
D1041	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D1041
D1042	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D1042
D1043	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D1043
D1050A	3' - 6"	7' - 0"	2"	F1	DHM	GCP-2MF	F-17A	DHM	GCP-2MF/STL	8 3/4"	H1/A-607	J4-A,B/A-606, J1/A-607	S1/A-607	H	45	S-04A	7	D1050A
D1050B	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	9"	H3/A-610	J3-A,B/A-610	S3-B/A-610	H	20	S-06	7	D1050B
D1051	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D1051
D1052	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D1052
D1053	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D1053
D1054	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D1054
D1060A	3' - 6"	7' - 0"	2"	F1	DHM	GCP-2MF	F-17A	DHM	GCP-2MF/STL	8 3/4"	H1/A-607	J4-A,B/A-606, J1/A-607	S1/A-607	H	45	S-04A	7	D1060A
D1060B	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	9"	H3/A-610	J3-A,B/A-610	S3-B/A-610	H	ST	S-06	7	D1060B
D1061	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D1061
D1062	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D1062
D1070A	3' - 6"	7' - 0"	2"	F1	DHM	GCP-2MF	F-17A	DHM	GCP-2MF/STL	8 3/4"	H1/A-607	J4-A,B/A-606, J1/A-606	S1/A-607		45	S-04A	7	D1070A
D1070B	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	8 3/4"	H5/A-606	J5-A,B/A-606	S5-B/A-606	H	ST	S-06	7	D1070B
D1071	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D1071
D1072	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D1072
D1080A	3' - 6"	7' - 0"	2"	F1	DHM	GCP-2MF	F-17A	DHM	GCP-2MF/STL	8 3/4"	H1/A-607	J4-A,B/A-606, J1/A-606	S1/A-607		45	S-04A	7	D1080A
D1080B	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	9"	H3/A-610	J3-A,B/A-610	S3-B/A-610	H	ST	S-06	7	D1080B
D1081	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D1081
D1082	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D1082
D1083	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D1083
D1084	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D1084
D1090A	3' - 6"	7' - 0"	2"	F1	DHM	GCP-2MF	F-17A	DHM	GCP-2MF/STL	8 3/4"	H1/A-607	J4-A,B/A-606, J1/A-607	S1/A-607	H	45	S-04A	7	D1090A
D1090B	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	9"	H3/A-610	J3-A,B/A-610	S3-B/A-610	H	ST	S-06	7	D1090B
D1091	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D1091
D1092	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D1092
D1093	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D1093
D1110A	3' - 6"	7' - 0"	2"	F1	DHM	GCP-2MF	F-17A	DHM	GCP-2MF/STL	8 3/4"	H1/A-607	J4-A,B/A-606, J1/A-607	S1/A-607	H	45	S-04A	7	D1110A
D1110B	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	9"	H3/A-610	J3-A,B/A-610	S3-B/A-610	H	ST	S-06	7	D1110B
D1111	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D1111
D1112	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D1112
D1120A	3' - 6"	7' - 0"	2"	F1	DHM	GCP-2MF	F-17	DHM	GCP-2MF/STL	8 3/4"	H1/A-607	J4-A,B/A-606, J1/A-607	S1/A-607	H	45	S-04A	7	D1120A
D1120B	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	9"	H3/A-610	J3-A,B/A-610	S3-B/A-610	H	ST	S-06	7	D1120B
D1120C	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	9"	H3/A-610	J3-A,B/A-610	S3-B/A-610	H	ST	S-06	7	D1120C
D1121	3' - 0"	7' - 0"	2"	D1	DHM	GCP-2	F-3	DHM	- - -	- - -	- - -	- - -	- - -	H	- - -	S-01A	9	D1121
D1122	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D1122
D1123	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D1123
D1124	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D1124
D1125	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D1125
D1126	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D1126
D2021	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D2021
D2022	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D2022
D2023	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D2023
D2024	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D2024
D2030	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	8 3/4"	H5/A-606	J5-A,B/A-606	S5-A/A-606	H	ST	S-06	7	D2030
D2031	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D2031
D2032	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D2032
D2040	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	9"	H3/A-610	J3-A,B/A-610	S3-A/A-610	H	ST	S-06	7	D2040
D2041	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D2041
D2042	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D2042
D2043	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D2043
D2050	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	9"	H3/A-610	J3-A,B/A-610	S3-A/A-610	H	20	S-06	7	D2050
D2051	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D2051
D2052	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D2052
D2053	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D2053
D2054	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D2054
D2060	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	9"	H3/A-610	J3-A,B/A-610	S3-A/A-610	H	ST	S-06	7	D2060
D2061	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D2061
D2062	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D2062
D2070	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	8 3/4"	H5/A-606	J5-A,B/A-606	S5-A/A-606	H	ST	S-06	7	D2070
D2071	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D2071
D2072	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D2072
D2080	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	9"	H3/A-610	J3-A,B/A-610	S3-A/A-610	H	ST	S-06	7	D2080
D2081	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D2081
D2082	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D2082
D2083	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D2083
D2084	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D2084
D2090	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	9"	H3/A-610	J3-A,B/A-610	S3-A/A-610	H	ST	S-06	7	D2090
D2091	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D2091
D2092	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D2092
D2093	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D2093
D2110	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	9"	H3/A-610	J3-A,B/A-610	S3-A/A-610	H	ST	S-06	7	D2110
D2111	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D2111
D2112	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D2112
D2120	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	9"	H3/A-610	J3-A,B/A-610	S3-A/A-610	H	ST	S-06	7	D2120
D2121	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D2121
D2122	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D2122
D2123	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D2123
D2124	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D2124
D2125	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D2125
D2126	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	D2126
E0001	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	- - -	BH-12		E0001
E0002	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	A	- - -	BH-25		E0002
E1000	3' - 0"	7' - 0"	2"	D1	DHM	GCP-1M	F-15	DHM	GCP-1M	8 3/4"	H2/A-611	J4-A,B, J10/A-606	S1/A-607	H	- - -	S-04A	7, 8, 13	E1000
E1001A	3' - 6"	7' - 0"	2"	F	DHM	GCP-2	F-17B	DHM	GCP-2	8 3/4"	H4/A-606	J4-A,B, J10/A-606, J1/A-606, J2/A-611	S1/A-607	H	- - -	S-04A	7,8	E1001A
E1001B	3' - 6"	7' - 0"	2"	F	DHM	GCP-2M	F-17B	DHM	GCP-2M	8 3/4"	H4/A-605	J4-A,B, J10/A-605, J1/A-606	S1/A-607	H	- - -	S-04	8	E1001B
E1002A	3' - 6"	7' - 0"	2"	F	DHM	GCP-2F	F-17B	DHM	GCP-2F	8 3/4"	H4/A-606	J4-A,B, J10/A-606, J1/A-606, J2/A-611	S1/A-607	H	45	S-04A	7, 8	E1002A
E1002B	3' - 6"	7' - 0"	2"	F	DHM	GCP-2F	F-17B	DHM	GCP-2F	8 3/4"	H4/A-606	J4-A,B, J10/A-606, J1/A-606, J2/A-611	S1/A-607	H	45	S-04A	7, 8	E1002B
E1003A	4' - 0"	7' - 0"	2"	F	DHM	GCP-2F	F-6	DHM	GCP-2F	8 3/4"	H4/A-608	J4-A,B/A-608	S3/A-608	H	45	S-05A	4, 7, 8	E1003A
E1003B	4' - 0"	7' - 0"	2"	F	DHM	GCP-2	F-5D	DHM	GCP-2	8 1/8"	H3-A/A-608	J3-B,D/A-608	S3/A-608	H	- - -	S-05	4, 7, 8	E1003B
E1004	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-2	DHM	- - -	9"	H3/A-610	J3-A/A-610	- - -	H	20	S-08		E1004
E1005	3' - 0"	7' - 0"	2"	D	DHM	GCP-2F	F-12	DHM	GCP-2F	9"	H3,H4/A-610	J3-A,B, J4/A-610	S3-B,S4/A-610	H	20	S-04	7	E1005
E1006	3' - 0"	7' - 0"	2"	G	DHM	- - -	F-2	DHM	- - -	8 3/4"	H4/A-606	J4-A/A-606	- - -	H	- - -	S-08A	5	E1006
E1007	3' - 0"	7' - 0"	2"	G	DHM	- - -	F-2	DHM	- - -	8 3/4"	H5/A-606	J5-A/A-606	- - -	H	- - -	S-08A	5	E1007
E1008A	3' - 6"	7' - 0"	2"	F1	DHM	GCP-2MF	F-17	DHM	GCP-2MF	8 3/4"	H4/A-606	J4-A,B/A-606, J1/A-606	S1/A-606	H	45	S-04A	7	E1008A
E1008B	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	8 3/4"	H5/A-606	J5-A,B/A-606	S5-B/A-606	H	- - -	S-06	7	E1008B
E1009A	3' - 6"	7' - 0"	2"	F1	DHM	GCP-2MF	F-17	DHM	GCP-2MF	8 3/4"	H4/A-606	J4-A,B/A-606, J1/A-606	S1/A-606	H	45	S-04A	7	E1009A
E1009B	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-2	DHM	- - -	8 3/4"	H4/A-606	J5-4/A-606	- - -	H	- - -	S-07		E1009B
E1009C	3' - 0"	7' - 0"	2"	B	DHM	GCP-2F	F-3	DHM	- - -	9"	H3/A-610	J3-A,B/A-610	S3-B/A-610	H	20	S-06	7	E1009C
E1009D	12' - 0"	5' - 7"	1/2"	OCD	STL	- - -	- - -	STL	- - -	- - -	H1/A-610	J1/A-610	S1/A-610	H	- - -	- - -	3	E1009D
E1010A	4' - 0"	7' - 0"	2"	F	DHM	GCP-2F	F-6	DHM	GCP-2F	8 3/4"	H4/A-608	J4-A,B/A-608	S3/A-608	H	45	S-05A	4, 7, 8	E1010A
E1010B	4' - 0"	7' - 0"	2"	F	DHM	GCP-2	F-5D	DHM	GCP-2	8 1/8"	H3-A/A-608	J3-B,D/A-608	S3/A-608	H	- - -	S-05	4, 7, 8	E1010B
E1011	3' - 0"	7' - 0"	1 3/4"	A	HM	- - -	F-2	HM	- - -	9"	H3/A-610	J3-A/A-610	- - -	H	20	BH-43		E1011

DOOR AND FRAME SCHEDULE - AREAS D & E

OPENING NUMBER	DOOR SIZE WIDTH	DOOR SIZE HEIGHT	DOOR SIZE THICK	DOOR TYPE	DOOR MAT'L	DOOR GLAZING	FRAME TYPE	FRAME MAT'L	FRAME GLAZING	FRAME DEPTH	DETAILS HEAD	DETAILS JAMB	DETAILS SILL	DOOR SIGN	FIRE RATING	HDWR SET	COMMENTS	OPENING NUMBER
E1012	4' - 8"	7' - 8"	2"	D	DHM	GCP-2	F-20	DHM	GCP-2	8 1/8"	H3-A/A-608	J1-A,B/A-611	S3/A-608	H	- - -	S-04A	4, 7	E1012
E1013	4' - 8"	7' - 8"	2"	A	DHM-G	- - -	F-3	DHM-G	- - -	8 3/4"	H5/A-606	J5-A,B/A-606	S5-B/A-606	- - -	- - -	S-09	7	E1013
E1014	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	8 3/4"	H5/A-606	J5-A,B/A-606	- - -	A	20	S-04	7	E1014
E1015B	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	9"	H3/A-610	J3-A,B/A-610	S3-B/A-610	H	20	S-08		E1015B
E1016A	4' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	8 3/4"	H5/A-606	J5-A,B/A-606	- - -	H	20	S-06	7	E1016A
E1016B	4' - 0"	7' - 0"	2"	A	DHM-G	- - -	F-3	DHM-G	- - -	8 3/4"	H5/A-606	J5-A,B/A-606	S5-B/A-606	H	- - -	S-09	7	E1016B
E1017A	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	9"	H3/A-610	J3-A,B/A-610	S3-B/A-610	H	20	S-06	7	E1017A
E1017B	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	8 3/4"	H4/A-610	J4-A,B/A-606	- - -	H	- - -	S-08		E1017B
E1017C	4' - 0"	7' - 0"	2"	A	DHM-G	- - -	F-3	DHM-G	- - -	8 3/4"	H5/A-606	J5-A,B/A-606	S5-B/A-606	H	- - -	S-09	7	E1017C
E1020A	3' - 6"	7' - 0"	2"	F1	DHM	GCP-2MF	F-17	DHM	GCP-2MF	8 3/4"	H4/A-606	J4-A,B/A-606, J1/A-606	S1/A-606	H	45	S-04A	7	E1020A
E1020B	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	9"	H3/A-610	J3-A,B/A-610	S3-B/A-610	H	20	S-06	7	E1020B
E1021	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E1021
E1022	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E1022
E1023	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E1023
E1024	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E1024
E1025	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E1025
E1026	3' - 0"	7' - 0"	2"	D1	DHM	GCP-2	F-3	DHM	- - -	- - -	- - -	- - -	- - -	H	- - -	S-01A	9	E1026
E1030A	3' - 6"	7' - 0"	2"	F1	DHM	GCP-2MF	F-17A	DHM	GCP-2MF	8 3/4"	H4/A-606	J4-A,B/A-606, J1/A-606	S1/A-606	H	45	S-04A	7	E1030A
E1030B	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	9"	H3/A-610	J3-A,B/A-610	S3-B/A-610	H	ST	S-06	7	E1030B
E1031	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E1031
E1032	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E1032
E1040A	3' - 6"	7' - 0"	2"	F1	DHM	GCP-2MF	F-17A	DHM	GCP-2MF	8 3/4"	H4/A-606	J4-A,B/A-606, J1/A-606	S1/A-606	H	45	S-04A	7	E1040A
E1040B	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	9"	H3/A-610	J3-A,B/A-610	S3-B/A-610	H	ST	S-06	7	E1040B
E1041	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E1041
E1042	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E1042
E1043	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E1043
E1050A	3' - 6"	7' - 0"	2"	F1	DHM	GCP-2MF	F-17A	DHM	GCP-2MF	8 3/4"	H1/A-607	J4-A,B/A-606, J1/A-606	S1/A-607	H	45	S-04A	7	E1050A
E1050B	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	9"	H3/A-610	J3-A,B/A-610	S3-B/A-610	H	ST	S-06	7	E1050B
E1051	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E1051
E1052	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E1052
E1053	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E1053
E1054	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E1054
E1060A	3' - 6"	7' - 0"	2"	F1	DHM	GCP-2MF	F-17A	DHM	GCP-2MF	8 3/4"	H1/A-607	J4-A,B/A-606, J1/A-606	S1/A-607	H	45	S-04A	7	E1060A
E1060B	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	9"	H3/A-610	J3-A,B/A-610	S3-B/A-610	H	ST	S-06	7	E1060B
E1061	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E1061
E1062	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E1062
E1070A	3' - 6"	7' - 0"	2"	F1	DHM	GCP-2MF	F-17A	DHM	GCP-2MF	8 3/4"	H4/A-605	J4-A,B/A-605, J1/A-606	S1/A-606	H	45	S-04A	7	E1070A
E1070B	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	8 3/4"	H5/A-606	J6-A,B/A-606	S5-B/A-606	H	ST	S-06	7	E1070B
E1071	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E1071
E1072	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E1072
E1080A	3' - 6"	7' - 0"	2"	F1	DHM	GCP-2MF	F-17A	DHM	GCP-2MF	8 3/4"	H4/A-606	J4-A,B/A-606, J1/A-606	S1/A-606	H	45	S-04A	7	E1080A
E1080B	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	9"	H3/A-610	J3-A,B/A-610	S3-B/A-610	H	ST	S-06	7	E1080B
E1081	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E1081
E1082	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E1082
E1083	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E1083
E1084	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E1084
E1090A	3' - 6"	7' - 0"	2"	F1	DHM	GCP-2MF	F-17A	DHM	GCP-2MF	8 3/4"	H4/A-606	J4-A,B/A-606, J1/A-606	S1/A-606	H	45	S-04A	7	E1090A
E1090B	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	9"	H3/A-610	J3-A,B/A-610	S3-B/A-610	H	20	S-06	7	E1090B
E1091	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E1091
E1092	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E1092
E1093	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E1093
E1110A	3' - 6"	7' - 0"	2"	F1	DHM	GCP-2MF	F-17A	DHM	GCP-2MF	8 3/4"	H4/A-606	J4-A,B/A-606, J1/A-606	S1/A-606	H	45	S-04A	7	E1110A
E1110B	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	9"	H3/A-610	J3-A,B/A-610	S3-B/A-610	H	ST	S-06	7	E1110B
E1111	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E1111
E1112	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E1112
E1120A	3' - 6"	7' - 0"	2"	F1	DHM	GCP-2MF	F-17	DHM	GCP-2MF	8 3/4"	H4/A-606	J4-A,B/A-606, J1/A-606	S1/A-606	H	45	S-04A	7	E1120A
E1120B	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	8 3/4"	H5/A-606	J6-A,B/A-606	S5-B/A-606	H	ST	S-06	7	E1120B
E1120C	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	9"	H3/A-610	J3-A,B/A-610	S3-B/A-610	H	ST	S-06	7	E1120C
E1121	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E1121
E1122	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E1122
E1123	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E1123
E1124	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E1124
E2021	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E2021
E2022	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E2022
E2023	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E2023
E2024	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E2024
E2025	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E2025
E2026	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E2026
E2030	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	9"	H3/A-610	J3-A,B/A-610	S3-A/A-610	H	ST	S-06	7	E2030
E2031	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E2031
E2032	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E2032
E2040	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	9"	H3/A-610	J3-A,B/A-610	S3-A/A-610	H	ST	S-06	7	E2040
E2041	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E2041
E2042	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E2042
E2043	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E2043
E2050	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	9"	H3/A-610	J3-A,B/A-610	S3-A/A-610	H	ST	S-06	7	E2050
E2051	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E2051
E2052	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E2052
E2053	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E2053
E2054	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E2054
E2060	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	9"	H3/A-610	J3-A,B/A-610	S3-A/A-610	H	ST	S-06	7	E2060
E2061	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E2061
E2062	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E2062
E2070	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	8 3/4"	H5/A-606	J5-A,B/A-606	S5-A/A-606	H	ST	S-06	7	E2070
E2071	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E2071
E2072	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E2072
E2080	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	9"	H3/A-610	J3-A,B/A-610	S3-A/A-610	H	ST	S-06	7	E2080
E2081	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E2081
E2082	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E2082
E2083	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E2083
E2084	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E2084
E2090	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	9"	H3/A-610	J3-A,B/A-610	S3-A/A-610	H	20	S-06	7	E2090
E2091	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E2091
E2092	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E2092
E2093	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E2093
E2110	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	9"	H3/A-610	J3-A,B/A-610	S3-A/A-610	H	ST	S-06	7	E2110
E2111	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E2111
E2112	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E2112
E2120	3' - 0"	7' - 0"	2"	A	DHM	- - -	F-3	DHM	- - -	8 3/4"	H5/A-606	J5-A,B/A-606	S5-A/A-606	H	ST	S-06	7	E2120
E2121	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E2121
E2122	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E2122
E2123	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E2123
E2124	3' - 0"	7' - 0"	2"	D1	DHM	LP-3	F-3	DHM	- - -	STL CELL	- - -	- - -	- - -	H	- - -	S-01A	7, 9	E2124

GENERAL NOTES:

A. REFER TO G-001 FOR ADDITIONAL GENERAL NOTES AND INFORMATION.
B. ALL HOLLOW METAL DOORS AND FRAMES ARE TO BE PAINTED.
C. EXTERIOR HOLLOW METAL DOORS AND FRAMES ARE TO BE GALVANIZED AND PAINTED.
D. ALL EXTERIOR DOORS SHALL BE INSULATED.
E. COORDINATE DOORS AND FRAMES WITH ACCESS CONTROL SYSTEM HARDWARE AND ELECTRICAL REQUIREMENTS INCLUDING ALL WIRING AND CONNECTIONS.
F. ALL WOOD DOORS TO BE FACTORY-FINISHED.
G. PROVIDE A ROOM IDENTIFICATION PANEL SIGN FOR EACH INTERIOR DOOR LOCATION OUTSIDE THE SECURE PERIMETER OF THE FACILITY AS SHOWN ON A-070 AND A-071.
H. PROVIDE INCLUDING MALE/FEMALE/UNISEX AND ADA GRAPHICS WHERE APPLICABLE. FINAL ROOM NAMES, ROOM NUMBERS, AND LOCATIONS TO BE DETERMINED PRIOR TO FABRICATION. MOUNTING FOR PANEL SIGNS TO BE ON THE WALL ADJACENT TO THE DOOR APPROXIMATELY 48"-54" A.F.F.
I. REFER TO SECURITY ELECTRONIC DRAWINGS FOR DOOR CONTROLS, MONITORING AND ACCESS CONTROL.
J. OPENING WIDTH SCHEDULED FOR SLIDING DOORS IS CLEAR OPENING WIDTH NOT ACTUAL WIDTH OF DOOR LEAF. CLEAR OPENING WIDTH DOES NOT INCLUDE MECHANICAL RELEASE COLUMN AND RECEIVER.

DOOR AND FRAME SCHEDULE ABBREVIATIONS:

AL	ALUMINUM
DHM	DETENTION HOLLOW METAL
DHM-G	DETENTION HOLLOW METAL - GALVANIZED
HM	HOLLOW METAL
HM-G	HOLLOW METAL - GALVANIZED
OCD	OVERHEAD COILING DOOR
SD	SECTIONAL DOOR
STL	STEEL
WD	WOOD

GLAZING SCHEDULE - COMMERCIAL

IG-1	1" CLEAR INSULATING LOW-E GLAZING
IG-2	1" INSULATED SPANDREL GLASS
LG-1	LAMINATED GLASS
LG-1F	LAMINATED FIRE-RATED GLASS

GLAZING SCHEDULE - DETENTION

BR-3M	MIRRORED (ONE WAY) LAMINATED BULLET-RESISTANT GLAZING
GCP-1	60 MINUTE PHYSICAL ATTACK (SECURE-TEM + POLY SP029)
GCP-1F	60 MINUTE PHYSICAL ATTACK, FIRE-RATED (SECURE-TEM + POLY SP029)
GCP-1M	60 MINUTE PHYSICAL ATTACK; MIRRORED (SECURE-TEM + POLY SP029)
GCP-1MF	60 MINUTE PHYSICAL ATTACK; MIRRORED, FIRE RATED (SECURE-TEM + POLY)
GCP-2	40 MINUTE PHYSICAL ATTACK (SECURE-TEM + POLY SP029)
GCP-2F	40 MINUTE PHYSICAL ATTACK, FIRE-RATED (SECURE-TEM + POLY)
GCP-2M	40 MINUTE PHYSICAL ATTACK; MIRRORED (SECURE-TEM + POLY SP029)
GCP-2MF	40 MINUTE PHYSICAL ATTACK; MIRRORED, FIRE-RATED (SECURE-TEM + POLY SP029)
GCP-3	20 MINUTE PHYSICAL ATTACK (SECURE-TEM + POLY SP029)
GCP-3F	20 MINUTE PHYSICAL ATTACK, FIRE-RATED (SECURE-TEM + POLY)
LP-3	CLEAR LAMINATED POLYCARBONATE
SIG-2	40 MINUTE LOW-E COATED, CLEAR INSULATING GLASS POLYCARBONATE UNIT
STL	7 GAUGE STEEL PANEL INFILL

DOOR AND FRAME SCHEDULE COMMENTS:

1. ADA DOOR OPERATOR WITH ACTUATOR CONTROLS ON BOTH SIDES OF THE DOOR.
2. INSULATED SECTIONAL DOOR WITH ELECTRIC OPERATOR.
3. INSULATED OVERHEAD COILING DOOR, WITH ELECTRIC OPERATOR.
4. SLIDING DOOR WITH ELECTRIC OPERATOR.
5. DUTCH DOOR. LOCK TOP LEAF IN THE OPEN POSITION.
6. NOT USED.
7. INTERCOM(S) TO BE MOUNTED IN DOOR FRAME.
8. DOUBLE RABBET FRAME.
9. DOOR, FRAME AND GLAZING PROVIDED BY MODULAR STEEL CELL MANUFACTURER.
10. CASED OPENING.
11. DOORS DELETED UNDER ALTERNATE NO. 04
12. PADDED CELL DOOR AND FRAME.
13. FOOD PASS WITH THUMB TURN MOUNTED ON CONTROL ROOM SIDE.

DLZ
ARCHITECTURE • ENGINEERING • PLANNING
SURVEYING • CONSTRUCTION SERVICES
DLZ INDIANA, LLC

ERIC B. RATTS
REGISTERED
No. AR19500134
STATE OF INDIANA
ARCHITECT

NO.	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: WS/GT CHK'D: CAG
DESIGNED: EBR
APPRV'D: EBR
DATE: September 5, 2019
PROJECT NUMBER
1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

DOOR AND FRAME SCHEDULE - AREAS D & E

DRAWING NUMBER
A-602
ARCHITECTURE

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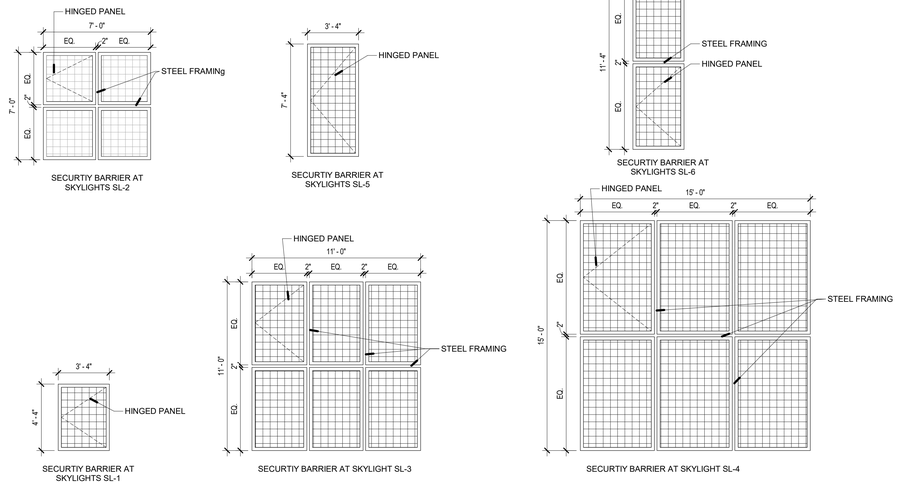


SECURTIY BARRIER AT SKYLIGHTS SL-2 | SECURTIY BARRIER AT SKYLIGHTS SL-5 | SECURTIY BARRIER AT SKYLIGHTS SL-6

SECURTIY BARRIER AT SKYLIGHTS SL-1 | SECURTIY BARRIER AT SKYLIGHT SL-3 | SECURTIY BARRIER AT SKYLIGHT SL-4

NOTE: OVERALL DIMENSIONS ARE SKYLIGHT OPENINGS (V.I.F.); REF. SKYLIGHT SECTION DETAILS ON SHEET A-124.

1 / A-603 **FIXED WOVEN ROD SECURITY BARRIERS AT SKYLIGHTS**
SCALE: 1/4" = 1'-0"

BORROWED LITE SCHEDULE

OPENING NUMBER	ELEVATION	DEPTH	MATERIAL	GLAZING	DETAILS HEAD	DETAILS JAMB	DETAILS SILL	FIRE RATING	COMMENTS	OPENING NUMBER
B1010A	BL-1C	8 3/4"	DHM	GCP-1	H1/A-607	J2/A-608	S2/A-608	- - -		B1010A
B1011A	BL-1C	8 3/4"	DHM	GCP-1	H1/A-607	J2/A-608	S2/A-608	- - -		B1011A
B1012A	BL-1C	8 3/4"	DHM	GCP-1	H1/A-607	J2/A-608	S2/A-608	- - -		B1012A
B1013A	BL-1D	8 3/4"	DHM	GCP-1	H1/A-607	J2/A-608	S2/A-608	- - -		B1013A
B1016A	BL-1E	8 3/4"	DHM	BR-3M/SP-1	H8/A-606	J8/A-606, J1/A-607	S1/A-607	- - -	8	B1016A
B1016B	BL-5B	8 3/4"	DHM	BR-3M/SP-1	H8/A-606	J8/A-606	S1/A-607	- - -	8	B1016B
B1016C	BL-4	8 3/4"	DHM	BR-3M/SP-1	H8/A-606	J8/A-606, J1/A-607	S1/A-607	- - -	8	B1016C
B1016D	BL-5A	8 3/4"	DHM	GCP-1MF/STL	H8/A-606	J1/A-607	S1/A-607	45	8	B1016D
B1016E	BL-10	8 3/4"	DHM	GCP-1MF/STL	H8/A-606	J1/A-607	S1/A-607	45	8	B1016E
B1035A	BL-3A	8 3/4"	DHM	GCP-3	H1/A-607	J1/A-607	S1/A-607	- - -		B1035A
B1037A	BL-3A	8 3/4"	DHM	GCP-2M	H1/A-607	J1/A-607	S1/A-607	- - -		B1037A
B1064A	BL-3B	8 3/4"	DHM	GCP-3	H1/A-607	J1/A-607	S1/A-607	- - -	8	B1064A
B1107A	BL-9	8 3/4"	DHM	GCP-2/STL	H6-A/A-608	J8/A-606	S1/A-607	- - -		B1107A
B1107B	BL-9	8 3/4"	DHM	GCP-2/STL	H6-A/A-608	J8/A-606	S1/A-607	- - -		B1107B
C1014C	BL-6	8 3/4"	DHM	GCP-2	H1/A-607	J1/A-607	S1/A-607	- - -	8	C1014C
C1014D	BL-6	8 3/4"	DHM	GCP-2	H1/A-607	J1/A-607	S1/A-607	- - -	8	C1014D
C1055A	BL-3A	8 3/4"	DHM	GCP-3	H1/A-607	J1/A-607	S1/A-607	- - -	8	C1055A
C1062A	BL-1B	8 3/4"	DHM	GCP-3	H6/A-606	J6/A-606	S6/A-606	- - -	8	C1062A
C1062B	BL-1B	8 3/4"	DHM	GCP-3	H6/A-606	J6/A-606	S6/A-606	- - -	8	C1062B
C1062C	BL-1B	8 3/4"	DHM	GCP-3	H6/A-606	J6/A-606	S6/A-606	- - -	8	C1062C
C1062D	BL-3B	8 3/4"	DHM	GCP-3	H1/A-607	J1/A-607	S1/A-607	- - -	8	C1062D
C1065C	BL-2	8 3/4"	DHM	GCP-2F	H1/A-607	J1/A-607	S1/A-607	45		C1065C
C1065D	BL-2	8 3/4"	DHM	GCP-2F	H1/A-607	J1/A-607	S1/A-607	45		C1065D
C1073C	BL-2	8 3/4"	DHM	GCP-2F	H1/A-607	J1/A-607	S1/A-607	45	8	C1073C
C1073D	BL-2	8 3/4"	DHM	GCP-2F	H1/A-607	J1/A-607	S1/A-607	45	8	C1073D
D1000A	BL-8	8 3/4"	DHM	GCP-2M/STL	H2/A-611	J10/A-606, J2/A-611	S1/A-606	- - -	8	D1000A
D1000B	BL-8	8 3/4"	DHM	GCP-2MF	H2/A-611	J10/A-606, J2/A-611	S1/A-606	45	8	D1000B
D1000C	BL-7	8 3/4"	DHM	GCP-2MF	H2/A-611	J10/A606	S1/A-606	45	8	D1000C
D1000D	BL-7	8 3/4"	DHM	GCP-2MF	H2/A-611	J10/A606	S1/A-606	45	8	D1000D
D1000E	BL-8	8 3/4"	DHM	GCP-2MF	H2/A-611	J10/A-606, J2/A-611	S1/A-606	45	8	D1000E
D1000F	BL-8	8 3/4"	DHM	GCP-2M/STL	H2/A-611	J10/A-606, J2/A-611	S1/A-606	- - -	8	D1000F
D1000G	BL-7	8 3/4"	DHM	GCP-2M/STL	H2/A-611	J10/A606	S1/A-606	- - -	8	D1000G
D1000H	BL-7	8 3/4"	DHM	GCP-2M/STL	H2/A-611	J10/A606	S1/A-606	- - -	8	D1000H
D1000I	BL-8	8 3/4"	DHM	GCP-2M/STL	H2/A-611	J10/A-606, J2/A-611	S1/A-606	- - -	8	D1000I
D1000J	BL-8	8 3/4"	DHM	GCP-2M/STL	H2/A-611	J10/A-606, J2/A-611	S1/A-606	- - -	8	D1000J
E1000A	BL-8	8 3/4"	DHM	GCP-2M/STL	H2/A-611	J10/A-606, J2/A-611	S1/A-606	- - -	8	E1000A
E1000B	BL-8	8 3/4"	DHM	GCP-2MF	H2/A-611	J10/A-606, J2/A-611	S1/A-606	45	8	E1000B
E1000C	BL-7	8 3/4"	DHM	GCP-2MF	H2/A-611	J10/A606	S1/A-606	45	8	E1000C
E1000D	BL-7	8 3/4"	DHM	GCP-2MF	H2/A-611	J10/A606	S1/A-606	45	8	E1000D
E1000E	BL-8	8 3/4"	DHM	GCP-2MF	H2/A-611	J10/A-606, J2/A-611	S1/A-606	45	8	E1000E
E1000F	BL-8	8 3/4"	DHM	GCP-2M/STL	H2/A-611	J10/A-606, J2/A-611	S1/A-606	- - -	8	E1000F
E1000G	BL-7	8 3/4"	DHM	GCP-2M/STL	H2/A-611	J10/A606	S1/A-606	- - -	8	E1000G
E1000H	BL-7	8 3/4"	DHM	GCP-2M/STL	H2/A-611	J10/A606	S1/A-606	- - -	8	E1000H
E1000I	BL-8	8 3/4"	DHM	GCP-2M/STL	H2/A-611	J10/A-606, J2/A-611	S1/A-606	- - -	8	E1000I
E1000J	BL-8	8 3/4"	DHM	GCP-2M/STL	H2/A-611	J10/A-606, J2/A-611	S1/A-606	- - -	8	E1000J
STEEL CELL	STL-BL		DHM	LP-3	- - -	- - -	- - -	- - -	9	STEEL CELL

STOREFRONT & CURTAIN WALL SCHEDULE

ELEVATION	DEPTH	MATERIAL	GLAZING	DETAILS HEAD	DETAILS JAMB	DETAILS SILL	COMMENTS	ELEVATION
CW-1	6"	AL	IG-1	H3/A-607	J3-B/A-607	S3-A/A-607		CW-1
CW-2	6"	AL	IG-1	H3/A-607	J3-B/A-607	S3-A/A-607		CW-2
CW-3	7 1/2"	AL	IG-1	H7/A-607	J7-A,B/A-607, J3-A,B/A-611	S7/A-607		CW-3
CW-4	7 1/2"	AL	IG-1	H2/A-609	J8-B/A607, J2-A,B,C/A-609	S7/A-607,S2/A-609		CW-4
CW-5	7 1/2"	AL	IG-1	H8/A-606	J8-A,B/A-606	S2, S4/A-608		CW-5
CW-6	7 1/2"	AL	IG-1	H2/A-609	J8-A/A-607, J2-A/A-609	S4/A-609		CW-6
SF-1	4 1/2"	AL	IG-1	H4/A-606	J4-A/A-606	S4/A-606		SF-1
SF-2	4 1/2"	AL	IG-1	H4/A-606	J4-A/A-606	S4/A-606		SF-2
SF-3	4 1/2"	AL	IG-1	H4/A-606	J4-A,B/A-606	S4/A-606		SF-3
SF-4	4 1/2"	AL	IG-1	H4/A-606	J4-A/A-606	S4/A-606		SF-4

DETENTION WINDOW SCHEDULE

ELEVATION	DEPTH	MATERIAL	GLAZING	DETAILS HEAD	DETAILS JAMB	DETAILS SILL	COMMENTS	ELEVATION
DW-1	8"	STL	SIG-2	H2/A-607	J2/A-607	S2-B/A-607		DW-1
DW-2	8"	STL	SIG-2	H2/A-607	J2/A-607	S2-A/A-607		DW-2
DW-3	8"	STL	SIG-2	H5/A-607	J5/A-607	S5/A-607		DW-3
DW-4	8"	STL	SIG-2	H5/A-607	J5/A-607	S5/A-607		DW-4

SKYLIGHT SCHEDULE

NUMBER	MARK	LENGTH	WIDTH	COMMENTS
288	SL-2	8' - 0"	8' - 0"	
289	SL-2	8' - 0"	8' - 0"	
B1025A	SL-2	8' - 0"	8' - 0"	
B1025B	SL-2	8' - 0"	8' - 0"	
B1037A	SL-6	12' - 0"	4' - 0"	
B1053A	SL-4	16' - 0"	16' - 0"	
B1053B	SL-4	16' - 0"	16' - 0"	
B1053C	SL-4	16' - 0"	16' - 0"	
B1053D	SL-5	8' - 0"	4' - 0"	
B1053E	SL-5	8' - 0"	4' - 0"	
B1095B	SL-1	5' - 0"	4' - 0"	
B1095C	SL-1	5' - 0"	4' - 0"	
B1095D	SL-1	5' - 0"	4' - 0"	
B1095E	SL-1	5' - 0"	4' - 0"	
B1095F	SL-1	5' - 0"	4' - 0"	
B1095G	SL-1	5' - 0"	4' - 0"	
B1112C	SL-1	5' - 0"	4' - 0"	
B1112D	SL-1	5' - 0"	4' - 0"	
D1020	SL-3	12' - 0"	12' - 0"	
D1030	SL-2	8' - 0"	8' - 0"	
D1040	SL-3	12' - 0"	12' - 0"	
D1050	SL-3	12' - 0"	12' - 0"	
D1060	SL-2	8' - 0"	8' - 0"	
D1080	SL-3	12' - 0"	12' - 0"	
D1090	SL-3	12' - 0"	12' - 0"	
D1110	SL-2	8' - 0"	8' - 0"	
D1120	SL-3	12' - 0"	12' - 0"	
E1020	SL-3	12' - 0"	12' - 0"	
E1030	SL-2	8' - 0"	8' - 0"	
E1040	SL-3	12' - 0"	12' - 0"	
E1050	SL-3	12' - 0"	12' - 0"	
E1070	SL-2	8' - 0"	8' - 0"	
E1080	SL-3	12' - 0"	12' - 0"	
E1090	SL-3	12' - 0"	12' - 0"	
E1110	SL-2	8' - 0"	8' - 0"	
E1120	SL-3	12' - 0"	12' - 0"	

*SKYLIGHT DIMENSIONS ARE TO OUTSIDE FACE OF CURB

GENERAL NOTES:

A. REFER TO G-001 FOR ADDITIONAL GENERAL NOTES AND INFORMATION.
B. ALL HOLLOW METAL DOORS AND FRAMES ARE TO BE PAINTED.
C. EXTERIOR HOLLOW METAL DOORS AND FRAMES ARE TO BE GALVANIZED AND PAINTED.
D. ALL EXTERIOR DOORS SHALL BE INSULATED.
E. COORDINATE DOORS AND FRAMES WITH ACCESS CONTROL SYSTEM HARDWARE AND ELECTRICAL REQUIREMENTS INCLUDING ALL WIRING AND CONNECTIONS.
F. ALL WOOD DOORS TO BE FACTORY-FINISHED.
G. PROVIDE A ROOM IDENTIFICATION PANEL SIGN FOR EACH INTERIOR DOOR LOCATION OUTSIDE THE SECURE PERIMETER OF THE FACILITY AS SHOWN ON A-070 AND A-071.
H. PROVIDE INCLUDING MALE/FEMALE/UNISEX AND ADA GRAPHICS WHERE APPLICABLE. FINAL ROOM NAMES, ROOM NUMBERS, AND LOCATIONS TO BE DETERMINED PRIOR TO FABRICATION. MOUNTING FOR PANEL SIGNS TO BE ON THE WALL ADJACENT TO THE DOOR APPROXIMATELY 48"-54" A.F.F.
I. REFER TO SECURITY ELECTRONIC DRAWINGS FOR DOOR CONTROLS, MONITORING AND ACCESS CONTROL.
J. OPENING WIDTH SCHEDULED FOR SLIDING DOORS IS CLEAR OPENING WIDTH NOT ACTUAL WIDTH OF DOOR LEAF. CLEAR OPENING WIDTH DOES NOT INCLUDE MECHANICAL RELEASE COLUMN AND RECEIVER.

DOOR AND FRAME SCHEDULE ABBREVIATIONS:

AL	ALUMINUM
DHM	DETENTION HOLLOW METAL
DHM-G	DETENTION HOLLOW METAL - GALVANIZED
HM	HOLLOW METAL
HM-G	HOLLOW METAL - GALVANIZED
OCD	OVERHEAD COILING DOOR
SD	SECTIONAL DOOR
STL	STEEL
WD	WOOD

GLAZING SCHEDULE - COMMERCIAL

IG-1	1" CLEAR INSULATING LOW-E GLAZING
IG-2	1" INSULATED SPANDREL GLASS
LG-1	LAMINATED GLASS
LG-1F	LAMINATED FIRE-RATED GLASS

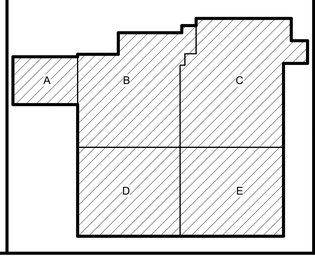
GLAZING SCHEDULE - DETENTION

BR-3M	MIRRORED (ONE WAY) LAMINATED BULLET-RESISTANT GLAZING
GCP-1	60 MINUTE PHYSICAL ATTACK (SECURE-TEM + POLY SP029)
GCP-1F	60 MINUTE PHYSICAL ATTACK, FIRE-RATED (SECURE-TEM + POLY SP029)
GCP-1M	60 MINUTE PHYSICAL ATTACK; MIRRORED (SECURE-TEM + POLY SP029)
GCP-1MF	60 MINUTE PHYSICAL ATTACK; MIRRORED, FIRE RATED (SECURE-TEM + POLY)
GCP-2	40 MINUTE PHYSICAL ATTACK (SECURE-TEM + POLY SP029)
GCP-2F	40 MINUTE PHYSICAL ATTACK, FIRE-RATED (SECURE-TEM + POLY)
GCP-2M	40 MINUTE PHYSICAL ATTACK; MIRRORED (SECURE-TEM + POLY SP029)
GCP-2MF	40 MINUTE PHYSICAL ATTACK; MIRRORED, FIRE-RATED (SECURE-TEM + POLY SP029)
GCP-3	20 MINUTE PHYSICAL ATTACK (SECURE-TEM + POLY SP029)
GCP-3F	20 MINUTE PHYSICAL ATTACK, FIRE-RATED (SECURE-TEM + POLY)
LP-3	CLEAR LAMINATED POLYCARBONATE
SIG-2	40 MINUTE LOW-E COATED, CLEAR INSULATING GLASS POLYCARBONATE UNIT
STL	7 GAUGE STEEL PANEL INFILL

DOOR AND FRAME SCHEDULE COMMENTS:

1. ADA DOOR OPERATOR WITH ACTUATOR CONTROLS ON BOTH SIDES OF THE DOOR.
2. INSULATED SECTIONAL DOOR WITH ELECTRIC OPERATOR.
3. INSULATED OVERHEAD COILING DOOR WITH ELECTRIC OPERATOR.
4. SLIDING DOOR WITH ELECTRIC OPERATOR.
5. DUTCH DOOR. LOCK TOP LEAF IN THE OPEN POSITION.
6. NOT USED.
7. INTERCOM(S) TO BE MOUNTED IN DOOR FRAME.
8. DOUBLE RABBET FRAME.
9. DOOR, FRAME AND GLAZING PROVIDED BY MODULAR STEEL CELL MANUFACTURER.
10. CASED OPENING.
11. DOORS DELETED UNDER ALTERNATE NO. 04
12. 2 HAND/1 DOOR AND FRAME.
13. FOOD PASS WITH THUMB TURN MOUNTED ON CONTROL ROOM SIDE.

KEY PLAN



DLZ
ARCHITECTURE • ENGINEERING • PLANNING
SURVEYING • CONSTRUCTION SERVICES
DLZ INDIANA, LLC

ERIC B. RATTS REGISTERED No. AR19500134 STATE OF INDIANA MARCH 12, 2019

NO.	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: WS/GT | CHK'D: CAG
DESIGNED: EBR
APPR'VD: EBR
DATE: September 5, 2019
PROJECT NUMBER: 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

FRAME SCHEDULES

DRAWING NUMBER: A-603 | ARCHITECTURE

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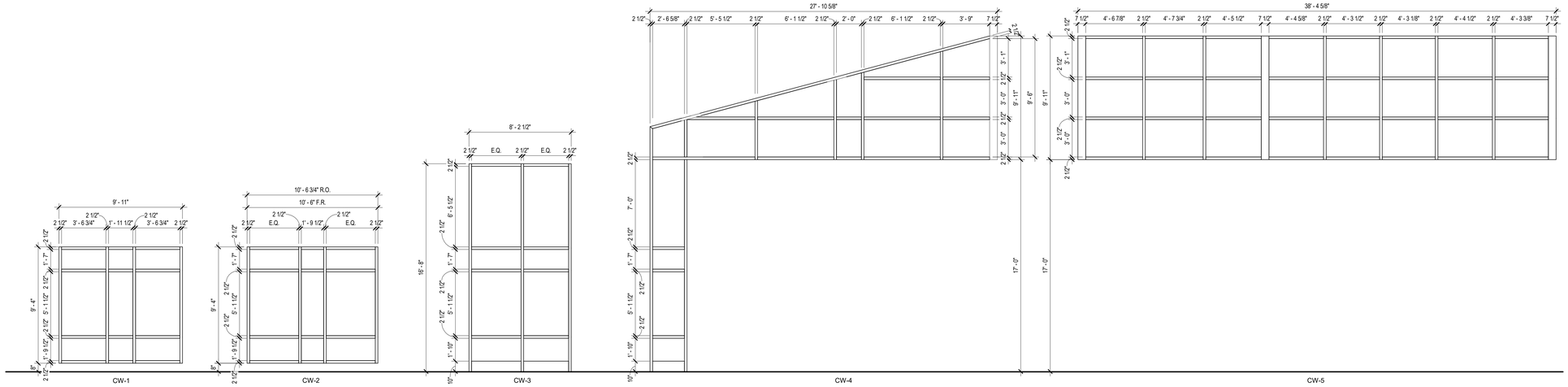
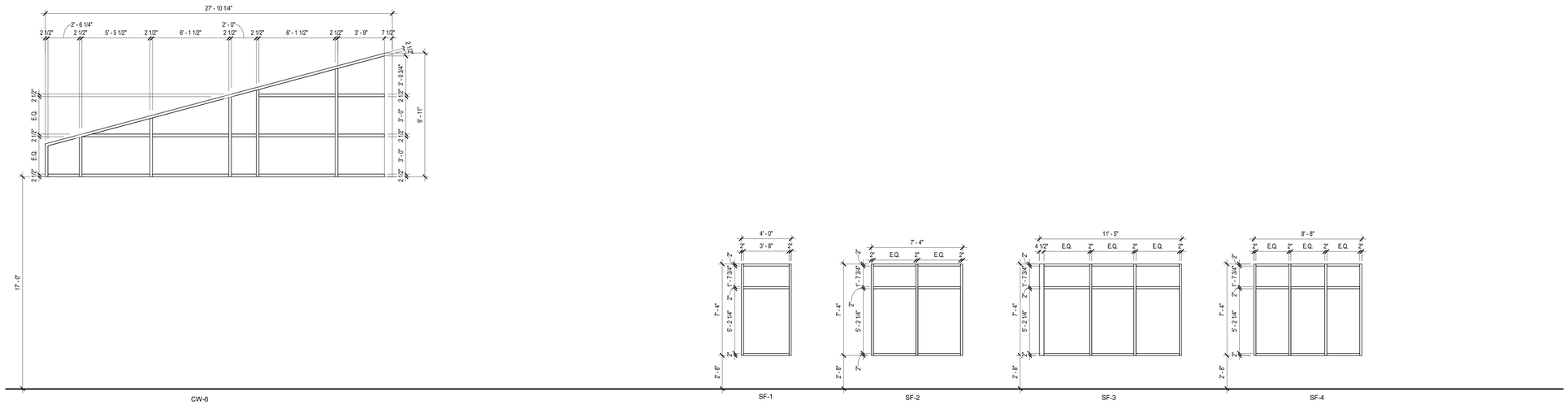
9/11/2019 8:55:21 AM

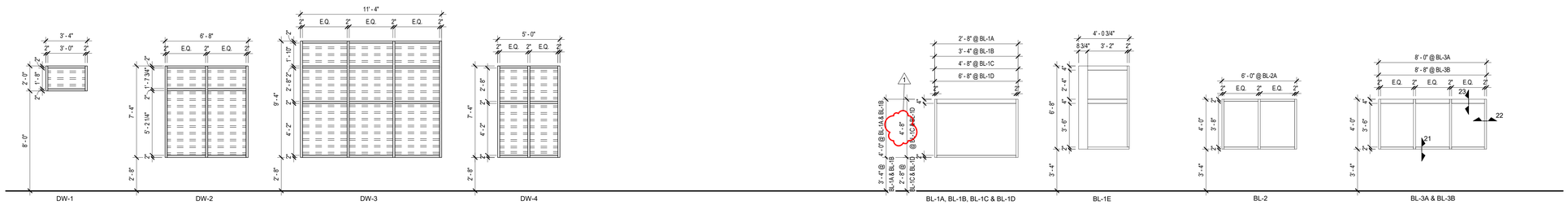


STOREFRONT ELEVATIONS - 1' - 0" = 1/4"



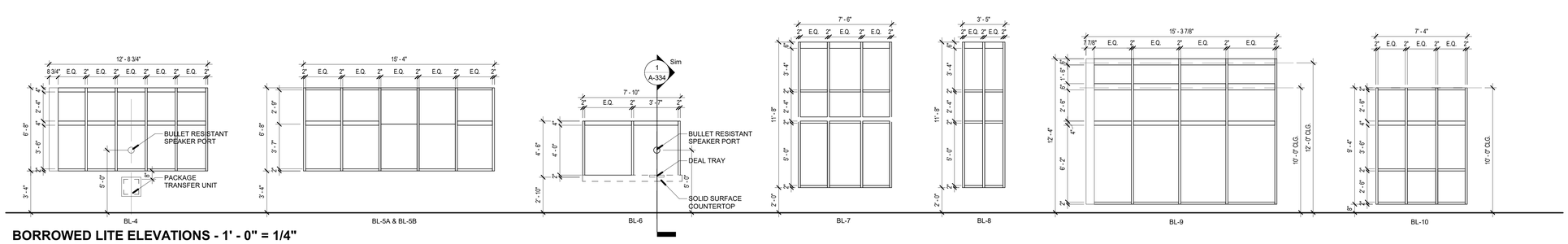
EXTERIOR FRAME ELEVATIONS - 1' - 0" = 1/4"

STORE FRONT ELEVATIONS



DETENTION WINDOW ELEVATIONS - 1' - 0" = 1/4"

BORROWED LITE ELEVATIONS



BORROWED LITE ELEVATIONS - 1' - 0" = 1/4"

GENERAL NOTES:

A. REFER TO G-001 FOR ADDITIONAL GENERAL NOTES AND INFORMATION.
B. ALL HOLLOW METAL DOORS AND FRAMES ARE TO BE PAINTED.
C. EXTERIOR HOLLOW METAL DOORS AND FRAMES ARE TO BE GALVANIZED AND PAINTED.
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DLZ INDIANA, LLC

ERIC B. RATTS
REGISTERED
No. AR19500134
STATE OF INDIANA
REGISTERED ARCHITECT

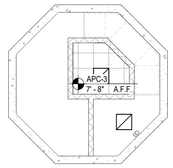
NO.	REVISION	DATE
1.	Addendum #01	09/12/19

DRAWN: WSG/T | CHK'D: CAG
DESIGNED: EBR
APPR'VD: EBR
DATE: September 5, 2019
PROJECT NUMBER: 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

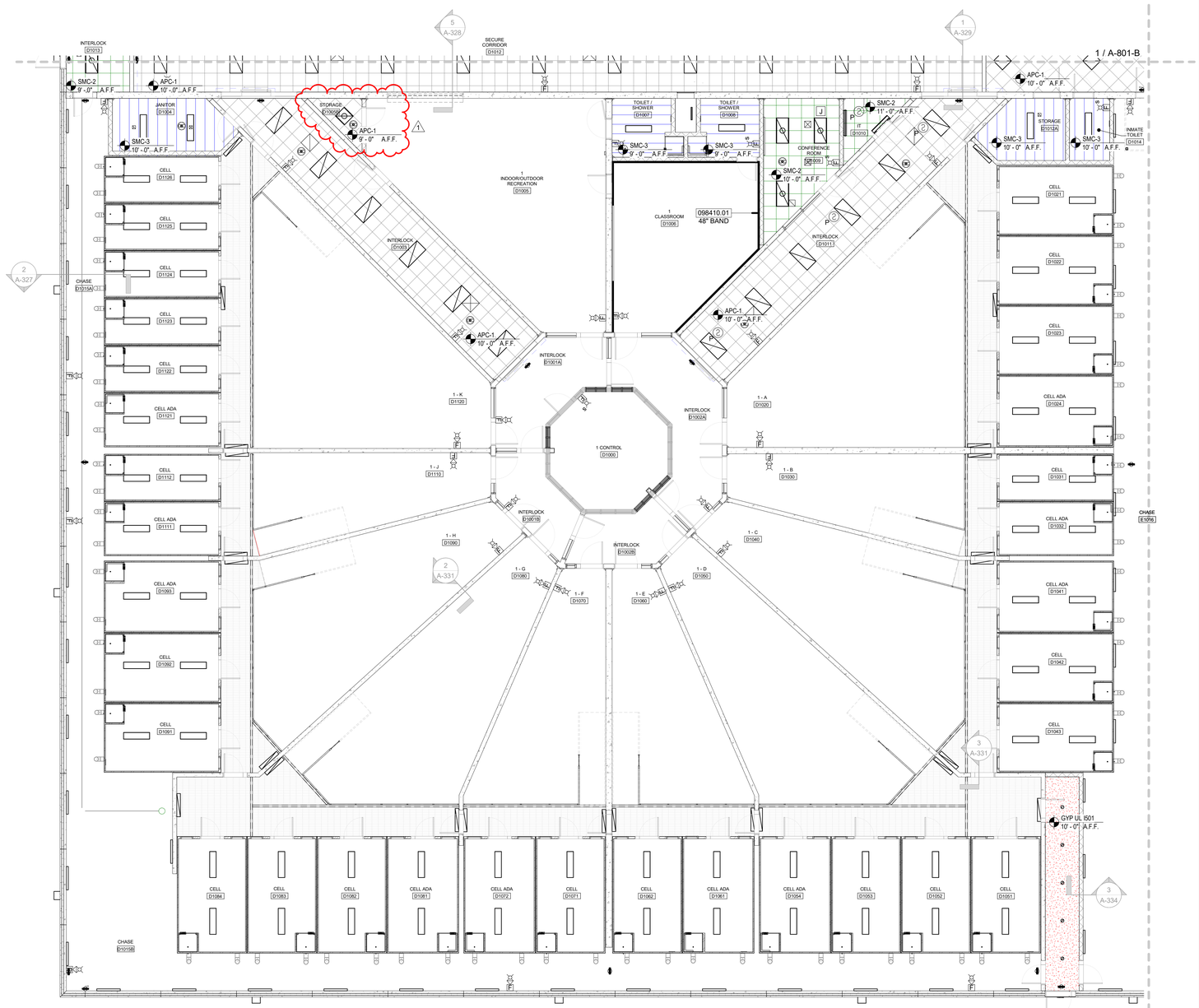
DOOR & WINDOW TYPES

DRAWING NUMBER: A-605
ARCHITECTURE



2 A-801-D **LOWER LEVEL - AREA D**
SCALE: 1/8" = 1'-0"

NORTH



1 A-801-D **FIRST FLOOR REFLECTED CEILING PLAN - AREA D**
SCALE: 1/8" = 1'-0"

NORTH

GENERAL NOTES:

1. REFER TO G-001 FOR ADDITIONAL GENERAL NOTES AND INFORMATION.
2. GYPSUM BOARD CEILINGS LOCATED IN TOILET ROOMS AND LOCKER ROOMS SHALL BE MOLD AND MOISTURE-RESISTANT TYPE.
3. EXPOSED STRUCTURAL STEEL, METAL DECK, AND PRE-CAST CONCRETE SHALL BE PAINTED.
4. EXPOSED DUCTWORK, PIPING AND CONDUIT SHALL BE PAINTED.
5. FIRE-PROTECTION SPRINKLER HEADS SHALL BE LOCATED WITHIN 2" OF THE CENTER OF ACOUSTICAL CEILING PANELS. COORDINATE WITH FIRE PROTECTION SYSTEM.
6. ALL KEYNOTES INDICATE ONE GRAPHIC REPRESENTATION TYPICAL. CONTRACTOR SHALL USE THE GRAPHICAL REPRESENTATIONS FOR COUNTS AND NOT THE KEYNOTES. THE ABSENCE OF A KEYNOTE DOES NOT ABSOLVE THE CONTRACTOR FROM PROVIDING THE FEATURE GRAPHICALLY SHOWN ON THE DRAWINGS.
7. STEEL CELL CEILINGS ARE TO BE FACTORY FINISHED.
8. BULKHEADS ARE TO BE 2" BELOW CEILING LINE UNLESS NOTED OTHERWISE.

KEYNOTES

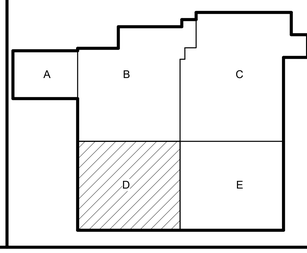
098410.01 FIXED SOUND ABSORBING PANEL

REFLECTED CEILING PLAN LEGEND

- **APC-1** - 24"x24" SUSPENDED ACOUSTICAL PANEL CEILING SYSTEM
- **APC-3** - 24"x24" SUSPENDED ACOUSTICAL PANEL CEILING SYSTEM, VINYL FACED
- **SMC-1** - 24"x24" SECURITY PANEL CEILING SYSTEM, SOLID FACE
- **SMC-2** - 24"x24" SECURITY PANEL CEILING SYSTEM, PERFORATED
- **SMC-3** - 24" SECURITY PLANK CEILING SYSTEM, SOLID
- **SMC-4** - 24" SECURITY PLANK CEILING SYSTEM, PERFORATED
- SUSPENDED GYPSUM BOARD CEILING (PAINTED)
- SUSPENDED GYPSUM BOARD CEILING - 1 HOUR FIRE RATED UL #I501
- PRECAST HOLLOW CORE SLAB
- METAL SOFFIT PANEL (PRE-FINISHED)
- EXPOSED
- RETURN AIR GRILLE, SEE MECHANICAL
- SUPPLY AIR DIFFUSER, SEE MECHANICAL
- EXHAUST GRILLE, SEE MECHANICAL
- LIGHT FIXTURE, SEE ELECTRICAL
- LIGHT FIXTURE, SEE ELECTRICAL
- LIGHT FIXTURE, SEE ELECTRICAL
- OC OCCUPANCY SENSOR
- S SMOKE DETECTOR
- ACCESS PANEL, COORDINATE LOCATION AND SIZE WITH MEP EQUIPMENT
- INDICATES WALL TO DECK

NOTE:
ELEMENTS ON THIS DRAWING ARE IDENTIFIED BY VARIOUS COLORS; IF THIS NOTE IS NOT RED, THIS DRAWING IS NOT IN COLOR AND NEEDS TO BE REPRINTED IN COLOR.

KEY PLAN



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ARCHITECTURE • ENGINEERING • PLANNING
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DLZ INDIANA, LLC

BRIC B. RATY'S REGISTERED No. AR19500134 STATE OF INDIANA MICHAEL

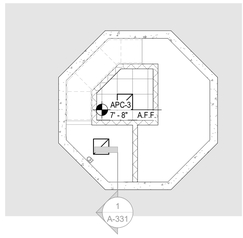
NO.	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: CAG CHK'D: SAC
DESIGNED: EBR
APPR'VD: EBR
DATE: September 5, 2019
PROJECT NUMBER: 1663-1190-90

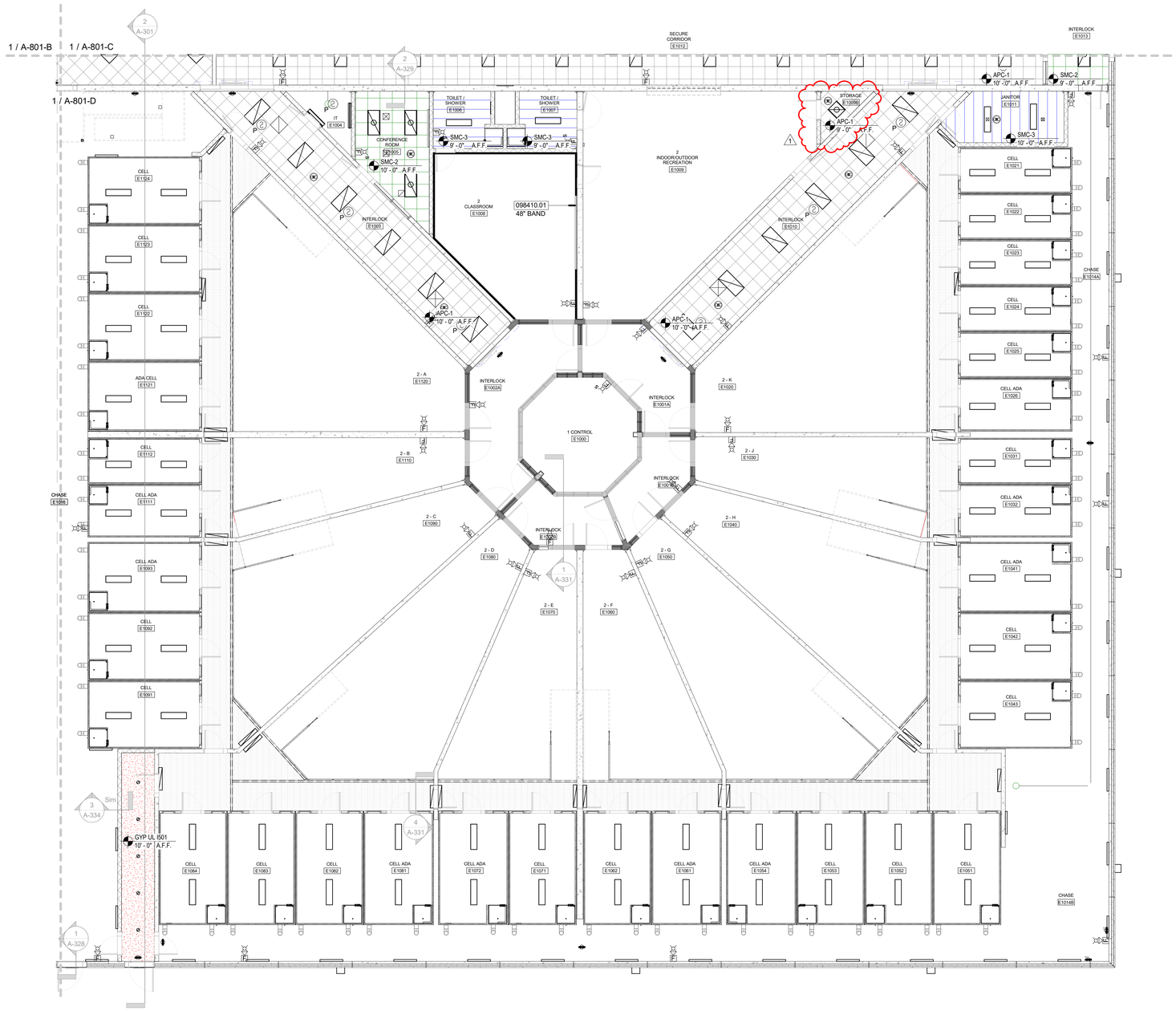
A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

FIRST FLOOR REFLECTED CEILING PLAN - AREA D

DRAWING NUMBER: A-801-D
ARCHITECTURE



2 A-801-E **LOWER LEVEL - AREA E**
SCALE: 1/8" = 1'-0"
NORTH



1 A-801-E **FIRST FLOOR REFLECTED CEILING PLAN - AREA E**
SCALE: 1/8" = 1'-0"
NORTH

GENERAL NOTES:

1. REFER TO G-001 FOR ADDITIONAL GENERAL NOTES AND INFORMATION.
2. GYPSUM BOARD CEILINGS LOCATED IN TOILET ROOMS AND LOCKER ROOMS SHALL BE MOLD AND MOISTURE-RESISTANT TYPE.
3. EXPOSED STRUCTURAL STEEL, METAL DECK, AND PRE-CAST CONCRETE SHALL BE PAINTED.
4. EXPOSED DUCTWORK, PIPING AND CONDUIT SHALL BE PAINTED.
5. FIRE-PROTECTION SPRINKLER HEADS SHALL BE LOCATED WITHIN 2" OF THE CENTER OF ACOUSTICAL CEILING PANELS. COORDINATE WITH FIRE PROTECTION SYSTEM.
6. ALL KEYNOTES INDICATE ONE GRAPHIC REPRESENTATION TYPICAL. CONTRACTOR SHALL USE THE GRAPHICAL REPRESENTATIONS FOR COUNTS AND NOT THE KEYNOTES. THE ABSENCE OF A KEYNOTE DOES NOT ABSOLVE THE CONTRACTOR FROM PROVIDING THE FEATURE GRAPHICALLY SHOWN ON THE DRAWINGS.
7. STEEL CELL CEILINGS ARE TO BE FACTORY FINISHED.
8. BULKHEADS ARE TO BE 2" BELOW CEILING LINE UNLESS NOTED OTHERWISE.

KEYNOTES

098410.01 FIXED SOUND ABSORBING PANEL

REFLECTED CEILING PLAN LEGEND

- **APC-1** - 24"x24" SUSPENDED ACOUSTICAL PANEL CEILING SYSTEM
- **APC-3** - 24"x24" SUSPENDED ACOUSTICAL PANEL CEILING SYSTEM, VINYL FACED
- **SMC-1** - 24"x24" SECURITY PANEL CEILING SYSTEM, SOLID FACE
- **SMC-2** - 24"x24" SECURITY PANEL CEILING SYSTEM, PERFORATED
- **SMC-3** - 24" SECURITY PLANK CEILING SYSTEM, SOLID
- **SMC-4** - 24" SECURITY PLANK CEILING SYSTEM, PERFORATED
- SUSPENDED GYPSUM BOARD CEILING (PAINTED)
- SUSPENDED GYPSUM BOARD CEILING - 1 HOUR FIRE RATED UL #I501
- PRECAST HOLLOW CORE SLAB
- METAL SOFFIT PANEL (PRE-FINISHED)
- EXPOSED
- RETURN AIR GRILLE, SEE MECHANICAL
- SUPPLY AIR DIFFUSER, SEE MECHANICAL
- EXHAUST GRILLE, SEE MECHANICAL
- LIGHT FIXTURE, SEE ELECTRICAL
- LIGHT FIXTURE, SEE ELECTRICAL
- LIGHT FIXTURE, SEE ELECTRICAL
- OC OCCUPANCY SENSOR
- S SMOKE DETECTOR
- ACCESS PANEL, COORDINATE LOCATION AND SIZE WITH MEP EQUIPMENT
- INDICATES WALL TO DECK

NOTE:
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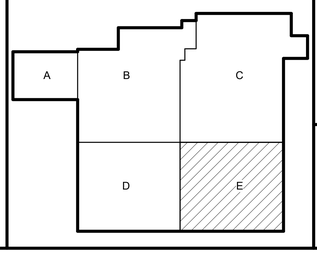
KEY PLAN



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ARCHITECTURE • ENGINEERING • PLANNING
SURVEYING • CONSTRUCTION SERVICES
DLZ INDIANA, LLC

BRIC B. RATY'S REGISTERED No. AR19500134 STATE OF INDIANA MEMBER NCARB

NO.	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: CAG
DESIGNED: EBR
APPRV'D: EBR
CHK'D: SAC
DATE: September 5, 2019
PROJECT NUMBER 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

FIRST FLOOR REFLECTED CEILING PLAN - AREA E

DRAWING NUMBER A-801-E
ARCHITECTURE

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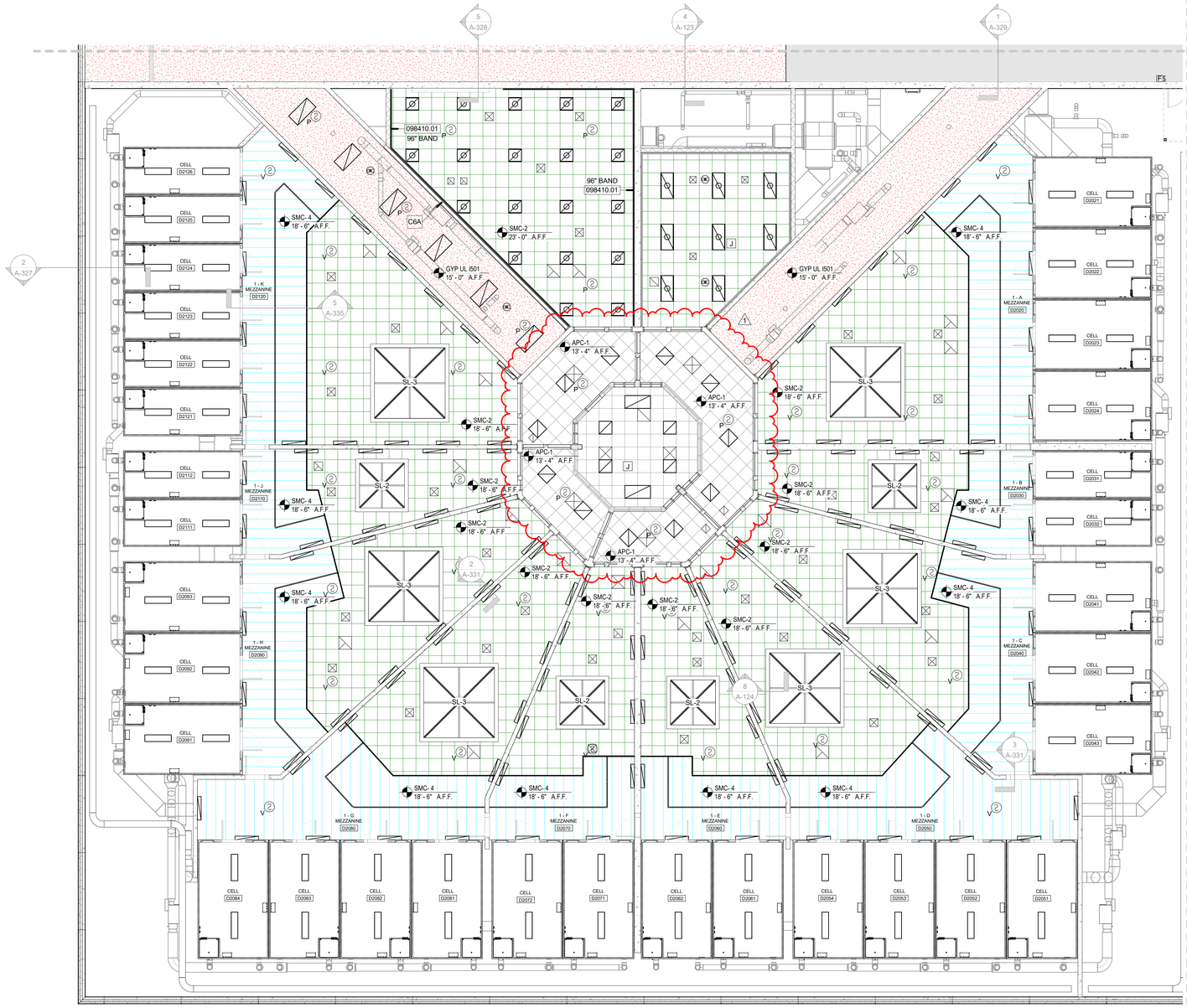

1 A-802-D **LEVEL 2 MEZZANINE - AREA D**
SCALE: 1/8" = 1'-0"
NORTH

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GENERAL NOTES:

1. REFER TO G-001 FOR ADDITIONAL GENERAL NOTES AND INFORMATION.
2. GYPSUM BOARD CEILINGS LOCATED IN TOILET ROOMS AND LOCKER ROOMS SHALL BE MOLD AND MOISTURE-RESISTANT TYPE.
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KEYNOTES

098410.01 FIXED SOUND ABSORBING PANEL

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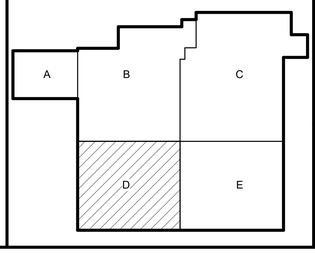
- **SMC-3** - 24" SECURITY PLANK CEILING SYSTEM, SOLID
- **SMC-4** - 24" SECURITY PLANK CEILING SYSTEM, PERFORATED
- SUSPENDED GYPSUM BOARD CEILING (PAINTED)
- SUSPENDED GYPSUM BOARD CEILING - 1 HOUR FIRE RATED UL #I501
- PRECAST HOLLOW CORE SLAB
- METAL SOFFIT PANEL (PRE-FINISHED)
- EXPOSED
- RETURN AIR GRILLE, SEE MECHANICAL
- SUPPLY AIR DIFFUSER, SEE MECHANICAL
- EXHAUST GRILLE, SEE MECHANICAL
- LIGHT FIXTURE, SEE ELECTRICAL
- LIGHT FIXTURE, SEE ELECTRICAL
- LIGHT FIXTURE, SEE ELECTRICAL
- OC OCCUPANCY SENSOR
- S SMOKE DETECTOR
- V ACCESS PANEL, COORDINATE LOCATION AND SIZE WITH MEP EQUIPMENT
- INDICATES WALL TO DECK

NOTE:
ELEMENTS ON THIS DRAWING ARE IDENTIFIED BY VARIOUS COLORS; IF THIS NOTE IS NOT RED, THIS DRAWING IS NOT IN COLOR AND NEEDS TO BE REPRINTED IN COLOR.

KEY PLAN



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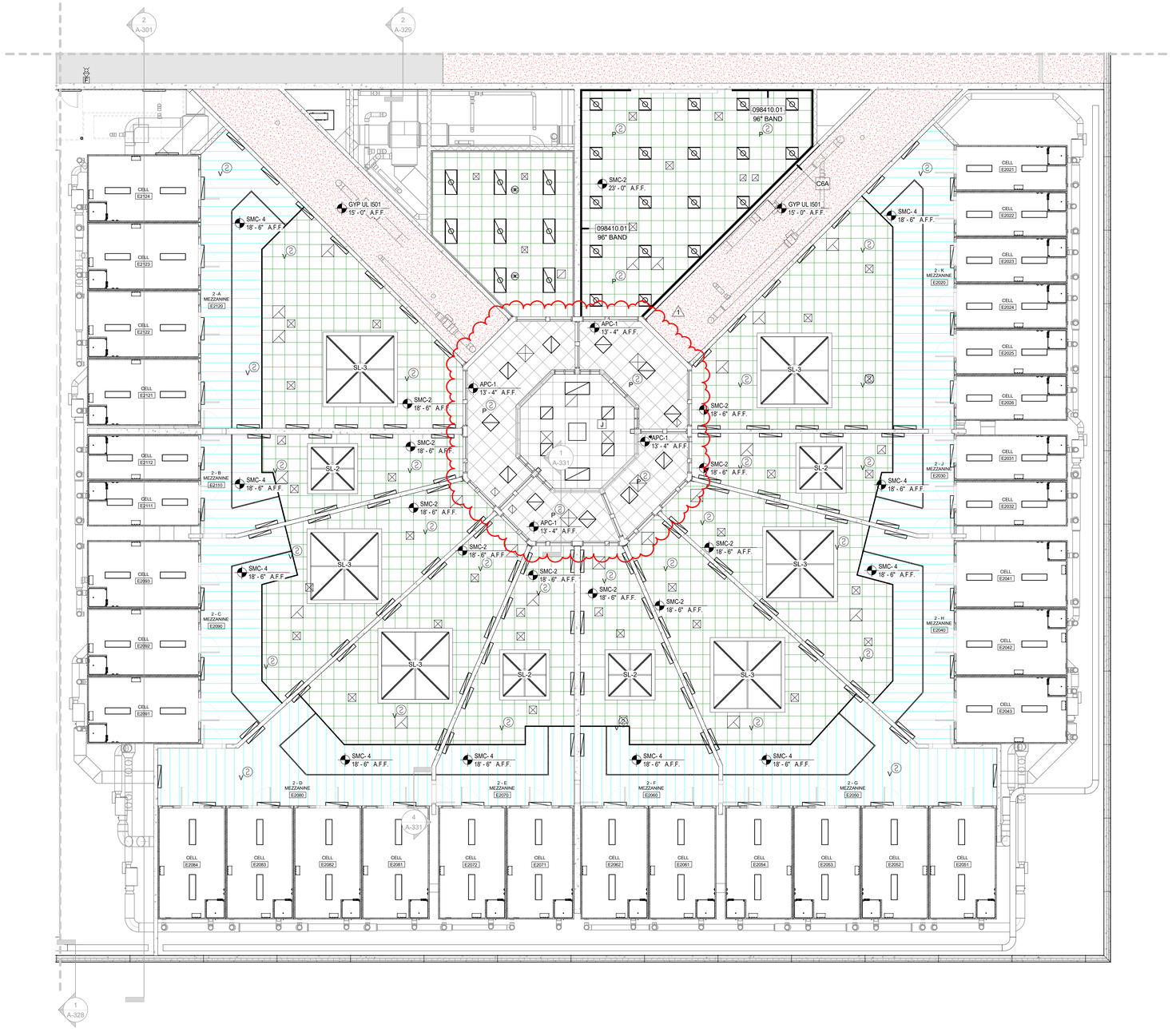
ERIC B. RATTS REGISTERED No. AR19500134 STATE OF INDIANA REGISTERED ARCHITECT

NO.	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: CAG | CHK'D: SAC
DESIGNED: EBR
APPRV'D: EBR
DATE: September 5, 2019
PROJECT NUMBER 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA
SECOND FLOOR REFLECTED CEILING PLAN - AREA D

DRAWING NUMBER A-802-D ARCHITECTURE



1 A-802-E **LEVEL 2 MEZZANINE - AREA E**
SCALE: 1/8" = 1'-0"
NORTH

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GENERAL NOTES:

1. REFER TO G-001 FOR ADDITIONAL GENERAL NOTES AND INFORMATION.
2. GYPSUM BOARD CEILINGS LOCATED IN TOILET ROOMS AND LOCKER ROOMS SHALL BE MOLD AND MOISTURE-RESISTANT TYPE.
3. EXPOSED STRUCTURAL STEEL, METAL DECK, AND PRE-CAST CONCRETE SHALL BE PAINTED.
4. EXPOSED DUCTWORK, PIPING AND CONDUIT SHALL BE PAINTED.
5. FIRE-PROTECTION SPRINKLER HEADS SHALL BE LOCATED WITHIN 2" OF THE CENTER OF ACOUSTICAL CEILING PANELS. COORDINATE WITH FIRE PROTECTION SYSTEM.
6. ALL KEYNOTES INDICATE ONE GRAPHIC REPRESENTATION TYPICAL. CONTRACTOR SHALL USE THE GRAPHICAL REPRESENTATIONS FOR COUNTS AND NOT THE KEYNOTES. THE ABSENCE OF A KEYNOTE DOES NOT ABSOLVE THE CONTRACTOR FROM PROVIDING THE FEATURE GRAPHICALLY SHOWN ON THE DRAWINGS.
7. STEEL CELL CEILINGS ARE TO BE FACTORY FINISHED.
8. BULKHEADS ARE TO BE 2" BELOW CEILING LINE UNLESS NOTED OTHERWISE.

KEYNOTES

098410.01 FIXED SOUND ABSORBING PANEL

REFLECTED CEILING PLAN LEGEND

- **APC-1** - 24"x24" SUSPENDED ACOUSTICAL PANEL CEILING SYSTEM
- **APC-3** - 24"x24" SUSPENDED ACOUSTICAL PANEL CEILING SYSTEM, VINYL FACED
- **SMC-1** - 24"x24" SECURITY PANEL CEILING SYSTEM, SOLID FACE
- **SMC-2** - 24"x24" SECURITY PANEL CEILING SYSTEM, PERFORATED
- **SMC-3** - 24" SECURITY PLANK CEILING SYSTEM, SOLID
- **SMC-4** - 24" SECURITY PLANK CEILING SYSTEM, PERFORATED
- SUSPENDED GYPSUM BOARD CEILING (PAINTED)
- SUSPENDED GYPSUM BOARD CEILING - 1 HOUR FIRE RATED UL #I501
- PRECAST HOLLOW CORE SLAB
- METAL SOFFIT PANEL (PRE-FINISHED)
- EXPOSED
- RETURN AIR GRILLE, SEE MECHANICAL
- SUPPLY AIR DIFFUSER, SEE MECHANICAL
- EXHAUST GRILLE, SEE MECHANICAL
- LIGHT FIXTURE, SEE ELECTRICAL
- LIGHT FIXTURE, SEE ELECTRICAL
- LIGHT FIXTURE, SEE ELECTRICAL
- OCCUPANCY SENSOR
- SMOKE DETECTOR
- ACCESS PANEL, COORDINATE LOCATION AND SIZE WITH MEP EQUIPMENT
- INDICATES WALL TO DECK

NOTE:
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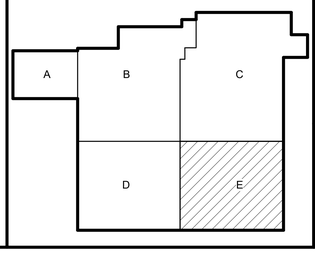
KEY PLAN



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BRIC B. RATTS — REGISTERED — No. AR19500134 — STATE OF INDIANA — REGISTERED ARCHITECT

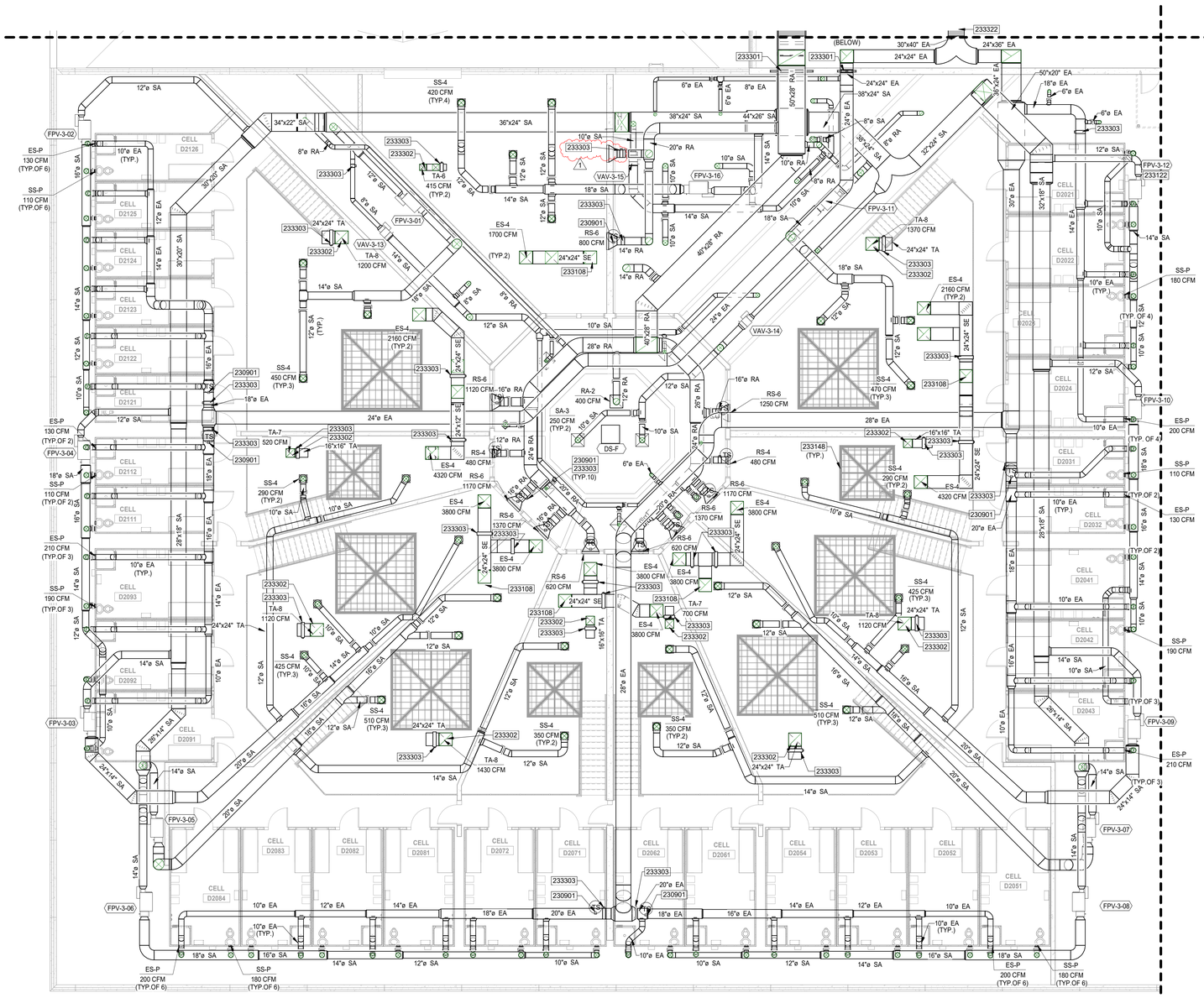
NO.	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: CAG
DESIGNED: EBR
APPRV'D: EBR
CHK'D: SAC
DATE: September 5, 2019
PROJECT NUMBER 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

SECOND FLOOR REFLECTED CEILING PLAN - AREA E

DRAWING NUMBER A-802-E
ARCHITECTURE



1 M-102-D **MEZZANINE DUCTWORK PLAN - AREA D**
SCALE: 1/8" = 1'-0"
NORTH

MECHANICAL NOTES

A. DUCT AND PIPING LAYOUTS ARE SCHEMATIC IN NATURE. PROVIDE ADDITIONAL TRANSITIONS, ELBOWS, OFFSETS, AND FITTINGS AS REQUIRED.

B. COORDINATE ANY STRUCTURAL SUPPORTS FOR OPENINGS WITH STRUCTURAL TRADES.

C. COORDINATE ALL WORK WITH OTHER TRADES TO PERMIT ACCESS AND SERVICE CLEARANCES TO ALL SYSTEMS. COORDINATE DUCT WITH ELECTRICAL J-BOXES TO PREVENT OBSTRUCTIONS.

D. DO NOT SCALE DRAWINGS FOR DIMENSIONS. REFER TO DIMENSIONED DRAWINGS.

E. REFER TO DETAIL SHEETS FOR ADDITIONAL INFORMATION ON INSTALLMENT METHODS.

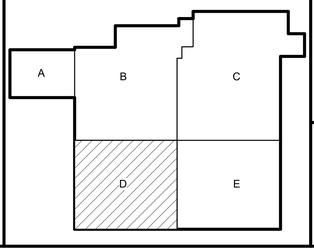
F. DEVIATIONS FROM BASIS OF DESIGN THAT AFFECT OTHER TRADES ARE THE RESPONSIBILITY OF THIS CONTRACTOR. ADDITIONAL COSTS TO PROVIDE LARGER ELECTRICAL CIRCUITS, MORE FLOOR SPACE, ADDITIONAL SUPPORTS, ADDITIONAL MATERIAL, ETC. SHALL BE BORNE BY THIS CONTRACTOR. COORDINATE ALL WORK WITH OTHER TRADES.

G. PROVIDE SECURITY BARS ON ALL DUCTWORK GREATER THAN 8"X8" OR 10" DIA. WHERE PENETRATIONS OF SECURITY WALL TO DECK OR STRUCTURE ABOVE OCCURS. SEE ARCHITECTURAL SECURE WALL PLAN SHEETS A-070 AND A-071 FOR SECURITY WALL LOCATIONS AND TYPE.

HVAC KEYNOTES

230901	PROVIDE RETURN / EXHAUST DUCT MOUNTED TEMPERATURE SENSOR.
233108	24x24 EXHAUST DUCT UP TO ROOF MOUNTED EXHAUST FAN.
233122	COORDINATE VAV BOX HEIGHT TO PROVIDE ADEQUATE CLEARANCE OF HOIST RAIL SYSTEM IN THIS AREA.
233148	LINE OF SKYLIGHT AREA TO BE UNENCUMBERED BY DUCTWORK OR PIPING.
233301	PROVIDE SECURITY BARS. SEE SPECIFICATION 23 33 00.
233302	TRANSFER AIR DUCT BOOT WITHOUT TURNING VANES. PROVIDE INTERNAL LINING PER SPECIFICATIONS.
233303	SMOKE DAMPER. SEE CONTROL DRAWINGS.
233322	PROVIDE DUCT SILENCER EA-AHU-4 EXHAUST PER SPECIFICATIONS 23 33 00.

KEY PLAN



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DLZ INDIANA, LLC

JOSHUA R. APLING
REGISTERED
PE 10100274
STATE OF INDIANA
PROFESSIONAL ENGINEER
6/25/19

NO.	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: DWB CHK'D: JRA
DESIGNED: DWB
APPRV'D: JRA
DATE: September 5, 2019
PROJECT NUMBER 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA
MEZZANINE DUCTWORK PLAN - AREA D

DRAWING NUMBER M-102-D MECHANICAL

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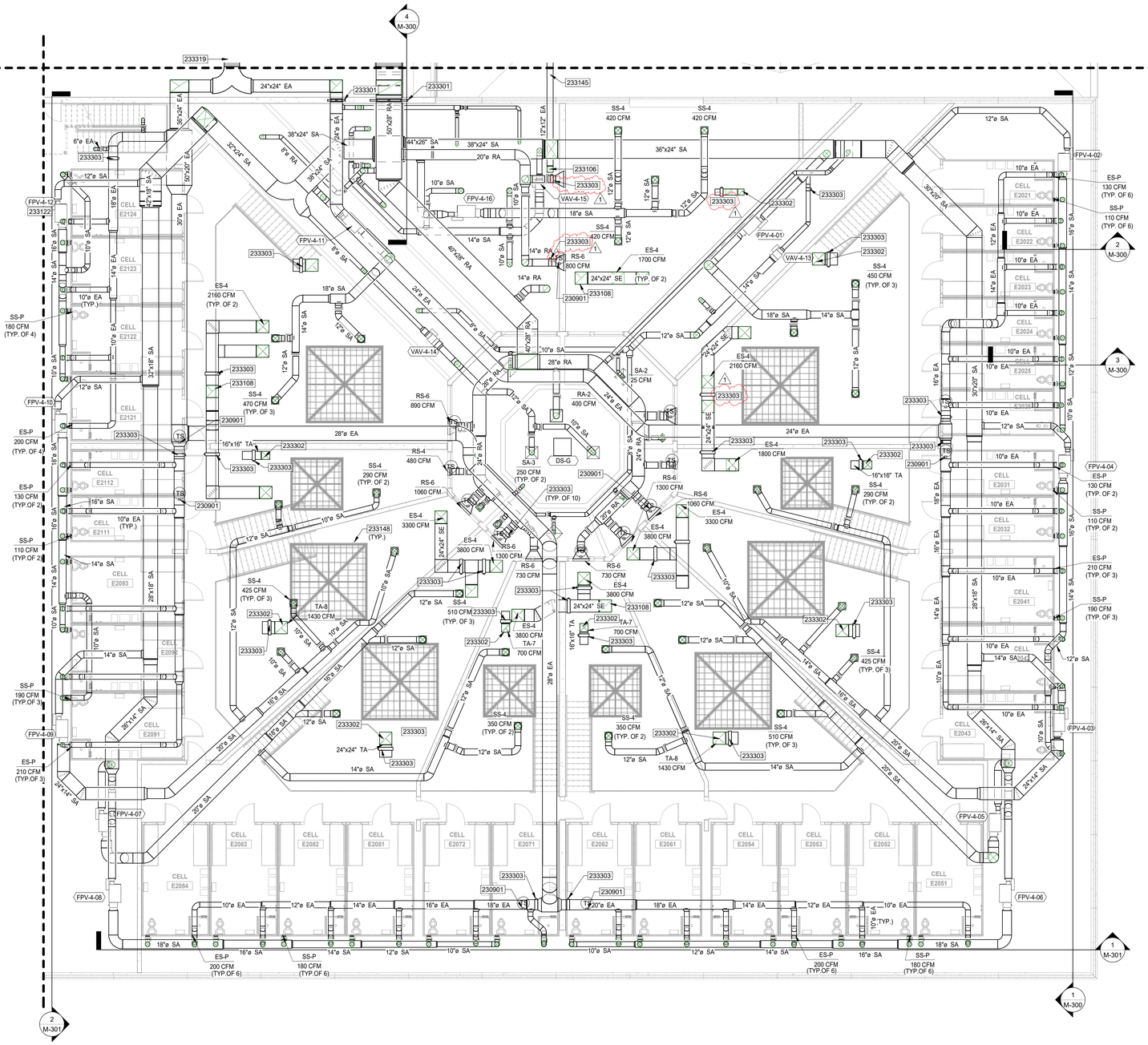


1 M-102-E SCALE: 1/8" = 1'-0"

MEZZANINE DUCTWORK PLAN - AREA E

NORTH

MECHANICAL NOTES

A. DUCT AND PIPING LAYOUTS ARE SCHEMATIC IN NATURE. PROVIDE ADDITIONAL TRANSITIONS, ELBOWS, OFFSETS, AND FITTINGS AS REQUIRED.

B. COORDINATE ANY STRUCTURAL SUPPORTS FOR OPENINGS WITH STRUCTURAL TRADES.

C. COORDINATE ALL WORK WITH OTHER TRADES TO PERMIT ACCESS AND SERVICE CLEARANCES TO ALL SYSTEMS. COORDINATE DUCT WITH ELECTRICAL J-BOXES TO PREVENT OBSTRUCTIONS.

D. DO NOT SCALE DRAWINGS FOR DIMENSIONS. REFER TO DIMENSIONED DRAWINGS.

E. REFER TO DETAIL SHEETS FOR ADDITIONAL INFORMATION ON INSTALLMENT METHODS.

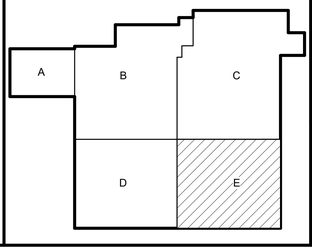
F. DEVIATIONS FROM BASIS OF DESIGN THAT AFFECT OTHER TRADES ARE THE RESPONSIBILITY OF THIS CONTRACTOR. ADDITIONAL COSTS TO PROVIDE LARGER ELECTRICAL CIRCUITS, MORE FLOOR SPACE, ADDITIONAL SUPPORTS, ADDITIONAL MATERIAL, ETC. SHALL BE BORNE BY THIS CONTRACTOR. COORDINATE ALL WORK WITH OTHER TRADES.

G. PROVIDE SECURITY BARS ON ALL DUCTWORK GREATER THAN 8"X8" OR 10" DIA. WHERE PENETRATIONS OF SECURITY WALL TO DECK OR STRUCTURE ABOVE OCCURS. SEE ARCHITECTURAL SECURE WALL PLAN SHEETS A-070 AND A-071 FOR SECURITY WALL LOCATIONS AND TYPE.

HVAC KEYNOTES

230901	PROVIDE RETURN / EXHAUST DUCT MOUNTED TEMPERATURE SENSOR.
233106	12x12 EXHAUST DUCT UP TO ROOF MOUNTED EXHAUST FAN.
233108	24x24 EXHAUST DUCT UP TO ROOF MOUNTED EXHAUST FAN.
233122	COORDINATE VAV BOX HEIGHT TO PROVIDE ADEQUATE CLEARANCE OF HOIST RAIL SYSTEM IN THIS AREA.
233145	EXHAUST DUCT FROM TRASH ROOM.
233148	LINE OF SKYLIGHT AREA TO BE UNENCUMBERED BY DUCTWORK OR PIPING.
233301	PROVIDE SECURITY BARS. SEE SPECIFICATION 23 33 00.
233302	TRANSFER AIR DUCT BOOT WITHOUT TURNING VANES. PROVIDE INTERNAL LINING PER SPECIFICATIONS.
233303	SMOKE DAMPER. SEE CONTROL DRAWINGS.
233319	PROVIDE DUCT SILENCER EA-AHU-3 EXHAUST PER SPECIFICATIONS 23 33 00.

KEY PLAN



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JOSHUA R. APLING — REGISTERED — PE 10700024 — STATE OF INDIANA — PROFESSIONAL ENGINEER

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DRAWN: DWB CHK'D: JRA
DESIGNED: DWB
APPRV'D: JRA
DATE: September 5, 2019
PROJECT NUMBER 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

MEZZANINE DUCTWORK PLAN -AREA E

DRAWING NUMBER M-102-E

MECHANICAL

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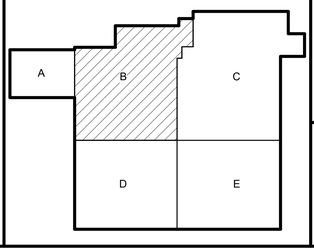
GENERAL NOTES

1. INSTALL ALL EQUIPMENTS PER MANUFACTURER'S RECOMMENDATIONS.
2. REFER TO DRAWINGS P-001 FOR GENERAL INFORMATION NOTES, SYMBOLS AND ABBREVIATION.
3. INVERT ELEVATIONS BASED ON 100.00' FINISHED FLOOR ELEVATION TO BOTTOM OF PIPE. SITE/CIVIL PLANS ESTABLISH FINISHED FLOOR ELEVATION.
4. PROVIDE GAS PRESSURE REGULATORS AS NEEDED FOR EQUIPMENT.
5. COORDINATE ALL BELOW GRADE PIPING WITH STRUCTURAL FOOTING.
6. EXACT LOCATION OF PLUMBING FIXTURES SHALL BE COORDINATED WITH ARCHITECTURAL PLANS TO MEET ADA REQUIREMENTS.
7. NO EXPOSED PIPING SHALL BE INSTALLED IN SECURITY/INMATE OCCUPIED AREAS.
8. WHERE PIPE SIZE MAY NOT BE INDICATED SERVING A FIXTURE, PROVIDE SIZES AS INDICATED IN THE PLUMBING FIXTURE SCHEDULES.
9. NOT ALL NOTES APPLICABLE TO EACH SHEET.

PLUMBING KEYNOTES

220501	DHWR BALANCING VALVE. PROVIDE SHUT-OFF, STRAINER AND CHECK VALVES DOWNSTREAM OF BALANCING VALVE. BALANCE TO GPM INDICATED ON PLANS.
220502	PROVIDE EXPANSION V-LOOP IN PIPING AT LOCATION INDICATED. REFER TO SPECIFICATION 220516 FOR DELEGATED DESIGN REQUIREMENTS. PROVIDE ALL GUIDES AND ANCHORS PER MANUFACTURER RECOMMENDATION.
220503	PROVIDE PIPE GUIDE IN PIPING AT LOCATION INDICATED. REFER TO SPECIFICATION 220516 FOR DELEGATED DESIGN REQUIREMENTS. PROVIDE ALL EXPANSION V-LOOPS AND ANCHORS PER MANUFACTURER RECOMMENDATION.
220504	PROVIDE PIPE ANCHOR IN PIPING AT LOCATION INDICATED. REFER TO SPECIFICATION 220516 FOR DELEGATED DESIGN REQUIREMENTS. PROVIDE ALL EXPANSION V-LOOPS AND PIPE GUIDES PER MANUFACTURER RECOMMENDATION.
221103	PROVIDE 1" DCW FOR REMOTE FLUSH VALVE. 1" DCW TO BE ROUTED FROM REMOTE FLUSH VALVE TO DT-1. REFER TO P-100 FOR 1" DCW ROUTING AND DT-1 LOCATION.
221104	PROVIDE SHUT-OFF VALVE.
221106	3/4" DCW AND DHW DOWN.
221107	3/4" DCW UP TO B2000 MECHANICAL ROOM ON MECHANICAL MEZZANINE FLOOR. REFER TO P-102-BC FOR PIPE CONTINUATION.
221109	3/4" DCW UP TO ROOF FOR RH-1.
221111	PROVIDE WITH FLEX PIPE TO CONNECT FROM 3/4" DHW PIPE IN CHASE TO SH FIXTURE.
221114	PIPE CAPPED FOR FUTURE EXPANSION. PROVIDE SHUT-OFF VALVE.
221116	PROVIDE WATER HAMMER ARRESTOR ON DCW AND DHW TYPICAL OF EACH CHASE.
221119	1/2"DCW TO HUMIDIFIER ON CRAC UNIT. PROVIDE 1/2" BACKFLOW PREVENTER. REFER TO MECHANICAL PLANS FOR EXACT LOCATION.
221305	4" SAN DN FROM FS-1 IN THE B2000 MECHANICAL ROOM ON MECHANICAL MEZZANINE FLOOR.
221306	4" SAN DN FROM FCO-1 IN THE B2000 MECHANICAL ROOM ON MECHANICAL MEZZANINE FLOOR.
221308	1-1/2" SAN DN AND 1-1/4" V UP.
221309	1-1/2" SAN DN AND 1-1/2" V UP.
221312	2" V UP.
221313	1-1/2" V UP.
221315	3" V UP. PROVIDE 4" VTR AT A ROOF TERMINATION.
221316	2" V UP. PROVIDE 4" VTR AT A ROOF TERMINATION.
221317	1-1/2" V UP. PROVIDE 4" VTR AT A ROOF TERMINATION.
221409	10" STM FROM ABOVE.
221412	6" STM DN FROM ORD-1.
221413	6" STM DN FROM RD-1.
221414	PROVIDE CO.
221415	8" STM DN.
221417	3" STM FROM RD-2.

KEY PLAN



1 FIRST FLOOR PLUMBING PLAN - AREA B
P-101-B SCALE: 1/8" = 1'-0"
NORTH

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JOSHUA R. APLING REGISTERED PE 10100274 STATE OF INDIANA PROFESSIONAL ENGINEER 6/25/19

NO.	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: KB
DESIGNED: KB
CHK'D: JRA
APPRV'D: JRA
DATE: September 5, 2019
PROJECT NUMBER 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA
FIRST FLOOR PLUMBING PLAN - AREA B

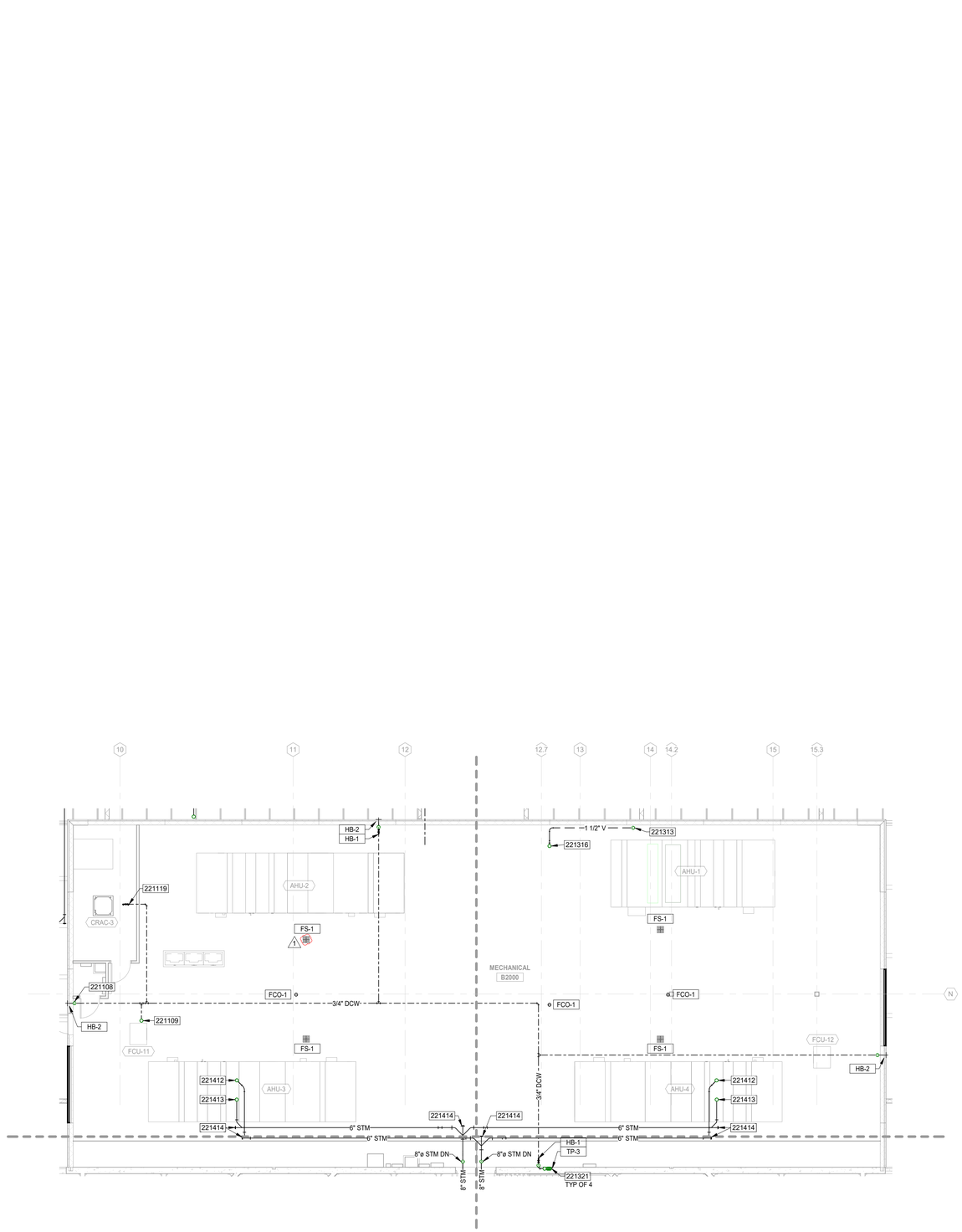
DRAWING NUMBER P-101-B
PLUMBING

GENERAL NOTES

1. INSTALL ALL EQUIPMENTS PER MANUFACTURER'S RECOMMENDATIONS.
2. REFER TO DRAWINGS P-001 FOR GENERAL INFORMATION NOTES, SYMBOLS AND ABBREVIATION.
3. INVERT ELEVATIONS BASED ON 100.00' FINISHED FLOOR ELEVATION TO BOTTOM OF PIPE. SITE/CIVIL PLANS ESTABLISH FINISHED FLOOR ELEVATION.
4. PROVIDE GAS PRESSURE REGULATORS AS NEEDED FOR EQUIPMENT.
5. COORDINATE ALL BELOW GRADE PIPING WITH STRUCTURAL FOOTING.
6. EXACT LOCATION OF PLUMBING FIXTURES SHALL BE COORDINATED WITH ARCHITECTURAL PLANS TO MEET ADA REQUIREMENTS.
7. NO EXPOSED PIPING SHALL BE INSTALLED IN SECURITY/INMATE OCCUPIED AREAS.
8. WHERE PIPE SIZE MAY NOT BE INDICATED SERVING A FIXTURE, PROVIDE SIZES AS INDICATED IN THE PLUMBING FIXTURE SCHEDULES.
9. NOT ALL NOTES APPLICABLE TO EACH SHEET.

PLUMBING KEYNOTES

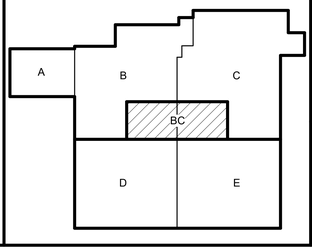
221108	3/4" DCW UP CLOSE TO WALL FROM THE FIRST FLOOR ABOVE CIELING SPACE. INSTALL DCW ROUTING PIPE IN B2000 MECHANICAL ROOM CLOSE TO ROOF.
221109	3/4" DCW UP TO ROOF FOR RH-1.
221119	1/2"DCW TO HUMIDIFIER ON CRAC UNIT. PROVIDE 1/2" BACKFLOW PREVENTER. REFER TO MECHANICAL PLANS FOR EXACT LOCATION.
221313	1-1/2" V UP.
221316	2" V UP. PROVIDE 4" VTR AT A ROOF TERMINATION.
221321	1/2" TP DN.
221412	6" STM DN FROM ORD-1.
221413	6" STM DN FROM RD-1.
221414	PROVIDE CO.



1 MECHANICAL MEZZANINE PLUMBING PLAN - AREA B & C
P-102-BC SCALE: 1/8" = 1'-0"

NORTH

KEY PLAN



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JOSHUA R. APLING REGISTERED PE 10100024 STATE OF INDIANA PROFESSIONAL ENGINEER
9/5/19

NO.	REVISION	DATE
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DESIGNED: KB
CHK'D: JRA
APPR'VD: JRA
DATE: September 5, 2019
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A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

MECHANICAL MEZZANINE PLUMBING PLAN - AREA B & C

DRAWING NUMBER P-102-BC

PLUMBING

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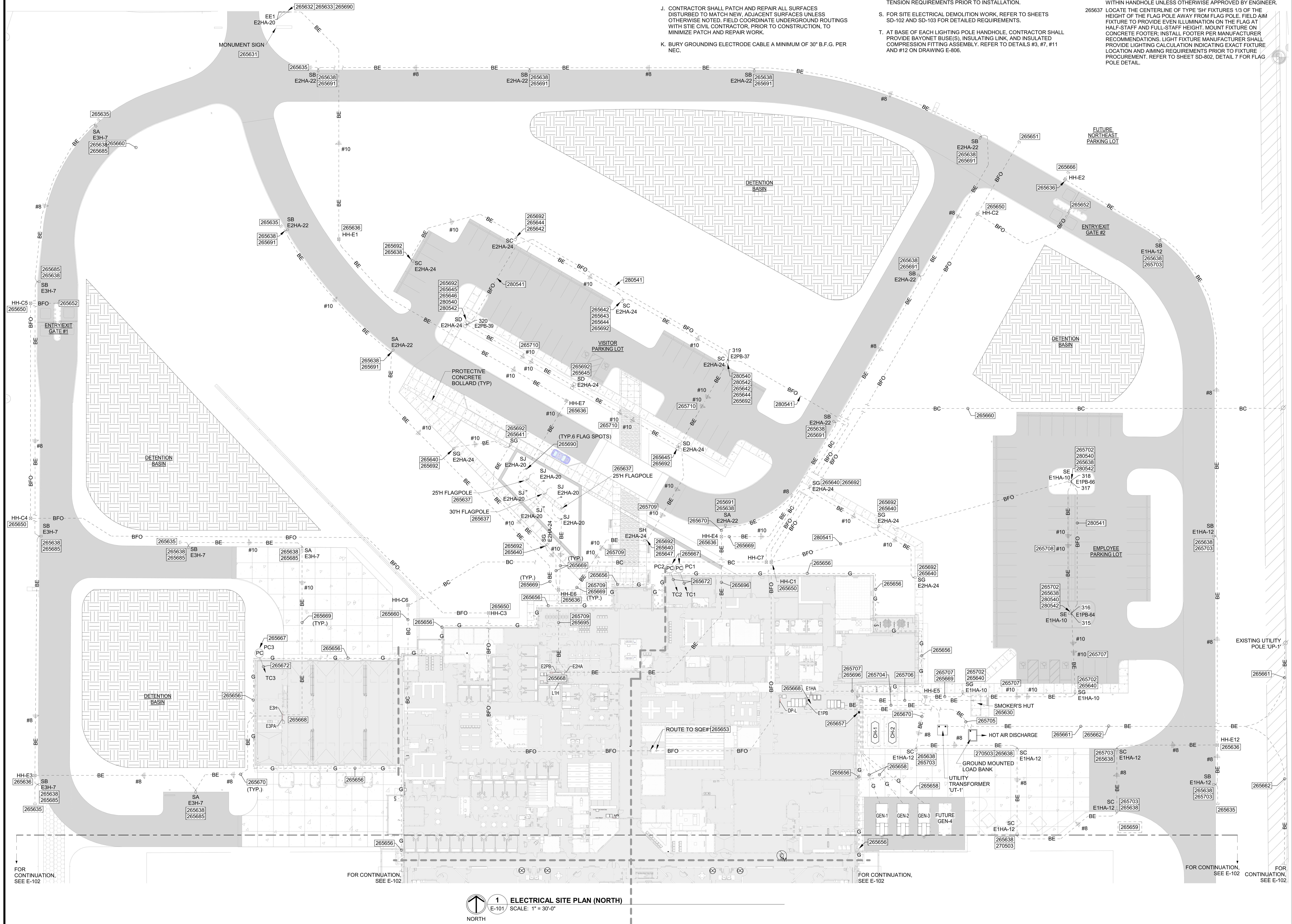

1 E-101 ELECTRICAL SITE PLAN (NORTH)
SCALE: 1" = 30'-0"
NORTH

GENERAL NOTES

A. FOR LIGHTING FIXTURE SCHEDULE, SEE DRAWING E-606.

B. (TYPICAL) CONDUIT DEPTH SHALL BE A MINIMUM 3'-6" BFG (I.E. BELOW FROSTLINE) U.O.N., COORDINATE DEPTH WITH PAVING DETAILS.

C. ELECTRIC UTILITY COMPANY IS DUKE ENERGY, CONTACT: TYLER ANGLE - PHONE: 812-231-8721 - EMAIL: Tyler.Angle@duke-energy.com.

D. REFER TO SITE-CIVIL DRAWINGS FOR TELEPHONE AND COMMUNICATIONS COMPANY CONTACT INFORMATION

E. USE RIGID GALVANIZED SLEEVES UNDER VEHICLE TRAFFIC AREAS. EXTEND SLEEVES 5'-0" BEYOND THE PAVED VEHICLE TRAFFIC AREAS.

F. CONTRACTOR SHALL FIELD COORDINATE (ON-SITE) PRIOR TO CONSTRUCTION WITH ELECTRIC UTILITY, TELEPHONE UTILITY AND CABLE TV UTILITY TO FIELD COORDINATE EXACT UTILITY REQUIREMENTS.

G. REFERENCE DRAWING SD-401 FOR LOCATIONS OF INCOMING UTILITIES.

H. ROUTINGS ARE DIAGRAMMATIC. FIELD COORDINATE EXACT ROUTINGS WITH SITE CIVIL CONTRACTOR, PRIOR TO CONSTRUCTION, TO AVOID UNDERGROUND UTILITIES, OBSTACLES, ETC. AS REQUIRED.

I. REFER TO SITE CIVIL PLANS FOR UNDERGROUND UTILITIES, PIPING, STRUCTURES, RIGHT OF WAYS, PROPERTY LINES, ETC.

J. CONTRACTOR SHALL PATCH AND REPAIR ALL SURFACES DISTURBED TO MATCH NEW, ADJACENT SURFACES UNLESS OTHERWISE NOTED. FIELD COORDINATE UNDERGROUND ROUTINGS WITH STIE CIVIL CONTRACTOR, PRIOR TO CONSTRUCTION, TO MINIMIZE PATCH AND REPAIR WORK.

K. BURY GROUNDING ELECTRODE CABLE A MINIMUM OF 30" B.F.G. PER NEC.

L. BURY COMMUNICATIONS CONDUITS A MINIMUM OF 3'-0" BFG (I.E. BELOW FROSTLINE) U.O.N.

M. PRIOR TO CONSTRUCTION, COORDINATE WITH CIVIL CONTRACTOR WHERE NECESSARY TO PROVIDE FINAL GRADING COVER AT POLE BASE FOUNDATIONS, BURIED CONDUITS, ETC. FOR SUFFICIENT GROUND COVER WHERE TOPOGRAPHY DROPS OFF STEEPLY AT EDGES OF ROADWAYS FOR DETENTION BASINS, ETC.

N. FOR DIRECT BURIED CONDUIT DETAIL, REFER TO SHEET E-XXX, DETAIL X.

O. ORIENT LIGHTING POLES HANDHOLES ON THE OPPOSITE SIDE (NON-TRAFFIC SIDE) OF PAVED ROADWAYS/PARKING AREAS U.O.N.

P. FOR BUILDING EXTERIOR, PERIMETER/COURTYARD/CANOPY LIGHTING, REFER TO SHEET E-301-A THROUGH E-301-E. ALSO REFER TO ARCHITECTURAL FACADE ELEVATION PLANS.

Q. REFER TO SECURITY ELECTRONICS DRAWINGS FOR DETAILED SECURITY ELECTRONICS (SE) CABLING REQUIREMENTS FOR SE CONDUIT ROUTINGS INDICATED THIS SHEET (I.E. FIBER OPTIC CABLING FOR CAMERAS, CARD READERS, INTERCOMS, ETC). REFER TO SHEET ES-300 AND ES-301 FOR SE RISER DIAGRAMS AND SHEET ES-400 FOR SE CABLE SCHEDULE.

R. CONTRACTOR SHALL USE LONG RADIUS BENDS FOR ALL COMMUNICATION/SECURITY ELECTRONICS (I.E. FIBER OPTIC CABLING) CONDUITS. MINIMIZE BENDS BETWEEN PULL POINTS TO NO MORE THAN THREE (3) 90 DEGREE BENDS; COORDINATE/COMPLY WITH CABLING MANUFACTURERS PULLING TENSION REQUIREMENTS PRIOR TO INSTALLATION.

S. FOR SITE ELECTRICAL DEMOLITION WORK, REFER TO SHEETS SD-102 AND SD-103 FOR DETAILED REQUIREMENTS.

T. AT BASE OF EACH LIGHTING POLE HANDHOLE, CONTRACTOR SHALL PROVIDE BAYONET BUSE(S), INSULATING LINK, AND INSULATED COMPRESSION FITTING ASSEMBLY. REFER TO DETAILS #3, #7, #11 AND #12 ON DRAWING E-806.

SITE KEYNOTES

2656## 2657## 2705## 2805##

265630 SMOKERS HUT SHALL BE NON-ILLUMINATED (LIGHTING/POWER FOR HUT SHALL NOT BE REQUIRED).

265631 ILLUMINATE NORTH FACE OF MONUMENT SIGN. REFER TO DETAIL 3 ON SHEET SD-803 FOR SIGN DETAILS.

265632 SURFACE MOUNT TYPE 'EE1' LIGHTING FIXTURES ON TOP OF CONCRETE FOUNDATION. FOR LIGHTING INSTALLATION AND CONCRETE FOUNDATION DETAILS, SEE SHEET E-806 DETAILS 9 & 10. EMBEDDED JUNCTION BOX SHALL BE LOCATED FOR A CONCEALED WIRING CONNECTION. FOLLOW MANUFACTURER INSTRUCTIONS FOR EXACT PLACEMENT OF BOX PRIOR TO CONSTRUCTION OF THE FOUNDATION.

265633 LOCATE THE CENTERLINE OF TYPE 'EE1' FIXTURES 12'-0" FROM THE FRONT (NORTH) FACE OF THE MONUMENT SIGH. FIELD AIM TYPE 'EE1' LIGHTING FIXTURES TO PROVIDE EVEN ILLUMINATION OF THE ENTIRE FACE OF THE MOMUMENT SIGN. FIELD AIM EACH FIXTURE AT THE CENTER HEIGHT OF THE LOWER PORTION OF THE SIGN FOR INITIAL AIMING; FIELD ADJUST AS NECESSARY TO OBTAIN EVEN ILLUMINATION ON THE ENTIRE SIGN FACE (APPROXIMATELY 25-30 FC AVERAGE VERTICAL). ADJUST AIM TO MAXIMIZE DARK SKIES, USE LIGHT METER AND MEASURE/RECORD POINT BY POINT MEASUREMENTS ON SIGN FACE. SUBMIT TO ENGINEER FOR FINAL APPROVAL OF AIMING PRIOR TO CONSTRUCTION COMPLETION.

265635 FURNISH AND INSTALL CONDUIT SLEEVE 5'-0" BEYOND THE LIGHTING POLE FOUNDATION FOR FUTURE USE (I.E. FUTURE LIGHTING/POLES). CAP CONDUIT END AND FLAG; RECORD LOCATION ON ELECTRICAL RECORD DRAWINGS. FURNISH WITH PULLSTRING IN CONDUIT SLEEVE.

265636 FURNISH AND INSTALL ELECTRICAL HANDHOLE. HANDHOLE COVER SHALL BE LABELED "ELECTRICAL". FOR ELECTRICAL HANDHOLE DETAIL, REFER TO SHEET E-802, DETAIL 2. MINIMIZE SPLICES WITHIN HANDHOLE UNLESS OTHERWISE APPROVED BY ENGINEER.

265637 LOCATE THE CENTERLINE OF TYPE 'SH' FIXTURES 1/3 OF THE HEIGHT OF THE FLAG POLE AWAY FROM FLAG POLE. FIELD AIM FIXTURE TO PROVIDE EVEN ILLUMINATION ON THE FLAG AT HALF-STAFF AND FULL-STAFF HEIGHT. MOUNT FIXTURE ON CONCRETE FOOTER; INSTALL FOOTER PER MANUFACTURER RECOMMENDATIONS. LIGHT FIXTURE MANUFACTURER SHALL PROVIDE LIGHTING CALCULATION INDICATING EXACT FIXTURE LOCATION AND AIMING REQUIREMENTS PRIOR TO FIXTURE PROCUREMENT. REFER TO SHEET SD-802, DETAIL 7 FOR FLAG POLE DETAIL.

SITE KEYNOTES

2656## 2657## 2705## 2805##

265638 TOP OF CONCRETE BASE FOR LIGHT POLE SHALL BE 2'-6" AFG. LIGHT POLE SHALL BE 28'-0"H. FOR LIGHTING POLE FOUNDATION DETAIL, REFER TO SHEET E-802, DETAIL #5. PROVIDE 3'-0" SPACING BETWEEN EDGE OF PAVED ROADWAY/PARKING LOT AND EDGE OF CONCRETE POLE FOUNDATION.

265640 TOP OF CONCRETE BASE FOR LIGHT POLE SHALL BE 0'-6" AFG. LIGHT POLE SHALL BE 15'-0"H. FOR LIGHTING POLE FOUNDATION DETAIL, REFER TO SHEET E-802, DETAIL #5. PROVIDE 2'-0" SPACING BETWEEN EDGE OF SIDEWALK AND EDGE OF CONCRETE POLE FOUNDATION.

265641 TOP OF CONCRETE BASE FOR LIGHT POLE SHALL BE 0'-0" AFG (I.E. FLUSH WITH CONCRETE WALKWAY). LIGHT POLE SHALL BE 15'-6"H. FOR LIGHTING POLE FOUNDATION DETAIL, REFER TO SHEET E-802, DETAIL #3. ALIGN CENTER OF POLE WITH CENTER OF ADJACENT LINE OF PROTECTIVE CONCRETE BOLLARDS (I.E. IN LOCATION AS INDICATED AND SPACED AS INDICATED).

265642 TOP OF CONCRETE BASE FOR LIGHT POLE SHALL BE 0'-6" AFG. LIGHT POLE SHALL BE 30'-0"H. FOR LIGHTING POLE FOUNDATION DETAIL, REFER TO SHEET E-802, DETAIL #5. LOCATE CENTERLINE OF LIGHTING POLE FOUNDATION 5'-0" FROM THE EDGE OF THE PAVED PARKING LOT.

265643 PROVIDE 2'-0" SPACING BETWEEN EDGE OF SIDEWALK (I.E. SIDEWALK ADJACENT TO THE EAST SIDE OF THE CONCRETE POLE FOUNDATION) AND EDGE OF CONCRETE POLE FOUNDATION.

265644 LIGHTING POLE SHALL BE CONFIGURED FOR TWO (2) LIGHTING FIXTURES [I.E. ONE (1) ARM/LIGHTING FIXTURE AS INDICATED AND ONE (1) FUTURE ARM/FUTURE LIGHTING FIXTURE ORIENTED 180 DEGREES APART FOR ILLUMINATION OF FUTURE VISITOR PARKING LOT]. PROVIDE POLE WITH ALL NECESSARY PROVISIONS TO ACCOMODATE THE FUTURE ARM/FUTURE LIGHTING FIXTURE.

265645 TOP OF CONCRETE BASE FOR LIGHT POLE SHALL BE 0'-6" AFG. LIGHT POLE SHALL BE 30'-0"H. FOR LIGHTING POLE FOUNDATION DETAIL, REFER TO SHEET E-802, DETAIL #5. LOCATE CENTERLINE OF LIGHTING POLE FOUNDATION IN THE CENTER OF THE SHRUB BED IN LOCATION AS INDICATED.

265646 PROVIDE 2'-0" SPACING BETWEEN EDGE OF SIDEWALK (I.E. SIDEWALK ADJACENT TO THE WEST SIDE OF THE CONCRETE POLE FOUNDATION) AND EDGE OF CONCRETE POLE FOUNDATION.

265647 PROVIDE 2'-0" SPACING BETWEEN EDGE OF BENCH (I.E. BENCH ADJACENT TO THE SOUTH SIDE OF THE CONCRETE POLE FOUNDATION) AND EDGE OF CONCRETE POLE FOUNDATION.

265650 FURNISH AND INSTALL COMMUNICATION HANDHOLE. HANDHOLE COVER SHALL BE LABELED "FIBER OPTIC". FOR COMMUNICATION HANDHOLE DETAIL, REFER TO SHEET E-802, DETAIL 2. SPLICES SHALL NOT BE ACCEPTABLE WITHIN HANDHOLE.

265651 CAP CONDUIT END AND PROVIDE PULLSTRING IN CONDUIT. FLAG LOCATION AND RECORD ON RECORD DRAWINGS. CONDUIT RESERVED FOR FUTURE NORTHEAST PARKING LOT (I.E. FUTURE FIBER OPTIC CABLE FOR FUTURE SECURITY CAMERAS).

265652 ROUTE CONDUIT UP TO NEMA 4X SECURITY ELECTRONICS ENCLOSURE. REFER TO SE RISER DIAGRAM REFER TO SECURITY ELECTRONICS (SE) RISER ON SHEET ES-300 FOR DETAILED REQUIREMENTS. FURNISH AND INSTALL ALL NECESSARY RACEWAYS, SLEEVES, J-BOXES, AND ELECTRICAL APPURTENANCES AS REQUIRED FOR SE EQUIPMENT (I.E. CAMERAS, CARD READERS, INTERCOMS) LOCATED AT ENTRY/EXIT GATE. REFER TO SE SERIES SHEETS FOR DETAILED REQUIREMENTS. FIELD COORDINATE EXACT LOCATIONS FOR ALL SE/GATE EQUIPMENT WITHIN THIS AREA WITH SE/GATE VENDORS PRIOR TO CONSTRUCTION.

265653 ROUTE CONDUITS FOR SECURITY ELECTRONICS (SE) CABLES (I.E. FIBER OPTIC CABLES) UP TO SQE#1 (IN SECURITY ROOM C1079). CAP SPARE CONDUITS (WITH PULLSTRINGS) AND LABEL. REFER TO SE RISER DIAGRAM ON SHEET ES-300 FOR DETAILED SE CABLING REQUIREMENTS.

265656 #1/0 CU GROUND LOOP IN FOOTING TRENCH FOR BUILDING GROUND. LOCATE 2'-6" BELOW FINISHED GRADE. BOND TO BUILDING REBAR.

265657 GROUND TEST WELL, REFER TO DETAIL #5, DRAWING E-803.

265658 #1/0 CU GROUNDING ELECTRODE CABLE FROM GENERATOR TO MAIN BUILDING GROUND BUS BAR #1 IN MECHANICAL #C1056. LOCATE 2'-6" BELOW FINISH GRADE.

265659 POST INDICATOR VALVE (P.I.V.) REFER TO DRAWING SD-401-D FOR EXACT LOCATION. FURNISH AND INSTALL 3/4"C. BETWEEN P.I.V. AND ELECTRICAL #C1054 FOR FIRE ALARM CONNECTION BETWEEN P.I.V. AND FIRE ALARM CONTROL PANEL (FACP-1), PROVIDE CABLES AS REQUIRED.

265660 (2)-4"C. FROM EXISTING UTILITY POLE TO MAIN DATA FRAME ROOM #B1060 FOR UTILITY COMMUNICATIONS FEEDS, ONE FOR TELEPHONE/DATA AND ONE FOR CABLE. COORDINATE EXACT LOCATION WITH OTHER TRADES BEFORE ROUGH-IN. FURNISH WITH PULLSTRINGS AND MARKER TAPES.

265661 RACEWAY #10A, REFER TO ONE-LINE DIAGRAM, DRAWING E-601. FURNISH WITH PULLSTRING AND MARKER TAPE. COORDINATE EXACT ROUTING WITH UTILITY.

265662 RACEWAY #10B, REFER TO ONE-LINE DIAGRAM, DRAWING E-601. FURNISH WITH PULLSTRING AND MARKER TAPE. COORDINATE EXACT ROUTING WITH UTILITY.

265666 FURNISH AND INSTALL CONDUIT SLEEVE 5'-0" BEYOND THE HANDHOLE FOR FUTURE USE (I.E. FUTURE LIGHTING FOR FUTURE EXTENSION/ADDITION TO NEW YARD/YARD FENCING TO BE INSTALLED). CAP CONDUIT END AND FLAG; RECORD LOCATION ON ELECTRICAL RECORD DRAWINGS. FURNISH WITH PULLSTRING IN CONDUIT SLEEVE.

265667 WALL MOUNT PHOTOCELL 12'-0" AFG (FIELD COORDINATE EXACT MOUNTING HEIGHT TO MATCH HEIGHT OF ADJACENT LIGHTING FIXTURES AS INDICATED ON ARCHITECTURAL ELEVATIONS/ELECTRICAL LIGHTING PLANS). FOR PHOTOCELL WIRING DETAILS, REFER TO EXTERIIOR LIGHTING WIRING DIAGRAMS ON SHEET E-807.

265668 REFER TO LIGHTING PLANS FOR DETAILED LOCATIONS OF TIMECLOCK, LIGHTING CONTACTORS, AND GENERATOR TRANSFER DEVICE; LOCATE THESE ELECTRICAL ITEMS ADJACENT TO ONE ANOTHER IN LOCATIONS AS INDICATED ON LIGHTING PLANS. FOR EXTERIOR LIGHTING CONTROL WIRING DETAILS, REFER TO EXTERIOR LIGHTING WIRING DIAGRAMS ON SHEET E-807.

265669 2 #10, #10G., 1"C (TYPICAL FOR ENTIRE CIRCUIT; I.E - ALL CIRCUIT SEGMENTS).

265670 2 #8, #10G., 1"C (TYPICAL FOR ENTIRE CIRCUIT; I.E - ALL CIRCUIT SEGMENTS).

265672 1#18 TWPR, 3/4"C.

265685 FIXTURE TO BE CONTROLLED ON/OFF VIA TIMECLOCK AND PHOTOCELL. REFER TO DETAIL #3 ON SHEET E-807. CONTROL VIA CONTACTOR #LC3B.

265690 FIXTURE TO BE CONTROLLED ON/OFF VIA TIMECLOCK AND PHOTOCELL. REFER TO DETAIL #2 ON SHEET E-807. CONTROL VIA CONTACTOR #LC2B.

265691 FIXTURE TO BE CONTROLLED ON/OFF VIA TIMECLOCK AND PHOTOCELL. REFER TO DETAIL #2 ON SHEET E-807. CONTROL VIA CONTACTOR #LC2C.

265692 FIXTURE TO BE CONTROLLED ON/OFF VIA TIMECLOCK AND PHOTOCELL. REFER TO DETAIL #2 ON SHEET E-807. CONTROL VIA CONTACTOR #LC2D.

265695 6#10, #10G., 1"C.

265696 2#10, 2#8, #10G., 1"C.

265702 FIXTURE TO BE CONTROLLED ON/OFF VIA TIMECLOCK AND PHOTOCELL. REFER TO DETAIL #1 ON SHEET E-807. CONTROL VIA CONTACTOR #LC1B.

265703 FIXTURE TO BE CONTROLLED ON/OFF VIA TIMECLOCK AND PHOTOCELL. REFER TO DETAIL #1 ON SHEET E-807. CONTROL VIA CONTACTOR #LC1C.

265704 RACEWAY #100, REFER TO ONE-LINE DIAGRAM, DRAWING E-601. FURNISH WITH PULLSTRING AND MARKER TAPE.

265705 RACEWAY #105 AND #315, REFER TO ONE-LINE DIAGRAM, DRAWING E-601. FURNISH WITH PULLSTRING AND MARKER TAPE.

265706 FURNISH AND INSTALL (1)-1"C. FROM MECHANICAL #C1053 TO SMOKER'S HUT FOR FUTURE POWER/LIGHTING. FURNISH WITH PULLSTRING AND MARKER TAPE. STUB AND CAP BELOW SMOKER'S HUT. STUB UP AND CAP BELOW PANEL 'E1PA' IN MECHANICAL ROOM.

265707 3#12, #12G., 3/4"C. FOR SECURITY CAMERA CIRCUITRY.

265708 2#12, #12G., 3/4"C. FOR SECURITY CAMERA CIRCUITRY.

265709 3#10, #10G., 3/4"C. FOR SECURITY CAMERA CIRCUITRY.

265710 2#10, #10G., 3/4"C. FOR SECURITY CAMERA CIRCUITRY.

270503 FURNISH AND INSTALL (1)-2"C. FROM BELOW COUNTER AREA OVER TO CHASE AND STUBBED OUT AT +12" A.F.F. FOR FUTURE COMMUNICATIONS CABLING. FURNISH WITH PULLSTRING.

280540 CCTV EQUIPMENT ENCLOSURE AT BASE OF POLE. FURNISH AND INSTALL 120VAC POWER TO ENCLOSURE. CONNECT TO CIRCUIT SHOWN USING 2#12+G. IN 3/4"C. REFER TO SECURITY DRAWINGS FOR ENCLOSURE INFORMATION.

280541 FURNISH AND INSTALL (1) 6-FIBER, 50 MICRON, MULTI-MODE, OUTDOOR DIRECT BURIAL FIBER CABLE LIKE WEST PENN #WP9C240T DAISY CHAINED TO EACH CAMERA FROM SECURITY ELECTRONICS ROOM #C1079. REFER TO SECURITY DRAWINGS FOR MORE INFORMATION.

280542 SECURITY CAMERA(S) TO BE MOUNTED ON POLE WITH BOTTOM AT +15' AFG. REFER TO SECURITY DRAWINGS FOR MORE INFORMATION.

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NO.	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: RDW CHK'D: MLH
DESIGNED: TKF
APPRV'D: MLH
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER
1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

ELECTRICAL SITE PLAN (NORTH)

DRAWING NUMBER
E-101
ELECTRICAL

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GENERAL NOTES

A. FOR LIGHTING FIXTURE SCHEDULE, SEE DRAWING E-606.

B. (TYPICAL) CONDUIT DEPTH SHALL BE A MINIMUM 3'-6" BFG (I.E. BELOW FROSTLINE) U.O.N., COORDINATE DEPTH WITH PAVING DETAILS.

C. ELECTRIC UTILITY COMPANY IS DUKE ENERGY, CONTACT: TYLER ANGLE - PHONE: 812-231-8721 - EMAIL: Tyler.Angle@duke-energy.com.

D. REFER TO SITE-CIVIL DRAWINGS FOR TELEPHONE AND COMMUNICATIONS COMPANY CONTACT INFORMATION

E. USE RIGID GALVANIZED SLEEVES UNDER VEHICLE TRAFFIC AREAS. EXTEND SLEEVES 5'-0" BEYOND THE PAVED VEHICLE TRAFFIC AREAS.

F. CONTRACTOR SHALL FIELD COORDINATE (ON-SITE) PRIOR TO CONSTRUCTION WITH ELECTRIC UTILITY, TELEPHONE UTILITY AND CABLE TV UTILITY TO FIELD COORDINATE EXACT UTILITY REQUIREMENTS.

G. REFERENCE DRAWING SD-401 FOR LOCATIONS OF INCOMING UTILITIES.

H. ROUTINGS ARE DIAGRAMMATIC, FIELD COORDINATE EXACT ROUTINGS WITH SITE CIVIL CONTRACTOR, PRIOR TO CONSTRUCTION, TO AVOID UNDERGROUND UTILITIES, OBSTACLES, ETC. AS REQUIRED.

I. REFER TO SITE CIVIL PLANS FOR UNDERGROUND UTILITIES, PIPING, STRUCTURES, RIGHT OF WAYS, PROPERTY LINES, ETC.

J. CONTRACTOR SHALL PATCH AND REPAIR ALL SURFACES DISTURBED TO MATCH NEW, ADJACENT SURFACES UNLESS OTHERWISE NOTED. FIELD COORDINATE UNDERGROUND ROUTINGS WITH STIE CIVIL CONTRACTOR, PRIOR TO CONSTRUCTION, TO MINIMIZE PATCH AND REPAIR WORK.

K. BURY GROUNDING ELECTRODE CABLE A MINIMUM OF 30" B.F.G. PER NEC.

L. BURY COMMUNICATIONS CONDUITS A MINIMUM OF 3'-0" BFG (I.E. BELOW FROSTLINE) U.O.N.

M. PRIOR TO CONSTRUCTION, COORDINATE WITH CIVIL CONTRACTOR WHERE NECESSARY TO PROVIDE FINAL GRADING COVER AT POLE BASE FOUNDATIONS, BURIED CONDUITS, ETC. FOR SUFFICIENT GROUND COVER WHERE TOPOGRAPHY DROPS OFF STEEPLY AT EDGES OF ROADWAYS FOR DETENTION BASINS, ETC.

N. FOR DIRECT BURIED CONDUIT DETAIL, REFER TO SHEET E-XXX, DETAIL X.

O. ORIENT LIGHTING POLES HANDHOLES ON THE OPPOSITE SIDE (NON-TRAFFIC SIDE) OF PAVED ROADWAYS/PARKING AREAS U.O.N.

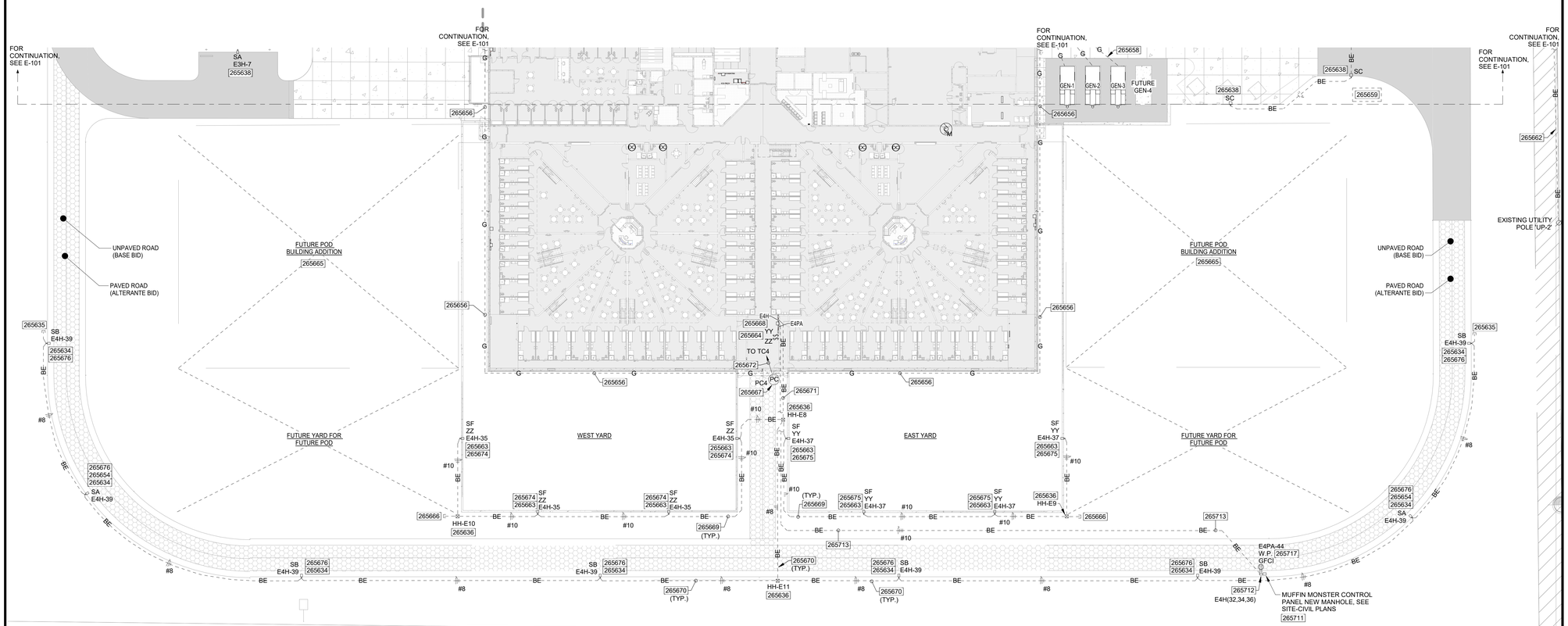
P. FOR BUILDING EXTERIOR, PERIMETER/COURTYARD/CANOPY LIGHTING, REFER TO SHEET E-301-A THROUGH E-301-E. ALSO REFER TO ARCHITECTURAL FACADE ELEVATION PLANS.

Q. REFER TO SECURITY ELECTRONICS DRAWINGS FOR DETAILED SECURITY ELECTRONICS (SE) CABLING REQUIREMENTS FOR SE CONDUIT ROUTINGS INDICATED THIS SHEET (I.E. FIBER OPTIC CABLING FOR CAMERAS, CARD READERS, INTERCOMS, ETC). REFER TO SHEET ES-300 AND ES-301 FOR SE RISER DIAGRAMS AND SHEET ES-400 FOR SE CABLE SCHEDULE.

R. CONTRACTOR SHALL USE LONG RADIUS BENDS FOR ALL COMMUNICATION/SECURITY ELECTRONICS (I.E. FIBER OPTIC CABLING) CONDUITS. MINIMIZE BENDS BETWEEN PULL POINTS TO NO MORE THAN THREE (3) 90 DEGREE BENDS; COORDINATE/COMPLY WITH CABLING MANUFACTURERS PULLING TENSION REQUIREMENTS PRIOR TO INSTALLATION.

S. FOR SITE ELECTRICAL DEMOLITION WORK, REFER TO SHEETS SD-102 AND SD-103 FOR DETAILED REQUIREMENTS.

T. AT BASE OF EACH LIGHTING POLE HANDHOLE, CONTRACTOR SHALL PROVIDE BAYONET BUSE(S), INSULATING LINK, AND INSULATED COMPRESSION FITTING ASSEMBLY. REFER TO DETAILS #3, #7, #11 AND #12 ON DRAWING E-806.



1 E-102 **ELECTRICAL SITE PLAN (SOUTH)**
SCALE: 1" = 30'-0"

NORTH

SITE KEYNOTES 2656##

265634 (BASE BID) (IF SOUTH LOOP IS AN UNPAVED ROADWAY) - PROVIDE CONDUIT SLEEVE (WITH PULLSTRING) FROM LIGHTING POLE TO 5'-0" FROM LIGHTING POLE AND CAP CONDUIT; FLAG AND RECOED ON ELECTRICAL DRAWINGS. (ALTERNATE BID) LIGHTING POLE/FIXTURE. ALTERNATE BID (IF SOUTH LOOP IS PAVED ROADWAY) - FURNISH AND INSTALL CABLE CONDUIT TO ALTERNATE LIGHTING POLES/FIXTURES LOCATED ALONG THE SOUTH LOOP (SEE SHEET E-102). REFER TO DIVISION 0 FRONT END SPECIFICATIONS FOR DETAILED REQUIREMENTS FOR ALTERNATES.

265635 FURNISH AND INSTALL CONDUIT SLEEVE 5'-0" BEYOND THE LIGHTING POLE FOUNDATION FOR FUTURE USE (I.E. FUTURE LIGHTING/POLES). CAP CONDUIT END AND FLAG; RECORD LOCATION ON ELECTRICAL RECORD DRAWINGS. FURNISH WITH PULLSTRING IN CONDUIT SLEEVE.

265636 FURNISH AND INSTALL ELECTRICAL HANDHOLE. HANDHOLE COVER SHALL BE LABELED "ELECTRICAL". FOR ELECTRICAL HANDHOLE DETAIL, REFER TO SHEET E-802, DETAIL 2. MINIMIZE SPLICES WITHIN HANDHOLE UNLESS OTHERWISE APPROVED BY ENGINEER.

265638 TOP OF CONCRETE BASE FOR LIGHT POLE SHALL BE 2'-6" AFG. LIGHT POLE SHALL BE 28'-0"H. FOR LIGHTING POLE FOUNDATION DETAIL, REFER TO SHEET E-802, DETAIL #5. PROVIDE 3'-0" SPACING BETWEEN EDGE OF PAVED ROADWAY/PARKING LOT AND EDGE OF CONCRETE POLE FOUNDATION.

265654 LOCATE EDGE OF TYPE 'SB' POLE BASE A MINIMUM OF 3'-0" FROM THE EDGE OF THE ROADWAY. MOUNT ON 3'-0"H CONCRETE POLE BASE. FOR CONCRETE POLE BASE DETAIL, SEE SHEET E-802 DETAIL #3.

265656 #1/0 CU GROUND LOOP IN FOOTING TRENCH FOR BUILDING GROUND. LOCATE 2'-6" BELOW FINISHED GRADE. BOND TO BUILDING REBAR.

265658 #1/0 CU GROUNDING ELECTRODE CABLE FROM GENERATOR TO MAIN BUILDING GROUND BUS BAR #1 IN MECHANICAL #C1056. LOCATE 2'-6" BELOW FINISH GRADE.

265659 POST INDICATOR VALVE (P.I.V.) REFER TO DRAWING SD-401-D FOR EXACT LOCATION. FURNISH AND INSTALL 3/4"C. BETWEEN P.I.V. AND ELECTRICAL #C1054 FOR FIRE ALARM CONNECTION BETWEEN P.I.V. AND FIRE ALARM CONTROL PANEL (FACP-1). PROVIDE CABLES AS REQUIRED.

265662 RACEWAY #10B, REFER TO ONE-LINE DIAGRAM, DRAWING E-601, FURNISH WITH PULLSTRING AND MARKER TAPE. COORDINATE EXACT ROUTING WITH UTILITY.

265663 TOP OF CONCRETE BASE FOR LIGHT POLE SHALL BE 0'-6" AFG. LIGHT POLE SHALL BE 30'-0"H. FOR LIGHTING POLE FOUNDATION DETAIL, REFER TO SHEET E-802, DETAIL #3. LOCATE EDGE OF POLE FOUNDATION 5'-0" FROM THE EDGE OF THE FENCE.

265664 EXTERIOR TYPE 'SF' LIGHTING FIXTURES SHALL BE MANUALLY SWITCHED FROM LOCAL TOGGLE LIGHT SWITCH; FIXTURES SHALL ALSO BE CONTROLLED VIA LIGHTING CONTACTOR FOR DUSK-TO-DAWN CONTROL. PROVIDE LABEL ON TOGGLE SWITCH FACEPLATE IDENTIFYING EXTERIOR LIGHTING ALSO INTERLOCKED/CONTROLLED VIA LIGHTING CONTACTOR. YARD IS NOT NORMALLY OCCUPIED BY INMATES EXCEPT FOR AN EMERGENCY EVACUATION.

265665 AVOID ROUTING UNDERGROUND ELECTRICAL WITHIN 20'-0" OF THE FUTURE POD BUILDINGS.

265666 FURNISH AND INSTALL CONDUIT SLEEVE 5'-0" BEYOND THE HANDHOLE FOR FUTURE USE (I.E. FUTURE LIGHTING FOR FUTURE EXTENSION/ADDITION TO NEW YARD/YARD FENCING TO BE INSTALLED). CAP CONDUIT END AND FLAG; RECORD LOCATION ON ELECTRICAL RECORD DRAWINGS. FURNISH WITH PULLSTRING IN CONDUIT SLEEVE.

265667 WALL MOUNT PHOTOCELL 12'-0" AFG (FIELD COORDINATE EXACT MOUNTING HEIGHT TO MATCH HEIGHT OF ADJACENT LIGHTING FIXTURES AS INDICATED ON ARCHITECTURAL ELEVATIONS/ELECTRICAL LIGHTING PLANS). FOR PHOTOCELL WIRING DETAILS, REFER TO EXTERIOR LIGHTING WIRING DIAGRAMS ON SHEET E-807.

265668 REFER TO LIGHTING PLANS FOR DETAILED LOCATIONS OF TIMECLOCK, LIGHTING CONTACTORS, AND GENERATOR TRANSFER DEVICE; LOCATE THESE ELECTRICAL ITEMS ADJACENT TO ONE ANOTHER IN LOCATIONS AS INDICATED ON LIGHTING PLANS. FOR EXTERIOR LIGHTING CONTROL WIRING DETAILS, REFER TO EXTERIOR LIGHTING WIRING DIAGRAMS ON SHEET E-807.

265669 2 #10, #10G., 1"C (TYPICAL FOR ENTIRE CIRCUIT; I.E - ALL CIRCUIT SEGMENTS).

265670 2 #8, #10G., 1"C (TYPICAL FOR ENTIRE CIRCUIT; I.E - ALL CIRCUIT SEGMENTS).

265671 4#10, 2#8, #10G., 1"C.

265672 1#18 TWPR, 3/4"C.

265674 FIXTURE SHALL BE MANUALLY SWITCHED FROM LOCAL TOGGLE LIGHT SWITCH, SWITCH LEG 'ZZ', IN STORAGE #E1016B; FIXTURE SHALL ALSO BE CONTROLLED VIA LIGHTING CONTACTOR #LC4B FOR DUSK-TO-DAWN CONTROL. CONNECT TO CIRCUIT SHOWN USING 2#10+G. IN 3/4"C.

265675 FIXTURE SHALL BE MANUALLY SWITCHED FROM LOCAL TOGGLE LIGHT SWITCH, SWITCH LEG 'YY', IN STORAGE #E1016B; FIXTURE SHALL ALSO BE CONTROLLED VIA LIGHTING CONTACTOR #LC4C FOR DUSK-TO-DAWN CONTROL. CONNECT TO CIRCUIT SHOWN USING 2#10+G. IN 3/4"C.

265676 FIXTURE TO BE CONTROLLED ON/OFF VIA TIMECLOCK AND PHOTOCELL. REFER TO DETAIL #6 ON SHEET E-807. CONTROL VIA CONTACTOR #LC4D.

265711 MUFFIN MONSTER MANHOLE WITH CONTROL PANEL, 5HP, 480V, 3-PHASE. REFER TO SPECIFICATIONS AND CIVIL PLANS FOR DETAILED REQUIREMENTS. CONNECT CONTROL PANEL TO CIRCUIT E4H(32,34,36) USING 3#10+G. IN 3/4"C. PROVIDE CONNECTION BETWEEN CONTROL AND MUFFIN MONSTER PER MANUFACTURER'S RECOMMENDATION. COORDINATE EXACT LOCATION OF MUFFIN MONSTER AND CONTROL PANEL BEFORE ROUGH-IN.

265712 MUFFIN MONSTER DISCONNECT, HEAVY DUTY 600VAC, 30A, 3-POLE NON-FUSED DISCONENCT SWITCH IN NEMA 3R ENCLOSURE. DISCONNECT TO BE LOCATED ADJACENT TO MUFFIN MONSTER CONTROL PANEL, PROVIDE UNI-STRUT SUPPORTS AS NEEDED. MOUNT INDEPENENT OF COONTROL PANEL WITH TOP AT +6'-0" AFG. VERIFY EXACT LOCATION OF CONTROL PANEL BEFORE ROUGH-IN. CONNECT TO CIRCUIT AS SHOWN USING 3#10+G. IN 3/4"C.

265713 5#10, 2#10G., 1"C. FOR GRINDER AND RECEPTACLE CIRCUITRY.

265717 FURNISH AND INSTALL (1) 20A, DUPLEX GFCI RECEPTACLE IN WEATHERPROOF ENLCOSURE. RECEPTACLE TO BE MOUNTED BELOW DISCONNECT. PROVIDE UNI-STRUT SUPPORTS AS NEEDED. CONNECT TO CIRCUIT SHOWN USING 2#10+#10G. IN 1"C., REFER TO KEYNOTE #265713 THIS SHEET.

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MARVIN L. HITCHCOCK STATE OF INDIANA PE10018675 REGISTERED PROFESSIONAL ENGINEER

NO.	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: RDW
DESIGNED: TKF
CHK'D: MLH
APPR'VD: MLH
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

ELECTRICAL SITE PLAN (SOUTH)

DRAWING NUMBER E-102 ELECTRICAL

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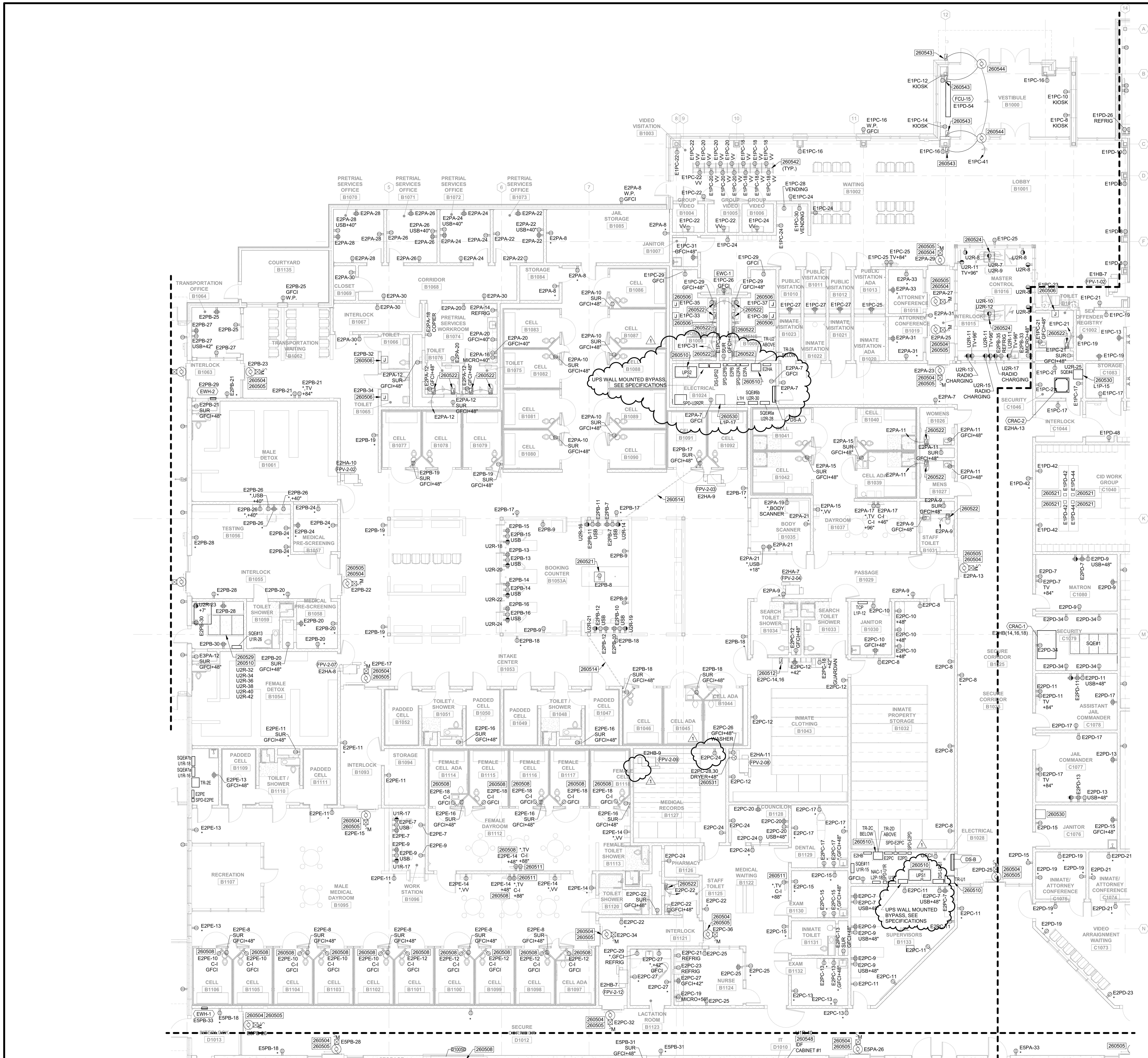


1 FIRST FLOOR POWER - AREA 'B'
E-201-B SCALE: 1/8" = 1'-0"
NORTH

GENERAL NOTES

A. FOR PANELBOARD SCHEDULES, SEE DRAWINGS E-701, E-702, E-703, E-704, E-705, E-706 AND E-707.

B. SEE MECHANICAL EQUIPMENT - ELECTRICAL CONNECTIONS SCHEDULE ON DRAWINGS E-604 & E-605 FOR EQUIPMENT CIRCUITING AND ADDITIONAL ELECTRICAL EQUIPMENT REQUIREMENTS FOR MECHANICAL EQUIPMENT (I.E. DISCONNECT, STARTER, ETC) AND EQUIPMENT NAMEPLATE ELECTRICAL LOAD INFORMATION (I.E. VOLTS, PHASE, FLA, MOCP, ETC.).

C. CONTRACTOR SHALL FIELD COORDINATE, PRIOR TO CONSTRUCTION, EXACT MOUNTING HEIGHTS AND LOCATIONS FOR WIRING DEVICES WITH THE CASEWORK SHOP DRAWINGS AND ARCHITECTURAL ELEVATIONS AND DETAILS.

D. REFER TO ARCHITECTURAL SHEETS FOR FIRE RATED WALLS AND CEILINGS. INSTALL FIRESTOP AT PENETRATIONS. INSTALL FIRE RATED PUTTY AROUND BOXES INSTALLED IN FIRE RATED WALLS AND OFFSET BACK TO BACK BOXES.

E. REFER TO SECURITY DRAWINGS, #SE SERIES, FOR ADDITIONAL EQUIPMENT AND WIRING REQUIREMENTS. PROVIDE BOXES, RACEWAYS, CABLING, SUPPORTS, ETC. AS REQUIRED FOR SECURITY EQUIPMENT. REFER TO SPECIFICATION SECTIONS 078123 "INTUMESCENT FIREPROOFING" AND 078443 "JOINT FIRESTOPPING" FOR DETAIL FIRESTOP REQUIREMENTS.

F. SEAL ALL PENETRATIONS THRU PRECAST, REFER TO SPECIFICATION 079200 "JOINT SEALANTS" FOR DETAILED REQUIREMENTS FOR SEALANT(S).

G. WATER MANAGEMENT SYSTEM TO BE PROVIDED BY OTHERS. CONNECT ALL VALVE CONTROLLERS AS FOLLOWS:
IN AREA B TO CIRCUIT E2PA-36, E2PB-31, E2PC-31 OR E2PE-21.
IN AREA C TO CIRCUIT K1L-7.
IN AREA D TO CIRCUIT E4PA-37, E5PA-45 OR E5PB-41.
IN AREA E TO CIRCUIT E4PA-39, E4PB-41 OR E5PA-47.
EACH CIRCUIT TO BE 2#12+G. IN 3/4"C. REFER TO CELL VALVE CONTROLLER (CVC) CONNECTION DETAIL #5 ON SHEET E-804.
COORDINATE CONTROLLER LOCATIONS BEFORE ROUGH-IN.

POWER KEYNOTES 2605##

260504 FURNISH AND INSTALL CONDUIT (3/4"C.) FROM EACH DOOR STARTER/CONTROLLER TO SECURITY CONTROL PANEL FOR ACCESS CONTROL WIRING. WIRING AND TERMINATIONS BY OTHERS. REFER TO SECURITY SERIES SHEETS FOR DETAILED WIRING REQUIREMENTS.

260505 FURNISH AND INSTALL POWER (1/8HP, 120V) FOR SLIDING DOOR CONTROLLERS, DOOR SAFETIES/LIMIT SWITCHES AND KEYED OPEN-CLOSE PUSHBUTTON CONTROL STATIONS FURNISHED BY DOOR EQUIPMENT VENDOR. CONTROL WIRING BY OTHERS. REFER TO SPECIFICATION 087100 "DOOR HARDWARE" FOR DETAILED REQUIREMENTS. INSTALL DOOR SAFETIES/LIMIT SWITCHES AND CONTROL SWITCH(S) PER MANUFACTURERS RECOMMENDATION. FURNISH AND INSTALL CONDUIT/POWER WIRING REQUIRED FOR A COMPLETE SYSTEM. FIELD-COORDINATE THE EQUIPMENT INSTALLATION AND CONDUIT REQUIREMENTS WITH THE DOOR EQUIPMENT VENDOR PRIOR TO CONSTRUCTION.

260506 NEW ELECTRIC HAND DRYER, REFER TO SPECIFICATIONS. COORDINATE EXACT HEIGHT AND LOCATION BEFORE ROUGH-IN.

260508 FURNISH AND INSTALL RECEPTACLE IN CUSTOM FLUSH MOUNTED, LOCKABLE WALL CABINET. FOR CABINET DETAIL, SEE SHEET E-801, DETAIL #4.

260510 EQUIPMENT TO BE MOUNTED ON CONCRETE PAD, REFER TO STRUCTURAL DRAWING S-530, DETAILS #8 AND/OR #9 FOR CONCRETE PAD INSTALLATION DETAIL.

260511 RECEPTACLE INDIVIDUALLY CONTROLLED BY SECURITY ELECTRONIC CABINET RELAY. REFER TO SECURITY EQUIPMENT PLANS AND DIVISION 28 SPECIFICATIONS FOR DETAILED WIRING REQUIREMENTS.

260512 PROVIDE POWER CONNECTION FOR "GUARDIAN SYSTEM" EQUIPMENT. CONNECT TO CIRCUIT SHOWN USING 2#10+G. IN 3/4"C. COORDINATE EXACT LOCATION WITH OWNER BEFORE ROUGH-IN.

260514 FURNISH AND INSTALL (1)-1"C. FROM BELOW COUNTER RAISED FLOOR OVER TO CHASE AND STUBBED OUT AT +12" A.F.F. FOR FUTURE POWER WIRING. FURNISH WITH PULLSTRING.

1
260521 FURNISH AND INSTALL 4-GANG FLOOR BOX, LIKE LEGRAND/WIREMOLD #RFB4 OR APPROVED EQUAL. MOUNT FLUSH IN FLOOR. FURNISH WITH TWO (2)-20A DUPLEX RECEPTACLES, ONE (1) #RFB-B BLANK DEVICE PLATE AND ONE (1) COMMUNICATIONS OUTLET, REFERENCE KEYNOTE #270502 ON E-401 SERIES SHEETS. VERIFY EXACT LOCATION WITH ARCHITECT BEFORE ROUGH-IN. ROUTE (1)-3/4"C. ROUTE ONE (1)-3/4"C. FROM BOX OVER AND UP NEAREST CHASE/WALL FOR POWER.

260522 AUTOMATIC FLUSH VALVE. REFER TO AUTOMATIC ELECTRIC FLUSH VALVE DETAIL #2 ON SHEET E-801.

260524 FURNISH AND INSTALL 8-GANG FLOOR BOX, LIKE LEGRAND/WIREMOLD #EFB8S OR APPROVED EQUAL WITH TWO (2) #EFB-8M 4-GANG MOUNTING BRACKETS, ONE (1) #EFB610BTXX FLUSH STYLE COVER LID WITH FINISH PER ARCHITECT. BOX TO HAVE SIX (6) DEVICE PLATES WITH SIX (6) 20A DUPLEX RECEPTACLES, ONE (1) #EFB-B BLANK DEVICE PLATE AND ONE (1) COMMUNICATIONS OUTLETS, REFERENCE KEYNOTE #270511 ON E-401 SERIES SHEETS. VERIFY EXACT LOCATION WITH ARCHITECT BEFORE ROUGH-IN. ROUTE (2)-3/4"C. FROM BOX OVER AND UP NEAREST WALL FOR POWER. PROVIDE A MAXIMUM OF (3) RECEPTACLES PER CIRCUIT.

260529 COMMUNICATIONS/DATA RACKS, REFER TO SPECIFICATIONS. EACH RACK TO RECEIVE TWO 20A, 120V CIRCUITS, AS INDICATED, IN 3/4"C. FROM PANEL 'U2R'. PROVIDE 2#12+G PER CIRCUIT.

260530 PREACTION DRY-POWER SYSTEM, 120V. CONNECT TO CIRCUIT SHOWN USING 2#12+G. IN 3/4"C. COORDINATE EXACT LOCATION.

260531 CONNECT TO CIRCUIT SHOWN WITH 2#10+G. IN 3/4"C.

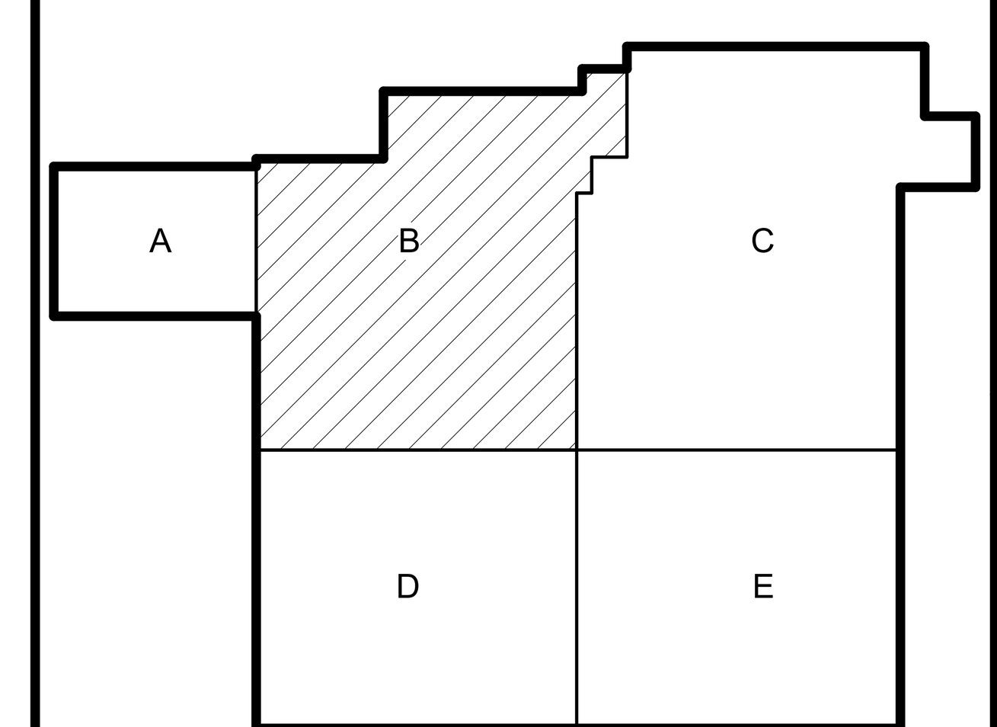
260542 ROUTE POWER CONDUCTORS UP TO VIDEO VISITATION STATION THROUGH CABINET SUPPORT LEGS. COORDINATE WITH EQUIPMENT SUPPLIER.

260543 AUTOMATIC DOOR OPENER. PUSHBUTTONS BY MANUFACTURER, WIRE PER MANUFACTURER'S RECOMMENDATION, 120V. COORDINATE EXACT LOCATION BEFORE ROUGH-IN.

260544 ELECTRIC DOOR. VERIFY WITH MANUFACTURER ALL FINAL CONNECTIONS.

1
260548 COMMUNICATIONS DATA CABINET, REFER TO SPECIFICATIONS. CONNECT TO CIRCUIT INDICATED USING 2#12+G. IN 3/4"C.

KEY PLAN



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DLZ INDIANA, LLC

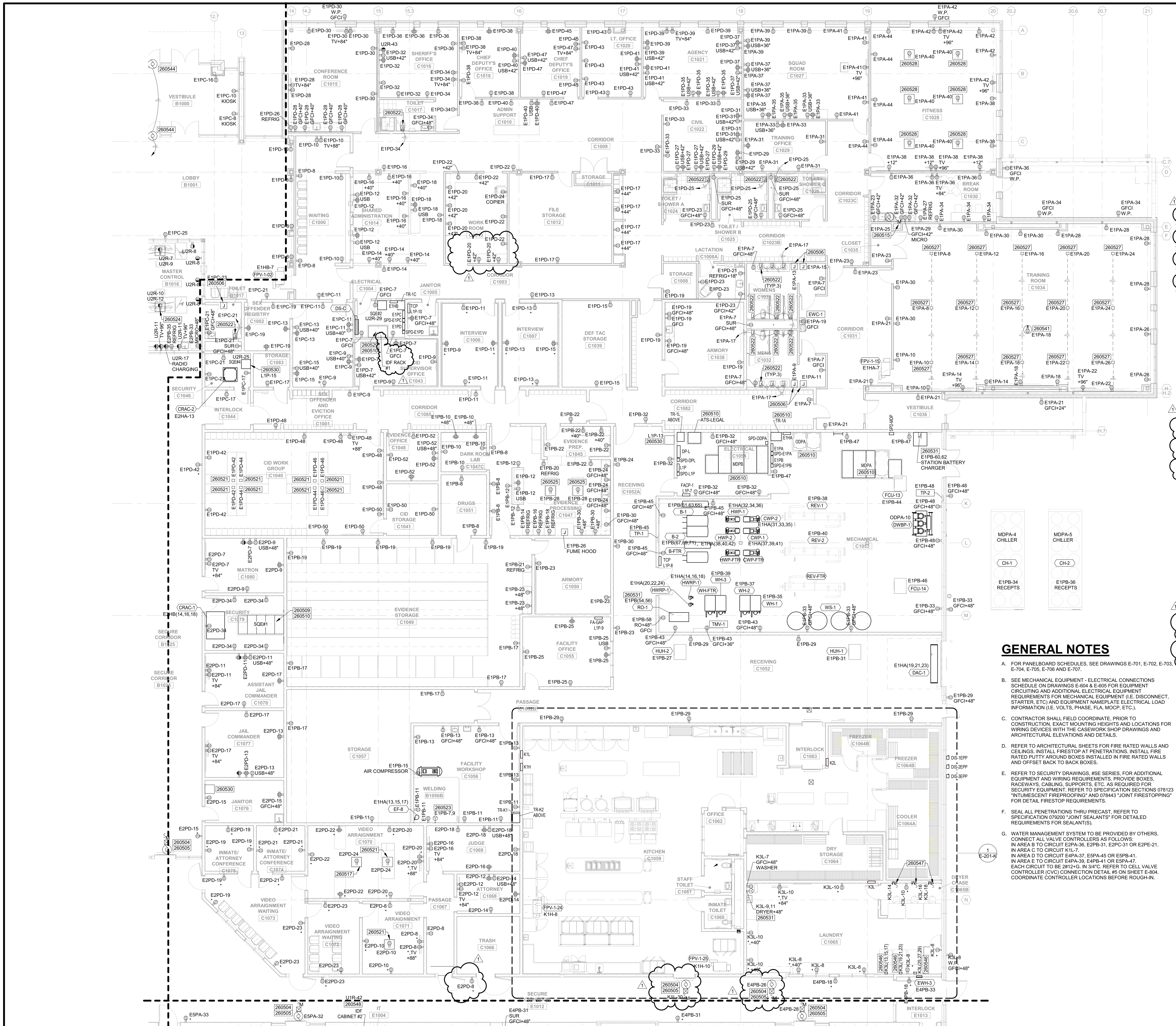
NO.	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: RDW CHK'D: MLH
DESIGNED: RDW
APPR'VD: MLH
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER
1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

FIRST FLOOR POWER PLAN - AREA B

DRAWING NUMBER
E-201-B
ELECTRICAL



1 FIRST FLOOR POWER - AREA 'C'
E-201-C SCALE: 1/8" = 1'-0"

POWER KEYNOTES

2605##

260504 FURNISH AND INSTALL CONDUIT (3/4"C.) FROM EACH DOOR STARTER/CONTROLLER TO SECURITY CONTROL PANEL FOR ACCESS CONTROL WIRING. WIRING AND TERMINATIONS BY OTHERS. REFER TO SECURITY SERIES SHEETS FOR DETAILED WIRING REQUIREMENTS.

260505 FURNISH AND INSTALL POWER (1/8HP, 120V) FOR SLIDING DOOR CONTROLLERS, DOOR SAFETIES/LIMIT SWITCHES AND KEYED OPEN-CLOSE PUSHBUTTON CONTROL STATIONS FURNISHED BY DOOR EQUIPMENT VENDOR. CONTROL WIRING BY OTHERS. REFER TO SPECIFICATION 087100 "DOOR HARDWARE" FOR DETAILED REQUIREMENTS. INSTALL DOOR SAFETIES/LIMIT SWITCHES AND CONTROL SWITCH(S) PER MANUFACTURERS RECOMMENDATION. FURNISH AND INSTALL CONDUIT/POWER WIRING REQUIRED FOR A COMPLETE SYSTEM. FIELD-COORDINATE THE EQUIPMENT INSTALLATION AND CONDUIT REQUIREMENTS WITH THE DOOR EQUIPMENT VENDOR PRIOR TO CONSTRUCTION.

260506 NEW ELECTRIC HAND DRYER, REFER TO SPECIFICATIONS. COORDINATE EXACT HEIGHT AND LOCATION BEFORE ROUGH-IN.

260509 SECURITY EQUIPMENT RACKS (5 TOTAL), REFER TO SECURITY DRAWINGS. PROVIDE TEN (10) 20A, 120V CIRCUITS FROM PANEL 'U1R' TO RACKS, CIRCUITS #19-#27,29 AND FOUR (4) 20A, 120V CIRCUITS FROM PANEL 'E2PD' TO RACKS, CIRCUITS #26, 28, 30, 32. COORDINATE WITH SECURITY CONTRACTOR ON EXACT LOCATION OF CIRCUITS. PROVIDE 2#12+G IN 3/4"C. FOR EACH CIRCUIT.

260510 EQUIPMENT TO BE MOUNTED ON CONCRETE PAD, REFER TO STRUCTURAL DRAWING S-530, DETAILS #8 AND/OR #9 FOR CONCRETE PAD INSTALLATION DETAIL.

260515 PROVIDE AND INSTALL AS REQUIRED TOGGLE SWITCH FOR GARBAGE DISPOSAL CONTROL WITH RACEWAY AND CONDUCTORS FROM SWITCH TO GARBAGE DISPOSAL UNIT, 3/4HP, 120V. MOUNT SWITCH ABOVE COUNTERTOP. CIRCUIT AS SHOWN.

260517 FURNISH AND INSTALL 2-GANG FLOOR BOX, LIKE LEGRAND/WIREMOLD #RFB2 OR APPROVED EQUAL. MOUNT FLUSH IN FLOOR. FURNISH WITH ONE (1)-20A DUPLEX RECEPTACLE AND ONE (1) COMMUNICATIONS OUTLET, REFERENCE KEYNOTE #S-- ON E-401 SERIES SHEETS. VERIFY EXACT LOCATION WITH ARCHITECT BEFORE ROUGH-IN. ROUTE ONE (1)-3/4"C. FROM BOX OVER AND UP NEAREST CHASE/WALL FOR POWER.

260521 FURNISH AND INSTALL 4-GANG FLOOR BOX, LIKE LEGRAND/WIREMOLD #RFB4 OR APPROVED EQUAL. MOUNT FLUSH IN FLOOR. FURNISH WITH TWO (2)-20A DUPLEX RECEPTACLES, ONE (1) #RFB-B BLANK DEVICE PLATE AND ONE (1) COMMUNICATIONS OUTLET, REFERENCE KEYNOTE #270502 ON E-401 SERIES SHEETS. VERIFY EXACT LOCATION WITH ARCHITECT BEFORE ROUGH-IN. ROUTE (1)-3/4"C. ROUTE ONE (1)-3/4"C. FROM BOX OVER AND UP NEAREST CHASE/WALL FOR POWER.

260522 AUTOMATIC FLUSH VALVE. REFER TO AUTOMATIC ELECTRIC FLUSH VALVE DETAIL #2 ON SHEET E-801.

260523 FURNISH AND INSTALL 240V, 30A NEMA L6-30 RECEPTACLE FOR OWNER PROVIDED PORTABLE PLUGIN WELDER. VERIFY EXACT LOCATION WITH OWNER BEFORE ROUGH-IN.

260524 FURNISH AND INSTALL 8-GANG FLOOR BOX, LIKE LEGRAND/WIREMOLD #EFB8S OR APPROVED EQUAL WITH TWO (2) #EFB-8M 4-GANG MOUNTING BRACKETS, ONE (1) #EFB610BTXX FLUSH STYLE COVER LID WITH FINISH PER ARCHITECT. BOX TO HAVE SIX (6) DEVICE PLATES WITH SIX (6) 20A DUPLEX RECEPTACLES, ONE (1) #EFB-B BLANK DEVICE PLATE AND ONE (1) COMMUNICATIONS OUTLETS, REFERENCE KEYNOTE #270511 ON E-401 SERIES SHEETS. VERIFY EXACT LOCATION WITH ARCHITECT BEFORE ROUGH-IN. ROUTE (2)-3/4"C. FROM BOX OVER AND UP NEAREST WALL FOR POWER. PROVIDE A MAXIMUM OF (3) RECEPTACLES PER CIRCUIT.

260525 FURNISH AND INSTALL 2-GANG FLOOR BOX, LIKE LEGRAND/WIREMOLD #RFB2 OR APPROVED EQUAL. MOUNT FLUSH IN FLOOR. FURNISH WITH TWO (2)-20A DUPLEX RECEPTACLE. COORDINATE EXACT LOCATION WITH OWNER PROVIDED CASEWORK BEFORE ROUGH-IN. ROUTE (1)-3/4"C.FROM BOX OVER AND UP NEAREST CHASE/WALL FOR POWER.

260527 FLUSH, 4-GANG COMBO FLOOR BOX LIKE LEGRAND/WIREMOLD #RFB4 OR APPROVED EQUAL. MOUNT FLUSH IN FLOOR. FURNISH WITH THREE (3)-20A DUPLEX RECEPTACLES AND ONE (1)-CAT6 COMMUNICATIONS OUTLET, REFERENCE KEYNOTE #270502 ON DRAWING #E-401-A. PROVIDE FLANGED CUTOUT COVER LIKE #FPCTC##. VERIFY EXACT LOCATION WITH ARCHITECT BEFORE ROUGH-IN AND COORDINATE WITH G.C. DURING CONSTRUCTION. COVER ASSEMBLY FINISH BY ARCHITECT. PROVIDE ALL COMPONENTS FOR A COMPLETE INSTALLATION. ROUTE (1)-3/4"C. FROM BOX AS SHOWN FOR POWER. CONNECT TO CIRCUIT SHOWN USING 2#12+G.

260528 FURNISH AND INSTALL 1-GANG FULLY ADJUSTABLE SHALLOW CAST IRON FLOOR BOX, LIKE WALKER #880CM1-1 WITH ONE (1) #817B ONE-GANG BRASS FLANGE AND ONE (1) #828R BRASS DUPLEX COVER PLATE. BOX TO HAVE ONE (1) 20A DUPLEX RECEPTACLE. VERIFY EXACT LOCATION WITH OWNER AND ARCHITECT BEFORE ROUGH-IN. ROUTE (1)-3/4"C. FROM BOX OVER AND UP/DN NEAREST WALL FOR POWER.

260529 COMMUNICATIONS/DATA RACKS, REFER TO SPECIFICATIONS. EACH RACK TO RECEIVE TWO 20A, 120V CIRCUITS, AS INDICATED, IN 3/4"C. FROM PANEL 'U2R'. PROVIDE 2#12+G PER CIRCUIT.

260530 PREACTION DRY-POWER SYSTEM, 120V. CONNECT TO CIRCUIT SHOWN USING 2#12+G. IN 3/4"C. COORDINATE EXACT LOCATION.

260531 CONNECT TO CIRCUIT SHOWN WITH 2#10+G. IN 3/4"C.

260541 DEVICE TO BE FLUSH MOUNTED IN CEILING FOR CEILING PROJECTOR. COORDINATE EXACT LOCATION WITH OWNER AND ARCHITECT BEFORE ROUGH-IN.

260544 ELECTRIC DOOR. VERIFY WITH MANUFACTURER ALL FINAL CONNECTIONS.

260546 FURNISH AND INSTALL 240VAC, 3-POLE, 30A HEAVY DUTY NON-FUSED SAFETY DISCONNECT SWITCH IN NEMA 4X STAINLESS STELL ENCLOSURE WITH KEY INTERLOCK SYSTEM. CONNECT TO CIRCUIT SHOWN USING 3#10+G. IN 3/4"C. PROVIDE CONNECTION AS NEEDED BETWEEN DISCONNECT AND WASHER.

260547 FURNISH AND INSTALL 125VAC, 20A, 1-POLE MANUAL MOTOR STARTER WITH TOGGLE DISCONNECT IN NEMA 1 ENCLOSURE. FURNISH WITH RED (RUN) LED PILOT LIGHT, MOTOR RATED. CONNECT TO CIRCUIT SHOWN USING 2#12+G. IN 3/4"C. PROVIDE CONNECTION AS NEEDED BETWEEN SWITCH AND DRYER.

260548 COMMUNICATIONS DATA CABINET, REFER TO SPECIFICATIONS. CONNECT TO CIRCUIT INDICATED USING 2#12+G. IN 3/4"C.

GENERAL NOTES

A. FOR PANELBOARD SCHEDULES, SEE DRAWINGS E-701, E-702, E-703, E-704, E-705, E-706 AND E-707.

B. SEE MECHANICAL EQUIPMENT - ELECTRICAL CONNECTIONS SCHEDULE ON DRAWINGS E-604 & E-605 FOR EQUIPMENT CIRCUITING AND ADDITIONAL ELECTRICAL EQUIPMENT REQUIREMENTS FOR MECHANICAL EQUIPMENT (I.E. DISCONNECT, STARTER, ETC) AND EQUIPMENT NAMEPLATE ELECTRICAL LOAD INFORMATION (I.E. VOLTS, PHASE, FLA, MOCP, ETC.).

C. CONTRACTOR SHALL FIELD COORDINATE, PRIOR TO CONSTRUCTION, EXACT MOUNTING HEIGHTS AND LOCATIONS FOR WIRING DEVICES WITH THE CASEWORK SHOP DRAWINGS AND ARCHITECTURAL ELEVATIONS AND DETAILS.

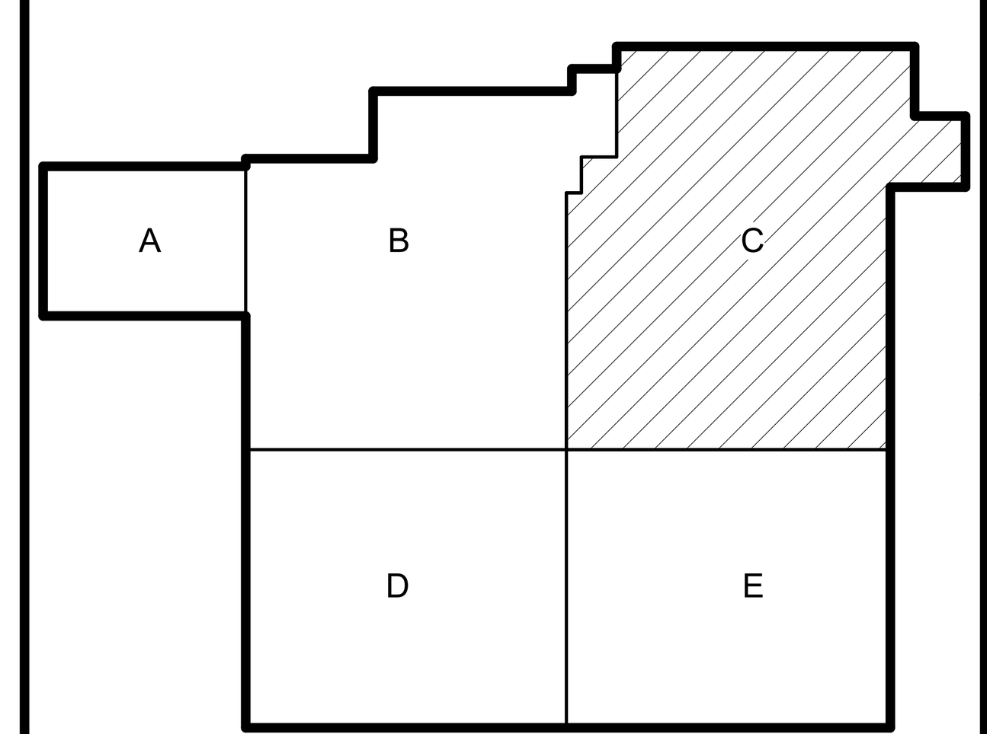
D. REFER TO ARCHITECTURAL SHEETS FOR FIRE RATED WALLS AND CEILINGS. INSTALL FIRESTOP AT PENETRATIONS. INSTALL FIRE RATED PUTTY AROUND BOXES INSTALLED IN FIRE RATED WALLS AND OFFSET BACK TO BACK BOXES.

E. REFER TO SECURITY DRAWINGS, #SE SERIES, FOR ADDITIONAL EQUIPMENT AND WIRING REQUIREMENTS. PROVIDE BOXES, RACEWAYS, CABLING, SUPPORTS, ETC. AS REQUIRED FOR SECURITY EQUIPMENT. REFER TO SPECIFICATION SECTIONS 078123 "INTUMESCENT FIREPROOFING" AND 078443 "JOINT FIRESTOPPING" FOR DETAIL FIRESTOP REQUIREMENTS.

F. SEAL ALL PENETRATIONS THRU PRECAST, REFER TO SPECIFICATION 079200 "JOINT SEALANTS" FOR DETAILED REQUIREMENTS FOR SEALANT(S).

G. WATER MANAGEMENT SYSTEM TO BE PROVIDED BY OTHERS. CONNECT ALL VALVE CONTROLLERS AS FOLLOWS:
IN AREA B TO CIRCUIT E2PA-36, E2PB-31, E2PC-31 OR E2PE-21.
IN AREA C TO CIRCUIT K1L-7.
IN AREA D TO CIRCUIT E4PA-37, E5PA-45 OR E5PB-41.
IN AREA E TO CIRCUIT E4PA-39, E4PB-41 OR E5PA-47.
EACH CIRCUIT TO BE 2#12+G. IN 3/4"C. REFER TO CELL VALVE CONTROLLER (CVC) CONNECTION DETAIL #5 ON SHEET E-804. COORDINATE CONTROLLER LOCATIONS BEFORE ROUGH-IN.

KEY PLAN



DLZ
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SURVEYING • CONSTRUCTION SERVICES
DLZ INDIANA, LLC

NO	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: RDW
CHK'D: MLH
DESIGNED: RDW
APPRV'D: MLH
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER
1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

FIRST FLOOR POWER PLAN - AREA C

DRAWING NUMBER
E-201-C
ELECTRICAL

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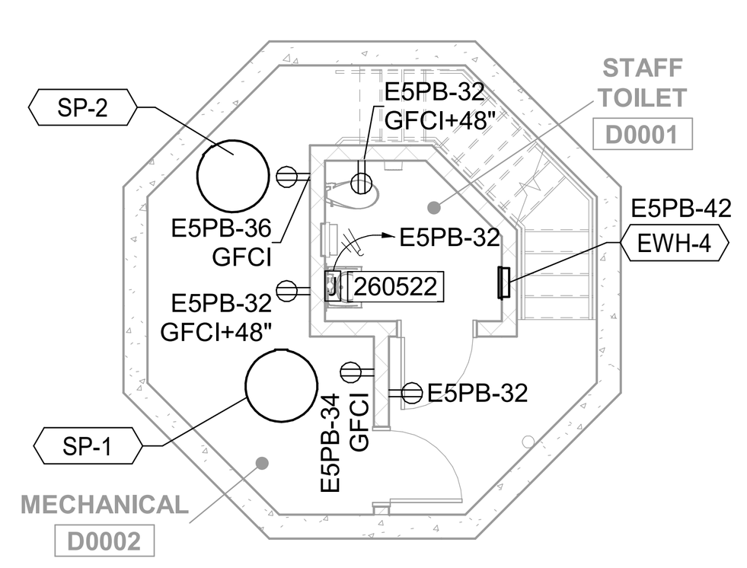
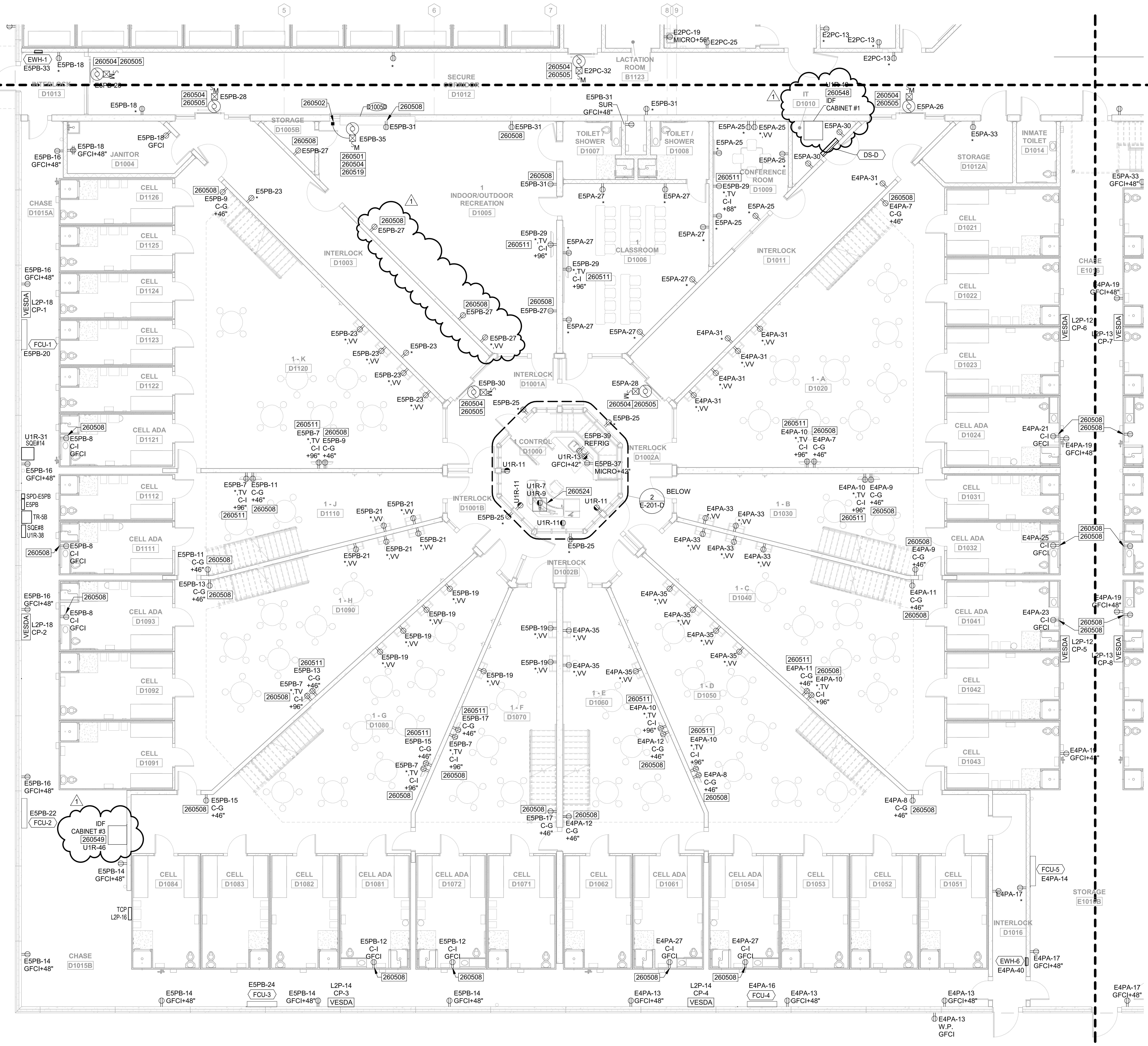


2 LOWER LEVEL POWER - AREA 'D'
E-201-D SCALE: 1/8" = 1'-0"
NORTH



1 FIRST FLOOR POWER - AREA 'D'
E-201-D SCALE: 1/8" = 1'-0"
NORTH

GENERAL NOTES

A. FOR PANELBOARD SCHEDULES, SEE DRAWINGS E-701, E-702, E-703, E-704, E-705, E-706 AND E-707.

B. SEE MECHANICAL EQUIPMENT - ELECTRICAL CONNECTIONS SCHEDULE ON DRAWINGS E-604 & E-605 FOR EQUIPMENT CIRCUITING AND ADDITIONAL ELECTRICAL EQUIPMENT REQUIREMENTS FOR MECHANICAL EQUIPMENT (I.E. DISCONNECT, STARTER, ETC) AND EQUIPMENT NAMEPLATE ELECTRICAL LOAD INFORMATION (I.E. VOLTS, PHASE, FLA, MOCP, ETC.).

C. CONTRACTOR SHALL FIELD COORDINATE, PRIOR TO CONSTRUCTION, EXACT MOUNTING HEIGHTS AND LOCATIONS FOR WIRING DEVICES WITH THE CASEWORK SHOP DRAWINGS AND ARCHITECTURAL ELEVATIONS AND DETAILS.

D. REFER TO ARCHITECTURAL SHEETS FOR FIRE RATED WALLS AND CEILINGS. INSTALL FIRESTOP AT PENETRATIONS. INSTALL FIRE RATED PUTTY AROUND BOXES INSTALLED IN FIRE RATED WALLS AND OFFSET BACK TO BACK BOXES.

E. REFER TO SECURITY DRAWINGS, #SE SERIES, FOR ADDITIONAL EQUIPMENT AND WIRING REQUIREMENTS. PROVIDE BOXES, RACEWAYS, CABLING, SUPPORTS, ETC. AS REQUIRED FOR SECURITY EQUIPMENT. REFER TO SPECIFICATION SECTIONS 078123 "INTUMESCENT FIREPROOFING" AND 078443 "JOINT FIRESTOPPING" FOR DETAIL FIRESTOP REQUIREMENTS.

F. SEAL ALL PENETRATIONS THRU PRECAST, REFER TO SPECIFICATION 079200 "JOINT SEALANTS" FOR DETAILED REQUIREMENTS FOR SEALANT(S).

G. WATER MANAGEMENT SYSTEM TO BE PROVIDED BY OTHERS. CONNECT ALL VALVE CONTROLLERS AS FOLLOWS:
IN AREA B TO CIRCUIT E2PA-36, E2PB-31, E2PC-31 OR E2PE-21.
IN AREA C TO CIRCUIT K1L-7.
IN AREA D TO CIRCUIT E4PA-37, E5PA-45 OR E5PB-41.
IN AREA E TO CIRCUIT E4PA-39, E4PB-41 OR E5PA-47.
EACH CIRCUIT TO BE 2#12+G. IN 3/4"C. REFER TO CELL VALVE CONTROLLER (CVC) CONNECTION DETAIL #5 ON SHEET E-804. COORDINATE CONTROLLER LOCATIONS BEFORE ROUGH-IN.

POWER KEYNOTES 2605##

260501 FURNISH AND INSTALL POWER (20A, 120V) AND CONTROL WIRING FOR OVERHEAD DOOR CONTROLLERS. DOOR SAFETIES/LIMIT SWITCHES AND KEYED OPEN-STOP-CLOSE PUSHBUTTON CONTROLLER STATIONS (WHERE INDICATED) FURNISHED BY OVERHEAD DOOR EQUIPMENT VENDOR. REFER TO SPECIFICATION 083613 "SECTIONAL DOORS" FOR DETAILED REQUIREMENTS. INSTALL DOOR SAFETIES/LIMIT SWITCHES, DOOR STARTER/CONTROLLER, AND PUSHBUTTON CONTROL STATION PER MANUFACTURERS RECOMMENDATION. FURNISH AND INSTALL ALL CABLING/CONDUIT REQUIRED FOR COMPLETE SYSTEM. FIELD-COORDINATE THE EQUIPMENT INSTALLATION AND CABLING/CONDUIT REQUIREMENTS WITH THE DOOR EQUIPMENT VENDOR PRIOR TO CONSTRUCTION.

260502 OVERHEAD DOOR SAFETY INTERLOCK DEVICES FURNISHED BY OVERHEAD DOOR VENDOR, INSTALLED BY CONTRACTOR.

260504 FURNISH AND INSTALL CONDUIT (3/4"C.) FROM EACH DOOR STARTER/CONTROLLER TO SECURITY CONTROL PANEL FOR ACCESS CONTROL WIRING. WIRING AND TERMINATIONS BY OTHERS. REFER TO SECURITY SERIES SHEETS FOR DETAILED WIRING REQUIREMENTS.

260505 FURNISH AND INSTALL POWER (1/8HP, 120V) FOR SLIDING DOOR CONTROLLERS, DOOR SAFETIES/LIMIT SWITCHES AND KEYED OPEN-CLOSE PUSHBUTTON CONTROL STATIONS FURNISHED BY DOOR EQUIPMENT VENDOR. CONTROL WIRING BY OTHERS. REFER TO SPECIFICATION 087100 "DOOR HARDWARE" FOR DETAILED REQUIREMENTS. INSTALL DOOR SAFETIES/LIMIT SWITCHES AND CONTROL SWITCH(S) PER MANUFACTURERS RECOMMENDATION. FURNISH AND INSTALL CONDUIT/POWER WIRING REQUIRED FOR A COMPLETE SYSTEM. FIELD-COORDINATE THE EQUIPMENT INSTALLATION AND CONDUIT REQUIREMENTS WITH THE DOOR EQUIPMENT VENDOR PRIOR TO CONSTRUCTION.

260508 FURNISH AND INSTALL RECEPTACLE IN CUSTOM FLUSH MOUNTED, LOCKABLE WALL CABINET. FOR CABINET DETAIL, SEE SHEET E-801, DETAIL #4.

260511 RECEPTACLE INDIVIDUALLY CONTROLLED BY SECURITY ELECTRONIC CABINET RELAY. REFER TO SECURITY EQUIPMENT PLANS AND DIVISION 28 SPECIFICATIONS FOR DETAILED WIRING REQUIREMENTS.

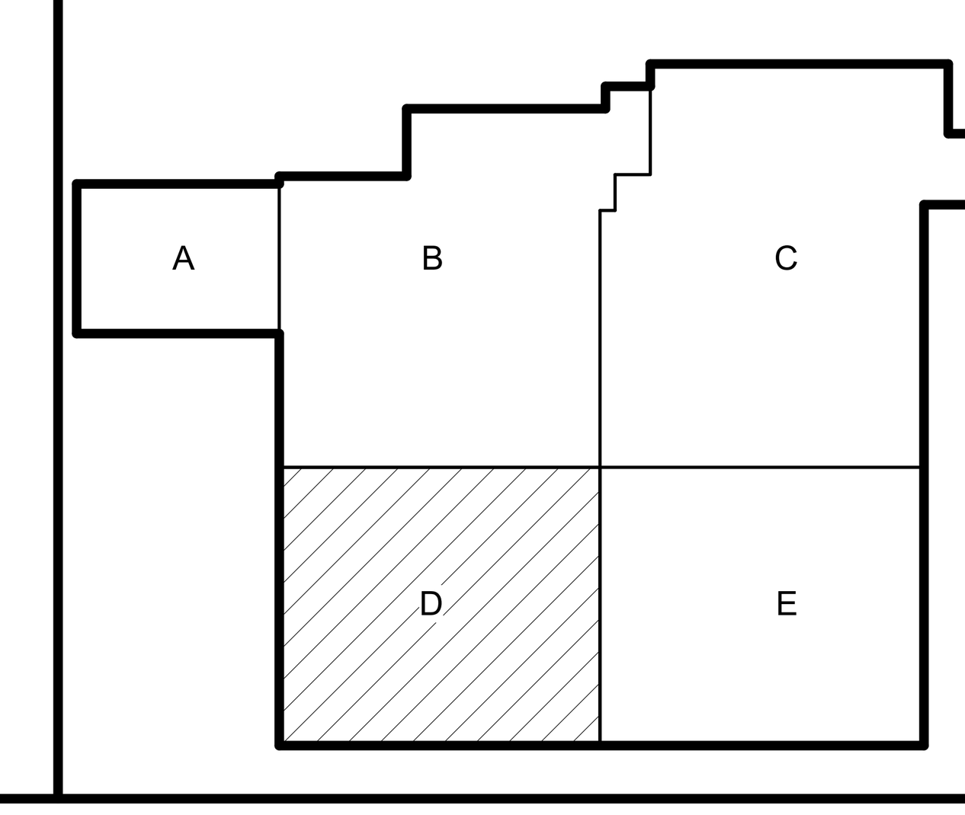
260519 CONTROL SWITCH(S) TO BE LOCATED IN CONTROL #D1000, COORDINATE EXACT LOCATION BEFORE ROUGH-IN.

260524 FURNISH AND INSTALL 8-GANG FLOOR BOX, LIKE LEGRAND/WIREMOLD #EFB8S OR APPROVED EQUAL WITH TWO (2) #EFB-8M 4-GANG MOUNTING BRACKETS, ONE (1) #EFB610BTXX FLUSH STYLE COVER LID WITH FINISH PER ARCHITECT. BOX TO HAVE SIX (6) DEVICE PLATES WITH SIX (6) 20A DUPLEX RECEPTACLES, ONE (1) #EFB-B BLANK DEVICE PLATE AND ONE (1) COMMUNICATIONS OUTLETS, REFERENCE KEYNOTE #270511 ON E-401 SERIES SHEETS. VERIFY EXACT LOCATION WITH ARCHITECT BEFORE ROUGH-IN. ROUTE (2)-3/4"C. FROM BOX OVER AND UP NEAREST WALL FOR POWER. PROVIDE A MAXIMUM OF (3) RECEPTACLES PER CIRCUIT.

260548 COMMUNICATIONS DATA CABINET, REFER TO SPECIFICATIONS. CONNECT TO CIRCUIT INDICATED USING 2#12+G. IN 3/4"C.

260549 COMMUNICATIONS DATA CABINET, REFER TO SPECIFICATIONS. CONNECT TO CIRCUIT INDICATED USING 2#10+#10G. IN 3/4"C.

KEY PLAN



DLZ
ARCHITECTURE • ENGINEERING • PLANNING
SURVEYING • CONSTRUCTION SERVICES
DLZ INDIANA, LLC

MARVIN L. HITCHCOCK
REGISTERED No. PE60018676
STATE OF INDIANA
PROFESSIONAL ENGINEER

NO.	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: RDW CHK'D: MLH
DESIGNED: RDW
APPR'VD: MLH
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER
1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

FIRST FLOOR AND LOWER LEVEL POWER PLANS - AREA D

DRAWING NUMBER
E-201-D
ELECTRICAL

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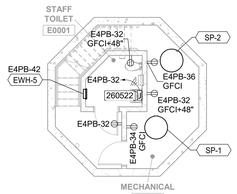
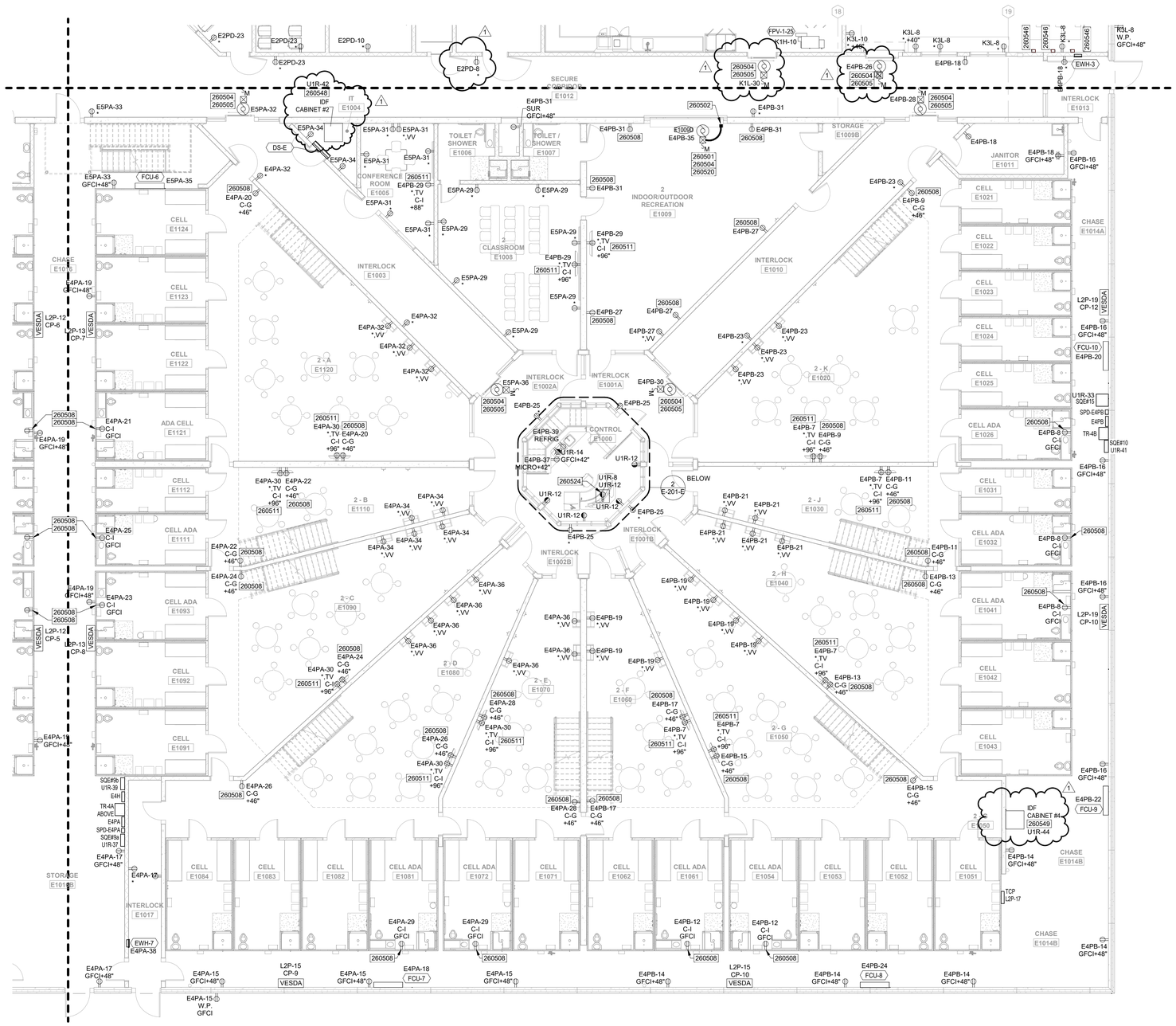


2 LOWER LEVEL POWER - AREA 'E'
E-201-E SCALE: 1/8" = 1'-0"
NORTH



1 FIRST FLOOR POWER - AREA 'E'
E-201-E SCALE: 1/8" = 1'-0"
NORTH

GENERAL NOTES

A. FOR PANELBOARD SCHEDULES, SEE DRAWINGS E-701, E-702, E-703, E-704, E-705, E-706 AND E-707.

B. SEE MECHANICAL EQUIPMENT - ELECTRICAL CONNECTIONS SCHEDULE ON DRAWINGS E-604 & E-605 FOR EQUIPMENT CIRCUITING AND ADDITIONAL ELECTRICAL EQUIPMENT REQUIREMENTS FOR MECHANICAL EQUIPMENT (I.E. DISCONNECT, STARTER, ETC) AND EQUIPMENT NAMEPLATE ELECTRICAL LOAD INFORMATION (I.E. VOLTS, PHASE, FLA, MOCP, ETC.).

C. CONTRACTOR SHALL FIELD COORDINATE, PRIOR TO CONSTRUCTION, EXACT MOUNTING HEIGHTS AND LOCATIONS FOR WIRING DEVICES WITH THE CASEWORK SHOP DRAWINGS AND ARCHITECTURAL ELEVATIONS AND DETAILS.

D. REFER TO ARCHITECTURAL SHEETS FOR FIRE RATED WALLS AND CEILINGS. INSTALL FIRESTOP AT PENETRATIONS. INSTALL FIRE RATED PUTTY AROUND BOXES INSTALLED IN FIRE RATED WALLS AND OFFSET BACK TO BACK BOXES.

E. REFER TO SECURITY DRAWINGS, #SE SERIES, FOR ADDITIONAL EQUIPMENT AND WIRING REQUIREMENTS. PROVIDE BOXES, RACEWAYS, CABLING, SUPPORTS, ETC. AS REQUIRED FOR SECURITY EQUIPMENT. REFER TO SPECIFICATION SECTIONS 078123 "INTUMESCENT FIREPROOFING" AND 078443 "JOINT FIRESTOPPING" FOR DETAIL FIRESTOP REQUIREMENTS.

F. SEAL ALL PENETRATIONS THRU PRECAST, REFER TO SPECIFICATION 079200 "JOINT SEALANTS" FOR DETAILED REQUIREMENTS FOR SEALANT(S).

G. WATER MANAGEMENT SYSTEM TO BE PROVIDED BY OTHERS. CONNECT ALL VALVE CONTROLLERS AS FOLLOWS:
IN AREA B TO CIRCUIT E2PA-36, E2PB-31, E2PC-31 OR E2PE-21.
IN AREA C TO CIRCUIT K1L-7.
IN AREA D TO CIRCUIT E4PA-37, E5PA-45 OR E5PB-41.
IN AREA E TO CIRCUIT E4PA-39, E4PB-41 OR E5PA-47.
EACH CIRCUIT TO BE 2#12+G. IN 3/4"C. REFER TO CELL VALVE CONTROLLER (CVC) CONNECTION DETAIL #5 ON SHEET E-804. COORDINATE CONTROLLER LOCATIONS BEFORE ROUGH-IN.

POWER KEYNOTES 2605##

260501 FURNISH AND INSTALL POWER (20A, 120V) AND CONTROL WIRING FOR OVERHEAD DOOR CONTROLLERS. DOOR SAFETIES/LIMIT SWITCHES AND KEYED OPEN-STOP-CLOSE PUSHBUTTON CONTROLLER STATIONS (WHERE INDICATED) FURNISHED BY OVERHEAD DOOR EQUIPMENT VENDOR. REFER TO SPECIFICATION 083613 "SECTIONAL DOORS" FOR DETAILED REQUIREMENTS. INSTALL DOOR SAFETIES/LIMIT SWITCHES, DOOR STARTER/CONTROLLER, AND PUSHBUTTON CONTROL STATION PER MANUFACTURERS RECOMMENDATION. FURNISH AND INSTALL ALL CABLING/CONDUIT REQUIRED FOR COMPLETE SYSTEM. FIELD-COORDINATE THE EQUIPMENT INSTALLATION AND CABLING/CONDUIT REQUIREMENTS WITH THE DOOR EQUIPMENT VENDOR PRIOR TO CONSTRUCTION.

260502 OVERHEAD DOOR SAFETY INTERLOCK DEVICES FURNISHED BY OVERHEAD DOOR VENDOR, INSTALLED BY CONTRACTOR.

260504 FURNISH AND INSTALL CONDUIT (3/4"C.) FROM EACH DOOR STARTER/CONTROLLER TO SECURITY CONTROL PANEL FOR ACCESS CONTROL WIRING. WIRING AND TERMINATIONS BY OTHERS. REFER TO SECURITY SERIES SHEETS FOR DETAILED WIRING REQUIREMENTS.

260505 FURNISH AND INSTALL POWER (1/8HP, 120V) FOR SLIDING DOOR CONTROLLERS, DOOR SAFETIES/LIMIT SWITCHES AND KEYED OPEN-CLOSE PUSHBUTTON CONTROL STATIONS FURNISHED BY DOOR EQUIPMENT VENDOR. CONTROL WIRING BY OTHERS. REFER TO SPECIFICATION 087100 "DOOR HARDWARE" FOR DETAILED REQUIREMENTS. INSTALL DOOR SAFETIES/LIMIT SWITCHES AND CONTROL SWITCH(S) PER MANUFACTURERS RECOMMENDATION. FURNISH AND INSTALL CONDUIT/POWER WIRING REQUIRED FOR A COMPLETE SYSTEM. FIELD-COORDINATE THE EQUIPMENT INSTALLATION AND CONDUIT REQUIREMENTS WITH THE DOOR EQUIPMENT VENDOR PRIOR TO CONSTRUCTION.

260508 FURNISH AND INSTALL RECEPTACLE IN CUSTOM FLUSH MOUNTED, LOCKABLE WALL CABINET. FOR CABINET DETAIL, SEE SHEET E-801, DETAIL #4.

260511 RECEPTACLE INDIVIDUALLY CONTROLLED BY SECURITY ELECTRONIC CABINET RELAY. REFER TO SECURITY EQUIPMENT PLANS AND DIVISION 28 SPECIFICATIONS FOR DETAILED WIRING REQUIREMENTS.

260520 CONTROL SWITCH(S) TO BE LOCATED IN CONTROL #E1000, COORDINATE EXACT LOCATION BEFORE ROUGH-IN.

260522 AUTOMATIC FLUSH VALVE. REFER TO AUTOMATIC ELECTRIC FLUSH VALVE DETAIL #2 ON SHEET E-801.

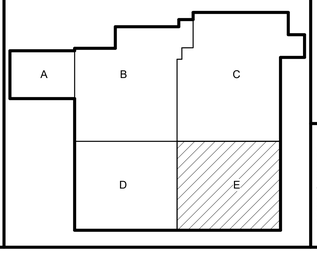
260524 FURNISH AND INSTALL 8-GANG FLOOR BOX, LIKE LEGRAND/WIREMOLD #EFB8S OR APPROVED EQUAL WITH TWO (2) #EFB-8M 4-GANG MOUNTING BRACKETS, ONE (1) #EFB610BTXX FLUSH STYLE COVER LID WITH FINISH PER ARCHITECT. BOX TO HAVE SIX (6) DEVICE PLATES WITH SIX (6) 20A DUPLEX RECEPTACLES, ONE (1) #EFB-B BLANK DEVICE PLATE AND ONE (1) COMMUNICATIONS OUTLETS. REFERENCE KEYNOTE #270511 ON E-401 SERIES SHEETS. VERIFY EXACT LOCATION WITH ARCHITECT BEFORE ROUGH-IN. ROUTE (2)-3/4"C. FROM BOX OVER AND UP NEAREST WALL FOR POWER. PROVIDE A MAXIMUM OF (3) RECEPTACLES PER CIRCUIT.

260546 FURNISH AND INSTALL 240VAC, 3-POLE, 30A HEAVY DUTY NON-FUSED SAFETY DISCONNECT SWITCH IN NEMA 4X STAINLESS STELL ENCLOSURE WITH KEY INTERLOCK SYSTEM. CONNECT TO CIRCUIT SHOWN USING 3#10+G. IN 3/4"C. PROVIDE CONNECTION AS NEEDED BETWEEN DISCONNECT AND WASHER.

260548 COMMUNICATIONS DATA CABINET, REFER TO SPECIFICATIONS. CONNECT TO CIRCUIT INDICATED USING 2#12+G. IN 3/4"C.

260549 COMMUNICATIONS DATA CABINET, REFER TO SPECIFICATIONS. CONNECT TO CIRCUIT INDICATED USING 2#10+#10G. IN 3/4"C.

KEY PLAN



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DLZ INDIANA, LLC

MARVIN L. HITCHCOCK ENGINEER STATE OF INDIANA PE20018675 PROFESSIONAL

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A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA
FIRST FLOOR AND LOWER LEVEL POWER PLANS - AREA E

DRAWING NUMBER E-201-E ELECTRICAL

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GENERAL NOTES

A. REFER TO FOOD SERVICE DRAWINGS FOR ADDITIONAL KITCHEN ELECTRICAL DETAILS AND INTERCONNECTION WIRING REQUIREMENTS.

B. FIELD COORDINATE EXACT RECEPTACLE NEMA CONFIGURATIONS REQUIRED FOR KITCHEN EQUIPMENT PLUGS PRIOR TO CONSTRUCTION. PROVIDE CORD AND PLUG SETS WHERE REQUIRED FOR FINAL CONNECTION OF EQUIPMENT.

C. FIELD COORDINATE EXACT RECEPTACLE AND/OR EQUIPMENT CONNECTION LOCATIONS WITH FOOD SERVICE EQUIPMENT CONTRACTOR PRIOR TO CONSTRUCTION.

D. MINIMIZE CONDUIT PENETRATIONS. REFER TO ARCHITECTURAL SPECIFICATIONS AND PLANS FOR SEALANT REQUIREMENTS.

E. ALL CIRCUITS THIS DRAWING FED FROM PANELBOARD 'K1H', 'K1L' OR 'K2L' U.O.N.

F. ALL 20A, 120V DUPLEX RECEPTACLES IN KITCHEN ROOM #C1059 SHALL BE NON-FEED-THRU GFCI TYPE, U.O.N. WITH VANDALPROOF STYLE RECEPTACLE FACEPLATE

G. PROVIDE FINAL CONNECTIONS TO ALL KITCHEN EQUIPMENT. ALL FINAL DIRECT CONNECTIONS OF EQUIPMENT SHALL BE RUN IN FLEXIBLE "LIQUID-TIGHT" CONDUIT WITH NEOPRENE JACKET.

H. PROVIDE SHUNT-TRIP CIRCUIT BREAKERS TO SHUT OFF FUEL VALVE(S), ELECTRICAL POWER AND CONTROL SOURCE TO ALL COOKING APPLIANCES LOCATED UNDER THE EXHUAST HOOD(S). SHUNT-TRIP BREAKERS SHALL BE INTERLOCKED WITH THE MICRO SWITCH OF THE FIRE PROTECTIONS SYSTEM. THE SHUNT-TRIP BREAKERS SHALL OPEN ON ACTUATION OF THE FIRE PROTECTION SYSTEM AND CAUSE ALL POWER TO THE COOKING EQUIPMENT TO BE SHUT OFF. REFER TO DETAILS #3 AND #4 ON DRAWING E-801.

I. SEAL ALL PENETRATIONS THRU PRECAST, REFER TO SPECIFICATION 079200 FOR TYPE.

J. ALL DEVICES IN KITCHEN SHALL BE VANDAL RESISTANT STYLE.

K. REFER TO DRAWING E-203 OR KITCHEN ROOFTOP EQUIPMENT.

KITCHEN KEYNOTES 2606##

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260504 FURNISH AND INSTALL CONDUIT (3/4"C.) FROM EACH DOOR STARTER/CONTROLLER TO SECURITY CONTROL PANEL FOR ACCESS CONTROL WIRING. WIRING AND TERMINATIONS BY OTHERS. REFER TO SECURITY SERIES SHEETS FOR DETAILED WIRING REQUIREMENTS.

260505 FURNISH AND INSTALL POWER (1/8HP, 120V) FOR SLIDING DOOR CONTROLLERS, DOOR SAFETIES/LIMIT SWITCHES AND KEYED OPEN-CLOSE PUSHBUTTON CONTROL STATIONS FURNISHED BY DOOR EQUIPMENT VENDOR. CONTROL WIRING BY OTHERS. REFER TO SPECIFICATION 087100 "DOOR HARDWARE" FOR DETAILED REQUIREMENTS. INSTALL DOOR SAFETIES/LIMIT SWITCHES AND CONTROL SWITCH(S) PER MANUFACTURERS RECOMMENDATION. FURNISH AND INSTALL CONDUIT/POWER WIRING REQUIRED FOR A COMPLETE SYSTEM. FIELD-COORDINATE THE EQUIPMENT INSTALLATION AND CONDUIT REQUIREMENTS WITH THE DOOR EQUIPMENT VENDOR PRIOR TO CONSTRUCTION.

260522 AUTOMATIC FLUSH VALVE. REFER TO AUTOMATIC ELECTRIC FLUSH VALVE DETAIL #2 ON SHEET E-801.

260546 FURNISH AND INSTALL 240VAC, 3-POLE, 30A HEAVY DUTY NON-FUSED SAFETY DISCONNECT SWITCH IN NEMA 4X STAINLESS STELL ENCLOSURE WITH KEY INTERLOCK SYSTEM. CONNECT TO CIRCUIT SHOWN USING 3#10+G. IN 3/4"C. PROVIDE CONNECTION AS NEEDED BETWEEN DISCONNECT AND WASHER.

260547 FURNISH AND INSTALL 125VAC, 20A, 1-POLE MANUAL MOTOR STARTER WITH TOGGLE DISCONNECT IN NEMA 1 ENCLOSURE. FURNISH WITH RED (RUN) LED PILOT LIGHT, MOTOR RATED. CONNECT TO CIRCUIT SHOWN USING 2#12+G. IN 3/4"C. PROVIDE CONNECTION AS NEEDED BETWEEN SWITCH AND DRYER.

260601 CONNECT TO CIRCUIT SHOWN WITH 2#12+G. IN 3/4"C.

260602 CONNECT TO CIRCUIT SHOWN WITH 3#12+G. IN 3/4"C.

260603 CONNECT TO CIRCUIT SHOWN WITH 3#6+#6G. IN 1"C.

260604 CONNECT TO CIRCUIT SHOWN WITH 3#8+#8G. IN 3/4"C.

260605 CONNECT TO CIRCUIT SHOWN WITH 2#10+#10G. IN 3/4"C.

260606 FLOOR MOUNTED JUNCTION BOX, REFER TO DETAIL #1 ON FS101. PROVIDE FLEX CONNECTION PER SPECIFICAITON FROM FLOOR MOUNTED JUNCTION BOX TO ITEM #E22 AND #ECO1 DEVICES.

260607 DEVICE POWERED FROM UTILITY DISTRIBUTION SYSTEM (UDS) (ITEM #E43), CONNECT TO UDS USING 2#12+G. IN 3/4"C.

260608 ITEM #E43 - UTILITY DISTRIBUTION SYSTEM (UDS) BY FOOD SERVICE EQUIPMENT SUPPLIER,

260609 PROVIDE CONDENSATE SEAL-OFF FITTING AT ALL TRANSITIONS BETWEEN DIFFERENT AMBIENT TEMPERATURES.

260610 FEED POWER TO EQUIPMENT FROM ABOVE.

260611 PROVIDE INTER CONNECTION AS REQUIRED TO DOOR LIGHT, HEATER AND ADDITIONAL LIGHT FITURES.

260612 COMPRESSOR LOCATED ON ROOF ABOVE FREEZER/COOLER UNITS. COORDINATE WITH EQUIPMENT SUPPLIER FOR EXACT LOCATION. REFER TO DRAWING E-203 FOR ADDITIONAL REQUIREMENTS.

260613 MANUAL MOTOR STARTER WITH 20A, 240VAC, 1P TOGGLE SWITCH DISCONNECT, RED (ON) LED PILOT LIGHT, IN NEMA 4X STAINLESS STEEL ENCLOSURE. CONNECT TO CIRCUIT AS SHOWN USING 2#12+G, IN 3/4"C.

260614 MANUAL MOTOR STARTER WITH 20A, 240VAC, 2P TOGGLE SWITCH DISCONNECT, RED (ON) LED PILOT LIGHT, IN NEMA 4X STAINLESS STEEL ENCLOSURE. CONNECT TO CIRCUIT AS SHOWN USING 2#12+G. IN 3/4"C.

260615 LOCATE MANUAL MOTOR STARTER ADJACENT TO FREEZER COIL (INSIDE WALK-IN COOLER). MOUNT INDEPENDENT OF COIL TO COOLER ENCLOSURE PER MANUFACTURER DIRECTIONS. PROVIDE WEATHERPROOF ENCLOSURE.

260616 LOCATE MANUAL MOTOR STARTER ADJACENT TO COOLER COIL (INSIDE WALK-IN COOLER). MOUNT INDEPENDENT OF COIL TO COOLER ENCLOSURE PER MANUFACTURER DIRECTIONS. PROVIDE WEATHERPROOF ENCLOSURE.

260617 3/4"C. BETWEEN COMPRESSOR AND COIL FOR CONTROL CABLING. CONTROL CABLING AS REQUIRED BY EQUIPMENT MANUFACTURER.

260618 PROVIDE CONNECTION TO DRAIN LINE HEAT TAPE AS NEEDED BETWEEN SWITCH AND TAPE.

260619 CONNECT TO CIRCUIT SHOWN WITH 3#3+#6G. IN 1-1/4"C.

260620 FURNISH AND INSTALL OCTAGONAL BOX FOR FIRE PULL STATION AT +48" AFF WITH 1/2"C. FROM TOP OF BOX TO HOOD FIRE SUPPRESSION CABINET. COORDINATE EXACT LOCATIONS BEFORE ROUGH-IN. PULL STATION SHALL BE LOCATED NO LESS THAN 10'-0" AND NO GREATER THAN 20'-0" FROM ANSUL/HOOD AND LOCATED ALONG PATH OF EGRESS.

260621 HOOD FIRE SUPPRESSION SYSTEM, CIRCUIT AS SHOWN USING 2#12+G. IN 3/4"C. VERIFY EXACT LOCATION BEFORE ROUGH-IN.

260622 PROVIDE 3/4"C. FROM FIRE SYSTEM MICROSWITCH ABOVE HOOD TO UTILITY DISTRIBUTION SYSTEM (UDS) FOR SHUNT TRIP BREAKER CONTROL WIRING. WIRING AS REQUIRED BY EQUIPMENT MANUFACTURER.

260623 PROVIDE 3/4"C. FROM FIRE SYSTEM MICROSWITCH ABOVE HOOD TO FACP, IN ELECTRICAL #C1054, FOR FIRE SUPPRESSION MONITORING WIRING. WIRING AS REQUIRED BY EQUIPMENT MANUFACTURER.

260624 PROVIDE 3/4"C. FROM FIRE SYSTEM MICROSWITCH ABOVE HOOD TO HOOD MAKE-UP AIR FAN TO SHUT DOWN RETURN AIR FAN AS NEEDED. WIRING AS REQUIRED BY EQUIPMENT MANUFACTURER.

260625 PROVIDE 4 SQ. JUNCTION BOX ABOVE HOOD FOR CONNECTION OF HOOD LIGHTS.

260626 ITEM #40A - PROVIDE 3/4"C. BETWEEN HOOD CONTROL PANEL AND JUNCTION BOX ABOVE HOOD FOR HOOD LIGHT WIRING, REFERENCE NOTE #K13. PROVIDE FINAL CONNECTION AS NEEDED TO HOOD LIGHTS.

260627 ITEM #40D - PROVIDE 3/4"C. BETWEEN HOOD CONTROL PANEL AND HOOD FIRE SUPPRESSION SYSTEM PANEL FOR CONTROL WIRING, CONTROL CABLING AS REQUIRED BY EQUIPMENT MANUFACTURER.

260628 ITEM #40E - PROVIDE 3/4"C. BETWEEN HOOD CONTROL PANEL AND DUCT SENSORS AT TOP OF EACH HOOD SECTION FOR CONTROL WIRING, CONTROL CABLING AS REQUIRED BY EQUIOPMENT MANUFACTURER. VERIFY EXACT SENSOR LOCATION.

260629 ITEM #40F - PROVIDE 3/4"C. BETWEEN HOOD CONTROL PANEL AND KITCHEN TEMPERATURE SENSOR FOR CONTROL WIRING, CONTROL CABLING AS REQUIRED BY EQUIPMENT MANUFACTURER. VERIFY EXACT SENSOR LOCATION.

260630 HOOD MAKE-UP AIR UNIT AND EXHAUST FAN LOCATED ON ROOF ABOVE, REFER TO SHEET E2.3 FOR MORE INFORMATION.

260631 PROVIDE WIRING AS NEEDED BETWEEN HOOD CONTROL PANEL AND HOOD MAKE-UP AIR UNIT VFD DRIVE. VFD QUICK CONNECTOR TO BE INCLUDED IN CONTROL PANEL, COORDINATE WITH EQUIPMENT MANUFACTURER. WIRE PER MANUFACTURER'S RECOMMENDATION.

260632 PROVIDE WIRING AS NEEDED BETWEEN HOOD CONTROL PANEL AND HOOD EXHAUST FAN VFD DRIVE. VFD QUICK CONNECTOR TO BE INCLUDED IN CONTROL PANEL, COORDINATE WITH EQUIPMENT MANUFACTURER. WIRE PER MANUFACTURER'S RECOMMENDATION.

260633 FURNISH AND INSTALL SEPARATE 120VAC INPUT TO HOOD SUPPLY FAN. CONNECT TO CIRCUIT K1L-31 USING 2#12+G. IN 3/4"C.

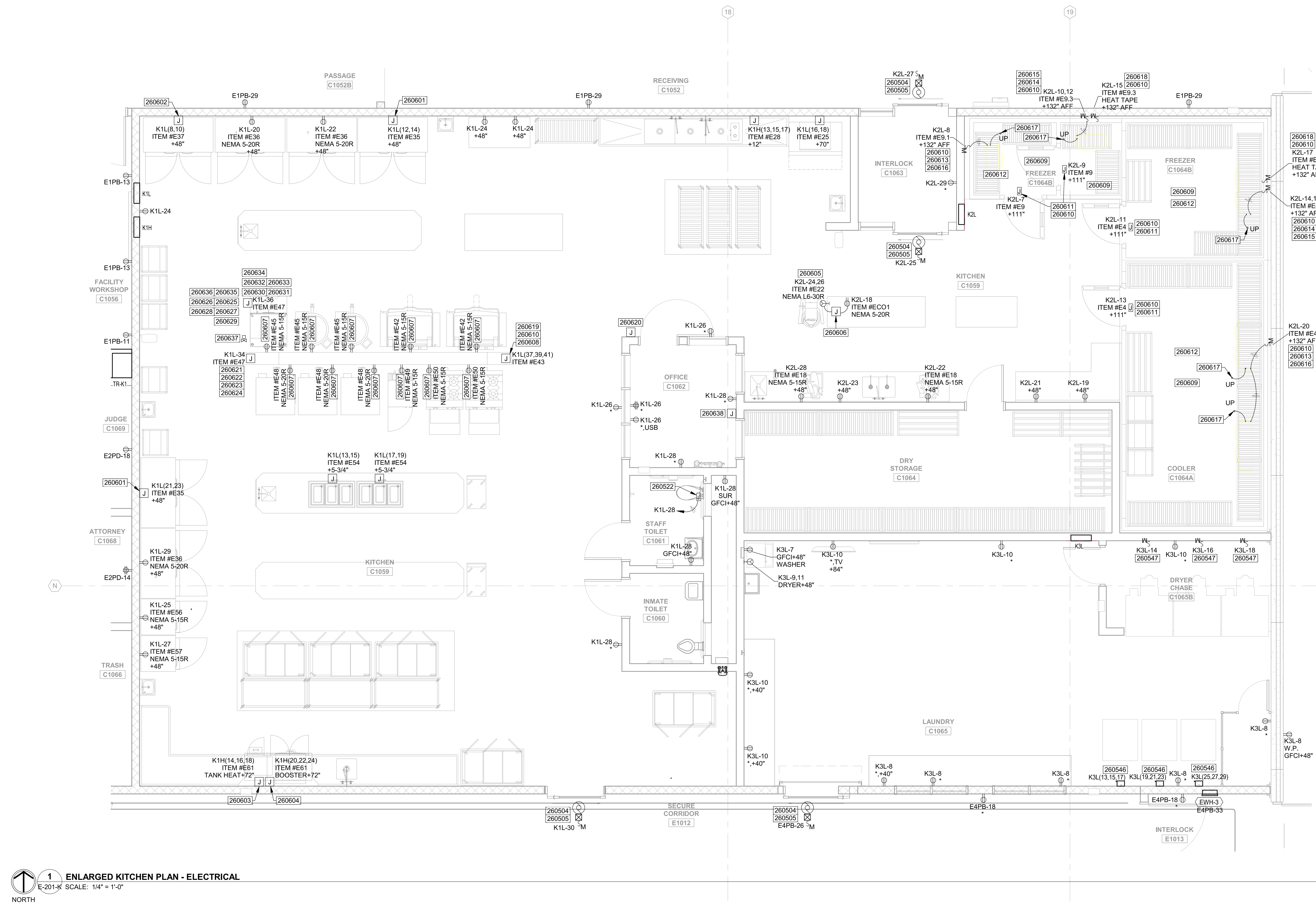
260634 PROVIDE 3/4"C. BETWEEN EXHAUST FAN AND HOOD FOR CONTROL WIRING, CONTROL CABLING AS REQUIRED BY EQUIPMENT MANUFACTURER.

260635 FURNISH AND INSTALL (1) CAT.6 CABLE TO CASELINK MONITOR AND CONTROL SYSTEM UNDER HOOD.

260636 FURNISH AND INSTALL POWER (120VAC) TO MOTORZIED DAMPERS. CONNECT TO CIRCUIT K1L-32 USING 2#12+G. IN 3/4"C. VERIFY EXACT LOCATION OF DAMPERS BEFORE ROUGH-IN.

260637 GAS SHUTOFF SOLENOID VALVE SHALL BE DE-ENERGIZED (VIA SHUNT TRIP BRANCH CIRCUIT BREAKER) UPON HOOD ANSUL ACTIVATION. FIELD COORDINATE/VERIFY SOLENOID VOLTAGE PRIOR TO CONSTRUCTION. REFER TO DETAIL #3 ON SHEET E-801.

260638 INSTALL REMOTE GAS VALVE SHUT-OFF CONTROL STATION FURNISHED BY KITCHEN EQUIPMENT VENDOR. WALL MOUNT 48" AFF AND PROVIDE EMERGENCY INSTRUCTION SIGNAGE ADJACENT TO CONTROL STATION. INTERLOCK SO THAT GAS VALVE OPENS UPON CONTROL STATION ACTIVATION AND/OR HOOD ANSUL ACTIVATION. REFER TO DETAIL #3 ON SHEET E-801.



1 ENLARGED KITCHEN PLAN - ELECTRICAL
E-201-K SCALE: 1/4" = 1'-0"
NORTH

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DLZ INDIANA, LLC

MARVIN L. HITCHCOCK REGISTERED No. PE60018676 STATE OF INDIANA PROFESSIONAL ENGINEER

NO.	REVISION	DATE
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DRAWN: RDW CHK'D: MLH
DESIGNED: RDW
APPR'VD: MLH
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

ENLARGED KITCHEN PLAN - ELECTRICAL

DRAWING NUMBER E-201-K
ELECTRICAL

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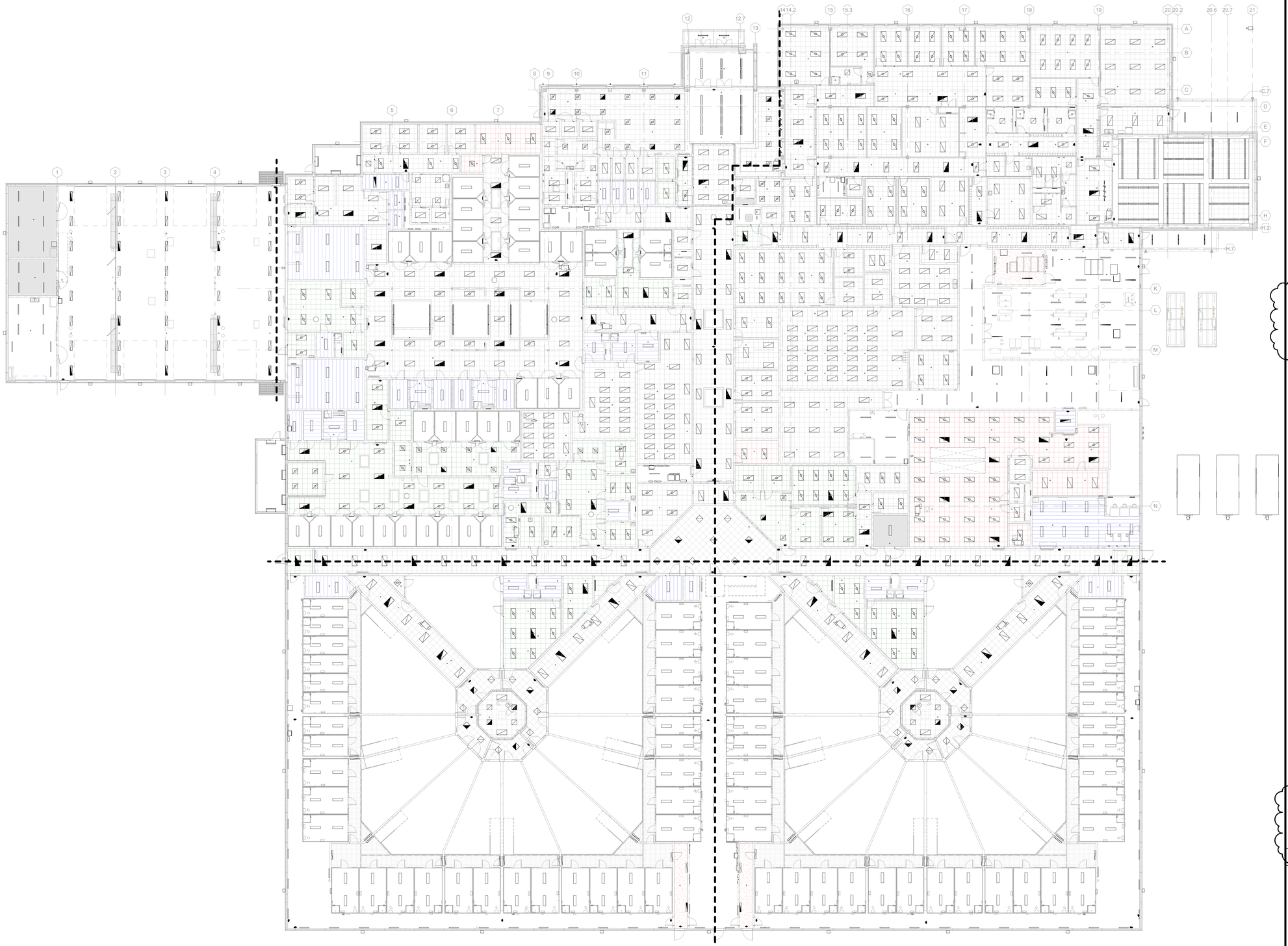

1 E-301 **FIRST FLOOR LIGHTING - OVERALL**
SCALE: 1/16" = 1'-0"
NORTH

THIS SHEET INCLUDED FOR OVERALL REFERENCE ONLY - SEE SHEETS E-301-A, E-301-B, E-301-C, E-301-D AND E-301-E FOR DETAILED REQUIREMENTS AND KEYED NOTES FOR POWER.

GENERAL NOTES

A. FOR LIGHTING FIXTURE SCHEDULE, SEE SHEET E-606. REFER TO REMARKS COLUMN ON LIGHTING FIXTURE SCHEDULE FOR FIXTURE MOUNTING HEIGHTS AND REQUIREMENTS U.O.N. ON THIS DRAWING.

B. FOR OCCUPANCY SENSOR WIRING DETAIL, SEE DETAIL #6 ON DRAWING E-802.

C. CONDUITS SHALL NOT BE ROUTED ALONG BUILDING EXTERIOR FOR EXTERIOR LIGHTING. CONCEAL BY ROUTING ON INTERIOR AND PENETRATE THROUGH WALL AT EACH EXTERIOR FIXTURE LOCATION.

D. FIELD COORDINATE, PRIOR TO CONSTRUCTION, EXACT MOUNTING HEIGHT OF ALL FIXTURES TO AVOID MECHANICAL DUCTWORK AND EQUIPMENT.

E. FOR EXTERIOR LIGHTING WIRING DIAGRAM, SEE DETAIL #— ON DRAWING E-802.

F. REFER TO ARCHITECTURAL SHEETS FOR FIRE RATED WALLS AND CEILINGS. INSTALL FIRESTOP AT PENETRATIONS. INSTALL FIRE RATED PUTTY AROUND BOXES INSTALLED IN FIRE RATED WALLS AND OFFSET BACK TO BACK BOXES.

G. CEILING MOUNTED OCCUPANCY SENSORS SHALL BE MOUNTED IN CENTER OF CEILING TILE U.O.N. COORDINATE EXACT LOCATIONS BEFORE ROUGH-IN.

H. OCCUPANCY SENSORS ARE SHOWN FOR PURPOSES OF IDENTIFYING ROOMS/AREAS WHERE REQUIRED. COORDINATE WITH MANUFACTURER ON QUANTITY AND LOCATIONS REQUIRED FOR COMPLETE COVERAGE.

I. PROVIDE POWER PACKS AS REQUIRED FOR OCCUPANCY SENSORS. POWER PACKS ARE NOT SHOWN. FIELD COORDINATE LOCATIONS AND RECORD ON ELECTRICAL RECORD DRAWINGS.

J. CROSS HATCHED/SHADED FIXTURES = FIXTURES POWERED V/A EMERGENCY BACKUP GENERATOR FOR EMERGENCY EGRESS.

K. EM = EMERGENCY EGRESS FIXTURE. N.L. = NIGHT LIGHT

L. WHERE SWITCH CIRCUIT IS NOT INDICATED, ALL FIXTURES IN ROOM OR AREA SHALL BE ON SAME SWITCH CIRCUIT CONTROLLED BY LIGHTING CONTROL DEVICE INDICATED FOR THAT SPACE.

M. SEAL ALL PENETRATIONS THRU PRECAST, REFER TO SPECIFICATION 079200 FOR TYPE

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NOTE:
AREAS/ROOMS WITH COLORED CEILING GRIDS SHOWN ARE FOR PURPOSES OF IDENTIFING "SECURITY" TYPE CEILINGS; NO JUNCTION BOXES SHALL BE INSTALLED ABOVE "SECURITY" TYPE CEILINGS UNLESS ATTACHED TO DEVICES MOUNTED IN/ON GRID.

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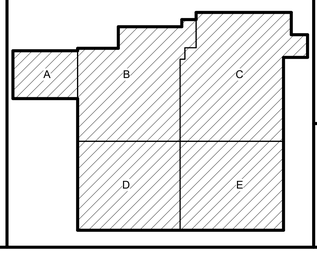
NOTE:
ELEMENTS ON THIS SHEET ARE IDENTIFIED BY VARIOUS COLORS; IF THIS NOTE IS NOT RED, THIS SHEET IS NOT IN COLOR AND NEEDS TO BE REPRINTED IN COLOR.

KEY PLAN



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TERRE HAUTE, INDIANA

FIRST FLOOR LIGHTING PLAN - OVERALL

DRAWING NUMBER E-301 ELECTRICAL

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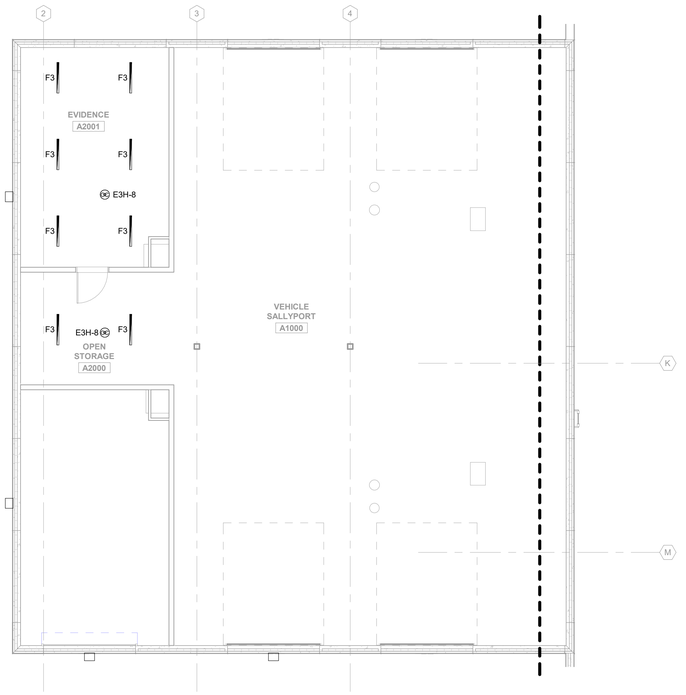
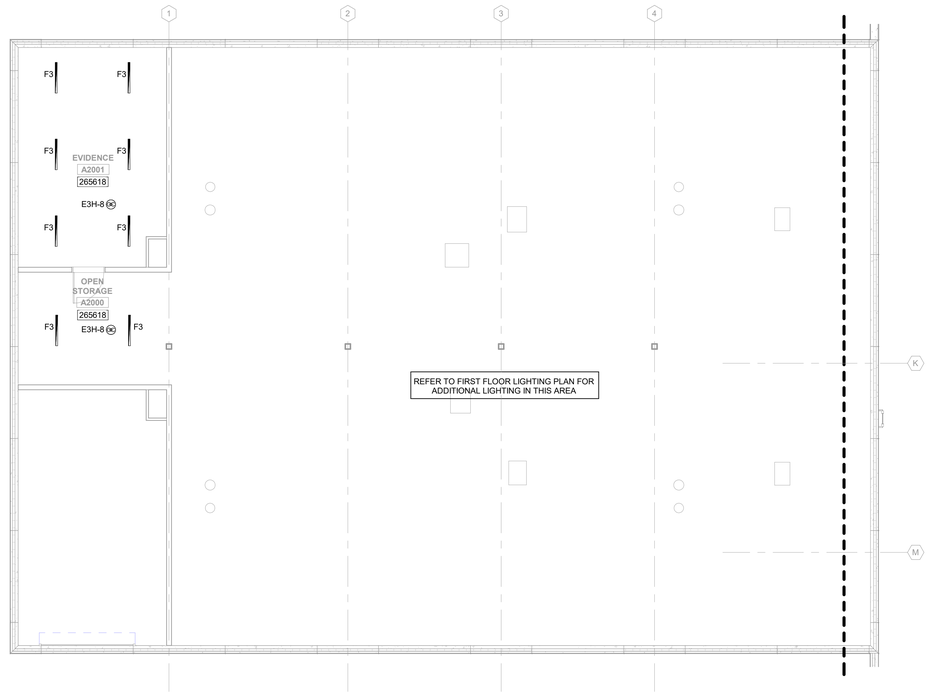
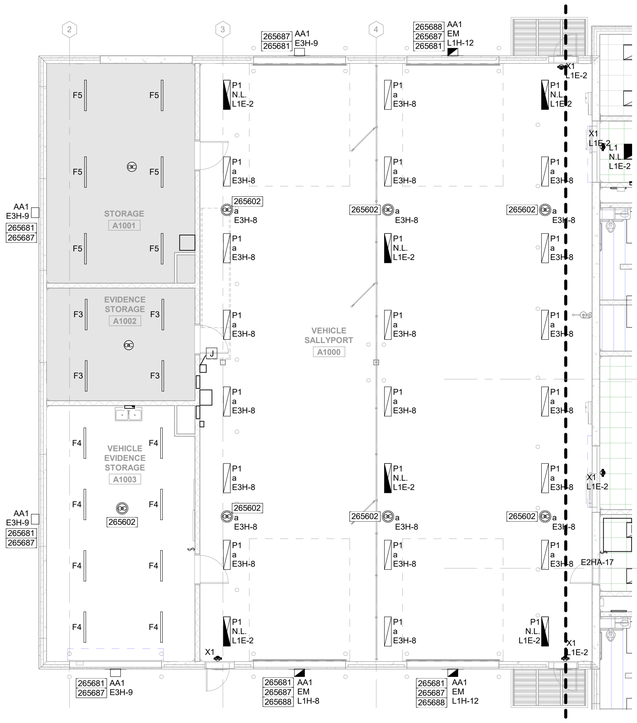


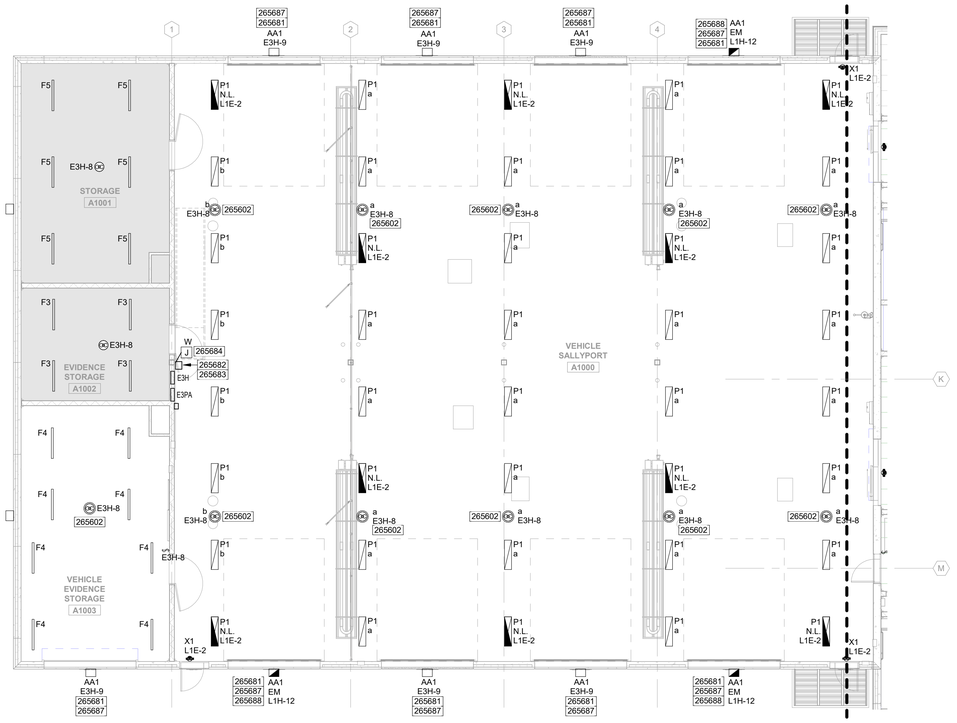
4 SECOND FLOOR LIGHTING - AREA 'A' ALTERNATE
E-301-A SCALE: 1/8" = 1'-0"



2 MEZZANINE LIGHTING PLAN - AREA 'A'
E-301-A SCALE: 1/8" = 1'-0"



3 FIRST FLOOR LIGHTING - AREA 'A' ALTERNATE
E-301-A SCALE: 1/8" = 1'-0"



1 FIRST FLOOR LIGHTING - AREA 'A'
E-301-A SCALE: 1/8" = 1'-0"

GENERAL NOTES

A. FOR LIGHTING FIXTURE SCHEDULE, SEE SHEET E-606. REFER TO REMARKS COLUMN ON LIGHTING FIXTURE SCHEDULE FOR FIXTURE MOUNTING HEIGHTS AND REQUIREMENTS U.O.N. ON THIS DRAWING.

B. FOR OCCUPANCY SENSOR WIRING DETAIL, SEE DETAIL #6 ON DRAWING E-802.

C. CONDUITS SHALL NOT BE ROUTED ALONG BUILDING EXTERIOR FOR EXTERIOR LIGHTING. CONCEAL BY ROUTING ON INTERIOR AND PENETRATE THROUGH WALL AT EACH EXTERIOR FIXTURE LOCATION.

D. FIELD COORDINATE, PRIOR TO CONSTRUCTION, EXACT MOUNTING HEIGHT OF ALL FIXTURES TO AVOID MECHANICAL DUCTWORK AND EQUIPMENT.

E. FOR EXTERIOR LIGHTING WIRING DIAGRAM, SEE DRAWING E-807.

F. REFER TO ARCHITECTURAL SHEETS FOR FIRE RATED WALLS AND CEILINGS. INSTALL FIRESTOP AT PENETRATIONS. INSTALL FIRE RATED PUTTY AROUND BOXES INSTALLED IN FIRE RATED WALLS AND OFFSET BACK TO BACK BOXES.

G. CEILING MOUNTED OCCUPANCY SENSORS SHALL BE MOUNTED IN CENTER OF CEILING TILE U.O.N. COORDINATE EXACT LOCATIONS BEFORE ROUGH-IN.

H. OCCUPANCY SENSORS ARE SHOWN FOR PURPOSES OF IDENTIFYING ROOMS/AREAS WHERE REQUIRED. COORDINATE WITH MANUFACTURER ON QUANTITY AND LOCATIONS REQUIRED FOR COMPLETE COVERAGE.

I. PROVIDE POWER PACKS AS REQUIRED FOR OCCUPANCY SENSORS. POWER PACKS ARE NOT SHOWN. FIELD COORDINATE LOCATIONS AND RECORD ON ELECTRICAL RECORD DRAWINGS.

J. CROSS HATCHED/SHADED FIXTURES = FIXTURES POWERED VIA EMERGENCY BACKUP GENERATOR FOR EMERGENCY EGRESS.

K. EM = EMERGENCY EGRESS FIXTURE. N.L. = NIGHT LIGHT

L. WHERE SWITCH CIRCUIT IS NOT INDICATED, ALL FIXTURES IN ROOM OR AREA SHALL BE ON SAME SWITCH CIRCUIT CONTROLLED BY LIGHTING CONTROL DEVICE INDICATED FOR THAT SPACE.

M. SEAL ALL PENETRATIONS THRU PRECAST, REFER TO SPECIFICATION 079200 FOR TYPE.

N. REFER TO DRAWING E-302-E FOR LIGHTING CONTROL NOTES.

LIGHTING KEYNOTES 2656##

265602 PIR HIGH BAY OCCUPANCY SENSOR. PROVIDE POWER PACK(S) AS RECOMMENDED. DEVICE TO BE FIXTURE MOUNTED OR PENDANT MOUNTED AT SAME HEIGHT AS FIXTURES IN ROOM.

265618 ALIGN FIXTURES IN ROOM WITH BOTTOM OF CIELING JOIST.

265681 CONNECT TO CIRCUIT SHOWN USING 2#10+#10G. IN 3/4"C.

265682 LIGHTING CONTACTORS, LC3A AND LC3B. REFER TO EXTERIOR LIGHTING WIRING DIAGRAM, SHEET E-807, DETAIL #3.

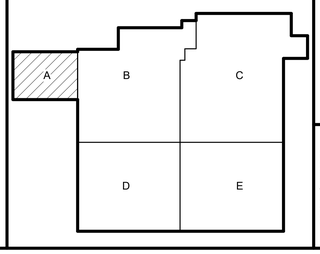
265683 NEW TIME CLOCK #TC3 FOR CONTROL OF EXTERIOR LIGHTING, REFER TO EXTERIOR LIGHTING WIRING DIAGRAM, SHEET E-807, DETAIL #3. CONNECT TO CIRCUIT E3PA-31 USING 2#12+G. IN 3/4"C.

265684 FURNISH AND INSTALL (1) EMERGENCY POWER CONTROL (ECP) MODULE #GTD3, LIKE LVS INC #EPC-1 OR APPROVED EQUAL IN WALL FOR CONTROL OF EXTERIOR EMERGENCY LIGHT. NON-EMERGENCY CIRCUIT SHALL BE CIRCUIT E4H-33. REFERENCE DETAIL #7 ON SHEET E-802. MODULE TO BE FLUSH MOUNTED AS INDICATED. RECORD EXACT LOCATION ON RECORD DRAWINGS.

265687 FIXTURE TO BE CONTROLLED ON/OFF VIA TIMECLOCK AND PHOTOCELL. REFER TO DETAIL #3 ON SHEET E-807. CONTROL VIA CONTACTOR #LC3A.

265688 FIXTURE TO BE CONTROLLED BY EMERGENCY POWER CONTROL MODULE LOCATED IN VEHICLE SALLYPORT #A1000.

KEY PLAN



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DLZ INDIANA, LLC

MARVIN L. HITCHCOCK
PE60018675
STATE OF INDIANA
PROFESSIONAL ENGINEER

NO.	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: MHK,RDW CHKD: MLH
DESIGNED: MHK,RDW
APPRVD: MLH
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

FIRST FLOOR AND MEZZANINE LIGHTING PLANS - AREA A

DRAWING NUMBER 1 E-301-A ELECTRICAL

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GENERAL NOTES

A. FOR LIGHTING FIXTURE SCHEDULE, SEE SHEET E-606. REFER TO REMARKS COLUMN ON LIGHTING FIXTURE SCHEDULE FOR FIXTURE MOUNTING HEIGHTS AND REQUIREMENTS U.O.N. ON THIS DRAWING.

B. FOR OCCUPANCY SENSOR WIRING DETAIL, SEE DETAIL #6 ON DRAWING E-802.

C. CONDUITS SHALL NOT BE ROUTED ALONG BUILDING EXTERIOR FOR EXTERIOR LIGHTING. CONCEAL BY ROUTING ON INTERIOR AND PENETRATE THROUGH WALL AT EACH EXTERIOR FIXTURE LOCATION.

D. FIELD COORDINATE, PRIOR TO CONSTRUCTION, EXACT MOUNTING HEIGHT OF ALL FIXTURES TO AVOID MECHANICAL DUCTWORK AND EQUIPMENT.

E. FOR EXTERIOR LIGHTING WIRING DIAGRAM, SEE DRAWING E-807.

F. REFER TO ARCHITECTURAL SHEETS FOR FIRE RATED WALLS AND CEILINGS. INSTALL FIRESTOP AT PENETRATIONS. INSTALL FIRE RATED PUTTY AROUND BOXES INSTALLED IN FIRE RATED WALLS AND OFFSET BACK TO BACK BOXES.

G. CEILING MOUNTED OCCUPANCY SENSORS SHALL BE MOUNTED IN CENTER OF CEILING TILE U.O.N. COORDINATE EXACT LOCATIONS BEFORE ROUGH-IN.

H. OCCUPANCY SENSORS ARE SHOWN FOR PURPOSES OF IDENTIFYING ROOMS/AREAS WHERE REQUIRED. COORDINATE WITH MANUFACTURER ON QUANTITY AND LOCATIONS REQUIRED FOR COMPLETE COVERAGE.

I. PROVIDE POWER PACKS AS REQUIRED FOR OCCUPANCY SENSORS. POWER PACKS ARE NOT SHOWN. FIELD COORDINATE LOCATIONS AND RECORD ON ELECTRICAL RECORD DRAWINGS.

J. CROSS HATCHED/SHADED FIXTURES = FIXTURES POWERED VIA EMERGENCY BACKUP GENERATOR FOR EMERGENCY EGRESS.

K. EM = EMERGENCY EGRESS FIXTURE. N.L. = NIGHT LIGHT

L. WHERE SWITCH CIRCUIT IS NOT INDICATED, ALL FIXTURES IN ROOM OR AREA SHALL BE ON SAME SWITCH CIRCUIT CONTROLLED BY LIGHTING CONTROL DEVICE INDICATED FOR THAT SPACE.

M. SEAL ALL PENETRATIONS THRU PRECAST, REFER TO SPECIFICATION 079200 FOR TYPE.

N. REFER TO DRAWING E-302-E FOR LIGHTING CONTROL NOTES.

LIGHTING KEYNOTES 2656##

265601 (TYPICAL) ALL CELLS, TOILETS & SHOWERS WILL HAVE LIGHTING FIXTURE(S) SUPPLIED BY CELL MANUFACTURER AND BE CONNECTED BY DIV. 26. FIXTURE SHALL BE 277V AND BE CONTROLLED THROUGH THE UTILITY CONTROL PANELS.

265602 PIR HIGH BAY OCCUPANCY SENSOR. PROVIDE POWER PACK(S) AS RECOMMENDED. DEVICE TO BE FIXTURE MOUNTED OR PENDANT MOUNTED AT SAME HEIGHT AS FIXTURES IN ROOM.

265604 LIGHTING IN ROOM/AREA TO BE CONTROLLED BY UTILITY CONTROL PANEL, REFER TO LIGHTING CONTROLS NOTE ON E-302-E AND SPECIFICATIONS FOR MORE INFORMATION.

265606 (TYPICAL) PROVIDE WALLBOX DIMMER(S) FOR 277V LED DRIVERS, SLIDER WITH POSITIVE OFF. DIMMER SHALL BE PROVIDED PER LIGHT FIXTURE MANUFACTURERS RECOMMENDATION FOR PROPER DIMMING OF LED FIXTURE(S).

265608 FURNISH AND INSTALL (1) EMERGENCY POWER CONTROL (ECP) MODULE LIKE LVS, INC #EPC-1 OR APPROVED EQUAL IN ROOM/AREA FOR CONTROL OF EMERGENCY LIGHT(S). NON-EMERGENCY CIRCUIT SHALL BE SAME CIRCUIT AS REST OF ROOM LIGHTING. REFERENCE DETAIL #7 ON SHEET E-802. MODULE TO BE FLUSH MOUNTED AS INDICATED. RECORD EXACT LOCATION ON RECORD DRAWINGS.

265609 MOUNT FIXTURES IN ROOM/AREA WITH BOTTOM AT +10'-0" AFF. CONTROL AND CIRCUIT AS SHOWN.

265610 (TYPICAL) OCCUPANCY SENSOR. PROVIDE POWER PACK(S) AS RECOMMENDED. DEVICE TO BE FIXTURE MOUNTED OR PENDANT MOUNTED AT SAME HEIGHT AS ROOM/AREA FIXTURES.

265611 FIXTURES IN ROOM/AREA TO BE CONTROLLED BY LIGHTING CONTROL SWITCH (DIMMER) IN BOOKING COUNTER #B1053A.

265614 FIXTURE TO BE STEM/PENDANT MOUNTED WITH BOTTOM AT +8'-0" AFF.

265619 ROOM LIGHTING CONTROLLER AND INDICATOR LIGHTS (ONE PER ZONE). REFER TO ASSOCIATED ROOM DETAIL ON SHEET E-805 FOR LIGHTING CONTROL SCHEMATIC.

265620 FLUSH MOUNT EPC IN WALL FOR CONTROL OF MALE MEDICAL DAYROOM B1095 EMERGENCY FIXTURES.

265621 FLUSH MOUNT EPC IN WALL FOR CONTROL OF FEMALE DAYROOM B1112 EMERGENCY FIXTURES.

265622 PROVIDE DAYLIGHT SENSOR (QTY AND LOCATION PER MANUFACTURER) FOR AUTOMATIC CONTROL OF ROOM LIGHTING LEVELS, REFER TO ASSOCIATED ROOM DETAIL ON E-805 FOR LIGHTING CONTROL SCHEMATIC.

265623 INSTALL EPC ABOVE CEILING FOR CONTROL OF MEDICAL WAITING B1122 AND INTERLOCK B1121 EMERGENCY FIXTURES.

265627 PROVIDE DAYLIGHT SENSOR (QTY AND LOCATION PER MANUFACTURER) FOR AUTOMATIC CONTROL OF ROOM LIGHTING LEVELS, REFER TO ASSOCIATED ROOM DETAIL ON E-806 FOR LIGHTING CONTROL SCHEMATIC.

265628 PROVIDE DAYLIGHT SENSOR (QTY AND LOCATION PER MANUFACTURER) FOR AUTOMATIC CONTROL OF ROOM LIGHTING LEVELS, REFER TO ASSOCIATED ROOM DETAIL ON E-805 FOR LIGHTING CONTROL SCHEMATIC, MOUNT ON WALL OF SKYLIGHT AT +11'-0" AFF.

265629 FIXTURE TO BE MOUNTED ON TOP OF CANOPY FOR ILLUMINATION OF SIGN ABOVE. FIELD COORDINATE EXACT LOCATION PRIOR TO ROUGH-IN.

265673 FIXTURE TO BE CONTROLLED ON/OFF VIA TIMECLOCK AND PHOTOCELL. REFER TO DETAIL #6 ON SHEET E-807. CONTROL VIA CONTACTOR #LC4A.

265680 FIXTURE TO BE CONTROLLED BY EMERGENCY POWER CONTROL MODULE LOCATED IN STORAGE #E1016B.

265681 CONNECT TO CIRCUIT SHOWN USING 2#10+#10G. IN 3/4"C.

265686 EXTERIOR TYPE 'CC1' LIGHTING FIXTURES SHALL BE MANUALLY SWITCHED FROM LOCAL EXTERIOR DIMMER SWITCH. DIMMER SWITCH SHALL BE COMPATIBLE WITH LED FIXTURE DRIVER. FIXTURES SHALL ALSO BE CONTROLLED VIA LIGHTING CONTACTOR FOR DUSK-TO-DAWN CONTROL. PROVIDE LABEL ON TOGGLE SWITCH FACEPLATE INDENTIFYING EXTERIOR LIGHTING ALSO INTERLOCKED/CONTROLLED VIA LIGHTING CONTACTOR.

265687 FIXTURE TO BE CONTROLLED ON/OFF VIA TIMECLOCK AND PHOTOCELL. REFER TO DETAIL #3 ON SHEET E-807. CONTROL VIA CONTACTOR #LC3A.

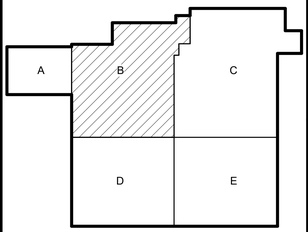
265689 FIXTURE TO BE CONTROLLED ON/OFF VIA TIMECLOCK AND PHOTOCELL. REFER TO DETAIL #2 ON SHEET E-807. CONTROL VIA CONTACTOR #LC2A.

265690 FIXTURE TO BE CONTROLLED ON/OFF VIA TIMECLOCK AND PHOTOCELL. REFER TO DETAIL #2 ON SHEET E-807. CONTROL VIA CONTACTOR #LC2B.

265693 LIGHTING CONTACTORS, LC2A, LC2B, LC2C AND LC2D, REFER TO EXTERIOR LIGHTING WIRING DIAGRAM, SHEET E-807, DETAIL #2.

265694 NEW TIME CLOCK #TC2 FOR CONTROL OF EXTERIOR LIGHTING, REFER TO EXTERIOR LIGHTING WIRING DIAGRAM, SHEET E-807, DETAIL #2. CONNECT TO CIRCUIT E2PA-35 USING 2#12+G. IN 3/4"C.

KEY PLAN



1 FIRST FLOOR LIGHTING - AREA 'B'
E-301-B SCALE: 1/8" = 1'-0"

NORTH

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DLZ INDIANA, LLC

MARVIN L. HITCHCOCK JR. REGISTERED PROFESSIONAL ENGINEER STATE OF INDIANA PE20018675

NO.	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: MHK,RDW CHKD: MLH
DESIGNED: MHK,RDW
APPRVD: MLH
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

FIRST FLOOR LIGHTING PLAN - AREA B

DRAWING NUMBER 1 E-301-B ELECTRICAL

1 FIRST FLOOR LIGHTING - AREA 'C'
E-301-C SCALE: 1/8" = 1'-0"
NORTH

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GENERAL NOTES

A. FOR LIGHTING FIXTURE SCHEDULE, SEE SHEET E-606. REFER TO REMARKS COLUMN ON LIGHTING FIXTURE SCHEDULE FOR FIXTURE MOUNTING HEIGHTS AND REQUIREMENTS U.O.N. ON THIS DRAWING.

B. FOR OCCUPANCY SENSOR WIRING DETAIL, SEE DETAIL #6 ON DRAWING E-802.

C. CONDUITS SHALL NOT BE ROUTED ALONG BUILDING EXTERIOR FOR EXTERIOR LIGHTING. CONCEAL BY ROUTING ON INTERIOR AND PENETRATE THROUGH WALL AT EACH EXTERIOR FIXTURE LOCATION.

D. FIELD COORDINATE, PRIOR TO CONSTRUCTION, EXACT MOUNTING HEIGHT OF ALL FIXTURES TO AVOID MECHANICAL DUCTWORK AND EQUIPMENT.

E. FOR EXTERIOR LIGHTING WIRING DIAGRAM, SEE DRAWING E-807.

F. REFER TO ARCHITECTURAL SHEETS FOR FIRE RATED WALLS AND CEILINGS. INSTALL FIRESTOP AT PENETRATIONS. INSTALL FIRE RATED PUTTY AROUND BOXES INSTALLED IN FIRE RATED WALLS AND OFFSET BACK TO BACK BOXES.

G. CEILING MOUNTED OCCUPANCY SENSORS SHALL BE MOUNTED IN CENTER OF CEILING TILE U.O.N. COORDINATE EXACT LOCATIONS BEFORE ROUGH-IN.

H. OCCUPANCY SENSORS ARE SHOWN FOR PURPOSES OF IDENTIFYING ROOMS/AREAS WHERE REQUIRED. COORDINATE WITH MANUFACTURER ON QUANTITY AND LOCATIONS REQUIRED FOR COMPLETE COVERAGE.

I. PROVIDE POWER PACKS AS REQUIRED FOR OCCUPANCY SENSORS. POWER PACKS ARE NOT SHOWN. FIELD COORDINATE LOCATIONS AND RECORD ON ELECTRICAL RECORD DRAWINGS.

J. CROSS HATCHED/SHADED FIXTURES = FIXTURES POWERED VIA EMERGENCY BACKUP GENERATOR FOR EMERGENCY EGRESS.

K. EM = EMERGENCY EGRESS FIXTURE. N.L. = NIGHT LIGHT

L. WHERE SWITCH CIRCUIT IS NOT INDICATED, ALL FIXTURES IN ROOM OR AREA SHALL BE ON SAME SWITCH CIRCUIT CONTROLLED BY LIGHTING CONTROL DEVICE INDICATED FOR THAT SPACE.

M. SEAL ALL PENETRATIONS THRU PRECAST, REFER TO SPECIFICATION 079200 FOR TYPE.

N. REFER TO DRAWING E-302-E FOR LIGHTING CONTROL NOTES.

LIGHTING KEYNOTES

2656##

265602 PIR HIGH BAY OCCUPANCY SENSOR. PROVIDE POWER PACK(S) AS RECOMMENDED. DEVICE TO BE FIXTURE MOUNTED OR PENDANT MOUNTED AT SAME HEIGHT AS FIXTURES IN ROOM.

265606 (TYPICAL) PROVIDE WALLBOX DIMMER(S) FOR 277V LED DRIVERS, SLIDER WITH POSITIVE OFF. DIMMER SHALL BE PROVIDED PER LIGHT FIXTURE MANUFACTURERS RECOMMENDATION FOR PROPER DIMMING OF LED FIXTURE(S).

265608 FURNISH AND INSTALL (1) EMERGENCY POWER CONTROL (ECP) MODULE LIKE LVS, INC #EPC-1 OR APPROVED EQUAL IN ROOM/AREA FOR CONTROL OF EMERGENCY LIGHT(S). NON-EMERGENCY CIRCUIT SHALL BE SAME CIRCUIT AS REST OF ROOM LIGHTING. REFERENCE DETAIL #7 ON SHEET E-802. MODULE TO BE FLUSH MOUNTED AS INDICATED. RECORD EXACT LOCATION ON RECORD DRAWINGS.

265609 MOUNT FIXTURES IN ROOM/AREA WITH BOTTOM AT +10'-0" AFF. CONTROL AND CIRCUIT AS SHOWN.

265610 (TYPICAL) OCCUPANCY SENSOR. PROVIDE POWER PACK(S) AS RECOMMENDED. DEVICE TO BE FIXTURE MOUNTED OR PENDANT MOUNTED AT SAME HEIGHT AS ROOM/AREA FIXTURES.

265613 MOUNT FIXTURES IN ROOM/AREA WITH BOTTOM AT +9'-0" AFF. CONTROL AND CIRCUIT AS SHOWN.

265617 IP65 RATED OCCUPANCY SENSOR LIKE HUBBELL #WSP-LWO-SM-UNV WITH #WSPLW0L260LM LENS OR APPROVED EQUAL. OUTDOOR SENSOR TO BE LOW/SURFACE MOUNTED WITH 360 DEGREE COVERAGE, UNIVERSAL VOLTAGE IN WHITE FINISH.

265619 ROOM LIGHTING CONTROLLER AND INDICATOR LIGHTS (ONE PER ZONE). REFER TO ASSOCIATED ROOM DETAIL ON SHEET E-805 FOR LIGHTING CONTROL SCHEMATIC.

265627 PROVIDE DAYLIGHT SENSOR (QTY AND LOCATION PER MANUFACTURER) FOR AUTOMATIC CONTROL OF ROOM LIGHTING LEVELS, REFER TO ASSOCIATED ROOM DETAIL ON E-806 FOR LIGHTING CONTROL SCHEMATIC.

265629 FIXTURE TO BE MOUNTED ON TOP OF CANOPY FOR ILLUMINATION OF SIGN ABOVE. FIELD COORDINATE EXACT LOCATION PRIOR TO ROUGH-IN.

265673 FIXTURE TO BE CONTROLLED ON/OFF VIA TIMECLOCK AND PHOTOCELL. REFER TO DETAIL #6 ON SHEET E-807. CONTROL VIA CONTACTOR #LC4A.

265689 FIXTURE TO BE CONTROLLED ON/OFF VIA TIMECLOCK AND PHOTOCELL. REFER TO DETAIL #2 ON SHEET E-807. CONTROL VIA CONTACTOR #LC2A.

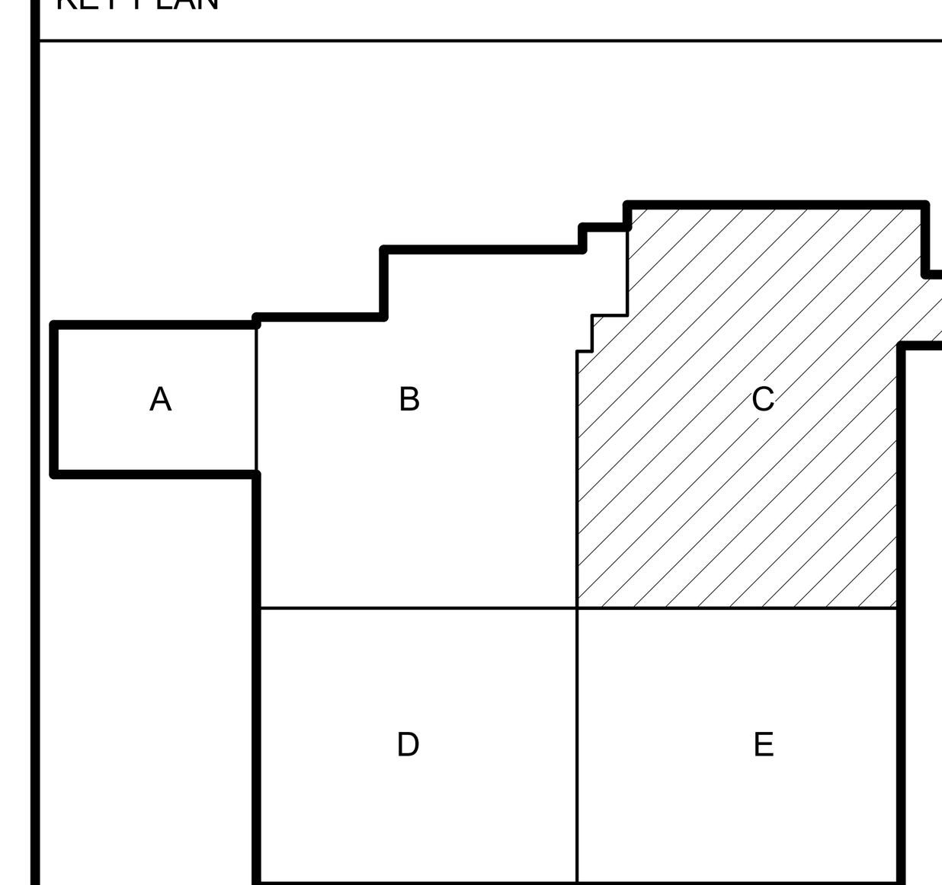
265690 FIXTURE TO BE CONTROLLED ON/OFF VIA TIMECLOCK AND PHOTOCELL. REFER TO DETAIL #2 ON SHEET E-807. CONTROL VIA CONTACTOR #LC2B.

265697 LIGHTING CONTACTORS, LC1A, LC1B AND LC1C, REFER TO EXTERIOR LIGHTING WIRING DIAGRAM, SHEET E-807, DETAIL #1.

265698 NEW TIME CLOCK #TC1 FOR CONTROL OF EXTERIOR LIGHTING, REFER TO EXTERIOR LIGHTING WIRING DIAGRAM, SHEET E-807, DETAIL #1. CONNECT TO CIRCUIT E1PA-48 USING 2#12+G. IN 3/4"C.

265699 FIXTURE TO BE CONTROLLED ON/OFF VIA TIMECLOCK AND PHOTOCELL. REFER TO DETAIL #1 ON SHEET E-807. CONTROL VIA CONTACTOR #LC1A.

KEY PLAN



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SURVEYING • CONSTRUCTION SERVICES
DLZ INDIANA, LLC

MARVIN L. HITCHCOCK REGISTERED No. PE60018676 STATE OF INDIANA PROFESSIONAL ENGINEER

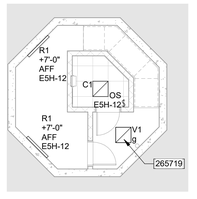
NO.	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: MHK,RDW CHK'D: MLH
DESIGNED: MHK,RDW
APPRV'D: MLH
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER
1663-1190-90

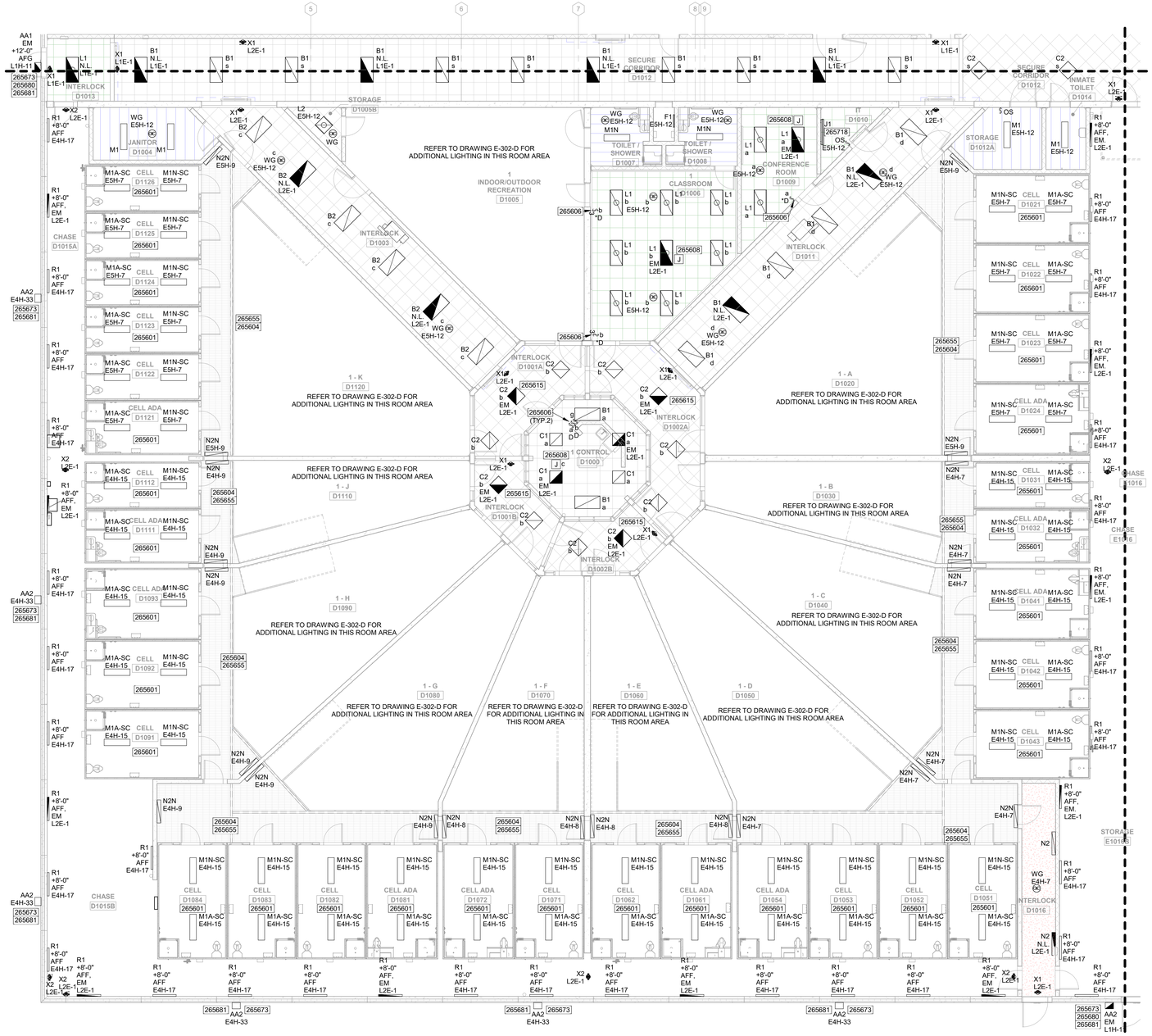
A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

FIRST FLOOR LIGHTING PLAN - AREA C

DRAWING NUMBER
E-301-C
ELECTRICAL



2 LOWER LEVEL LIGHTING - AREA 'D'
E-301-D SCALE: 1/8" = 1'-0"
NORTH



1 FIRST FLOOR LIGHTING - AREA 'D'
E-301-D SCALE: 1/8" = 1'-0"
NORTH

GENERAL NOTES

A. FOR LIGHTING FIXTURE SCHEDULE, SEE SHEET E-606. REFER TO REMARKS COLUMN ON LIGHTING FIXTURE SCHEDULE FOR FIXTURE MOUNTING HEIGHTS AND REQUIREMENTS U.O.N. ON THIS DRAWING.

B. FOR OCCUPANCY SENSOR WIRING DETAIL, SEE DETAIL #6 ON DRAWING E-802.

C. CONDUITS SHALL NOT BE ROUTED ALONG BUILDING EXTERIOR FOR EXTERIOR LIGHTING. CONCEAL BY ROUTING ON INTERIOR AND PENETRATE THROUGH WALL AT EACH EXTERIOR FIXTURE LOCATION.

D. FIELD COORDINATE, PRIOR TO CONSTRUCTION, EXACT MOUNTING HEIGHT OF ALL FIXTURES TO AVOID MECHANICAL DUCTWORK AND EQUIPMENT.

E. FOR EXTERIOR LIGHTING WIRING DIAGRAM, SEE DRAWING E-807.

F. REFER TO ARCHITECTURAL SHEETS FOR FIRE RATED WALLS AND CEILINGS. INSTALL FIRESTOP AT PENETRATIONS. INSTALL FIRE RATED PUTTY AROUND BOXES INSTALLED IN FIRE RATED WALLS AND OFFSET BACK TO BACK BOXES.

G. CEILING MOUNTED OCCUPANCY SENSORS SHALL BE MOUNTED IN CENTER OF CEILING TILE U.O.N. COORDINATE EXACT LOCATIONS BEFORE ROUGH-IN.

H. OCCUPANCY SENSORS ARE SHOWN FOR PURPOSES OF IDENTIFYING ROOMS/AREAS WHERE REQUIRED. COORDINATE WITH MANUFACTURER ON QUANTITY AND LOCATIONS REQUIRED FOR COMPLETE COVERAGE.

I. PROVIDE POWER PACKS AS REQUIRED FOR OCCUPANCY SENSORS. POWER PACKS ARE NOT SHOWN. FIELD COORDINATE LOCATIONS AND RECORD ON ELECTRICAL RECORD DRAWINGS.

J. CROSS HATCHED/SHADED FIXTURES = FIXTURES POWERED VIA EMERGENCY BACKUP GENERATOR FOR EMERGENCY EGRESS.

K. EM = EMERGENCY EGRESS FIXTURE. N.L. = NIGHT LIGHT

L. WHERE SWITCH CIRCUIT IS NOT INDICATED, ALL FIXTURES IN ROOM OR AREA SHALL BE ON SAME SWITCH CIRCUIT CONTROLLED BY LIGHTING CONTROL DEVICE INDICATED FOR THAT SPACE.

M. SEAL ALL PENETRATIONS THRU PRECAST, REFER TO SPECIFICATION 079200 FOR TYPE.

N. REFER TO DRAWING E-302-E FOR LIGHTING CONTROL NOTES.

LIGHTING KEYNOTES 2656##

265601 (TYPICAL) ALL CELLS, TOILETS & SHOWERS WILL HAVE LIGHTING FIXTURE(S) SUPPLIED BY CELL MANUFACTURER AND BE CONNECTED BY DIV. 26. FIXTURE SHALL BE 277V AND BE CONTROLLED THROUGH THE UTILITY CONTROL PANELS.

265604 LIGHTING IN ROOM/AREA TO BE CONTROLLED BY UTILITY CONTROL PANEL, REFER TO LIGHTING CONTROLS NOTE ON E-302-E AND SPECIFICATIONS FOR MORE INFORMATION.

265606 (TYPICAL) PROVIDE WALLBOX DIMMER(S) FOR 277V LED DRIVERS, SLIDER WITH POSITIVE OFF. DIMMER SHALL BE PROVIDED PER LIGHT FIXTURE MANUFACTURERS RECOMMENDATION FOR PROPER DIMMING OF LED FIXTURE(S).

265608 FURNISH AND INSTALL (1) EMERGENCY POWER CONTROL (ECP) MODULE LIKE LVS, INC #EPC-1 OR APPROVED EQUAL IN ROOM/AREA FOR CONTROL OF EMERGENCY LIGHT(S). NON-EMERGENCY CIRCUIT SHALL BE SAME CIRCUIT AS REST OF ROOM LIGHTING. REFERENCE DETAIL #7 ON SHEET E-802. MODULE TO BE FLUSH MOUNTED AS INDICATED. RECORD EXACT LOCATION ON RECORD DRAWINGS.

265615 FIXTURE TO BE CONTROLLED BY EMERGENCY POWER CONTROL MODULE LOCATED IN CONTROL #D1000.

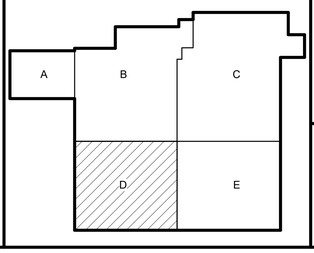
265655 FOR WALL MOUNT FIXTURES UNDER GRATED CATWALK, REFER TO DETAIL 4 ON E-807 FOR MOUNTING DETAILS.

265673 FIXTURE TO BE CONTROLLED ON/OFF VIA TIMECLOCK AND PHOTOCELL. REFER TO DETAIL #6 ON SHEET E-807. CONTROL VIA CONTACTOR #LC4A.

265680 FIXTURE TO BE CONTROLLED BY EMERGENCY POWER CONTROL MODULE LOCATED IN STORAGE #E1016B.

265681 CONNECT TO CIRCUIT SHOWN USING 2#10+#10G. IN 3/4"C.

KEY PLAN



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ARCHITECTURE • ENGINEERING • PLANNING
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DLZ INDIANA, LLC

MARK L. HITCHCOCK
STATE OF INDIANA
PE20018675
REGISTERED PROFESSIONAL ENGINEER

NO.	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: MHK,RE/CHKD: MLH
DESIGNED: MHK-RGW
APPRVD: MLH
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA
FIRST FLOOR AND LOWER LEVEL LIGHTING PLANS - AREA D

DRAWING NUMBER 1 E-301-D ELECTRICAL

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GENERAL NOTES

A. FOR LIGHTING FIXTURE SCHEDULE, SEE SHEET E-606. REFER TO REMARKS COLUMN ON LIGHTING FIXTURE SCHEDULE FOR FIXTURE MOUNTING HEIGHTS AND REQUIREMENTS U.O.N. ON THIS DRAWING.

B. FOR OCCUPANCY SENSOR WIRING DETAIL, SEE DETAIL #6 ON DRAWING E-802.

C. CONDUITS SHALL NOT BE ROUTED ALONG BUILDING EXTERIOR FOR EXTERIOR LIGHTING. CONCEAL BY ROUTING ON INTERIOR AND PENETRATE THROUGH WALL AT EACH EXTERIOR FIXTURE LOCATION.

D. FIELD COORDINATE, PRIOR TO CONSTRUCTION, EXACT MOUNTING HEIGHT OF ALL FIXTURES TO AVOID MECHANICAL DUCTWORK AND EQUIPMENT.

E. FOR EXTERIOR LIGHTING WIRING DIAGRAM, SEE DRAWING E-807.

F. REFER TO ARCHITECTURAL SHEETS FOR FIRE RATED WALLS AND CEILINGS. INSTALL FIRESTOP AT PENETRATIONS. INSTALL FIRE RATED PUTTY AROUND BOXES INSTALLED IN FIRE RATED WALLS AND OFFSET BACK TO BACK BOXES.

G. CEILING MOUNTED OCCUPANCY SENSORS SHALL BE MOUNTED IN CENTER OF CEILING TILE U.O.N. COORDINATE EXACT LOCATIONS BEFORE ROUGH-IN.

H. OCCUPANCY SENSORS ARE SHOWN FOR PURPOSES OF IDENTIFYING ROOMS/AREAS WHERE REQUIRED. COORDINATE WITH MANUFACTURER ON QUANTITY AND LOCATIONS REQUIRED FOR COMPLETE COVERAGE.

I. PROVIDE POWER PACKS AS REQUIRED FOR OCCUPANCY SENSORS. POWER PACKS ARE NOT SHOWN. FIELD COORDINATE LOCATIONS AND RECORD ON ELECTRICAL RECORD DRAWINGS.

J. CROSS HATCHED/SHADED FIXTURES = FIXTURES POWERED VIA EMERGENCY BACKUP GENERATOR FOR EMERGENCY EGRESS.

K. EM = EMERGENCY EGRESS FIXTURE. N.L. = NIGHT LIGHT

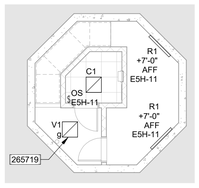
L. WHERE SWITCH CIRCUIT IS NOT INDICATED, ALL FIXTURES IN ROOM OR AREA SHALL BE ON SAME SWITCH CIRCUIT CONTROLLED BY LIGHTING CONTROL DEVICE INDICATED FOR THAT SPACE.

M. SEAL ALL PENETRATIONS THRU PRECAST, REFER TO SPECIFICATION 079200 FOR TYPE.

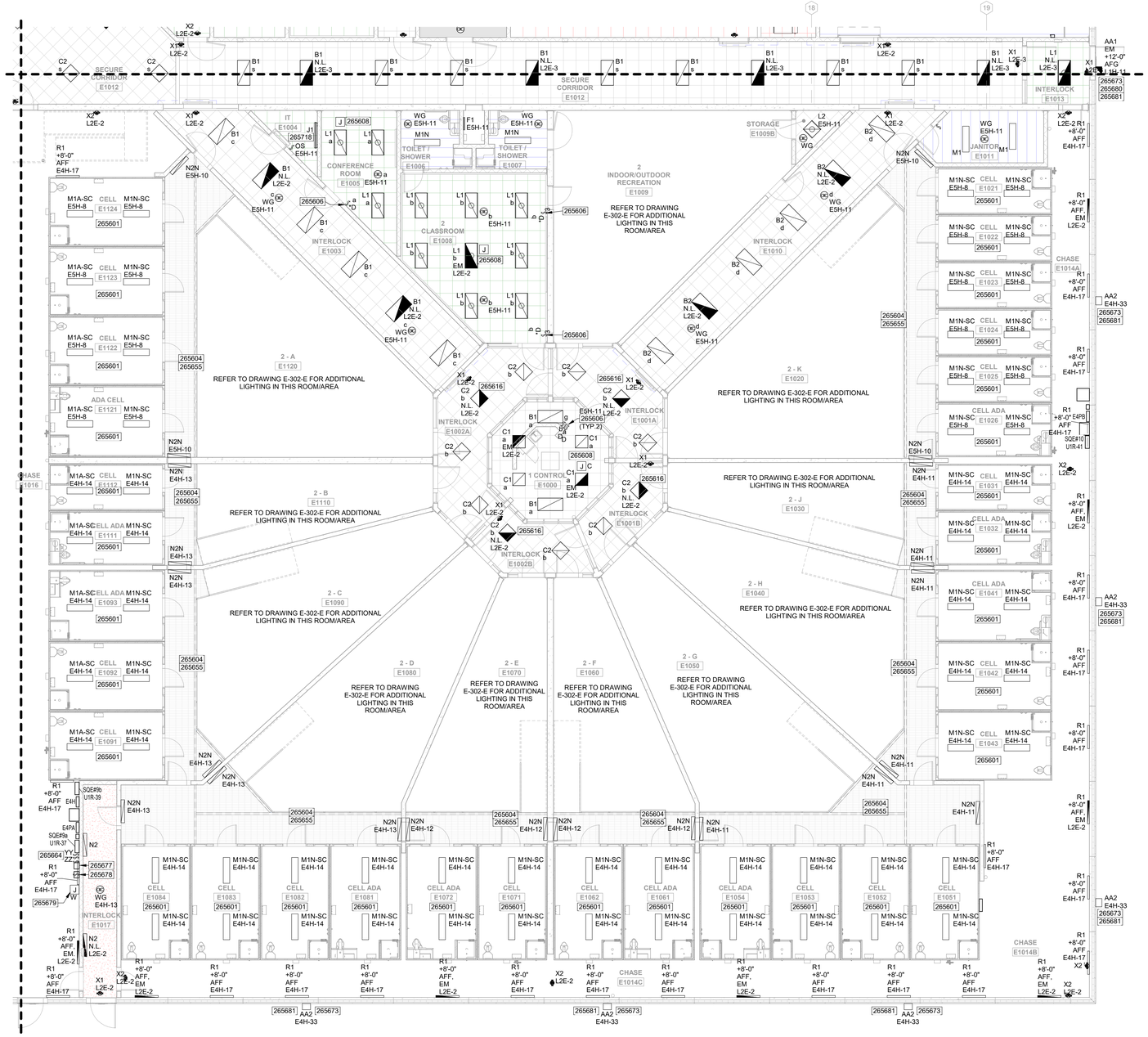
N. REFER TO DRAWING E-302-E FOR LIGHTING CONTROL NOTES.

LIGHTING KEYNOTES 2656##

265601	(TYPICAL) ALL CELLS, TOILETS & SHOWERS WILL HAVE LIGHTING FIXTURE(S) SUPPLIED BY CELL MANUFACTURER AND BE CONNECTED BY DIV. 26. FIXTURE SHALL BE 277V AND BE CONTROLLED THROUGH THE UTILITY CONTROL PANELS.
265604	LIGHTING IN ROOM/AREA TO BE CONTROLLED BY UTILITY CONTROL PANEL. REFER TO LIGHTING CONTROLS NOTE ON E-302-E AND SPECIFICATIONS FOR MORE INFORMATION.
265606	(TYPICAL) PROVIDE WALLBOX DIMMER(S) FOR 277V LED DRIVERS, SLIDER WITH POSITIVE OFF. DIMMER SHALL BE PROVIDED PER LIGHT FIXTURE MANUFACTURERS RECOMMENDATION FOR PROPER DIMMING OF LED FIXTURE(S).
265608	FURNISH AND INSTALL (1) EMERGENCY POWER CONTROL (ECP) MODULE LIKE LVS, INC #EPC-1 OR APPROVED EQUAL IN ROOM/AREA FOR CONTROL OF EMERGENCY LIGHT(S). NON-EMERGENCY CIRCUIT SHALL BE SAME CIRCUIT AS REST OF ROOM LIGHTING. REFERENCE DETAIL #7 ON SHEET E-802. MODULE TO BE FLUSH MOUNTED AS INDICATED. RECORD EXACT LOCATION ON RECORD DRAWINGS.
265616	FIXTURE TO BE CONTROLLED BY EMERGENCY POWER CONTROL MODULE LOCATED IN CONTROL #E1000.
265655	FOR WALL MOUNT FIXTURES UNDER GRATED CATWALK, REFER TO DETAIL 4 ON E-807 FOR MOUNTING DETAILS.
265664	EXTERIOR TYPE 'SF' LIGHTING FIXTURES SHALL BE MANUALLY SWITCHED FROM LOCAL TOGGLE LIGHT SWITCH; FIXTURES SHALL ALSO BE CONTROLLED VIA LIGHTING CONTACTOR FOR DUSK-TO-DAWN CONTROL. PROVIDE LABEL ON TOGGLE SWITCH FACEPLATE IDENTIFYING EXTERIOR LIGHTING ALSO INTERLOCKED/CONTROLLED VIA LIGHTING CONTACTOR. YARD IS NOT NORMALLY OCCUPIED BY INMATES EXCEPT FOR AN EMERGENCY EVACUATION.
265673	FIXTURE TO BE CONTROLLED ON/OFF VIA TIMECLOCK AND PHOTOCELL. REFER TO DETAIL #6 ON SHEET E-807. CONTROL VIA CONTACTOR #LC4A.
265677	LIGHTING CONTACTORS, LC4A-LC4D, REFER TO EXTERIOR LIGHTING WIRING DIAGRAM, SHEET E-807, DETAIL #6.
265678	NEW TIME CLOCK #TC4 FOR CONTROL OF EXTERIOR LIGHTING, REFER TO EXTERIOR LIGHTING WIRING DIAGRAM, SHEET E-807, DETAIL #6. CONNECT TO CIRCUIT E4PA-42 USING 2#12+G. IN 3/4"C.
265679	FURNISH AND INSTALL (1) EMERGENCY POWER CONTROL (ECP) MODULE #GTD4, LIKE LVS INC #EPC-1 OR APPROVED EQUAL IN WALL FOR CONTROL OF EXTERIOR EMERGENCY LIGHT. NON-EMERGENCY CIRCUIT SHALL BE CIRCUIT E4H-33. REFERENCE DETAIL #7 ON SHEET E-802. MODULE TO BE FLUSH MOUNTED AS INDICATED. RECORD EXACT LOCATION ON RECORD DRAWINGS.
265680	FIXTURE TO BE CONTROLLED BY EMERGENCY POWER CONTROL MODULE LOCATED IN STORAGE #E1016B.
265681	CONNECT TO CIRCUIT SHOWN USING 2#10+#10G. IN 3/4"C.

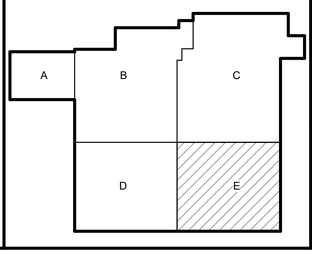


2 LOWER LEVEL LIGHTING - AREA 'E'
E-301-E SCALE: 1/8" = 1'-0"
NORTH



1 FIRST FLOOR LIGHTING - AREA 'E'
E-301-E SCALE: 1/8" = 1'-0"
NORTH

KEY PLAN



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DLZ INDIANA, LLC

MARK L. HITCHCOCK REGISTERED PROFESSIONAL ENGINEER PE20018675 STATE OF INDIANA

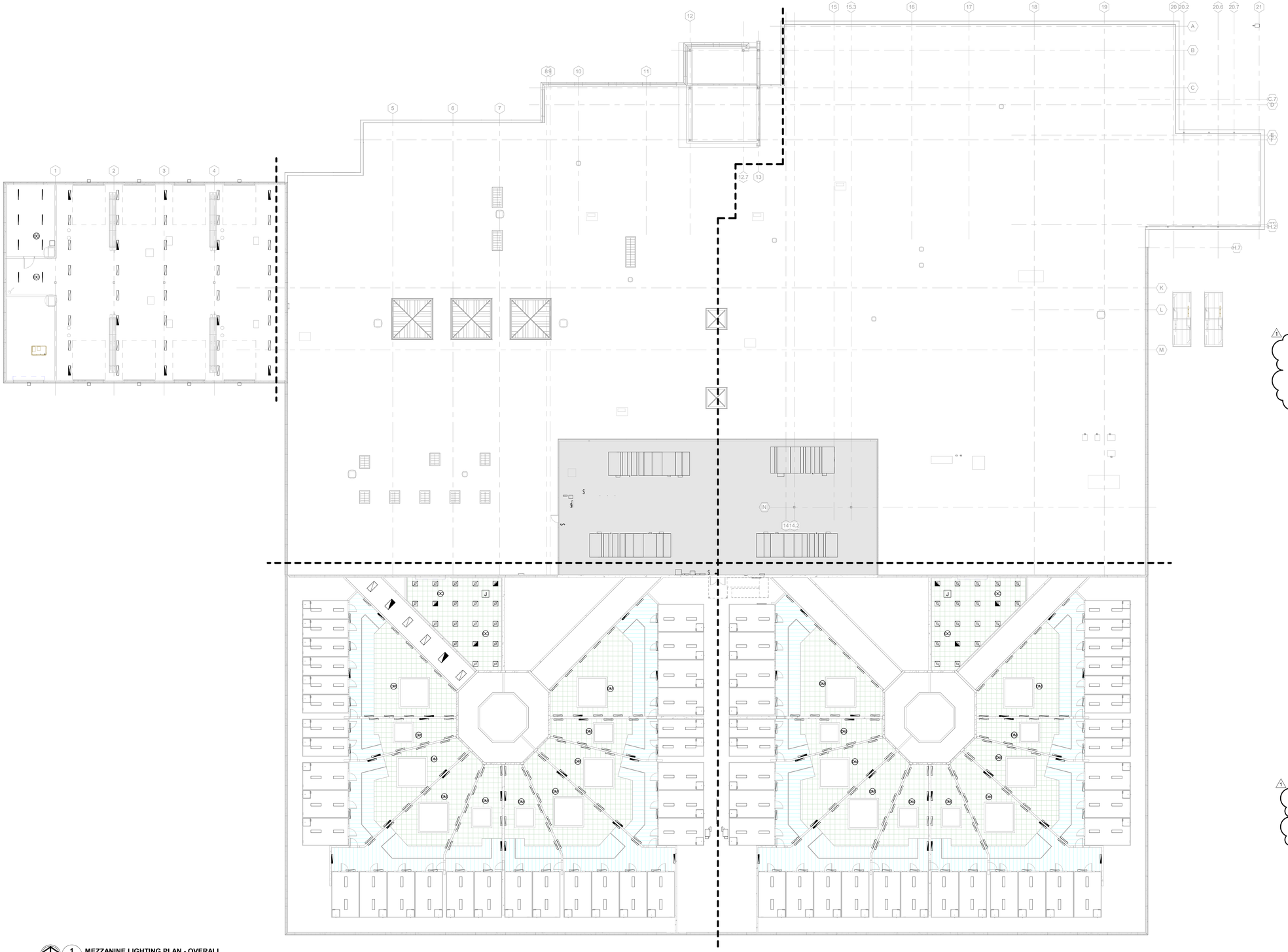
NO.	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: MHK,RDV CHK'D: MLH
DESIGNED: MHK,RDV
APPRV'D: MLH
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

FIRST FLOOR AND LOWER LEVEL LIGHTING PLANS - AREA E

DRAWING NUMBER E-301-E (1) ELECTRICAL



1 MEZZANINE LIGHTING PLAN - OVERALL
E-302 SCALE: 1/16" = 1'-0"

NORTH

THIS SHEET INCLUDED FOR OVERALL REFERENCE ONLY - SEE SHEETS E-302-D AND E-302-E FOR DETAILED REQUIREMENTS AND KEYED NOTES FOR POWER.

GENERAL NOTES

A. FOR LIGHTING FIXTURE SCHEDULE, SEE SHEET E-606. REFER TO REMARKS COLUMN ON LIGHTING FIXTURE SCHEDULE FOR FIXTURE MOUNTING HEIGHTS AND REQUIREMENTS U.O.N. ON THIS DRAWING.

B. FOR OCCUPANCY SENSOR WIRING DETAIL, SEE DETAIL #6 ON DRAWING E-802.

C. CONDUITS SHALL NOT BE ROUTED ALONG BUILDING EXTERIOR FOR EXTERIOR LIGHTING. CONCEAL BY ROUTING ON INTERIOR AND PENETRATE THROUGH WALL AT EACH EXTERIOR FIXTURE LOCATION.

D. FIELD COORDINATE, PRIOR TO CONSTRUCTION, EXACT MOUNTING HEIGHT OF ALL FIXTURES TO AVOID MECHANICAL DUCTWORK AND EQUIPMENT.

E. FOR EXTERIOR LIGHTING WIRING DIAGRAM, SEE DETAIL #— ON DRAWING E-802.

F. REFER TO ARCHITECTURAL SHEETS FOR FIRE RATED WALLS AND CEILINGS. INSTALL FIRESTOP AT PENETRATIONS. INSTALL FIRE RATED PUTTY AROUND BOXES INSTALLED IN FIRE RATED WALLS AND OFFSET BACK TO BACK BOXES.

G. CEILING MOUNTED OCCUPANCY SENSORS SHALL BE MOUNTED IN CENTER OF CEILING TILE U.O.N. COORDINATE EXACT LOCATIONS BEFORE ROUGH-IN.

H. OCCUPANCY SENSORS ARE SHOWN FOR PURPOSES OF IDENTIFYING ROOMS/AREAS WHERE REQUIRED. COORDINATE WITH MANUFACTURER ON QUANTITY AND LOCATIONS REQUIRED FOR COMPLETE COVERAGE.

I. PROVIDE POWER PACKS AS REQUIRED FOR OCCUPANCY SENSORS. POWER PACKS ARE NOT SHOWN. FIELD COORDINATE LOCATIONS AND RECORD ON ELECTRICAL RECORD DRAWINGS.

J. CROSS HATCHED/SHADED FIXTURES = FIXTURES POWERED VIA EMERGENCY BACKUP GENERATOR FOR EMERGENCY EGRESS.

K. EM = EMERGENCY EGRESS FIXTURE. N.L. = NIGHT LIGHT

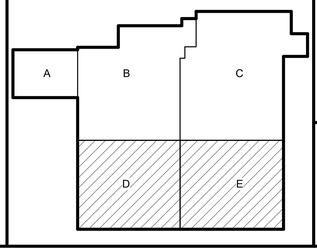
L. WHERE SWITCH CIRCUIT IS NOT INDICATED, ALL FIXTURES IN ROOM OR AREA SHALL BE ON SAME SWITCH CIRCUIT CONTROLLED BY LIGHTING CONTROL DEVICE INDICATED FOR THAT SPACE.

M. SEAL ALL PENETRATIONS THRU PRECAST, REFER TO SPECIFICATION 079200 FOR TYPE

1 NOTE:
AREAS/ROOMS WITH COLORED CEILING GRIDS SHOWN ARE FOR PURPOSES OF IDENTIFING "SECURITY" TYPE CEILINGS; NO JUNCTION BOXES SHALL BE INSTALLED ABOVE "SECURITY" TYPE CEILINGS UNLESS ATTACHED TO DEVICES MOUNTED IN/ON GRID.

1 NOTE:
ELEMENTS ON THIS SHEET ARE IDENTIFIED BY VARIOUS COLORS; IF THIS NOTE IS NOT RED, THIS SHEET IS NOT IN COLOR AND NEEDS TO BE REPRINTED IN COLOR.

KEY PLAN



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DLZ INDIANA, LLC

MARVIN L. HITCHCOCK
LICENSED PROFESSIONAL ENGINEER
PE60018675
STATE OF INDIANA

NO.	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: MHK,RDW CHK'D: MLH
DESIGNED: MHK,RDW
APPRV'D: MLH
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

MEZZANINE LIGHTING PLAN - OVERALL

DRAWING NUMBER E-302 ELECTRICAL

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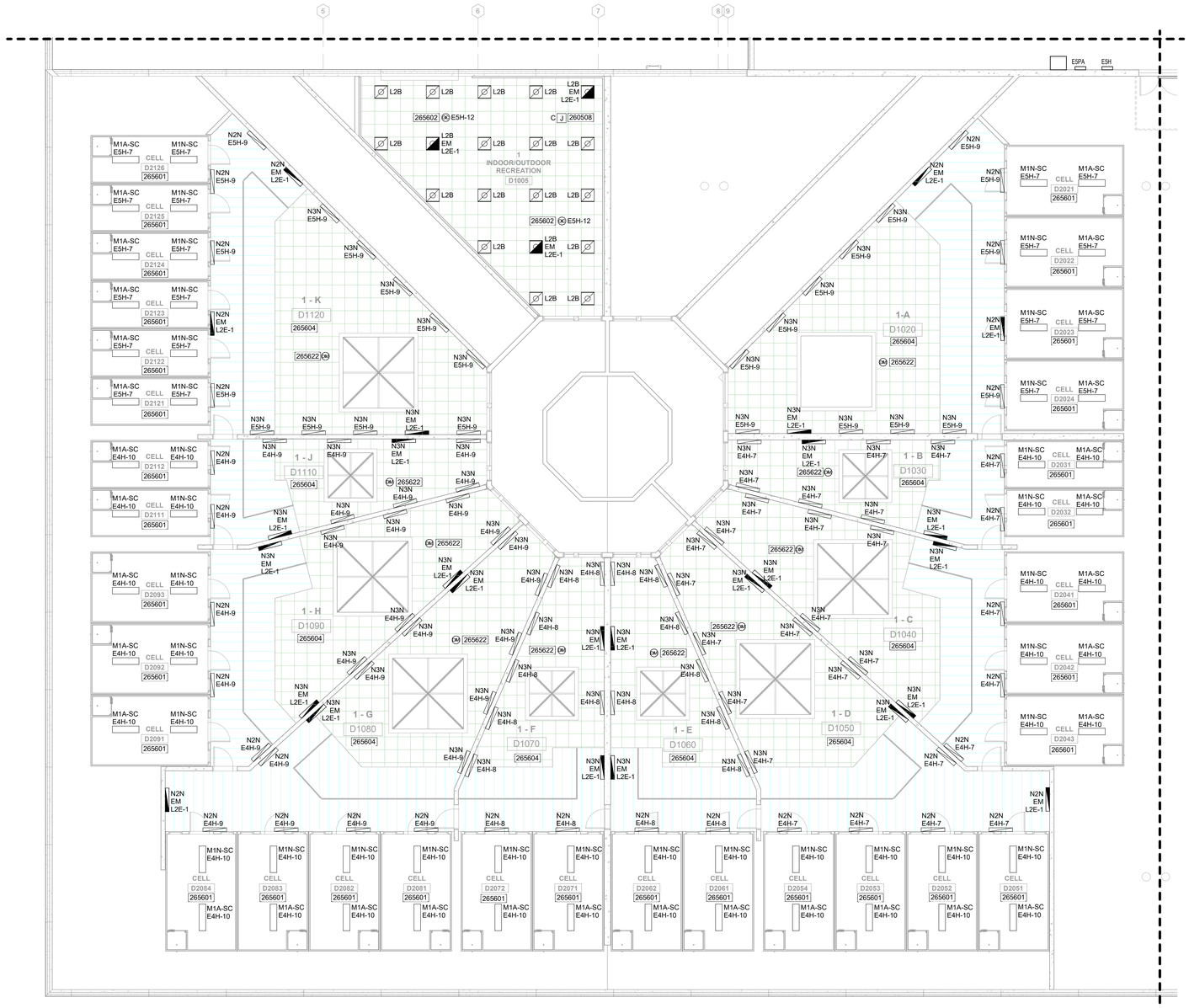

1 E-302-D **MEZZANINE LIGHTING PLAN - AREA 'D'**
SCALE: 1/8" = 1'-0"

NORTH

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GENERAL NOTES

A. FOR LIGHTING FIXTURE SCHEDULE, SEE SHEET E-606. REFER TO REMARKS COLUMN ON LIGHTING FIXTURE SCHEDULE FOR FIXTURE MOUNTING HEIGHTS AND REQUIREMENTS U.O.N. ON THIS DRAWING.

B. FOR OCCUPANCY SENSOR WIRING DETAIL, SEE DETAIL #6 ON DRAWING E-802.

C. CONDUITS SHALL NOT BE ROUTED ALONG BUILDING EXTERIOR FOR EXTERIOR LIGHTING. CONCEAL BY ROUTING ON INTERIOR AND PENETRATE THROUGH WALL AT EACH EXTERIOR FIXTURE LOCATION.

D. FIELD COORDINATE, PRIOR TO CONSTRUCTION, EXACT MOUNTING HEIGHT OF ALL FIXTURES TO AVOID MECHANICAL DUCTWORK AND EQUIPMENT.

E. FOR EXTERIOR LIGHTING WIRING DIAGRAM, SEE DRAWING E-807.

F. REFER TO ARCHITECTURAL SHEETS FOR FIRE RATED WALLS AND CEILINGS. INSTALL FIRESTOP AT PENETRATIONS. INSTALL FIRE RATED PUTTY AROUND BOXES INSTALLED IN FIRE RATED WALLS AND OFFSET BACK TO BACK BOXES.

G. CEILING MOUNTED OCCUPANCY SENSORS SHALL BE MOUNTED IN CENTER OF CEILING TILE U.O.N. COORDINATE EXACT LOCATIONS BEFORE ROUGH-IN.

H. OCCUPANCY SENSORS ARE SHOWN FOR PURPOSES OF IDENTIFYING ROOMS/AREAS WHERE REQUIRED. COORDINATE WITH MANUFACTURER ON QUANTITY AND LOCATIONS REQUIRED FOR COMPLETE COVERAGE.

I. PROVIDE POWER PACKS AS REQUIRED FOR OCCUPANCY SENSORS. POWER PACKS ARE NOT SHOWN. FIELD COORDINATE LOCATIONS AND RECORD ON ELECTRICAL RECORD DRAWINGS.

J. CROSS HATCHED/SHADED FIXTURES = FIXTURES POWERED VIA EMERGENCY BACKUP GENERATOR FOR EMERGENCY EGRESS.

K. EM = EMERGENCY EGRESS FIXTURE. N.L. = NIGHT LIGHT

L. WHERE SWITCH CIRCUIT IS NOT INDICATED, ALL FIXTURES IN ROOM OR AREA SHALL BE ON SAME SWITCH CIRCUIT CONTROLLED BY LIGHTING CONTROL DEVICE INDICATED FOR THAT SPACE.

M. SEAL ALL PENETRATIONS THRU PRECAST, REFER TO SPECIFICATION 079200 FOR TYPE.

N. REFER TO DRAWING E-302-E FOR LIGHTING CONTROL NOTES.

LIGHTING KEYNOTES 2656##

265601 (TYPICAL) ALL CELLS, TOILETS & SHOWERS WILL HAVE LIGHTING FIXTURE(S) SUPPLIED BY CELL MANUFACTURER AND BE CONNECTED BY DIV. 26. FIXTURE SHALL BE 277V AND BE CONTROLLED THROUGH THE UTILITY CONTROL PANELS.

265602 PIR HIGH BAY OCCUPANCY SENSOR. PROVIDE POWER PACK(S) AS RECOMMENDED. DEVICE TO BE FIXTURE MOUNTED OR PENDANT MOUNTED AT SAME HEIGHT AS FIXTURES IN ROOM.

265604 LIGHTING IN ROOM/AREA TO BE CONTROLLED BY UTILITY CONTROL PANEL. REFER TO LIGHTING CONTROLS NOTE ON E-302-E AND SPECIFICATIONS FOR MORE INFORMATION.

265622 PROVIDE DAYLIGHT SENSOR (QTY AND LOCATION PER MANUFACTURER) FOR AUTOMATIC CONTROL OF ROOM LIGHTING LEVELS. REFER TO ASSOCIATED ROOM DETAIL ON E-805 FOR LIGHTING CONTROL SCHEMATIC.

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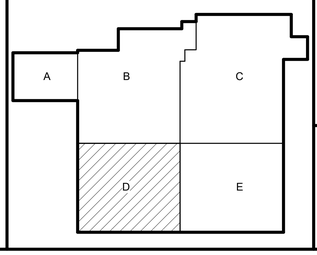
MARVIN L. HITCHCOCK
REGISTERED
PROFESSIONAL ENGINEER
STATE OF INDIANA
PE20018675

KEY PLAN



A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

MEZZANINE LIGHTING PLAN - AREA D

NO.	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: MHK,RD/CHKD: MLH
DESIGNED: MHK,RGW
APPRVD: MLH
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER 1663-1190-90

DRAWING NUMBER 1 E-302-D
ELECTRICAL

LIGHTING CONTROLS NOTES:

1 SECURITY SYSTEM INTEGRATOR SHALL CONTROL LIGHTING IN ALL ROOMS/AREAS INDICATED ON THE LIGHTING PLANS THRU THE VIDEO GRAPHIC USER INTERFACE (VGUI).

2 HOUSING POD - AREAS D & E - (DAYROOM 1-A #D1020, 1-B #D1030, 1-J #D1110, 1-K #D1120, 2-A #E1120, 2-B #E1110, 2-J #E103 AND 2-K #E1020) :
EACH DAYROOM AND ASSOCIATED GROUP OF CELLS SHALL BE CONTROLLED SEPARATELY BY THE VIDEO GRAPHIC USER INTERFACE (VGUI). ALL LIGHTING IN EACH ZONE SHALL BE CONTROLLED ON "DAYLIGHTS FULL ON, NIGHTLIGHTS FULL OFF" OR OFF "DAYLIGHTS FULL OFF, NIGHTLIGHTS FULL ON". DAYROOM CIRCUIT SHALL FEED INTO ROOM CONTROLLER TO IDAYLIGHT DIMMING, REFER TO DETAIL #4, DRAWING E-805.

3 HOUSING POD - AREAS D & E - (ALL ROOMS NOT MENTIONED, IN #2 ABOVE) :
EACH DAYROOM AND ASSOCIATED GROUP OF CELLS SHALL BE CONTROLLED SEPARATELY BY THE VIDEO GRAPHIC USER INTERFACE (VGUI). ALL LIGHTING IN EACH ZONE SHALL BE CONTROLLED ON "DAYLIGHTS FULL ON, NIGHTLIGHTS FULL OFF" OR OFF "DAYLIGHTS FULL OFF, NIGHTLIGHTS FULL ON". DAYROOM CIRCUIT SHALL FEED INTO ROOM CONTROLLER TO IDAYLIGHT DIMMING, REFER TO DETAIL #4, DRAWING E-805.

4 MISC. ROOMS :
ALL LIGHTING IN EACH ROOM SHALL BE CONTROLLED ON/OFF BY THE VIDEO GRAPHIC USER INTERFACE (VGUI). THE VGUI SHALL CONTROL VIDEO GRAPHIC USER INTERFACE (VGUI). THE VGUI SHALL CONTROL DAYTIME LIGHTING AND NIGHT TIME (NIGHT LIGHTS) SEPARATELY. THE SYSTEM SHALL HAVE THE ABILITY TO TURN ALL LIGHTS OFF IN IN A ZONE, INCLUDING NIGHT LIGHTS.

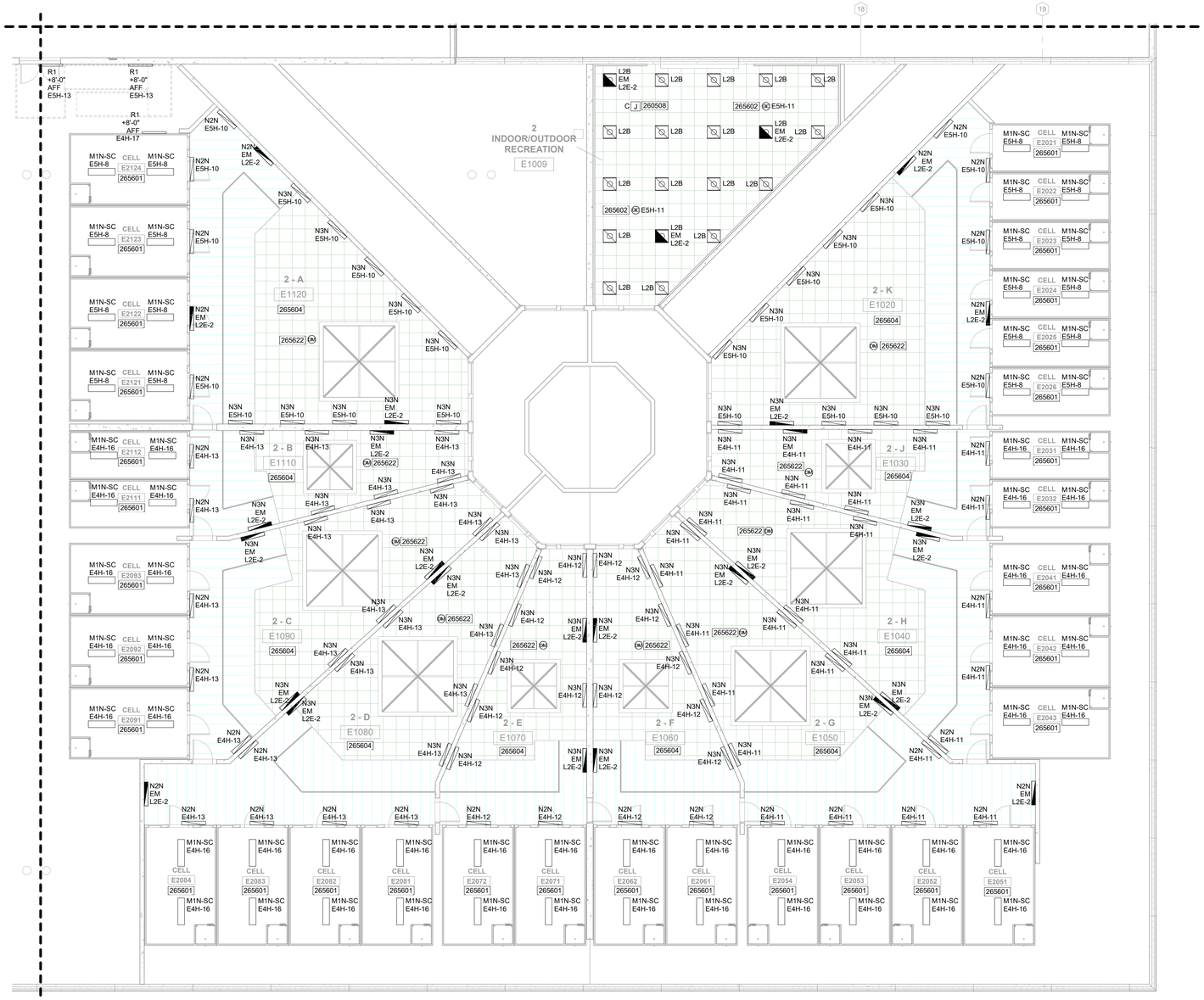
4 INDOOR/OUTDOOR RECS
ALL LIGHTING IN EACH ROOM SHALL BE CONTROLLED ON/OFF BY THE VIDEO GRAPHIC USER INTERFACE (VGUI). THE VGUI SHALL CONTROL VIDEO GRAPHIC USER INTERFACE (VGUI).

5 MEDICAL AND INTAKE CENTER CELLS, ADA CELLS, FEMALE CELLS, FEMALE ADA CELLS & PADDED CELLS:
EACH CELLS SHALL BE CONTROLLED SEPARATELY BY THE VIDEO GRAPHIC USER INTERFACE (VGUI). ALL LIGHTING IN EACH ZONE SHALL BE CONTROLLED ON "DAYLIGHTS FULL ON, NIGHTLIGHTS FULL OFF" OR OFF "DAYLIGHTS FULL OFF, NIGHTLIGHTS FULL ON".

6 INTAKE CENTER - DAYROOM #B1037
DAYROOM AND ITS ASSOCIATED GROUP OF CELLS SHALL BE CONTROLLED SEPARATELY BY THE VIDEO GRAPHIC USER INTERFACE (VGUI). ALL LIGHTING IN EACH ZONE SHALL BE CONTROLLED ON "DAYLIGHTS FULL ON, NIGHTLIGHTS FULL OFF" OR OFF "DAYLIGHTS FULL OFF, NIGHTLIGHTS FULL ON". DAYROOM CIRCUIT SHALL FEED INTO ROOM CONTROLLER TO IDAYLIGHT DIMMING, REFER TO DETAIL #3, DRAWING E-805.

GENERAL NOTES:

A RELAY PANELS TO BE PROVIDED BY SECURITY ELECTRONICS CONTRACTOR.



1 MEZZANINE LIGHTING PLAN - AREA 'E'
E-302-E SCALE: 1/8" = 1'-0"

NORTH

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GENERAL NOTES

A. FOR LIGHTING FIXTURE SCHEDULE, SEE SHEET E-606. REFER TO REMARKS COLUMN ON LIGHTING FIXTURE SCHEDULE FOR FIXTURE MOUNTING HEIGHTS AND REQUIREMENTS U.O.N. ON THIS DRAWING.

B. FOR OCCUPANCY SENSOR WIRING DETAIL, SEE DETAIL #6 ON DRAWING E-802.

C. CONDUITS SHALL NOT BE ROUTED ALONG BUILDING EXTERIOR FOR EXTERIOR LIGHTING. CONCEAL BY ROUTING ON INTERIOR AND PENETRATE THROUGH WALL AT EACH EXTERIOR FIXTURE LOCATION.

D. FIELD COORDINATE, PRIOR TO CONSTRUCTION, EXACT MOUNTING HEIGHT OF ALL FIXTURES TO AVOID MECHANICAL DUCTWORK AND EQUIPMENT.

E. FOR EXTERIOR LIGHTING WIRING DIAGRAM, SEE DRAWING E-807.

F. REFER TO ARCHITECTURAL SHEETS FOR FIRE RATED WALLS AND CEILINGS. INSTALL FIRESTOP AT PENETRATIONS. INSTALL FIRE RATED PUTTY AROUND BOXES INSTALLED IN FIRE RATED WALLS AND OFFSET BACK TO BACK BOXES.

G. CEILING MOUNTED OCCUPANCY SENSORS SHALL BE MOUNTED IN CENTER OF CEILING TILE U.O.N. COORDINATE EXACT LOCATIONS BEFORE ROUGH-IN.

H. OCCUPANCY SENSORS ARE SHOWN FOR PURPOSES OF IDENTIFYING ROOMS/AREAS WHERE REQUIRED. COORDINATE WITH MANUFACTURER ON QUANTITY AND LOCATIONS REQUIRED FOR COMPLETE COVERAGE.

I. PROVIDE POWER PACKS AS REQUIRED FOR OCCUPANCY SENSORS. POWER PACKS ARE NOT SHOWN. FIELD COORDINATE LOCATIONS AND RECORD ON ELECTRICAL RECORD DRAWINGS.

J. CROSS HATCHED/SHADED FIXTURES = FIXTURES POWERED VIA EMERGENCY BACKUP GENERATOR FOR EMERGENCY EGRESS.

K. EM = EMERGENCY EGRESS FIXTURE. N.L. = NIGHT LIGHT

L. WHERE SWITCH CIRCUIT IS NOT INDICATED, ALL FIXTURES IN ROOM OR AREA SHALL BE ON SAME SWITCH CIRCUIT CONTROLLED BY LIGHTING CONTROL DEVICE INDICATED FOR THAT SPACE.

M. SEAL ALL PENETRATIONS THRU PRECAST, REFER TO SPECIFICATION 079200 FOR TYPE.

N. REFER TO DRAWING E-302-E FOR LIGHTING CONTROL NOTES.

LIGHTING KEYNOTES 2656##

265601 (TYPICAL) ALL CELLS, TOILETS & SHOWERS WILL HAVE LIGHTING FIXTURE(S) SUPPLIED BY CELL MANUFACTURER AND BE CONNECTED BY DIV. 26. FIXTURE SHALL BE 277V AND BE CONTROLLED THROUGH THE UTILITY CONTROL PANELS.

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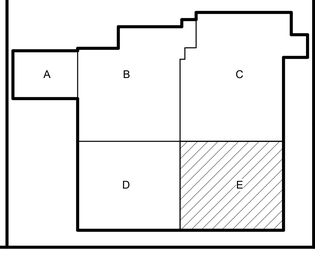
265604 LIGHTING IN ROOM/AREA TO BE CONTROLLED BY UTILITY CONTROL PANEL, REFER TO LIGHTING CONTROLS NOTE ON E-302-E AND SPECIFICATIONS FOR MORE INFORMATION.

265622 PROVIDE DAYLIGHT SENSOR (QTY AND LOCATION PER MANUFACTURER) FOR AUTOMATIC CONTROL OF ROOM LIGHTING LEVELS. REFER TO ASSOCIATED ROOM DETAIL ON E-805 FOR LIGHTING CONTROL SCHEMATIC.

KEY PLAN



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DLZ INDIANA, LLC

MARVIN L. HITCHCOCK 10000 STATE OF INDIANA PROFESSIONAL ENGINEER

NO.	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: MHK,RDW CHKD: MLH
DESIGNED: MHK,RDW
APPRVD: MLH
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

MEZZANINE LIGHTING PLAN - AREA E

DRAWING NUMBER E-302-E
ELECTRICAL

GENERAL NOTES

A. REFER TO DRAWING E-803, DETAIL #10 FOR FIRE ALARM DEVICES MOUNTING REQUIREMENTS PER NFPA 72.

B. CONTRACTOR SHALL COORDINATE ALL DEVICE HEIGHTS AND EXACT LOCATIONS WITH CASEWORK SHOP DRAWINGS AND ARCHITECTURAL ELEVATION DRAWINGS.

C. ALL FIRE ALARM CONDUITS SHALL BE FACTORY PAINTED "RED". ALL PULL/JUNCTION BOX COVERS SHALL BE FACTORY PAINTED RED.

D. FOR MUTOA BACKBOX AND IN-WALL SLEEVE DETAIL, SEE DETAIL #10 ON DRAWING E-801.

E. REFER TO ARCHITECTURAL DRAWINGS FOR FIRE RATED WALLS AND CEILINGS. INSTALL FIRESTOP AT PENETRATIONS. INSTALL FIRE RATED PUTTY AROUND BOXES INSTALLED IN FIRE RATED WALLS AND OFFSET BACK TO BACK BOXES.

F. REFER TO SECURITY DRAWINGS, #SE SERIES, AND DIVISION 28 SPECIFICATIONS FOR ADDITIONAL SECURITY SYSTEM REQUIREMENTS. PROVIDE BOXES AND RACEWAYS CABLING, AND ASSOCIATED ITEMS AS NECESSARY FOR A COMPLETE AND FUNCTIONAL SECURITY SYSTEM.

G. PROPOSED WAP LOCATIONS AND QUANTITY SHOWN ARE SCHEMATIC ONLY. WAP VENDOR SHALL PROVIDE EXACT LOCATIONS AND QUANTITY OF WIRELESS ACCESS POINTS.

1. FURNISH AND INSTALL SPECIFICATION GRADE, POWER OVER ETHERNET, WIRELESS ACCESS POINT (WAP) ROUTERS FOR COMPLETE COVERAGE OF BUILDING; QUANTITY AND LOCATION TO BE DETERMINED BY WAP VENDOR USING PREDICTIVE ANALYSIS SOFTWARE.
2. ROUTER MANUFACTURERS SHALL BE BY NETGEAR, RUCKUS OR CISCO. PROVIDE WITH NETWORK MANAGEMENT SOFTWARE. WAP VENDOR SHALL PROVIDE A PREDICTIVE ANALYSIS OF WIRELESS PERFORMANCE AND WIRELESS ROUTERS.
3. PROVIDE INDICATING PREDICTIVE TRAFFIC/USAGE AND COVERAGE PATTERNS AS PART OF SHOP DRAWING SUBMITTAL.
4. FURNISH AND INSTALL (2) CAT 6 DATA CABLE WITH 10' OF SLACK FOR FINAL PLACEMENT OF ROUTER HARDWARE.
5. UNITS TO BE SURFACE MOUNTED ON BOTTOM OF PRECAST, ACOUSTICAL CEILING OR STRUCTURE. PROVIDE MOUNTING ACCESSORIES AS REQUIRED.
6. FURNISH AND INSTALL CUSTOM COVER OVER WIRELESS ACCESS POINT (WAP) ROUTERS LOCATED IN INMATE AREAS LIKE TERRAWAVE SOLUTIONS #V10102-C-1131 OR APPROVED EQUAL. COVER SHALL BE SIZED TO MATCH ROUTER AND UTILIZE TORX-HEAD CENTER PIN SCREWS.

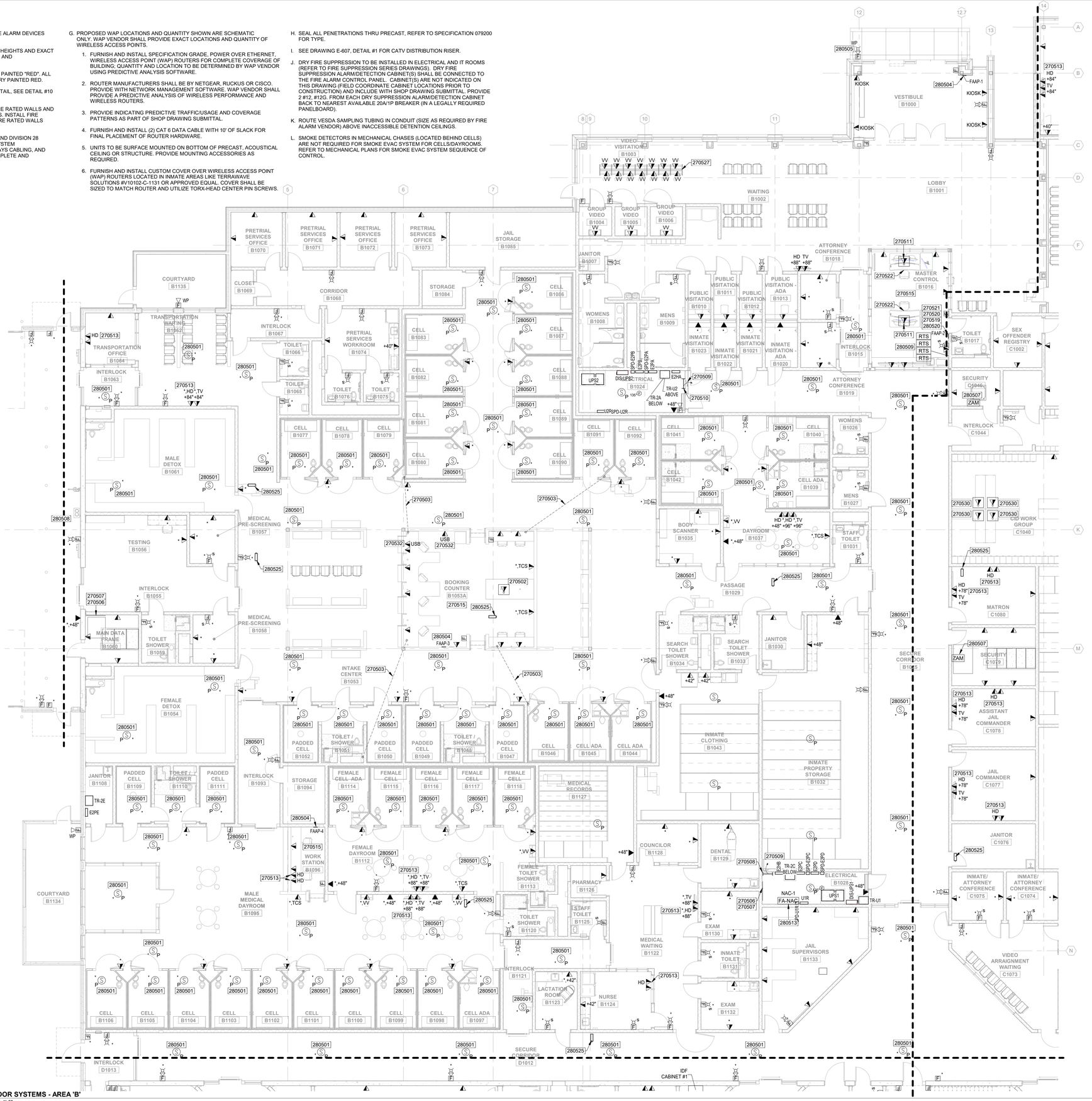
H. SEAL ALL PENETRATIONS THRU PRECAST. REFER TO SPECIFICATION 079200 FOR TYPE.

I. SEE DRAWING E-607, DETAIL #1 FOR CATV DISTRIBUTION RISER.

J. DRY FIRE SUPPRESSION TO BE INSTALLED IN ELECTRICAL AND IT ROOMS (REFER TO FIRE SUPPRESSION SERIES DRAWINGS). DRY FIRE SUPPRESSION ALARM/DETECTION CABINET(S) SHALL BE CONNECTED TO THE FIRE ALARM CONTROL PANEL. CABINET(S) ARE NOT INDICATED ON THIS DRAWING (FIELD COORDINATE CABINET LOCATIONS PRIOR TO CONSTRUCTION) AND INCLUDE WITH SHOP DRAWING SUBMITTAL. PROVIDE 2 #12, #12G. FROM EACH DRY SUPPRESSION ALARM/DETECTION CABINET BACK TO NEAREST AVAILABLE 20A/1P BREAKER (IN A LEGALLY REQUIRED PANELBOARD).

K. ROUTE VESDA SAMPLING TUBING IN CONDUIT (SIZE AS REQUIRED BY FIRE ALARM VENDOR) ABOVE INACCESSIBLE DETENTION CEILINGS.

L. SMOKE DETECTORS IN MECHANICAL CHASES (LOCATED BEHIND CELLS) ARE NOT REQUIRED FOR SMOKE EVAC SYSTEM FOR CELLS/DAYROOMS. REFER TO MECHANICAL PLANS FOR SMOKE EVAC SYSTEM SEQUENCE OF CONTROL.



1 FIRST FLOOR SYSTEMS - AREA 'B'
E-401-B SCALE: 1/8" = 1'-0"

NORTH

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SYSTEMS KEYNOTES

2705##
2805##

270502 NEW 4-GANG FLOOR BOX, REFER TO KEYNOTE #260521 OR #260527 ON DRAWING #E-201-C. FURNISH AND INSTALL (1) DATA/COMMUNICATIONS OUTLET WITH SIX (6) CAT.6 JACKS/CABLES. ROUTE (1)-1-1/4"C, AS SHOWN FROM BOX OVER AND UP WALL TO NEAREST CABLE TRAY FOR CABLING.

270503 FURNISH AND INSTALL (1)-2"C. FROM BELOW COUNTER AREA OVER TO CHASE AND STUBBED OUT AT +12" A.F.F. FOR FUTURE COMMUNICATIONS CABLING. FURNISH WITH PULLSTRING.

270506 TELEPHONE TERMINAL BOARD 'TTB-1'. FURNISH AND INSTALL 4' X 8' X 3/4" FIRE RETARDENT PLYWOOD FOR TELEPHONE/CATV DEMARK. PAINT (2) COATS MARINE GRADE FIRE RETARDENT PAINT TO MATCH WALL FINISH.

270507 FURNISH AND INSTALL A 10-POINT GROUND TERMINAL STRIP ON TELEPHONE TERMINAL BOARD. BOND ALL COMMUNICATIONS EQUIPMENT ON TELEPHONE TERMINAL BOARD TO TERMINAL STRIP WITH #10 AWG GREEN INSULATED GROUND CABLE. REFER TO DETAIL 2 ON SHEET E-803.

270508 GROUND BUS BAR NO.2. MOUNT AT +8'-0" AFF. REFER TO TELE-DATA EQUIPMENT GROUND BUS DETAIL #3, SHEET E-803. BOND TO MAIN GROUND BUS BAR NO.1 (IN location) USE #1/0AWG COPPER GREEN INSULATED CABLE.

270509 #1/0 AWG GREEN INSULATED GROUND CABLE. BOND TO MAIN GROUND BUS #1 (IN MECHANICAL #A150). REFER TO DETAIL #4, DRAWING E-803.

270510 GROUND BUS BAR NO.3. MOUNT AT +8'-0" AFF. REFER TO TELE-DATA EQUIPMENT GROUND BUS DETAIL #3, SHEET E-803. BOND TO MAIN GROUND BUS BAR NO.1 (IN location) USE #1/0AWG COPPER GREEN INSULATED CABLE.

270511 NEW 8-GANG FLOOR BOX. REFER TO KEYNOTE #260524 ON E-201 SERIES DRAWINGS. FURNISH AND INSTALL (1) DATA/COMMUNICATIONS OUTLET WITH SIX (6) CAT.6 JACKS/CABLES. ROUTE (2)-1"C. FROM BOX OVER AND UP WALL TO NEAREST CABLE TRAY FOR CABLING.

270513 FURNISH AND INSTALL SPECIALTY OUTLET WITH (1) HDMI PORT FOR INTERFACING LAPTOP/COMPUTER WITH TV IN ROOM. FURNISH AND INSTALL PRE-TERMINATED HDMI BETWEEN LAPTOP/COMPUTER INTERFACE MUTOA AND TV INTERFACE MUTOA WITH 1"C. FURNISH MATCHING HDMI PORT AT TV LOCATION.

270515 PROVIDE SIGNAL REFERENCE GROUNDING FOR RAISED FLOOR. REFER TO RAISED FLOOR GROUNDING DETAIL #10 ON SHEET E-802.

270519 ATS ANNUNCIATOR PANEL 'ATS-ANN1', RECESS MOUNTED. VERIFY EXACT LOCATION WITH OWNER BEFORE ROUGH-IN.

270520 ATS ANNUNCIATOR PANEL 'ATS-ANN2', RECESS MOUNTED. VERIFY EXACT LOCATION WITH OWNER BEFORE ROUGH-IN.

270521 GENERATOR ANNCIATOR PANEL 'GEN-ANN', RECESS MOUNTED. VERIFY EXACT LOCATION WITH OWNER BEFORE ROUGH-IN.

270522 FURNISH AND INSTALL (1)-2"C. FROM BELOW WORKSTATION ROUTED TO NEAREST WALL AND STUBBED OUT ABOVE CEILING WITH BUSHING FOR DVI CABLE BETWEEN MONITOR(S) AND NETWORK VIDEO CLIENTS PCS. FURNISH WITH PULLSTRING. COORDINATE EXACT LOCATION OF WORKSTATION.

270527 ROUTE COMMUNICATIONS CABLING UP TO VIDEO VISITATION STATION THROUGH CABINET SUPPORT LEGS. COORDINATE WITH EQUIPMENT SUPPLIER.

270530 NEW 4-GANG FLOOR BOX, REFER TO KEYNOTE #260521 OR #260527 ON DRAWING #E-201-C. FURNISH AND INSTALL (1) DATA/COMMUNICATIONS OUTLET WITH TWO (2) CAT.6 JACKS/CABLES. ROUTE (1)-1"C. FROM BOX OVER AND UP WALL TO NEAREST CABLE TRAY FOR CABLING.

270532 FURNISH AND INSTALL SPECIALTY OUTLET WITH (1) USB PORT FOR INTERFACING OWNER PROVIDED CAMERA SYSTEM WITH COMPUTER IN BOOKING COUNTER #B1053A. FURNISH AND INSTALL PRE-TERMINATED USB CABLE BETWEEN CAMERA INTERFACE AND COMPUTER INTERFACE WITH 1-1/4"C. FURNISH WITH MATCHING USB PORT AT COMPUTER LOCATION. VERIFY EXACT LOCATION OF OUTLETS WITH OWNER BEFORE ROUGH-IN, MODIFY LOCATION(S) AS NEEDED PER OWNER'S WRITTEN INSTRUCTION.

280501 REFER TO SMOKE DETECTOR DETENTION COVER DETAIL #9, DRAWING E-801.

280504 FIRE ALARM ANNUNCIATOR PANEL (F.A.A.P.). PANEL TO BE RECESS MOUNTED WITH TOP AT +60" A.F.F. PROVIDE CONNECTION PER MANUFACTURER'S RECOMMENDATION TO MAIL FIRE ALARM CONTROL PANEL (FACP-1) IN ELECTRICAL ROOM #C1054.

280505 FIRE ALARM HORN/STROBE TO ACTIVATE WHEN WATER IS FLOWING IN SPRINKLER SYSTEM. FIELD LOCATE EXTERIOR HORN/STROBE SO THAT IT IS READILY VISIBLE TO THE APPROACHING FIRE DEPARTMENT FROM THE PUBLIC STREET, ROAD, OR HIGHWAY AND PUBLIC ENTRY WAY. REFER TO IBC 903.4.2 FIELD VERIFY LOCATION IS ACEPTABLE TO AHJ PRIOR TO CONSTRUCTION.

280507 ROOM CONTAINS SELF-CONTAINED DRY-POWDER FIRE SUPPRESSION SYSTEM. PROVIDE ZAM FOR ALARM MONITORING OF FIRE SUPPRESSION SYSTEM CONTROL PANEL BY FIRE ALARM CONTROL PANEL (FACP-1) LOCATED IN ELECTRICAL ROOM #C1054 AS RECOMMENDED BY SYSTEM MANUFACTURER. FURNISH CABLING AS REQUIRED IN 3/4"C. COORDINATE WITH MECHANICAL CONTRACTOR AND INSTALL/WIRE ALL ASSOCIATED ELECTRICAL APPURTENANCES AND DEVICES (I.E. SMOKE DETECTOR, PULL STATION, TELEPHONE OUTLET) TO FIRE SUPPRESSION PANEL AS NECESSARY AND AS REQUIRED BY FIRE SUPPRESSION SYSTEM MANUFACTURER.

280508 CO AND NO2 SENSORS (FURNISHED AND INSTALLED BY OTHERS) SHALL BE MONITORED BY THE BMS (BUILDING MANAGEMENT SYSTEM). ALARMING TO FIRE ALARM CONTROL PANEL FOR HIGH CO OR NO2 LEVELS SHALL BE ACTIVATED BY THE BMS PANEL (VIA BACnet COMMUNICATION/MONITORING PATHWAY BETWEEN BMS AND FACP-1).

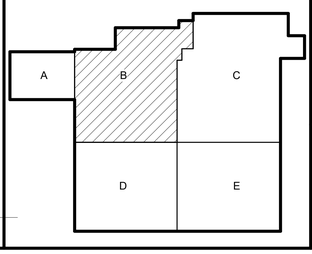
280509 REMOTE TEST STATIONS FOR AIR HANDLING UNITS IN PENTHOUSE (FOR INTERLOCKING SHUT-DOWN INDICATION AND TESTING OF AIR HANDLING UNIT UPON DUCT SMOKE DETECTION). REFER TO PENTHOUSE ELECTRICAL PLAN ON DRAWING E-202-BC. MOUNT ON WALL NEAR FIRE ALARM ANNUNCIATOR PANEL 'FAAP-2'.

280513 REFER TO FIRE ALARM/DETECTION RISER DIAGRAM ON DRAWING E-804.

280520 INTERACTIVE FIREFIGHTERS' TOUCHSCREEN DISPLAY PANEL TO BE RECESS MOUNTED WITH TOP AT +60" AFF. PROVIDE CONNECTION PER MANUFACTURER'S RECOMMENDATION TO FIRE ALARM CONTROL PANEL (FACP-1) IN ELECTRICAL ROOM #C1054.

280525 SMOKE DAMPER. PROVIDE CONNECTION TO FIRE ALARM AS NEEDED PER MANUFACTURER'S RECOMMENDATION. REFER TO MECHANICAL DRAWINGS AND SPECIFICATION 233300 FOR DETAILED REQUIREMENTS.

KEY PLAN



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DLZ INDIANA, LLC

MARK L. HITCHCOCK · 21ST CENTURY · NORTH · PE20116670 · STATE OF INDIANA · REGISTERED · PROFESSIONAL ENGINEER

NO.	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: RDW CHK'D: MLH
DESIGNED: RDW, TKF
APPRV'D: MLH
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

FIRST FLOOR SYSTEMS PLAN - AREA B

DRAWING NUMBER 1 E-401-B ELECTRICAL

SYSTEMS KEYNOTES 2705## 2805##

270501 FURNISH AND INSTALL ONE 2-PORT HDMI SPLITTER LIKE KVMSWITCH #HDMI-VS-2P OR APPROVED EQUAL TO SPLIT ONE HDMI SIGNAL INPUT ONTO TWO IDENTICAL TV'S SIMULTANEOUSLY. SPLITTER TO BE LOCATED ABOVE ACCESSIBLE CEILING.

270502 NEW 4-GANG FLOOR BOX. REFER TO KEYNOTE #260521 OR #260527 ON DRAWING #E-201-C. FURNISH AND INSTALL (1) DATA/COMMUNICATIONS OUTLET WITH SIX (6) CAT.6 JACKS/CABLES. ROUTE (1)-1-1/4"C. AS SHOWN FROM BOX OVER AND UP WALL TO NEAREST CABLE TRAY FOR CABLING.

270504 BOND WATER SERVICE TO MAIN GROUND BUS BAR. USE #4 AWG GREEN INSULATED GROUNDING ELECTRODE CABLE. REFER TO SERVICE GROUNDING ELECTRODE SYSTEM SCHEMATIC DETAIL #1, SHEET E-803.

270505 FURNISH AND INSTALL ONE 3-PORT HDMI VIDEO SWITCH LIKE KVMSWITCH #SE-HD-L-LC OR APPROVED EQUAL TO DISPLAY VIDEO/AUDIO SIGNALS FROM MULTIPLE SOURCES ONTO ONE HDMI DISPLAY. SWITCH TO BE LOCATED ABOVE ACCESSIBLE CEILING.

270511 NEW 8-GANG FLOOR BOX. REFER TO KEYNOTE #260524 ON E-201 SERIES DRAWINGS. FURNISH AND INSTALL (1) DATA/COMMUNICATIONS OUTLET WITH SIX (6) CAT.6 JACKS/CABLES. ROUTE (2)-1"C. FROM BOX OVER AND UP WALL TO NEAREST CABLE TRAY FOR CABLING.

270512 FURNISH AND INSTALL ONE 4-PORT HDMI SPLITTER LIKE SEWELL #SW-32893 OR APPROVED EQUAL TO SPLIT ONE HDMI SIGNAL INPUT ONTO FOUR TV'S SIMULTANEOUSLY. SPLITTER TO BE LOCATED ABOVE ACCESSIBLE CEILING.

270513 FURNISH AND INSTALL SPECIALTY OUTLET WITH (1) HDMI PORT FOR INTERFACING LAPTOP/COMPUTER WITH TV IN ROOM. FURNISH AND INSTALL PRE-TERMINATED HDMI BETWEEN LAPTOP/COMPUTER INTERFACE MUTOA AND TV INTERFACE MUTOA WITH 1"C. FURNISH MATCHING HDMI PORT AT TV LOCATION.

270514 FURNISH AND INSTALL DEVICE IN CUSTOM FLUSH MOUNTED, LOCKABLE WALL CABINET. FOR CABINET DETAIL, SEE SHEET E-803, DETAIL #7.

270515 PROVIDE SIGNAL REFERENCE GROUNDING FOR RAISED FLOOR. REFER TO RAISED FLOOR GROUNDING DETAIL #10 ON SHEET E-802.

270519 ATS ANNUNCIATOR PANEL 'ATS-ANN1'; RECESS MOUNTED. VERIFY EXACT LOCATION WITH OWNER BEFORE ROUGH-IN.

270520 ATS ANNUNCIATOR PANEL 'ATS-ANN2', RECESS MOUNTED. VERIFY EXACT LOCATION WITH OWNER BEFORE ROUGH-IN.

270521 GENERATOR ANNUNCIATOR PANEL 'GEN-ANN', RECESS MOUNTED. VERIFY EXACT LOCATION WITH OWNER BEFORE ROUGH-IN.

270522 FURNISH AND INSTALL (1)-2"C. FROM BELOW WORKSTATION ROUTED TO NEAREST WALL AND STUBBED OUT ABOVE CEILING WITH BUSHING FOR DVI CABLE BETWEEN MONITOR(S) AND NETWORK VIDEO CLIENTS PCS. FURNISH WITH PULLSTRING. COORDINATE EXACT LOCATION ON WORKSTATION.

270523 DEVICE TO BE FLUSH MOUNTED IN CEILING FOR CEILING PROJECTOR. COORDINATE EXACT LOCATION WITH OWNER AND ARCHITECT BEFORE ROUGH-IN.

270530 NEW 4-GANG FLOOR BOX. REFER TO KEYNOTE #260521 OR #260527 ON DRAWING #E-201-C. FURNISH AND INSTALL (1) DATA/COMMUNICATIONS OUTLET WITH TWO (2) CAT.6 JACKS/CABLES. ROUTE (1)-1"C. FROM BOX OVER AND UP WALL TO NEAREST CABLE TRAY FOR CABLING.

270531 NEW 2-GANG FLOOR BOX. REFER TO KEYNOTE #260517 ON DRAWING #E-201-C. FURNISH AND INSTALL (1) DATA/COMMUNICATIONS OUTLET WITH TWO (2) CAT.6 JACKS/CABLES. ROUTE (1)-1"C. FROM BOX OVER AND UP WALL TO NEAREST CABLE TRAY FOR CABLING.

280501 REFER TO SMOKE DETECTOR DETENTION COVER DETAIL #9, DRAWING E-801.

280503 PROVIDE FLOW MONITOR SWITCH, TAMPER MONITOR SWITCH AND BACKFLOW PREVENTOR MONITOR SWITCH FOR EACH SPRINKLER ZONE. REFER TO FIRE SUPPRESSION SHEETS FOR ZONE REQUIREMENTS.

280504 FIRE ALARM ANNUNCIATOR PANEL (F.A.A.P.). PANEL TO BE RECESS MOUNTED WITH TOP AT +60" A.F.F. PROVIDE CONNECTION PER MANUFACTURER'S RECOMMENDATION TO MAIL FIRE ALARM CONTROL PANEL (FACP-1) IN ELECTRICAL ROOM #C1054.

280507 ROOM CONTAINS SELF-CONTAINED DRY-POWDER FIRE SUPPRESSION SYSTEM. PROVIDE ZAM FOR ALARM MONITORING OF FIRE SUPPRESSION SYSTEM CONTROL PANEL BY FIRE ALARM CONTROL PANEL (FACP-1) LOCATED IN ELECTRICAL ROOM #C1054 AS RECOMMENDED BY SYSTEM MANUFACTURER. FURNISH CABLING AS REQUIRED IN 3/4"C. COORDINATE WITH MECHANICAL CONTRACTOR AND INSTALL/WIRE ALL ASSOCIATED ELECTRICAL APPURTENANCES AND DEVICES (I.E. SMOKE DETECTOR, PULL STATION, TELEPHONE OUTLET) TO FIRE SUPPRESSION PANEL AS NECESSARY AND AS REQUIRED BY FIRE SUPPRESSION SYSTEM MANUFACTURER.

280509 REMOTE TEST STATIONS FOR AIR HANDLING UNITS IN PENTHOUSE (FOR INTERLOCKING SHUT-DOWN INDICATION AND TESTING OF AIR HANDLING UNIT UPON DUCT SMOKE DETECTION). REFER TO PENTHOUSE ELECTRICAL PLAN ON DRAWING E-202-BC. MOUNT ON WALL NEAR FIRE ALARM ANNUNCIATOR PANEL 'FAAP-2'.

280510 KITCHEN HOOD IS EQUIPPED WITH ANSUL (DRY-TYPE FIRE SUPPRESSION SYSTEM). PROVIDE ZAM FOR ALARM MONITORING OF FIRE SUPPRESSION ACTIVATION WITH ANSUL SYSTEM. CONNECT TO ANSUL PANEL WITH 3/4"C. (CABLING TYPE AS REQUIRED BY ANSUL MFR).

280511 PROVIDE A (KEYED) MANUAL ACTIVATION DEVICE ALONG THE MEANS OF EGRESS AND LOCATED A MINIMUM OF 10'-0" , AND A MAXIMUM OF 20'-0", FROM KITCHEN HOOD EXHAUST SYSTEM. INTERCONNECT TO ANSUL SYSTEM TO AUTOMATICALLY SHUT-DOWN POWER TO (AND SHUT-OFF GAS TO) EQUIPMENT LOCATED UNDER THE KITCHEN HOOD AND TO AUTOMATICALLY ACTIVATE KITCHEN HOOD FIRE SUPPRESSION SYSTEM. CONNECT TO ANSUL PANEL WITH 3/4"C. (CABLING TYPE AS REQUIRED BY ANSUL MFR). REFER TO MECHANICAL AND KITCHEN EQUIPMENT VENDOR DRAWINGS FOR REQUIREMENTS FOR SHUT-DOWN OF THE KITCHEN MAKE-UP-AIR UNIT UPON ANSUL ACTIVATION.

280512 PROVIDE TWO (2) POTS OUTLETS FOR EACH OF TWO (UDACTS) IN FIRE ALARM CONTROL PANEL. CONNECT TO UDACTS. POTS LINES SHALL BE WIRED DIRECTLY BACK 110 BLOCK ON TELEPHONE TERMINAL BOARD TTB-1 (LOCATED IN ROOM MAIN DATA FRAME #B1060 AHEAD OF OTHER TELEPHONE HEAD-END EQUIPMENT. COORDINATE WITH OWNER AND TELEPHONE UTILITY AND PROVIDE TWO (2) DEDICATED OUTSIDE TELEPHONE LINES.

280513 REFER TO FIRE ALARM/DETECTION RISER DIAGRAM ON DRAWING E-804.

280514 GRAPHIC ANNUNCIATOR WORKSTATION AND PRINTER FOR FIRE ALARM/DETECTION SYSTEM. MOUNT WORKSTATION/PRINTER ADJACENT TO FACILITY MANAGER'S DESK AT A SEPARATE, DEDICATED WORKSTATION WITHIN THIS ROOM. PC, MONITORS, PRINTER, FURNISHED BY FIRE ALARM VENDOR. WORKSTATION FURNITURE, UPS PROVIDED BY OWNER AS PART OF LOOSE FURNISHINGS. REFER TO SPECIFICATION 284621.11 FOR DETAILED REQUIREMENTS.

280515 PROVIDE ONE (1) DATA OUTLET AT FIRE ALARM CONTROL PANEL FOR INTRANET/INTERNET CONNECTION FOR VPN REMOTE WEB (CLOUD) BASED ACCESS FOR PUSH NOTIFICATIONS OF ALARMS TO REMOTE USERS (I.E. MAINTENANCE PERSONNEL LAPTOPS, TABLETS, MOBILE PHONES, ETC.). ALSO COULD BASED SOFTWARE IS AVAILABLE BY MANUFACTUERE TO REAL-TIME REMOTE MONITORING/PINGING/TROUBLESHOOTING OF FIRE ALARM CONTROL PANEL FROM REMOTE USERS (I.E. SERIVCE TECHNICIAN LAPTION, MAINTENANCE PERSONNEL LAPTOP, ETC.).

280520 INTERACTIVE FIREFIGHTERS' TOUCHSCREEN DISPLAY PANEL TO BE RECESS MOUNTED WITH TOP AT +60" AFF. PROVIDE CONNECTION PER MANUFACTURER'S RECOMMENDATION TO FIRE ALARM CONTROL PANEL (FACP-1) IN ELECTRICAL ROOM #C1054.

280521 DEVICES IN TRASH ROOM #c1066 SHALL BE EQUIPPED WITH WATERTIGHT COVER SUITABLE FOR PROTECTION FROM WATER HOSE SPRAY.

280522 PROVIDE A NON-POWERED/NON0ILLUMINATED GRAPHIC ANNUNCIATOR PANEL FOR FIRE ALARM/DETECTION SYSTEM. REFER TO SPECIFICATION 284621.11 "ADDRESSABLE FIRE-ALARM SYSTEM" FOR DETAILED REQUIREMENTS. MOUNT ABOVE OR ADJACENT TO FIRE ALARM GRAPHIC WORKSTATION.

280525 SMOKE DAMPER. PROVIDE CONNECTION TO FIRE ALARM AS NEEDED PER MANUFACTURER'S RECOMMENDATION. REFER TO MECHANICAL DRAWINGS AND SPECIFICATION 233300 FOR DETAILED REQUIREMENTS.

GENERAL NOTES

A. REFER TO DRAWING E-803, DETAIL #10 FOR FIRE ALARM DEVICES MOUNTING REQUIREMENTS PER NFPA.

B. CONTRACTOR SHALL COORDINATE ALL DEVICE HEIGHTS AND EXACT LOCATIONS WITH CASEWORK SHOP DRAWINGS AND ARCHITECTURAL ELEVATION DRAWINGS.

C. ALL FIRE ALARM CONDUITS SHALL BE FACTORY PAINTED "RED". ALL PULL/JUNCTION BOX COVERS SHALL BE FACTORY PAINTED RED.

D. FOR MUTOA BACKBOX AND IN-WALL SLEEVE DETAIL, SEE DETAIL #10 ON DRAWING E-801.

E. REFER TO ARCHITECTURAL DRAWINGS FOR FIRE RATED WALLS AND CEILINGS. INSTALL FIRESTOP AT PENETRATIONS. INSTALL FIRE RATED PUTTY AROUND BOXES INSTALLED IN FIRE RATED WALLS AND OFFSET BACK TO BACK BOXES.

F. REFER TO SECURITY DRAWINGS, #SE SERIES, AND DIVISION 28 SPECIFICATIONS FOR ADDITIONAL SECURITY SYSTEM REQUIREMENTS. PROVIDE BOXES AND RACEWAYS CABLING, AND ASSOCIATED ITEMS AS NECESSARY FOR A COMPLETE AND FUNCTIONAL SECURITY SYSTEM.

G. PROPOSED WAP LOCATIONS AND QUANTITY SHOWN ARE SCHEMATIC ONLY. WAP VENDOR SHALL PROVIDE EXACT LOCATIONS AND QUANTITY OF WIRELESS ACCESS POINTS.

1. FURNISH AND INSTALL SPECIFICATION GRADE, POWER OVER ETHERNET, WIRELESS ACCESS POINT (WAP) ROUTERS FOR COMPLETE COVERAGE OF BUILDING, QUANTITY AND LOCATION TO BE DETERMINED BY WAP VENDOR USING PREDICTIVE ANALYSIS SOFTWARE.
2. ROUTER MANUFACTURERS SHALL BE BY NETGEAR, RUCKUS OR CISCO. PROVIDE WITH NETWORK MANAGEMENT SOFTWARE. WAP VENDOR SHALL PROVIDE A PREDICTIVE ANALYSIS OF WIRELESS PERFORMANCE AND WIRELESS ROUTERS.
3. PROVIDE INDICATING PREDICTIVE TRAFFIC/USAGE AND COVERAGE PATTERNS AS PART OF SHOP DRAWING SUBMITTAL.
4. FURNISH AND INSTALL (2) CAT 6 DATA CABLE WITH 10' OF SLACK FOR FINAL PLACEMENT OF ROUTER HARDWARE.
5. UNITS TO BE SURFACE MOUNTED ON BOTTOM OF PRECAST, ACOUSTICAL CEILING OR STRUCTURE. PROVIDE MOUNTING ACCESSORIES AS REQUIRED.
6. FURNISH AND INSTALL CUSTOM COVER OVER WIRELESS ACCESS POINT (WAP) ROUTERS LOCATED IN INMATE AREAS LIKE TERRAWAVE SOLUTIONS #V10102-C-1131 OR APPROVED EQUAL. COVER SHALL BE SIZED TO MATCH ROUTER AND UTILIZE TORX-HEAD CENTER PIN SCREWS.

H. SEAL ALL PENETRATIONS THRU PRECAST, REFER TO SPECIFICATION 079200 FOR TYPE.

I. SEE DRAWING E-607, DETAIL #1 FOR CATV DISTRIBUTION RISER.

J. DRY FIRE SUPPRESSION TO BE INSTALLED IN ELECTRICAL AND IT ROOMS (REFER TO FIRE SUPPRESSION SERIES DRAWINGS). DRY FIRE SUPPRESSION ALARM/DETECTION CABINET(S) SHALL BE CONNECTED TO THE FIRE ALARM CONTROL PANEL. CABINET(S) ARE NOT INDICATED ON THIS DRAWING (FIELD COORDINATE CABINET LOCATIONS PRIOR TO CONSTRUCTION) AND INCLUDE WITH SHOP DRAWING SUBMITTAL. PROVIDE 2 #12, #12G. FROM EACH DRY SUPPRESSION ALARM/DETECTION CABINET BACK TO NEAREST AVAILABLE 20A/1P BREAKER (IN A LEGALLY REQUIRED PANELBOARD).

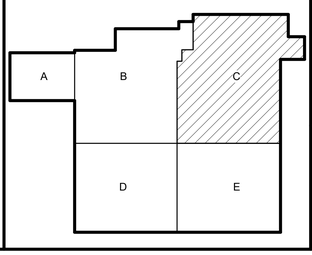
K. ROUTE VESDA SAMPLING TUBING IN CONDUIT (SIZE AS REQUIRED BY FIRE ALARM VENDOR) ABOVE INACCESSIBLE DETENTION CEILINGS.

L. SMOKE DETECTORS IN MECHANICAL CHASES (LOCATED BEHIND CELLS) ARE NOT REQUIRED FOR SMOKE EVAC SYSTEM FOR CELLS/DAYROOMS. REFER TO MECHANICAL PLANS FOR SMOKE EVAC SYSTEM SEQUENCE OF CONTROL.

1 FIRST FLOOR SYSTEMS - AREA 'C'
E-401-C SCALE: 1/8" = 1'-0"

NORTH

KEY PLAN



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ARCHITECTURE · ENGINEERING · PLANNING
SURVEYING · CONSTRUCTION SERVICES
DLZ INDIANA, LLC

MARVIN J. HITCHCOCK 10100175 STATE OF INDIANA REGISTERED PROFESSIONAL ENGINEER

NO.	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: RDW CHKD: MLH
DESIGNED: RDW, TKF
APPVD: MLH
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA
FIRST FLOOR SYSTEMS PLAN - AREA C

DRAWING NUMBER: E-401-C (1) ELECTRICAL

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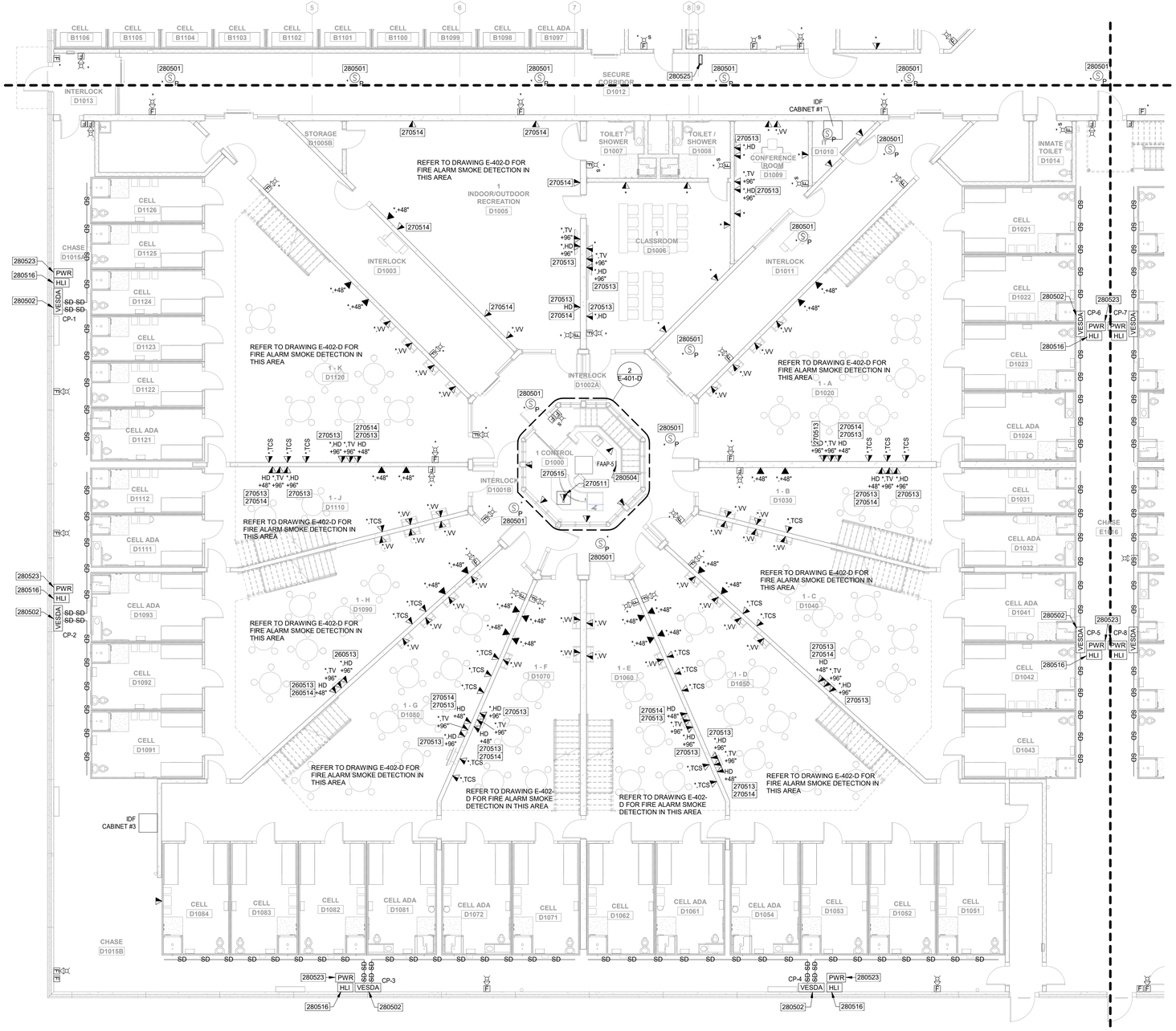
2 LOWER LEVEL SYSTEMS - AREA 'D'
E-401-D SCALE: 1/8" = 1'-0"
NORTH



1 FIRST FLOOR SYSTEMS - AREA 'D'
E-401-D SCALE: 1/8" = 1'-0"
NORTH

GENERAL NOTES

A. REFER TO DRAWING E-803, DETAIL #10 FOR FIRE ALARM DEVICES MOUNTING REQUIREMENTS PER NFPA.

B. CONTRACTOR SHALL COORDINATE ALL DEVICE HEIGHTS AND EXACT LOCATIONS WITH CASEWORK SHOP DRAWINGS AND ARCHITECTURAL ELEVATION DRAWINGS.

C. ALL FIRE ALARM CONDUITS SHALL BE FACTORY PAINTED "RED". ALL PULL/JUNCTION BOX COVERS SHALL BE FACTORY PAINTED RED.

D. FOR MUTOA BACKBOX AND IN-WALL SLEEVE DETAIL, SEE DETAIL #10 ON DRAWING E-801.

E. REFER TO ARCHITECTURAL DRAWINGS FOR FIRE RATED WALLS AND CEILINGS. INSTALL FIRESTOP AT PENETRATIONS. INSTALL FIRE RATED PUTTY AROUND BOXES INSTALLED IN FIRE RATED WALLS AND OFFSET BACK TO BACK BOXES.

F. REFER TO SECURITY DRAWINGS, #SE SERIES, AND DIVISION 28 SPECIFICATIONS FOR ADDITIONAL SECURITY SYSTEM REQUIREMENTS. PROVIDE BOXES AND RACEWAYS CABLING, AND ASSOCIATED ITEMS AS NECESSARY FOR A COMPLETE AND FUNCTIONAL SECURITY SYSTEM.

G. PROPOSED WAP LOCATIONS AND QUANTITY SHOWN ARE SCHEMATIC ONLY. WAP VENDOR SHALL PROVIDE EXACT LOCATIONS AND QUANTITY OF WIRELESS ACCESS POINTS.

1. FURNISH AND INSTALL SPECIFICATION GRADE, POWER OVER ETHERNET, WIRELESS ACCESS POINT (WAP) ROUTERS FOR COMPLETE COVERAGE OF BUILDING; QUANTITY AND LOCATION TO BE DETERMINED BY WAP VENDOR USING PREDICTIVE ANALYSIS SOFTWARE.
2. ROUTER MANUFACTURERS SHALL BE BY NETGEAR, RUCKUS OR CISCO. PROVIDE WITH NETWORK MANAGEMENT SOFTWARE. WAP VENDOR SHALL PROVIDE A PREDICTIVE ANALYSIS OF WIRELESS PERFORMANCE AND WIRELESS ROUTERS.
3. PROVIDE INDICATING PREDICTIVE TRAFFIC/USAGE AND COVERAGE PATTERNS AS PART OF SHOP DRAWING SUBMITTAL.
4. FURNISH AND INSTALL (2) CAT 6 DATA CABLE WITH 10' OF SLACK FOR FINAL PLACEMENT OF ROUTER HARDWARE.
5. UNITS TO BE SURFACE MOUNTED ON BOTTOM OF PRECAST, ACOUSTICAL CEILING OR STRUCTURE. PROVIDE MOUNTING ACCESSORIES AS REQUIRED.
6. FURNISH AND INSTALL CUSTOM COVER OVER WIRELESS ACCESS POINT (WAP) ROUTERS LOCATED IN INMATE AREAS LIKE TERRAWAVE SOLUTIONS #V10102-C-1131 OR APPROVED EQUAL. COVER SHALL BE SIZED TO MATCH ROUTER AND UTILIZE TORX-HEAD CENTER PIN SCREWS.

H. SEAL ALL PENETRATIONS THRU PRECAST, REFER TO SPECIFICATION 079200 FOR TYPE.

I. SEE DRAWING E-607, DETAIL #1 FOR CATV DISTRIBUTION RISER.

J. DRY FIRE SUPPRESSION TO BE INSTALLED IN ELECTRICAL AND IT ROOMS (REFER TO FIRE SUPPRESSION SERIES DRAWINGS). DRY FIRE SUPPRESSION ALARM/DETECTION CABINET(S) SHALL BE CONNECTED TO THE FIRE ALARM CONTROL PANEL. CABINET(S) ARE NOT INDICATED ON THIS DRAWING (FIELD COORDINATE CABINET LOCATIONS PRIOR TO CONSTRUCTION) AND INCLUDE WITH SHOP DRAWING SUBMITTAL. PROVIDE 2 #12, #12G. FROM EACH DRY SUPPRESSION ALARM/DETECTION CABINET BACK TO NEAREST AVAILABLE 20A/1P BREAKER (IN A LEGALLY REQUIRED PANELBOARD).

K. ROUTE VESDA SAMPLING TUBING IN CONDUIT (SIZE AS REQUIRED BY FIRE ALARM VENDOR) ABOVE INACCESSIBLE DETENTION CEILINGS. ALSO REFER TO SPECIFICATION 284621.11 FOR DETAILED REQUIREMENTS FOR VESDA EQUIPMENT/TUBING/DETECTORS, CONTRACTOR QUALIFICATION REQUIREMENTS, AND REQUIREMENTS FOR A WORKMANLIKE INSTALLATION OF ALL ASSOCIATED APPURTENANCES.

L. SMOKE DETECTORS IN MECHANICAL CHASES (LOCATED BEHIND CELLS) ARE NOT REQUIRED FOR SMOKE EVAC SYSTEM FOR CELLS/DAYROOMS. REFER TO MECHANICAL PLANS FOR SMOKE EVAC SYSTEM SEQUENCE OF CONTROL.

SYSTEMS KEYNOTES 2805## 2705##

270511 NEW 8-GANG FLOOR BOX, REFER TO KEYNOTE #260524 ON E-201 SERIES DRAWINGS. FURNISH AND INSTALL (1) DATA/COMMUNICATIONS OUTLET WITH SIX (6) CAT 6 JACKS/CABLES. ROUTE (2)-1"C. FROM BOX OVER AND UP WALL TO NEAREST CABLE TRAY FOR CABLING.

270513 FURNISH AND INSTALL SPECIALTY OUTLET WITH (1) HDMI PORT FOR INTERFACING LAPTOP/COMPUTER WITH TV IN ROOM. FURNISH AND INSTALL PRE-TERMINATED HDMI BETWEEN LAPTOP/COMPUTER INTERFACE MUTOA AND TV INTERFACE MUTOA WITH 1"C. FURNISH MATCHING HDMI PORT AT TV LOCATION.

270514 FURNISH AND INSTALL DEVICE IN CUSTOM FLUSH MOUNTED, LOCKABLE WALL CABINET. FOR CABINET DETAIL, SEE SHEET E-803, DETAIL #7.

270515 PROVIDE SIGNAL REFERENCE GROUNDING FOR RAISED FLOOR, REFER TO RAISED FLOOR GROUNDING DETAIL #10 ON SHEET E-802.

280501 REFER TO SMOKE DETECTOR DETENTION COVER DETAIL #9, DRAWING E-801.

280502 ONE (1) VESDA SMOKE DETECTION SAMPLING POINT/HEAD SHALL BE INSTALLED ON THE RETURN DUCTWORK FOR EACH CELL. ROUTE VESDA TUBING BACK TO VESDA AIR SAMPLING SMOKE DETECTOR/ALARM CABINET. FIELD COORDINATE EXACT CABINET QUANTITIES AND LOCATIONS WITH FIRE ALARM VENDOR PRIOR TO PROCUREMENT/CONSTRUCTION. PROVIDE SHOP DRAWING SUBMITTAL INDICATING EXACT LOCATIONS. VESDA CABINET(S) SHALL BE INSTALLED IN THE CHASE ADJACENT TO THE CELLS(S), WALL MOUNT TOP OF CABINET +6'-0" AFF. REFER TO M-SERIES DRAWINGS FOR HVAC DUCTWORK FOR EACH CELL AND SPECIFICATION SECTION 284621.11 FOR DETAILED REQUIREMENTS. REFER TO FIRE ALARM/DETECTION RISER DIAGRAM ON DRAWING E-804.

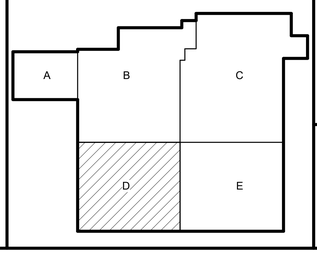
280504 FIRE ALARM ANNUNCIATOR PANEL (F.A.A.P.). PANEL TO BE RECESS MOUNTED WITH TOP AT +60" A.F.F. PROVIDE CONNECTION PER MANUFACTURER'S RECOMMENDATION TO MAIL FIRE ALARM CONTROL PANEL (FACP-1) IN ELECTRICAL ROOM #C1054.

280516 PROVIDE HIGH-LEVEL-INTERFACE (HLI) AT EACH VESDA AIR SAMPLING SMOKE DETECTOR/ALARM CABINET FOR VESDA COMMUNICATION NETWORK. CONNECT TO ADJACENT VESDA CABINETS WITHIN A SMOKE CONTROL ZONE AND HOMERUN BACK TO MAIN FIRE ALARM CONTROL PANEL (FACP-1) IN ELECTRICAL ROOM #C1054. [ALTERNATIVELY, WHERE FACP-1 IS NOT SUPPORTED BY THE VESDA COMMUNICATIONS NETWORK, PROVIDE ONE(1) ZAM (FOR MONITORING SMOKE DETECTION ALARM) FOR EACH SMOKE DETECTION SAMPLING POINT ALARM. PROVIDE ONE (1) ZAM (FOR MONITORING GENERAL ALARMS SUCH AS TROUBLE, CLEAN FILTER, ETC.) EACH VESDA AIR SAMPLING SMOKE DETECTION/ALARM CABINET; REFER TO SPECIFICATION 284621.11 FOR DETAILED REQUIREMENTS. ROUTE ZAM(S) BACK TO MAIN FIRE ALARM PANEL (FACP-1) IN ELECTRICAL ROOM #C1054].

280523 PROVIDE VESDA POWER SUPPLY CABINET WITH BATTERY CHARGER/BATTERIES (120VAC INPUT POWER, 24VDC OUTPUT POWER). LOCATE ADJACENT TO EACH AIR SAMPLING SMOKE DETECTOR ALARM/MONITORING PANEL. REFER TO DRAWINGS E-201-D AND E-201-E FOR CIRCUITING INFORMATION.

280525 SMOKE DAMPER. PROVIDE CONNECTION TO FIRE ALARM AS NEEDED PER MANUFACTURER'S RECOMMENDATION. REFER TO MECHANICAL DRAWINGS AND SPECIFICATION 233300 FOR DETAILED REQUIREMENTS.

KEY PLAN



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NO.	REVISION	DATE
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DRAWN: RDW | CHK'D: MLH
DESIGNED: RDW, TKF
APPRV'D: MLH
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER: 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

FIRST FLOOR AND LOWER LEVEL SYSTEMS PLANS - AREA D

DRAWING NUMBER: E-401-D
ELECTRICAL

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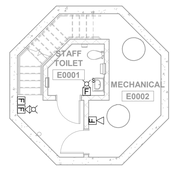
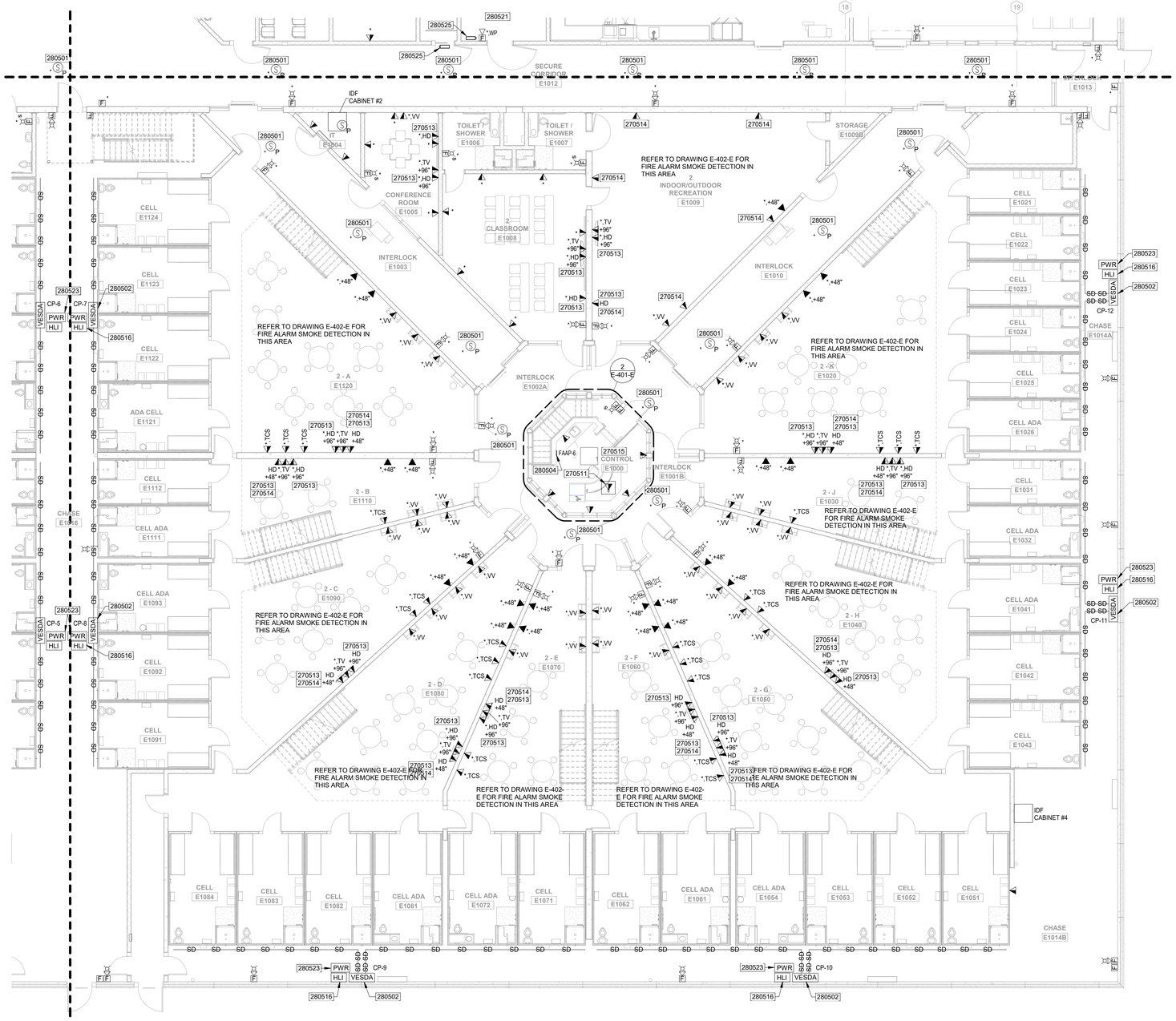


2 E-401-E **LOWER LEVEL SYSTEMS - AREA 'E'**
SCALE: 1/8" = 1'-0"
NORTH



1 E-401-E **FIRST FLOOR SYSTEMS - AREA 'E'**
SCALE: 1/8" = 1'-0"
NORTH

GENERAL NOTES

A. REFER TO DRAWING E-803, DETAIL #10 FOR FIRE ALARM DEVICES MOUNTING REQUIREMENTS PER NFPA.

B. CONTRACTOR SHALL COORDINATE ALL DEVICE HEIGHTS AND EXACT LOCATIONS WITH CASEWORK SHOP DRAWINGS AND ARCHITECTURAL ELEVATION DRAWINGS.

C. ALL FIRE ALARM CONDUITS SHALL BE FACTORY PAINTED "RED". ALL PULL/JUNCTION BOX COVERS SHALL BE FACTORY PAINTED RED.

D. FOR MUTOA BACKBOX AND IN-WALL SLEEVE DETAIL, SEE DETAIL #10 ON DRAWING E-801.

E. REFER TO ARCHITECTURAL DRAWINGS FOR FIRE RATED WALLS AND CEILINGS. INSTALL FIRESTOP AT PENETRATIONS. INSTALL FIRE RATED PUTTY AROUND BOXES INSTALLED IN FIRE RATED WALLS AND OFFSET BACK TO BACK BOXES.

F. REFER TO SECURITY DRAWINGS, #SE SERIES, AND DIVISION 28 SPECIFICATIONS FOR ADDITIONAL SECURITY SYSTEM REQUIREMENTS. PROVIDE BOXES AND RACEWAYS CABLING, AND ASSOCIATED ITEMS AS NECESSARY FOR A COMPLETE AND FUNCTIONAL SECURITY SYSTEM.

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3. PROVIDE INDICATING PREDICTIVE TRAFFIC/USAGE AND COVERAGE PATTERNS AS PART OF SHOP DRAWING SUBMITTAL.
4. FURNISH AND INSTALL (2) CAT 6 DATA CABLE WITH 10' OF SLACK FOR FINAL PLACEMENT OF ROUTER HARDWARE.
5. UNITS TO BE SURFACE MOUNTED ON BOTTOM OF PRECAST, ACOUSTICAL CEILING OR STRUCTURE. PROVIDE MOUNTING ACCESSORIES AS REQUIRED.
6. FURNISH AND INSTALL CUSTOM COVER OVER WIRELESS ACCESS POINT (WAP) ROUTERS LOCATED IN INMATE AREAS LIKE TERRAWAVE SOLUTIONS #V1010Z-C-1131 OR APPROVED EQUAL. COVER SHALL BE SIZED TO MATCH ROUTER AND UTILIZE TORX-HEAD CENTER PIN SCREWS.

H. SEAL ALL PENETRATIONS THRU PRECAST, REFER TO SPECIFICATION 079200 FOR TYPE.

I. SEE DRAWING E-607, DETAIL #1 FOR CATV DISTRIBUTION RISER.

J. DRY FIRE SUPPRESSION TO BE INSTALLED IN ELECTRICAL AND IT ROOMS (REFER TO FIRE SUPPRESSION SERIES DRAWINGS). DRY FIRE SUPPRESSION ALARM/DETECTION CABINET(S) SHALL BE CONNECTED TO THE FIRE ALARM CONTROL PANEL. CABINET(S) ARE NOT INDICATED ON THIS DRAWING (FIELD COORDINATE CABINET LOCATIONS PRIOR TO CONSTRUCTION) AND INCLUDE WITH SHOP DRAWING SUBMITTAL. PROVIDE 2 #12, #12G. FROM EACH DRY SUPPRESSION ALARM/DETECTION CABINET BACK TO NEAREST AVAILABLE 20A/1P BREAKER (IN A LEGALLY REQUIRED PANELBOARD).

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L. SMOKE DETECTORS IN MECHANICAL CHASES (LOCATED BEHIND CELLS) ARE NOT REQUIRED FOR SMOKE EVAC SYSTEM FOR CELLS/DAYROOMS. REFER TO MECHANICAL PLANS FOR SMOKE EVAC SYSTEM SEQUENCE OF CONTROL.

SYSTEMS KEYNOTES 2805## 2705##

270511 NEW 8-GANG FLOOR BOX, REFER TO KEYNOTE #260524 ON E-201 SERIES DRAWINGS. FURNISH AND INSTALL (1) DATA/COMMUNICATIONS OUTLET WITH SIX (6) CAT.6 JACKS/CABLES. ROUTE (2)-1"C. FROM BOX OVER AND UP WALL TO NEAREST CABLE TRAY FOR CABLING.

270513 FURNISH AND INSTALL SPECIALTY OUTLET WITH (1) HDMI PORT FOR INTERFACING LAPTOP/COMPUTER WITH TV IN ROOM. FURNISH AND INSTALL PRE-TERMINATED HDMI BETWEEN LAPTOP/COMPUTER INTERFACE MUTOA AND TV INTERFACE MUTOA WITH 1"C. FURNISH MATCHING HDMI PORT AT TV LOCATION.

270514 FURNISH AND INSTALL DEVICE IN CUSTOM FLUSH MOUNTED, LOCKABLE WALL CABINET. FOR CABINET DETAIL, SEE SHEET E-803, DETAIL #7.

270515 PROVIDE SIGNAL REFERENCE GROUNDING FOR RAISED FLOOR, REFER TO RAISED FLOOR GROUNDING DETAIL #10 ON SHEET E-802.

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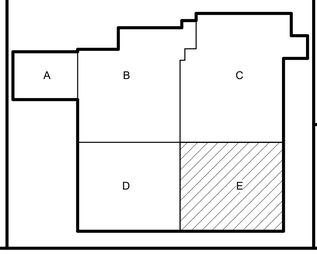
280516 PROVIDE HIGH-LEVEL-INTERFACE (HLI) AT EACH VESDA AIR SAMPLING SMOKE DETECTOR/ALARM CABINET FOR VESDA COMMUNICATION NETWORK. CONNECT TO ADJACENT VESDA CABINETS WITHIN A SMOKE CONTROL ZONE AND HOMERUN BACK TO MAIN FIRE ALARM CONTROL PANEL (FACP-1) IN ELECTRICAL ROOM #C1054. [ALTERNATIVELY, WHERE FACP-1 IS NOT SUPPORTED BY THE VESDA COMMUNICATIONS NETWORK, PROVIDE ONE(1) ZAM (FOR MONITORING GENERAL ALARMS SUCH AS TROUBLE, CLEAN FILTER, ETC.) EACH VESDA AIR SAMPLING SMOKE DETECTION/ALARM CABINET; REFER TO SPECIFICATION 284621.11 FOR DETAILED REQUIREMENTS. ROUTE ZAM(S) BACK TO MAIN FIRE ALARM PANEL (FACP-1) IN ELECTRICAL ROOM #C1054].

280521 DEVICES IN TRASH ROOM #c1066 SHALL BE EQUIPPED WITH WATERTIGHT COVER SUITABLE FOR PROTECTION FROM WATER HOSE SPRAY.

280523 PROVIDE VESDA POWER SUPPLY CABINET WITH BATTERY CHARGER/BATTERIES (120VAC INPUT POWER, 24VDC OUTPUT POWER). LOCATE ADJACENT TO EACH AIR SAMPLING SMOKE DETECTOR ALARM/MONITORING PANEL. REFER TO DRAWINGS E-201-D AND E-201-E FOR CIRCUITING INFORMATION.

280525 SMOKE DAMPER. PROVIDE CONNECTION TO FIRE ALARM AS NEEDED PER MANUFACTURER'S RECOMMENDATION. REFER TO MECHANICAL DRAWINGS AND SPECIFICATION 233300 FOR DETAILED REQUIREMENTS.

KEY PLAN



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NO.	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: RDW | CHK'D: MLH
DESIGNED: RDW/ TKF
APPR'VD: MLH
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

FIRST FLOOR AND LOWER LEVEL SYSTEMS PLANS - AREA E

DRAWING NUMBER 1 E-401-E ELECTRICAL

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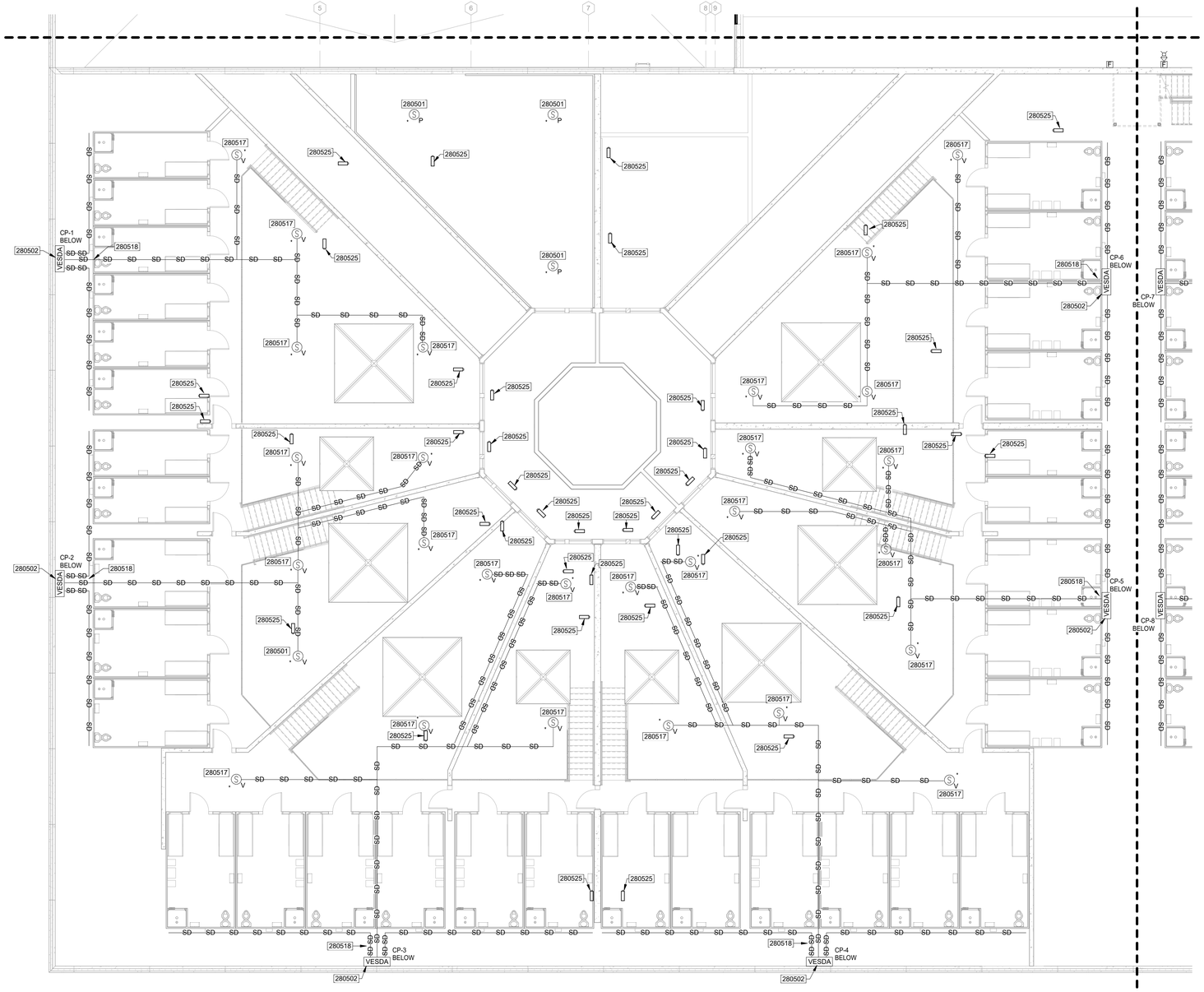

1 E-402-D **MEZZANINE SYSTEMS PLAN - AREA 'D'**
SCALE: 1/8" = 1'-0"

NORTH

GENERAL NOTES

A. REFER TO DRAWING E-803, DETAIL #10 FOR FIRE ALARM DEVICES MOUNTING REQUIREMENTS PER NFPA.

B. CONTRACTOR SHALL COORDINATE ALL DEVICE HEIGHTS AND EXACT LOCATIONS WITH CASEWORK SHOP DRAWINGS AND ARCHITECTURAL ELEVATION DRAWINGS.

C. ALL FIRE ALARM CONDUITS SHALL BE FACTORY PAINTED "RED". ALL PULL/JUNCTION BOX COVERS SHALL BE FACTORY PAINTED RED.

D. FOR MUTOA BACKBOX AND IN-WALL SLEEVE DETAIL, SEE DETAIL #10 ON DRAWING E-801.

E. REFER TO ARCHITECTURAL DRAWINGS FOR FIRE RATED WALLS AND CEILINGS. INSTALL FIRESTOP AT PENETRATIONS. INSTALL FIRE RATED PUTTY AROUND BOXES INSTALLED IN FIRE RATED WALLS AND OFFSET BACK TO BACK BOXES.

F. REFER TO SECURITY DRAWINGS, #SE SERIES, AND DIVISION 28 SPECIFICATIONS FOR ADDITIONAL SECURITY SYSTEM REQUIREMENTS. PROVIDE BOXES AND RACEWAYS CABLING, AND ASSOCIATED ITEMS AS NECESSARY FOR A COMPLETE AND FUNCTIONAL SECURITY SYSTEM.

G. PROPOSED WAP LOCATIONS AND QUANTITY SHOWN ARE SCHEMATIC ONLY. WAP VENDOR SHALL PROVIDE EXACT LOCATIONS AND QUANTITY OF WIRELESS ACCESS POINTS.

1. FURNISH AND INSTALL SPECIFICATION GRADE, POWER OVER ETHERNET, WIRELESS ACCESS POINT (WAP) ROUTERS FOR COMPLETE COVERAGE OF BUILDING; QUANTITY AND LOCATION TO BE DETERMINED BY WAP VENDOR USING PREDICTIVE ANALYSIS SOFTWARE.
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5. UNITS TO BE SURFACE MOUNTED ON BOTTOM OF PRECAST, ACOUSTICAL CEILING OR STRUCTURE. PROVIDE MOUNTING ACCESSORIES AS REQUIRED.
6. FURNISH AND INSTALL CUSTOM COVER OVER WIRELESS ACCESS POINT (WAP) ROUTERS LOCATED IN INMATE AREAS LIKE TERRAWAVE SOLUTIONS #V10102-C-1131 OR APPROVED EQUAL. COVER SHALL BE SIZED TO MATCH ROUTER AND UTILIZE TORX-HEAD CENTER PIN SCREWS.

H. SEAL ALL PENETRATIONS THRU PRECAST, REFER TO SPECIFICATION 079200 FOR TYPE.

I. SEE DRAWING E-607, DETAIL #1 FOR CATV DISTRIBUTION RISER.

J. DRY FIRE SUPPRESSION TO BE INSTALLED IN ELECTRICAL AND IT ROOMS (REFER TO FIRE SUPPRESSION SERIES DRAWINGS). DRY FIRE SUPPRESSION ALARM/DETECTION CABINET(S) SHALL BE CONNECTED TO THE FIRE ALARM CONTROL PANEL. CABINET(S) ARE NOT INDICATED ON THIS DRAWING (FIELD COORDINATE CABINET LOCATIONS PRIOR TO CONSTRUCTION) AND INCLUDE WITH SHOP DRAWING SUBMITTAL. PROVIDE 2 #12, #12G. FROM EACH DRY SUPPRESSION ALARM/DETECTION CABINET BACK TO NEAREST AVAILABLE 20A/1P BREAKER (IN A LEGALLY REQUIRED PANELBOARD).

K. ROUTE VESDA SAMPLING TUBING IN CONDUIT (SIZE AS REQUIRED BY FIRE ALARM VENDOR) ABOVE INACCESSIBLE DETENTION CEILINGS. ALSO REFER TO SPECIFICATION 284621.11 FOR DETAILED REQUIREMENTS FOR VESDA EQUIPMENT/TUBING/DETECTORS, CONTRACTOR QUALIFICATION REQUIREMENTS, AND REQUIREMENTS FOR A WORKMANLIKE INSTALLATION OF ALL ASSOCIATED APPURTENANCES.

L. SMOKE DETECTORS IN MECHANICAL CHASES (LOCATED BEHIND CELLS) ARE NOT REQUIRED FOR SMOKE EVAC SYSTEM FOR CELLS/DAYROOMS. REFER TO MECHANICAL PLANS FOR SMOKE EVAC SYSTEM SEQUENCE OF CONTROL.

SYSTEMS KEYNOTES

2705## 2805##

280501 REFER TO SMOKE DETECTOR DETENTION COVER DETAIL #9, DRAWING E-801.

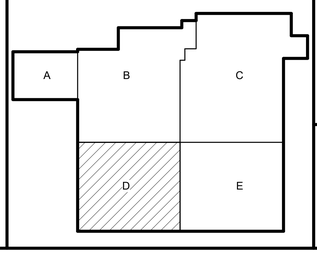
280502 ONE (1) VESDA SMOKE DETECTION SAMPLING POINT/HEAD SHALL BE INSTALLED ON THE RETURN DUCTWORK FOR EACH CELL. ROUTE VESDA TUBING BACK TO VESDA AIR SAMPLING SMOKE DETECTOR/ALARM CABINET. FIELD COORDINATE EXACT CABINET QUANTITIES AND LOCATIONS WITH FIRE ALARM VENDOR PRIOR TO PROCUREMENT/CONSTRUCTION. PROVIDE SHOP DRAWING SUBMITTAL INDICATING EXACT LOCATIONS. VESDA CABINET(S) SHALL BE INSTALLED IN THE CHASE ADJACENT TO THE CELLS(S). WALL MOUNT TOP OF CABINET +6'-0" AFF. REFER TO M-SERIES DRAWINGS FOR HVAC DUCTWORK FOR EACH CELL AND SPECIFICATION SECTION 284621.11 FOR DETAILED REQUIREMENTS. REFER TO FIRE ALARM/DETECTION RISER DIAGRAM ON DRAWING E-804.

280517 REFER TO FLUSH MOUNT, TAMPER-PROOF ASPIRATING SMOKE DETECTOR SAMPLING PORT DETAIL #2, DRAWING E-804.

280518 ROUTE SAMPLING TUBES DOWN TO VESDA AIR SAMPLING SMOKE DETECTOR/ALARM CABINET LOCATED ON LEVEL 1. REFER TO LEVEL 1 SYSTEMS PLANS.

280525 SMOKE DAMPER. PROVIDE CONNECTION TO FIRE ALARM AS NEEDED PER MANUFACTURER'S RECOMMENDATION. REFER TO MECHANICAL DRAWINGS AND SPECIFICATION 233300 FOR DETAILED REQUIREMENTS.

KEY PLAN



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MARVIN L. HITCHCOCK 10100 REGISTERED PROFESSIONAL ENGINEER STATE OF INDIANA PE001 9675

NO.	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: RDW CHK'D: MLH
DESIGNED: RDW,TKF
APPR'VD: MLH
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA
MEZZANINE SYSTEMS PLAN - AREA D

DRAWING NUMBER 1 E-402-D ELECTRICAL

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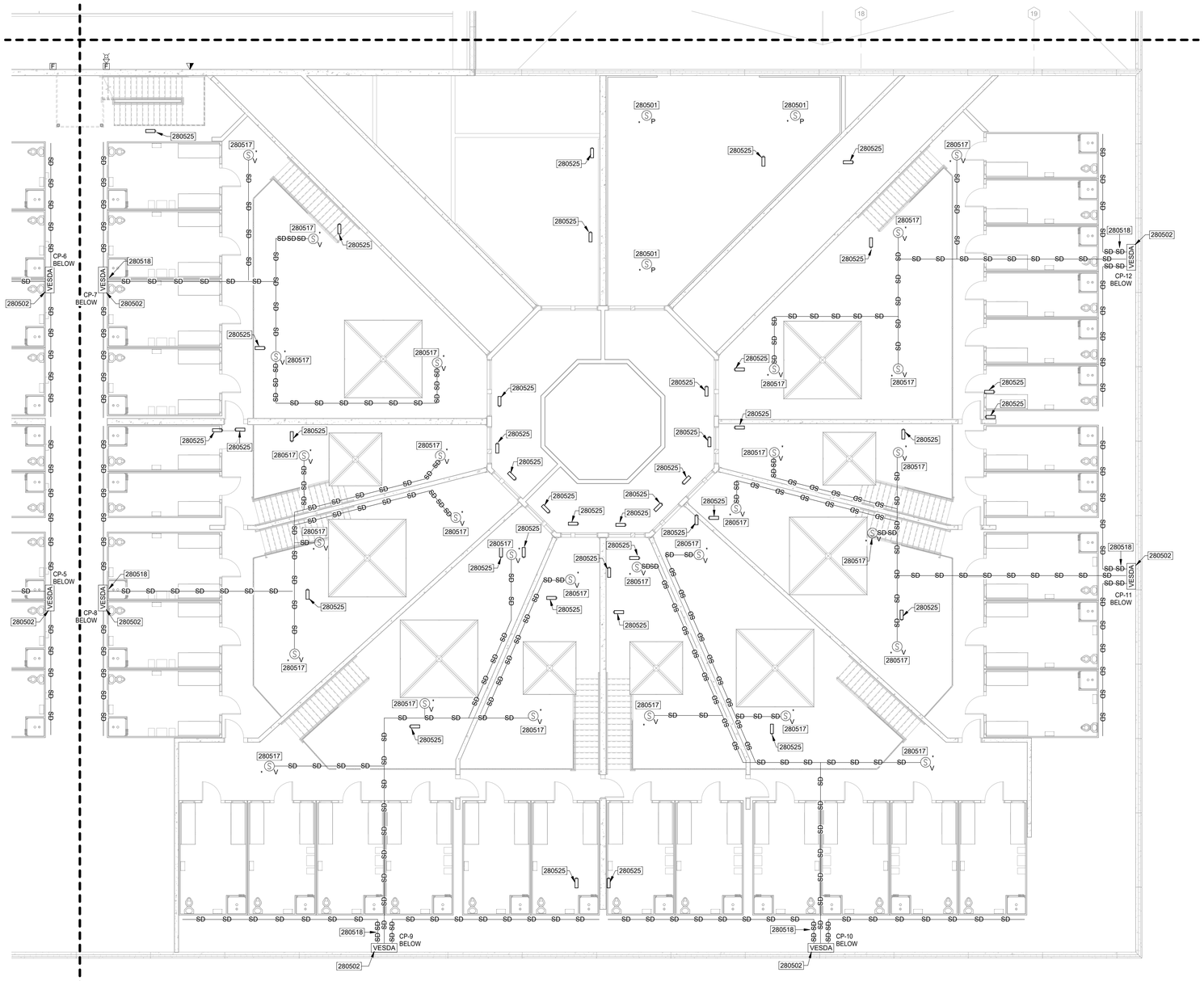


1 E-402-E **MEZZANINE SYSTEMS PLAN - AREA 'E'**
SCALE: 1/8" = 1'-0"

NORTH

GENERAL NOTES

A. REFER TO DRAWING E-803, DETAIL #10 FOR FIRE ALARM DEVICES MOUNTING REQUIREMENTS PER NFPA.

B. CONTRACTOR SHALL COORDINATE ALL DEVICE HEIGHTS AND EXACT LOCATIONS WITH CASEWORK SHOP DRAWINGS AND ARCHITECTURAL ELEVATION DRAWINGS.

C. ALL FIRE ALARM CONDUITS SHALL BE FACTORY PAINTED "RED". ALL PULL/JUNCTION BOX COVERS SHALL BE FACTORY PAINTED RED.

D. FOR MUTOA BACKBOX AND IN-WALL SLEEVE DETAIL, SEE DETAIL #10 ON DRAWING E-801.

E. REFER TO ARCHITECTURAL DRAWINGS FOR FIRE RATED WALLS AND CEILINGS. INSTALL FIRESTOP AT PENETRATIONS. INSTALL FIRE RATED PUTTY AROUND BOXES INSTALLED IN FIRE RATED WALLS AND OFFSET BACK TO BACK BOXES.

F. REFER TO SECURITY DRAWINGS, #SE SERIES, AND DIVISION 28 SPECIFICATIONS FOR ADDITIONAL SECURITY SYSTEM REQUIREMENTS. PROVIDE BOXES AND RACEWAYS CABLING, AND ASSOCIATED ITEMS AS NECESSARY FOR A COMPLETE AND FUNCTIONAL SECURITY SYSTEM.

G. PROPOSED WAP LOCATIONS AND QUANTITY SHOWN ARE SCHEMATIC ONLY. WAP VENDOR SHALL PROVIDE EXACT LOCATIONS AND QUANTITY OF WIRELESS ACCESS POINTS.

1. FURNISH AND INSTALL SPECIFICATION GRADE, POWER OVER ETHERNET, WIRELESS ACCESS POINT (WAP) ROUTERS FOR COMPLETE COVERAGE OF BUILDING; QUANTITY AND LOCATION TO BE DETERMINED BY WAP VENDOR USING PREDICTIVE ANALYSIS SOFTWARE.
2. ROUTER MANUFACTURERS SHALL BE BY NETGEAR, RUCKUS OR CISCO. PROVIDE WITH NETWORK MANAGEMENT SOFTWARE. WAP VENDOR SHALL PROVIDE A PREDICTIVE ANALYSIS OF WIRELESS PERFORMANCE AND WIRELESS ROUTERS.
3. PROVIDE INDICATING PREDICTIVE TRAFFIC/USAGE AND COVERAGE PATTERNS AS PART OF SHOP DRAWING SUBMITTAL.
4. FURNISH AND INSTALL (2) CAT 6 DATA CABLE WITH 10' OF SLACK FOR FINAL PLACEMENT OF ROUTER HARDWARE.
5. UNITS TO BE SURFACE MOUNTED ON BOTTOM OF PRECAST, ACOUSTICAL CEILING OR STRUCTURE. PROVIDE MOUNTING ACCESSORIES AS REQUIRED.
6. FURNISH AND INSTALL CUSTOM COVER OVER WIRELESS ACCESS POINT (WAP) ROUTERS LOCATED IN INMATE AREAS LIKE TERRAWAVE SOLUTIONS #V10102-C-1131 OR APPROVED EQUAL. COVER SHALL BE SIZED TO MATCH ROUTER AND UTILIZE TORX-HEAD CENTER PIN SCREWS.

H. SEAL ALL PENETRATIONS THRU PRECAST, REFER TO SPECIFICATION 079200 FOR TYPE.

I. SEE DRAWING E-607, DETAIL #1 FOR CATV DISTRIBUTION RISER.

J. DRY FIRE SUPPRESSION TO BE INSTALLED IN ELECTRICAL AND IT ROOMS (REFER TO FIRE SUPPRESSION SERIES DRAWINGS). DRY FIRE SUPPRESSION ALARM/DETECTION CABINET(S) SHALL BE CONNECTED TO THE FIRE ALARM CONTROL PANEL. CABINET(S) ARE NOT INDICATED ON THIS DRAWING (FIELD COORDINATE CABINET LOCATIONS PRIOR TO CONSTRUCTION) AND INCLUDE WITH SHOP DRAWING SUBMITTAL. PROVIDE 2 #12, #12G. FROM EACH DRY SUPPRESSION ALARM/DETECTION CABINET BACK TO NEAREST AVAILABLE 20A/1P BREAKER (IN A LEGALLY REQUIRED PANELBOARD).

K. ROUTE VESDA SAMPLING TUBING IN CONDUIT (SIZE AS REQUIRED BY FIRE ALARM VENDOR) ABOVE INACCESSIBLE DETENTION CEILINGS. ALSO REFER TO SPECIFICATION 284621.11 FOR DETAILED REQUIREMENTS FOR VESDA EQUIPMENT/TUBING/DETECTORS, CONTRACTOR QUALIFICATION REQUIREMENTS, AND REQUIREMENTS FOR A WORKMANLIKE INSTALLATION OF ALL ASSOCIATED APPURTENANCES.

L. SMOKE DETECTORS IN MECHANICAL CHASES (LOCATED BEHIND CELLS) ARE NOT REQUIRED FOR SMOKE EVAC SYSTEM FOR CELLS/DAYROOMS. REFER TO MECHANICAL PLANS FOR SMOKE EVAC SYSTEM SEQUENCE OF CONTROL.

SYSTEMS KEYNOTES 2705## 2805##

280501 REFER TO SMOKE DETECTOR DETENTION COVER DETAIL #9, DRAWING E-801.

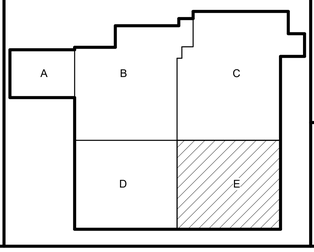
280502 ONE (1) VESDA SMOKE DETECTION SAMPLING POINT/HEAD SHALL BE INSTALLED ON THE RETURN DUCTWORK FOR EACH CELL. ROUTE VESDA TUBING BACK TO VESDA AIR SAMPLING SMOKE DETECTOR/ALARM CABINET. FIELD COORDINATE EXACT CABINET QUANTITIES AND LOCATIONS WITH FIRE ALARM VENDOR PRIOR TO PROCUREMENT/CONSTRUCTION. PROVIDE SHOP DRAWING SUBMITTAL INDICATING EXACT LOCATIONS. VESDA CABINET(S) SHALL BE INSTALLED IN THE CHASE ADJACENT TO THE CELLS(S). WALL MOUNT TOP OF CABINET +6'-0" AFF. REFER TO M-SERIES DRAWINGS FOR HVAC DUCTWORK FOR EACH CELL AND SPECIFICATION SECTION 284621.11 FOR DETAILED REQUIREMENTS. REFER TO FIRE ALARM/DETECTION RISER DIAGRAM ON DRAWING E-804.

280517 REFER TO FLUSH MOUNT, TAMPER-PROOF ASPIRATING SMOKE DETECTOR SAMPLING PORT DETAIL #2, DRAWING E-804.

280518 ROUTE SAMPLING TUBES DOWN TO VESDA AIR SAMPLING SMOKE DETECTOR/ALARM CABINET LOCATED ON LEVEL 1. REFER TO LEVEL 1 SYSTEMS PLANS.

280525 SMOKE DAMPER. PROVIDE CONNECTION TO FIRE ALARM AS NEEDED PER MANUFACTURER'S RECOMMENDATION. REFER TO MECHANICAL DRAWINGS AND SPECIFICATION 233300 FOR DETAILED REQUIREMENTS.

KEY PLAN



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MARVIN L. HITCHCOCK 13 STATE OF INDIANA PE0018675 PROFESSIONAL ENGINEER

NO.	REVISION	DATE
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DESIGNED: RDW, TKF
APPRV'D: MLH
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

MEZZANINE SYSTEMS PLAN - AREA E

DRAWING NUMBER 1 E-402-E ELECTRICAL

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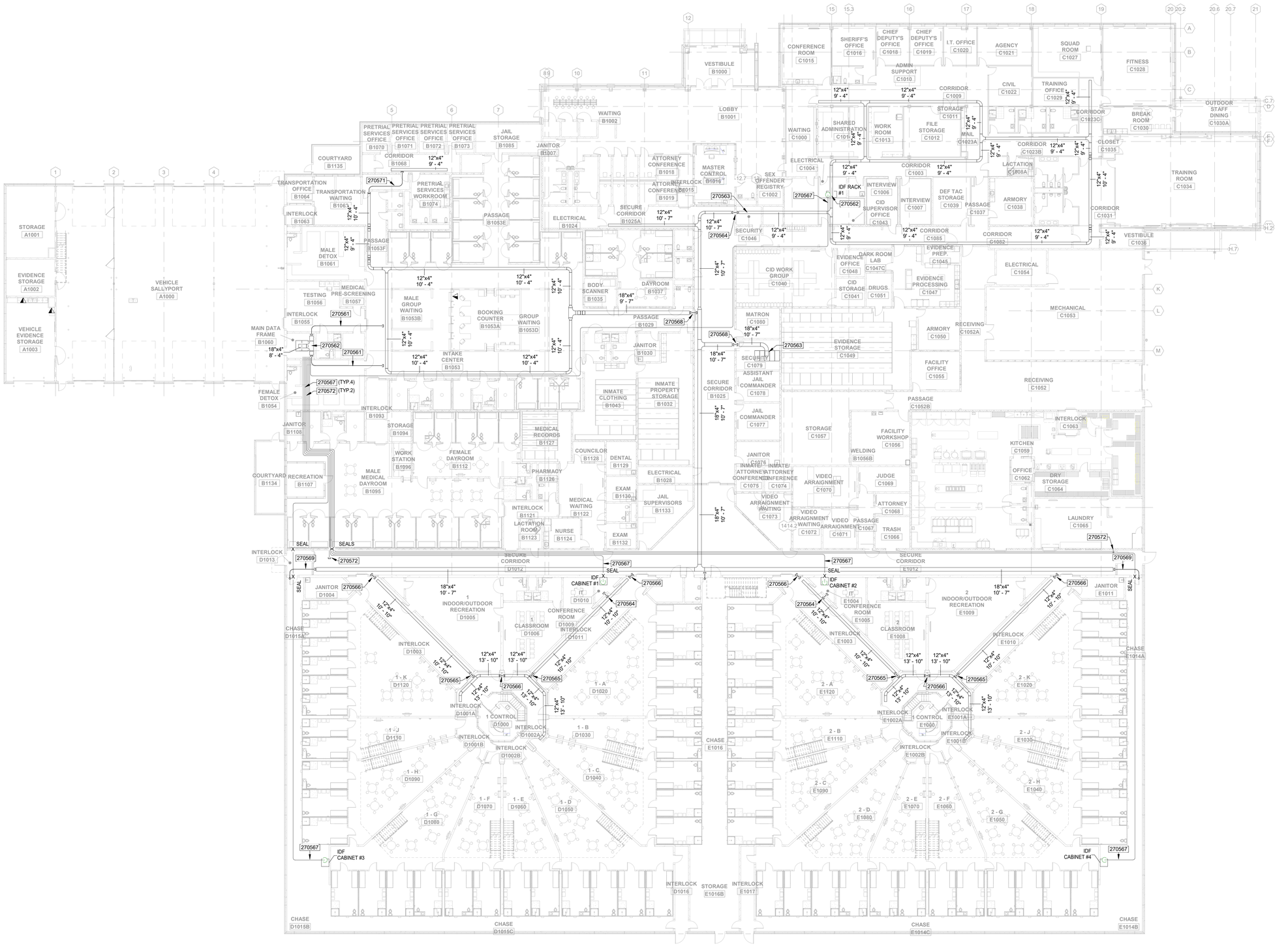


1 E-501 **FIRST FLOOR CABLE TRAY PLAN - OVERALL**
SCALE: 1/16" = 1'-0"
NORTH

GENERAL NOTES

A. CABLE TRAY TYPE SHALL BE WIRE BASKET TYPE TRAY. REFER TO SPECIFICATION 270536 FOR DETAILED REQUIREMENTS.

B. CABLE TRAY INIDICATED IS DIAGRAMMATIC. CONTRACTO SHALL FURNISH AND INSTALL ALL NECESSARY ITEMS (SUPPORTS, BENDS, CONNECTORS, ETC.) AS NECESSARY FOR A COMPLETE SYSTEM. FIELD COORDINATE EXACT ROUTINGS/HEIGHTS PRIOR TO CONSTRUCTION. FIELD COORDINATE WITH OTHER DISCIPLINES TO AVOID OTHER UTILITIES, OBSTRUCTIONS, ETC. (I.E. MECHANICAL CONTRACTOR TO AVOID DUCTWORK, SANITARY PIPING, ETC.). REFER TO SHEETS E-501 AND E-502 FOR CABLE TRAY ROUTINGS.

C. BOND CABLE TRAY PER NEC.

D. ALL CABLES INSTALL ON CABLE TRAY SHALL BE PLENUM RATED AND NON-TRAY RATED.

E. CABLE SHALL NOT BE USED ABOVE INACCESSIBLE CEILINGS. USE RACEWAY (WITH EQUIVALENT CROSS SECTIONAL AREA) FOR INACCESSIBLE CEILINGS.

F. CABLES LAYED IN CABLE TRAY SHALL BE LOOSELY BUNDLED TO ACCOMMODATE HEAT DISSIPATION. DO NOT BUNDLE WITH METAL WIRE TIE WRAPS; USE PLASTIC TIE WRAPS. ARRANGE IN A WORKMANLIKE MANNER; GROUP SIMILAR CABLE TYPES FOR ACCOMODATING ONGOING MAINTENANCE.

G. CALBES SHALL BE COLOR CODED. COLOR CODE AS FOLLOWS:

1) RED = FIRE ALARM (IN CONDUIT).

2) BLUE = STRUCTURED CALBE (DATA / VOIP).

3) WHITE = STRUCTURED CABLE (POTS TELEPHONE).

4) GRAY = TEMPERATURE CONTROL (COORDINATE WITH MC).

5) GREEN = VIDEO VISITATION PHONE.

6) YELLOW = SECURITY (CCTV).

7) PURPLE = SECURITY (ACCESS CONTROL).

8) BLACK = CABLE TV (COAX).

9) OTHER MISC. AS APPROVED BY ENGINEER. SUBMIT A PROPOSED COLOR SCHEDULE FOR ALL CABLE TYPES.

H. DO NOT ROUTE 70V RATED PUBLIC ADDRESS SPEAKER CABLES WITH OTHER LOW VOLTAGE COMMUNICATIONS CABLES (I.E. TO AVOID CROSSTALK, INDUCED NOISE). SPEAKER CABLE SHALL NOT BE INSTALLED ON CABLE TRAY.

I. DON NOT INSTALL POWER CABLE(S) WITH CABLE TRAY.

J. USE J-HOOKS FOR SUPPORTING CABLES FROM CABLE TRAY TO THE MUTOA (MULTI-USER TELECOMMUNICATION OUTLETS ASSEMBLY). FOR J-HOOK INSTALLATION DETAIL, SEE SHEET E-802, DETAIL #8.

K. CABLE TRAY FILL SHALL NOT EXCEED 40% OF ITS CROSS SECTIONAL AREA PER NEC.

L. CALBE TRAY SHALL BE SIZED TO ACCOMODATE 25% SPARE CAPACITY FOR FUTURE USE.

270566

CABLE TRAY KEYNOTES

270561 FURNISH AND INSTALL (3)-4"C. FROM CABLE TRAY STUBBED INTO CEILING SPACE OF MAIN DATA FRAME #B1060. PROVIDE SEALS AS REQUIRED.

270562 ROUTE ABOVE DATA RACK(S)/CABINET(S). COORDINATE EXACT LOCATION BEFORE ROUGH-IN.

270563 ROUTE ABOVE SECURITY RACK(S). COORDINATE EXACT LOCATION BEFORE ROUGH-IN.

270564 FURNISH AND INSTALL (3)-4" SLEEVES THRU 1 HOUR FIRE PARTITION. STUB OUT ABOVE ACCESSIBLE CEILING. PROVIDE SEALS AS REQUIRED.

270565 ROUTE (3)-4"C. UP WALL AND SLEEVE THRU 1 HOUR FIRE PARTITION. STUB OUT ABOVE ACCESSIBLE CEILING NEAR CABLE TRAY. PROVIDE SEALS AS REQUIRED.

270566 FURNISH AND INSTALL (3)-4" SLEEVES THRU 1 HOUR SMOKE BARRIER. STUB OUT ABOVE ACCESSIBLE CEILING. PROVIDE SEALS AS REQUIRED.

270567 FURNISH AND INSTALL (1)-4"C. FROM COMMUNICATIONS RACK/CABINET OVER TO MAIN DATA FRAME #B1060, STUB OUT ABOVE ACCESSIBLE CEILING FOR FIBER OPTIC BACKBONE CABLING. PROVIDE SEALS AS REQUIRED. COORDINATE EXACT ROUTING WITH ALL TRADES TO AVOID EQUIPMENT, DUCTS, PIPING, ETC. FURNISH WITH LONG SWEEP ELBOWS AND PULLSTRING.

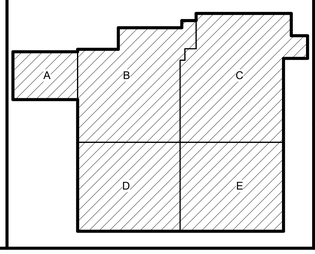
270568 FURNISH AND INSTALL (4)-4" SLEEVES THRU 1 HOUR FIRE PARTITION. STUB OUT ABOVE ACCESSIBLE CEILING. PROVIDE SEALS AS REQUIRED.

270569 (3)-4"C. FROM MEZZANINE LEVEL. STUB OUT IN ACCESSIBLE SECURE CORRIDOR CEILING NEAR CABLE TRAY. PROVIDE SEALS AS REQUIRED. REFER TO MEZZANINE CALBE TRAY PLAN, DRAWING E-502 FOR CONTINUATION.

270571 FURNISH AND INSTALL (3)-4"C. FROM CABLE ABOVE TRANSPORTATION WAITING #B1062 STUBBED INTO ACCESSIBLE CEILING SPACE OF CORRIDOR #B1068.

270572 FURNISH AND INSTALL (1)-4"C. FROM MAIN DATA FRAME #B1060 STUBBED OUT ABOVE ACCESSIBLE CEILING OF SECURE CORRIDOR FOR FUTURE HOUSING POD FIBER OPTIC BACKBONE CABLING. PROVIDE SEALS AS REQUIRED. COORDINATE EXACT ROUTING WITH ALL TRADES TO AVOID EQUIPMENT, DUCTS, PIPING, ETC. FURNISH WITH LONG SWEEP ELBOWS AND PULLSTRING.

KEY PLAN



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MARVIN L. HITCHCOCK 10601 REGISTERED PROFESSIONAL ENGINEER STATE OF INDIANA

NO.	REVISION	DATE
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DRAWN: RDV | CHK'D: MLH
DESIGNED: RDW, TKF
APPRVD: MLH
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

FIRST FLOOR CABLE TRAY PLAN - OVERALL

DRAWING NUMBER 1 E-501 | ELECTRICAL

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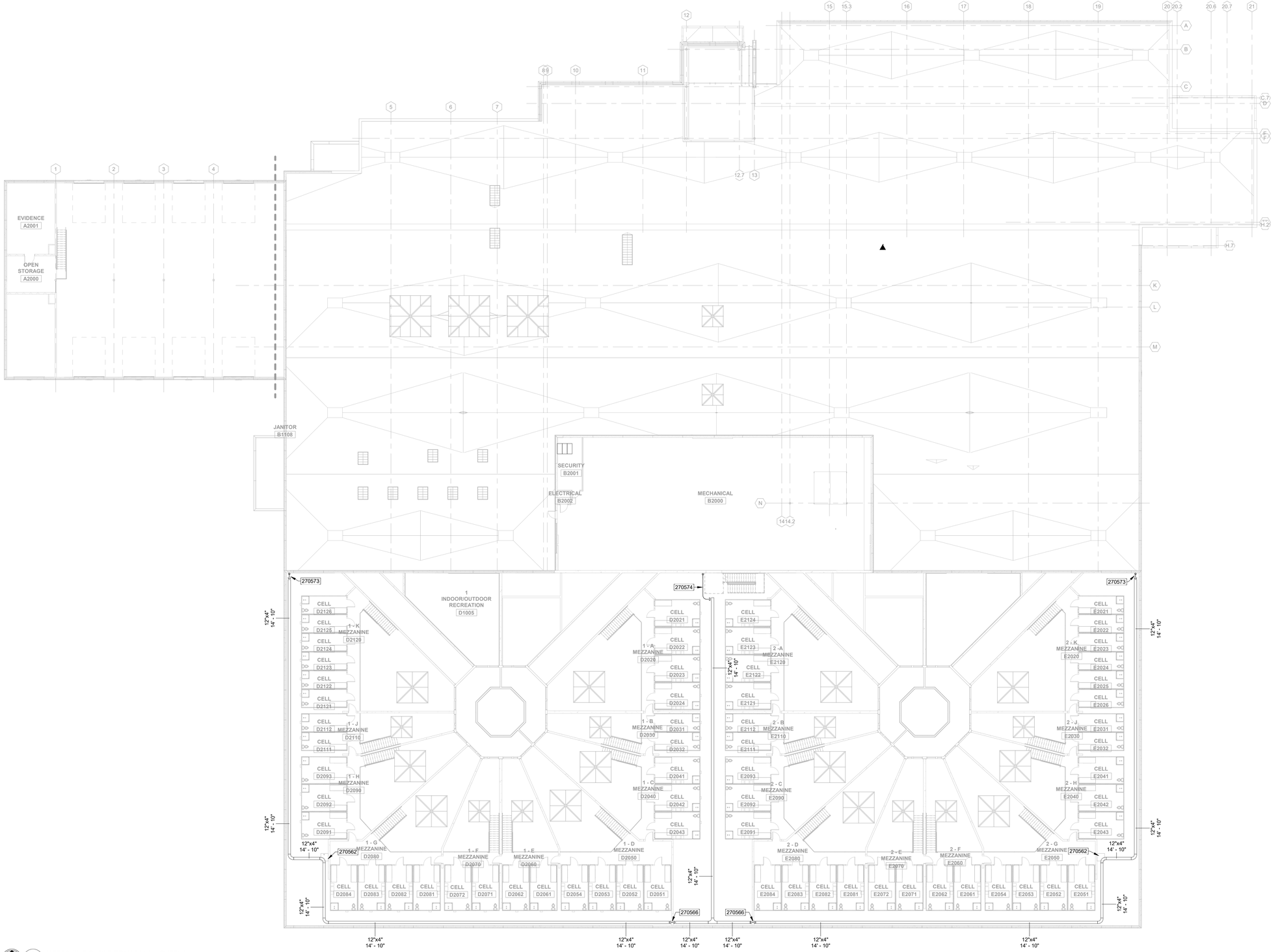

1 E-502 **MEZZANINE CABLE TRAY PLAN - OVERALL**
SCALE: 1/16" = 1'-0"

NORTH

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GENERAL NOTES

A. CABLE TRAY TYPE SHALL BE WIRE BASKET TYPE TRAY. REFER TO SPECIFICATION 270536 FOR DETAILED REQUIREMENTS.

B. CABLE TRAY INIDICATED IS DIAGRAMMATIC. CONTRACTO SHALL FURNISH AND INSTALL ALL NECESSARY ITEMS (SUPPORTS, BENDS, CONNECTORS, ETC.) AS NECESSARY FOR A COMPLETE SYSTEM. FIELD COORDINATE EXACT ROUTINGS/HEIGHTS PRIOR TO CONSTRUCTION. FIELD COORDINATE WITH OTHER DISCIPLINES TO AVOID OTHER UTILITIES, OBSTRUCTIONS, ETC. (I.E. MECHANICAL CONTRACTOR TO AVOID DUCTWORK, SANITARY PIPING, ETC.). REFER TO SHEETS E-501 AND E-502 FOR CABLE TRAY ROUTINGS.

C. BOND CABLE TRAY PER NEC.

D. ALL CABLES INSTALL ON CABLE TRAY SHALL BE PLENUM RATED AND NON-TRAY RATED.

E. CABLE SHALL NOT BE USED ABOVE INACCESSIBLE CEILINGS. USE RACEWAY (WITH EQUIVALENT CROSS SECTIONAL AREA) FOR INACCESSIBLE CEILINGS.

F. CABLES LAYED IN CABLE TRAY SHALL BE LOOSELY BUNDLED TO ACCOMMODATE HEAT DISSIPATION. DO NOT BUNDLE WITH METAL WIRE TIE WRAPS; USE PLASTIC TIE WRAPS. ARRANGE IN A WORKMANLIKE MANNER; GROUP SIMILAR CABLE TYPES FOR ACCOMODATING ONGOING MAINTENANCE.

G. CALBES SHALL BE COLOR CODED. COLOR CODE AS FOLLOWS:

1) RED = FIRE ALARM (IN CONDUIT).

2) BLUE = STRUCTURED CALBE (DATA / VOIP).

3) WHITE = STRUCTURED CABLE (POTS TELEPHONE).

4) GRAY = TEMPERATURE CONTROL (COORDINATE WITH MC).

5) GREEN = VIDEO VISITATION PHONE.

6) YELLOW = SECURITY (CCTV).

7) PURPLE = SECURITY (ACCESS CONTROL).

8) BLACK = CABLE TV (COAX).

9) OTHER MISC. AS APPROVED BY ENGINEER. SUBMIT A PROPOSED COLOR SCHEDULE FOR ALL CABLE TYPES.

H. DO NOT ROUTE 70V RATED PUBLIC ADDRESS SPEAKER CABLES WITH OTHER LOW VOLTAGE COMMUNICATIONS CABLES (I.E. TO AVOID CROSSTALK, INDUCED NOISE). SPEAKER CABLE SHALL NOT BE INSTALLED ON CABLE TRAY.

I. DON NOT INSTALL POWER CABLE(S) WITH CABLE TRAY.

J. USE J-HOOKS FOR SUPPORTING CABLES FROM CABLE TRAY TO THE MUTOA (MULTI-USER TELECOMMUNICATION OUTLETS ASSEMBLY). FOR J-HOOK INSTALLATION DETAIL, SEE SHEET E-802, DETAIL #8.

K. CABLE TRAY FILL SHALL NOT EXCEED 40% OF ITS CROSS SECTIONAL AREA PER NEC.

L. CALBE TRAY SHALL BE SIZED TO ACCOMODATE 25% SPARE CAPACITY FOR FUTURE USE.

2705##

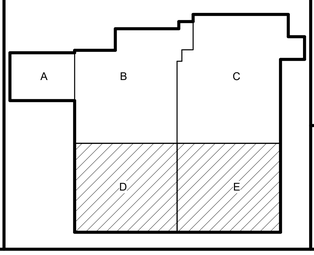
CABLE TRAY KEYNOTES

270566 FURNISH AND INSTALL (3)-4" SLEEVES THRU 1 HOUR SMOKE BARRIER. STUB OUT ABOVE ACCESSIBLE CEILING. PROVIDE SEALS AS REQUIRED.

270573 ROUTE (3)-4"C. DOWN TO FIRST FLOOR. REFER TO FIRST FLOOR CABLE TRAY PLAN, DRAWING E-501 FOR CONTINUATION. PROVIDE SEALS AS REQUIRED.

270574 ROUTE (3)-4"C. DOWN TO FIRST FLOOR. ROUTE AROUND STAIR. REFER TO FIRST FLOOR CABLE TRAY PLAN, DRAWING E-501 FOR CONTINUATION. PROVIDE SEALS AS REQUIRED.

KEY PLAN



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REGISTERED PROFESSIONAL ENGINEER

NO.	REVISION	DATE
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DRAWN: RDW CHKD: MLH
DESIGNED: RDW TKF
APPRVD: MLH
DATE: SEPTEMBER 5, 2019
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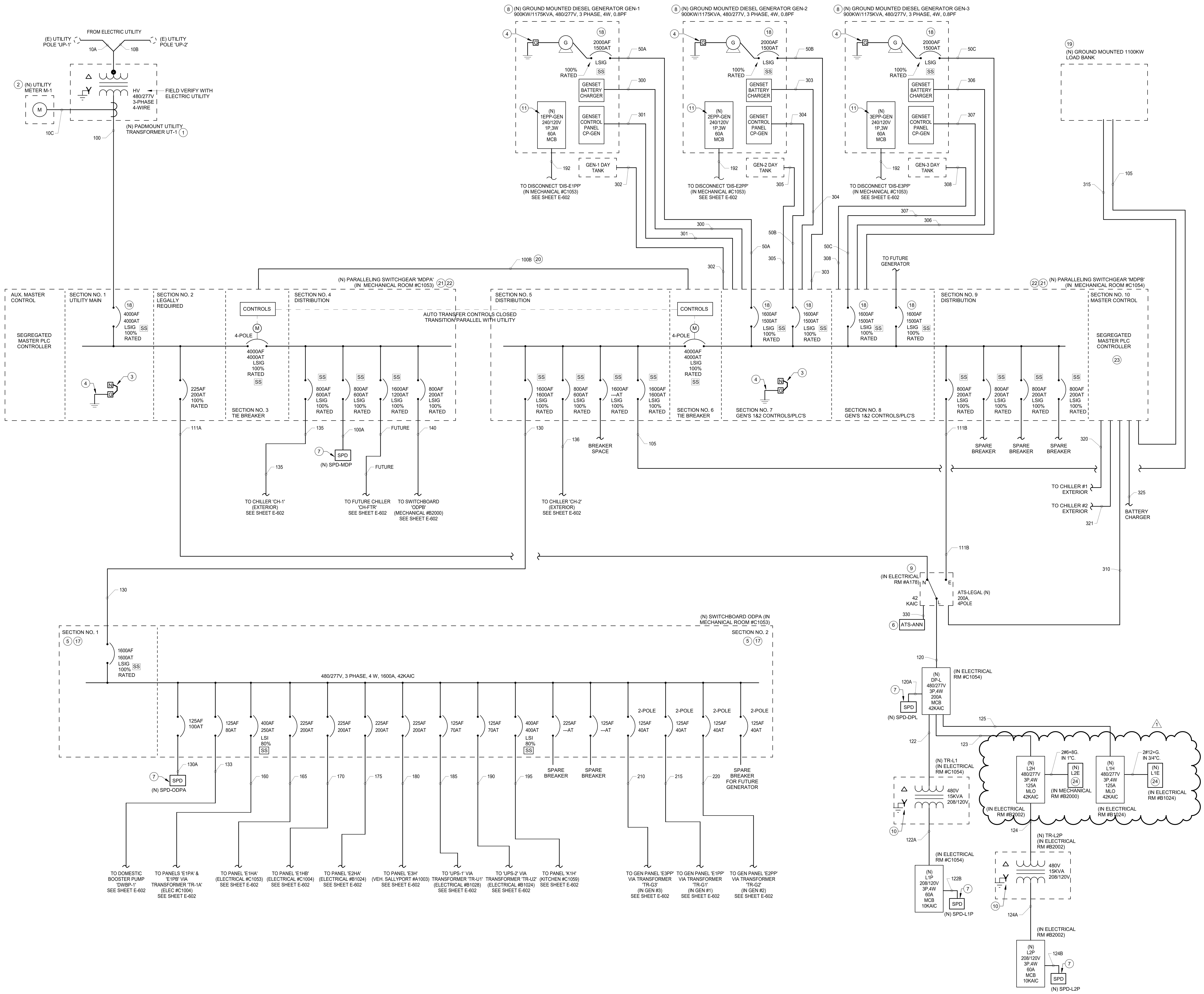
A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

MEZZANINE CABLE TRAY PLAN - OVERALL

DRAWING NUMBER E-502 ELECTRICAL



GENERAL NOTES

A. FOR PANELBOARD SCHEDULES, SEE DRAWINGS E-701, E-702, E-703, E-704, E-705, E-706 AND E-707.

B. FOR CONDUIT AND CABLE SCHEDULE, SEE DRAWING E-603.

C. FOR SERVICE GROUNDING ELECTRODE SCHEMATIC, SEE DETAIL # 1 ON DRAWING E-803.

D. REFERENCE MECHANICAL EQUIPMENT CONNECTION SCHEDULE, DRAWING E-604 AND E-605.

E. FOR TRANSFORMER SCHEDULE, SEE SHEET E-607.

F. BREAKERS INDICATED ARE 80% RATED, THERMAL MAGNETIC, MOLDED CASE U.O.N.

CODED NOTES (#)

1. UTILITY TRANSFORMER FURNISHED AND INSTALLED BY DUKE ENERGEY. CONCRETE PAD FURNISHED AND INSTALLED BY CONTRACTOR IN ACCORDANCE WITH THE ELECTRIC UTILITY'S STANDARDS.
2. METER CABINET FURNISHED AND INSTALLED BY CONTRACTOR. FIELD COORDINATE CABINET REQUIREMENTS WITH DUKE ENERGY. METER BASE FURNISHED AND INSTALL BY DUKE ENERGY.
3. EQUIP SWITCGEAR 'MDPA' WITH REMOVABLE NEUTRAL LINK.
4. FOR SERVICE ENTRANCE GROUNDING ELECTRODE SYSTEM DETAIL, SEE DRAWING E-803, DETAIL #1. ALSO, REFER TO DETAIL # 8 ON DRAWING E-803 FOR SERVICE ENTRANCE GROUNDING SCHEME.
5. SECTION SHALL BE SWITCHBOARD CONSTRUCTION. REFER TO SPECIFICATION 262413 FOR DETAILED EQUIPMENT REQUIREMENTS.
6. ANNUNCIATOR LOCATED IN MASTER CONTROL ROOM #B1016.
7. REMOTE SURGE PROTECTIVE DEVICE (SPD). REFER TO SPECIFICATION 264313 FOR DETAILED EQUIPMENT REQUIREMENTS. PROVIDE A MAXIMUM LENGTH OF 6' OF CONDUCTORS TO SPD.
8. DIESEL ENGINE GENERATOR WITH NON-WALK-IN LEVEL 1 SOUND ENCLOSURE AND 48 HOUR DOUBLE WALL FUEL TANK. REFER TO SPECIFICATION 263213.14 FOR DETAILED EQUIPMENT REQUIREMENTS.
9. AUTOMATIC TRANSFER SWITCH WITH SWITCHED NEUTRAL AND MAINTENANCE BYPASS. REFER TO SPECIFICATION 263600 FOR DETAILED EQUIPMENT REQUIREMENTS.
10. FOR TRANSFORMER GROUNDING DETAIL, SEE DETAIL #6 ON SHEET E-803. (TYPICAL FOR ALL TRANFORMERS). REFER TO SPECIFICATIONS FOR DETAILED EQUIPMENT REQUIREMENTS.
11. PANEL, 120/240V, 1-PHASE, 3-WIRE FOR GENSET CHARGERS, HEATERS, LIGHTS AND RECEPTACLES. PANEL PROVIDED AND PRE-WIRED BY GENERATOR MANUFACTURER.
12. FURNISH AND INSTALL 240VAC, 2-POLE, 100A HEAVY DUTY FUSED SAFETY DISCONNECT SWITCHES 'DIS-1EPP', 'DIS-2EPP' AND 'DIS-3EPP' IN NEMA 3R ENCLOSURES, FUSE AT 60A. REFER TO DRAWING E-201-C FOR LOCATION.
13. FURNISH AND INSTALL (3) EMPTY 1" CONDUITS STUBBED OUT ABOVE ACCESSIBLE CEILING FOR FUTURE USE. CAP THE END OF THE CONDUIT LOCATED IN CEILING.
14. NEW UPS. REFER TO KEYNOTE #260533, ON DRAWING E-201-B AND SPECIFICATION 263353 FOR DETAILED EQUIPMENT REQUIREMENTS.
15. NEW UPS BATTERY CABINET WITH DISCONNECT. REFER TO KEYNOTE #260534, ON DRAWING E-201-B AND SPECIFICATION 263353 FOR DETAILED EQUIPMENT REQUIREMENTS.
16. FURNISH AND INSTALL 240VAC, 3-POLE, 200A HEAVY DUTY FUSED SAFETY DISCONNECT SWITCH 'DIS-UPS1' IN NEMA 1 ENCLOSURE, FUSE AT 250A. REFER TO DRAWING E-201-B FOR LOCATION. PROVIDE NEUTRAL LUGS SUITABLE FOR TWO (2) NEUTRALS.
17. SWITCHBOARD SECTION TO BE PROVIDED WITH A MINIMUM OF 60" MOUNTING SPACE.
18. BREAKER SHALL BE SERVICE ENTRANCE RATED.
19. LOAD BANK, REFER TO SPECIFICATIONS FOR DETAILED EQUIPMENT REQUIREMENTS.
20. 4000A, 480V, 3-PHASE BUS DUCT, REFER TO SPECIFICATIONS FOR DETAILED EQUIPMENT REQUIREMENTS.
21. PARALLELING SWITCHGEAR. REFER TO SPECIFICATIONS FOR DETAILED EQUIPMENT REQUIREMENTS.
22. SUBMIT DIMENSIONED PLAN SHOWING ELECTRICAL GEAR WITH REQUIRED CLEARANCES AND SERVICE SPACE AROUND EQUIPMENT IN MECHANICAL #C1053 AND ELECTRICAL #C1054 TO ENGINEER FOR APPROVAL PRIOR TO SUBMITTING GEAR SUBMITTALS.
23. FURNISH AND INSTALL (1)-CAT6 CABLE FROM SECTION 10 - MASTER CONTROL CABINET AND NEAREST COMMUNICATIONS OUTLET.
24. FURNISH AND INSTALL CENTRAL UNINTERRUPTIBLE EMERGENCY LIGHTING INVERTER, SINGLE PHASE, 277V INPUT/OUTPUT WITH 4 OUTPUT BREAKERS, 90-MINUTE RATED BATTERY BACKUP CAPACITY AT RATED LOAD, UL 924 LISTED, 3KW MINIMUM FOR L1E, 10KW MINIMUM FOR L2E, CONTROLLED POWER MODEL ELU OR APPROVED EQUAL BY MYERS, DUAL-LITE, EATON.

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A NEW
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TERRE HAUTE, INDIANA

ONE-LINE DIAGRAM

DRAWING NUMBER
E-601
ELECTRICAL

Lighting Fixture Schedule

TYPE	LAMP	WATTAGE	VOLTAGE	DESCRIPTION	BASIS OF DESIGN	EQUAL MANUFACTURER AS APPROVED BY ENGINEER	EQUAL MANUFACTURER AS APPROVED BY ENGINEER	TYPE COMMENTS
A1	LED	30 W	277 V	2' X 4' LED GRID LAY IN BASKET STYLE TROFFER, 3000 LUMENS, 4000K COLOR, 1 DRIVER, UNIVERSAL VOLTAGE, METAL DIFFUSER WITH .075' DIA. ROUND HOLES, ACRYLIC DIFFUSER BACKING	LITHONIA 2AVL4G-30L-MDR-MVOLT-EZ1-LP840	EATON METALUX 24RDI-30-UNV-L840-CD1-U	HUBBELL COLUMBIA LSTE-24-40-VW-G-MPO-ED1-U	LAY IN
A2	LED	41 W	277 V	2' X 4' LED GRID LAY IN BASKET STYLE TROFFER, 4000 LUMENS, 4000K COLOR, 1 DRIVER, UNIVERSAL VOLTAGE, METAL DIFFUSER WITH .075' DIA. ROUND HOLES, ACRYLIC DIFFUSER BACKING	LITHONIA 2AVL4G-40L-MDR-MVOLT-EZ1-LP840	EATON METALUX 24RDI-40-UNV-L840-CD1-U	HUBBELL COLUMBIA LSTE-24-40-LW-G-MPO-ED1-U	LAY IN
AA1	LED	34 W	277 V	WALL MOUNTED ARCHITECTURAL AREA LIGHT, 34W, 3730 LUMENS, 600mA DRIVER, 1 LIGHT SQUARES, TYPE IV FORWARD THROW DISTRIBUTION, FINISH PER ARCHITECT, 80CRI, 3000K COLOR, 277V, 1P66 RATED.	EATON McGRAW EDISON GWC-AF(600Ma)-01-LED-E1-T4FT-XX-8030-F277-600	LITHONIA DSXW SERIES AS AN APPROVED EQUAL.	HUBBELL LIGHTING WDS SERIES AS AN APPROVED EQUAL.	MOUNT ON WALL WITH BOTTOM AT +17'-4" AFG UNLESS OTHERWISE NOTED.
AA2	LED	34 W	277 V	WALL MOUNTED ARCHITECTURAL AREA LIGHT, 34W, 3638 LUMENS, 600mA DRIVER, 1 LIGHT SQUARES, TYPE II DISTRIBUTION, FINISH PER ARCHITECT, 80CRI, 3000K COLOR, 277V, 1P66 RATED.	EATON McGRAW EDISON GWC-AF(600Ma)-01-LED-E1-T2-XX-8030-F277-600	LITHONIA DSXW SERIES AS AN APPROVED EQUAL.	HUBBELL LIGHTING WDS SERIES AS AN APPROVED EQUAL.	MOUNT ON WALL WITH BOTTOM AT +12'-0" AFG UNLESS OTHERWISE NOTED.
B1	LED	23 W	277 V	2' X 4', LAY-IN GRID TROFFER WITH FLAT 0.156 ACRYLIC LENS, 3000 LUMENS, 4000K, COLD ROLLED STEEL HOUSING, FRAME AND HOUSING WITH WHITE POWDER COAT FINISH. PAINTED AFTER FABRICATION	LITHONIA 2GTL-4-30L-FW-A19-MVOLT-EZ1-LP840-PAF	EATON METALUX 24GR-FA-LD5-30-A19/156-UNV-L840-CD1-PAF-U	HUBBELL COLUMBIA LJT-24-40-VW-G-FA-A19-ED1-U-PAF	LAY IN
B2	LED	30 W	277 V	2' X 4', LAY-IN GRID TROFFER WITH FLAT 0.156 ACRYLIC LENS, 4000 LUMENS, 4000K, COLD ROLLED STEEL HOUSING, FRAME AND HOUSING WITH WHITE POWDER COAT FINISH. PAINTED AFTER FABRICATION	LITHONIA 2GTL-4-40L-FW-A19-MVOLT-EZ1-LP840-PAF	EATON METALUX 24GR-FA-LD5-42-A19/156-UNV-L840-CD1-PAF-U	HUBBELL COLUMBIA LJT-24-40-MW-G-FA-A19-ED1-U-PAF	LAY IN
B3	LED	36 W	277 V	2' X 4', LAY-IN GRID TROFFER WITH FLAT 0.156 ACRYLIC LENS, 4800 LUMENS, 4000K, COLD ROLLED STEEL HOUSING, FRAME AND HOUSING WITH WHITE POWDER COAT FINISH. PAINTED AFTER FABRICATION	LITHONIA 2GTL-4-48L-FW-A19-MVOLT-EZ1-LP840-PAF	EATON METALUX 24GR-FA-LD5-48-A19/156-UNV-L840-CD1-PAF-U	HUBBELL COLUMBIA LJT-24-40-ML-G-FA-A19-ED1-U-PAF	LAY IN
C1	LED	18 W	277 V	2' X 2', LAY-IN GRID TROFFER WITH FLAT 0.156 ACRYLIC LENS, 2000 LUMENS, 4000K, COLD ROLLED STEEL HOUSING, FRAME AND HOUSING WITH WHITE POWDER COAT FINISH. PAINTED AFTER FABRICATION	LITHONIA 2GTL-2-20L-FW-A19-MVOLT-EZ1-LP840-PAF	EATON METALUX 22GR-FA-LD5-20-A19/156-UNV-L840-CD1-PAF-U	HUBBELL COLUMBIA LJT-22-40-MW-G-FA-A19-ED1-U-PAF	LAY IN
C1F	LED	18 W	277 V	2' X 2', LAY-IN GRID TROFFER WITH FLAT 0.156 ACRYLIC LENS, 2000 LUMENS, 4000K, COLD ROLLED STEEL HOUSING, FRAME AND HOUSING WITH WHITE POWDER COAT FINISH. PAINTED AFTER FABRICATION, FLANGE-MOUNTED	LITHONIA 2GTLF-2-20L-FW-A19-MVOLT-EZ1-LP840-PAF	EATON METALUX 22GR-FA-LD5-20-A19/156-UNV-L840-CD1-PAF-U, DF-22-W	HUBBELL COLUMBIA LJT-22-40-MW-SM-FA-A19-ED1-U-PAF	LAY IN
C2	LED	29 W	277 V	2' X 2', LAY-IN GRID TROFFER WITH FLAT 0.156 ACRYLIC LENS, 3300 LUMENS, 4000K, COLD ROLLED STEEL HOUSING, FRAME AND HOUSING WITH WHITE POWDER COAT FINISH. PAINTED AFTER FABRICATION	LITHONIA 2GTL-2-33L-FW-A19-MVOLT-EZ1-LP840-PAF	EATON METALUX 22GR-FA-LD5-32-A19/156-UNV.L840-CD1-PAF-U	HUBBELL COLUMBIA LJT-22-40-ML-G-FA-A19-ED1-U-PAF	LAY IN
CC1	LED	19 W	277 V	2' LONG LINEAR WALL MOUNT WITH DIRECT (DOWN) WALL GRAZE LIGHTING, 19W, 1732 LUMENS, 3000K COLOR, 80CRI, UNIVERSAL VOLTAGE, DIFFUSE LENS, 3" FIXED MOUNTING BRACKET AND FINISH AS SELECTED BY ARCHITECT.	ARCHITECTURAL AREA LIGHTING RN-D-X-2-7-3K8-WG-DL-UNV-F3-EMF1-XX	CALIFORNIA ACCENT LIGHTING ALS600T-ASM-XX-3.0K-8W-10V-BF-WET-UNV-2FT / ALS600T-AA-XX-3"	BARTCO BSW214-2-30-ID-H-ASYM / DISTRIBUTION ARM MOUNT / SN FINISH	MOUNT ON WALL WITH BOTTOM AT +12'-0" AFG UNLESS OTHERWISE NOTED.
CC2	LED	19 W	277 V	2' LONG LINEAR WALL MOUNT WITH DIRECT (DOWN) PENDANT MOUNTED SYMMETRICAL DISTRIBUTION LIGHT, 19W, 1732 LUMENS, 3000K COLOR, 80CRI, UNIVERSAL VOLTAGE, DIFFUSE LENS, 12" PENDANT MOUNTING BRACKET AND FINISH AS SELECTED BY ARCHITECT.	ARCHITECTURAL AREA LIGHTING RN-D-X-2-7-3K8-SM-DL-UNV-PSW12-EMF1-XX	CALIFORNIA ACCENT LIGHTING ALS800T-F-XX-3.0K-8W-10V-BF-WET-277V-2FT / PENDANT MOUNT	BARTCO BSW214-2-30-ID-H / STEM MOUNT / SN FINISH	SURFACE MOUNTED
D1	LED	19 W	277 V	6" DIAMETER LED FIXTURE, RECESSED DOWNLIGHT, 16GA STEEL, 1500 LUMENS, 4000K, SEMI-SPECULAR REFLECTOR, WHITE DIE CAST TRIM RING, MEDIUM DISTRIBUTION.	GOTHAM LIGHTING EVO-6AR-40/15-MD-LSS-MVOLT-EZ1-TRW	EATON PORTFOLIO LD6B-15-D010-EU6B-1020-80-40-6LB-M-1-H-HB26	HUBBELL PRESCOLITE LTR-6RD-H-SL-15L-DM1 / LTR-6RD-T-SL-40K-8-MD-SS-WT-B24	FLUSH MOUNTED IN CEILING
D2	LED	19 W	277 V	6" DIAMETER LED FIXTURE, RECESSED DOWNLIGHT, 1000 LUMENS, 4000K, SPECULAR REFLECTOR, WHITE DIE CAST TRIM RING, RECESSED LENS, SUITABLE FOR WET LOCATION (SHOWER RATED)	GOTHAM LIGHTING EVO-40/10-6DFR-MVOLT	EATON HALO PD610ED010 / PDM6A840 / 61VW	HUBBELL PRESCOLITE LB6LEDA10L-40K-WH-DBXQL	FLUSH MOUNTED IN CEILING
EE1	LED		277 V	48"L. x 3-3/8"H. x 2-3/4"W., LINEAR LED LIGHT, EXTRUDED ALUMINUM HOUSING WITH ALUMINUM END CAPS, CUSTOM COLOR POWDER-COAT FINISH (FINISH COLOR SHALL MATCH THE FINISH COLOR OF THE SIGN TO BE ILLUMINATED), CORROSION RESISTANT FINISH OPTICS, 15WATTS PER FOOT LIGHT SOURCE, 4000K COLOR, 82+CRI, 3686 LUMENS, 120V, NON-DIMMABLE, TEMPERED GLASS LENS, SUITABLE FOR -20 DEGREES C TO 50 DEGREES C AMBIENT TEMPERATURE, 5-YEAR WARRANTY, SURFACE MOUNT, CONCEALED WIRE MOUNTING OPTION.	INSIGHT LIGHTING MVWII-15-40K-ASYU-SMSCW-48"-INT1-NO-CC-CRF	CALIFORNIA ACCENT LIGHTING ALS450T-F-XX-3.0K-9W-BF-WET-277V-4FT / ALS450T-MC-2	OR APPROVED PERFORMANCE EQUAL.	CUSTOM FINISH SHALL MATCH SIGN. SUBMIT COLOR CHART WITH ALL AVAILABLE COLORS FOR IFNAL SELECTION BY ARCHITECT. FIELD COORDINATE MINIMUM LENGTH OF AC JUMPER CABLES REQUIRED PRIOR TO PROCUREMENT FOR FEED THROUGH WIRING TO MULTIPLE FIXTURES AND FOR LEADER CABLE. FIXTURE REQUIRES A WET RATED JUNCTION BOX FOR CONCEALED WIRE CONNECTION.
F1	LED	10 W	277 V	2' LED SURFACE STRIPLIGHT WITH FLAT DIFFUSE LENS, 1500 LUMENS, 80CRI, 4000K COLOR, GENERAL DISTRIBUTION, DIMMING DRIVER, PIR INTEGRAL OCCUPANCY SENSOR AND FINISH BY ARCHITECT.	LITHONIA CLX-L24-1500LM-HEF-FDL-MVOLT-EZ1-40K-80CRI-MSD7-XX	OR APPROVED PERFORMANCE EQUAL	OR APPROVED PERFORMANCE EQUAL.	WALL MOUNT, COORDINATE WITH MECHANICAL AND PLUMBING EQUIPMENT IN CHASE
F2	LED	19 W	277 V	4' LED SURFACE STRIPLIGHT WITH FLAT DIFFUSE LENS, 3000 LUMENS, 80CRI, 4000K COLOR, GENERAL DISTRIBUTION, PREMIUM EFFICIENCY WITH WHITE FINISH AND WIDE DECORATIVE 48" REFLECTOR WITH UPLIGHT.	LITHONIA CLX-L48-3000LM-HEF-FDL-MVOLT-EZ1-40K-80CRI-WH-CLXRWU48WH-ZACVH	EATON METALUX 4ILED-LD5-5-W-FL/UPL-UNV-L840-CD1-U AYC-CHAIN/SET-U	HUBBELL COLUMBIA EQUAL	MOUNT WITH BOTTOM AT +12'-0" AFF UNLESS OTHERWISE NOTED.
F3	LED	19 W	277 V	4' LED SURFACE STRIPLIGHT WITH FLAT DIFFUSE LENS, 3000 LUMENS, 80CRI, 4000K COLOR, GENERAL DISTRIBUTION, PREMIUM EFFICIENCY WITH WHITE FINISH AND WIDE DECORATIVE 48" REFLECTOR.	LITHONIA CLX-L48-3000LM-HEF-FDL-MVOLT-EZ1-40K-80CRI-WH-CLXRW48WH-ZACVH	EATON METALUX 4ILED-LD5-5-W-FL-UNV-L840-CD1-U AYC-CHAIN/SET-U	HUBBELL COLUMBIA EQUAL	FIXTURE TO BE SURFACE MOUNTED ON BOTTOM OF FLOOR, PRECAST, STRUCTURE, ETC.
F4	LED	32 W	277 V	4' LED SURFACE STRIPLIGHT WITH FLAT DIFFUSE LENS, 5000 LUMENS, 80CRI, 4000K COLOR, GENERAL DISTRIBUTION, PREMIUM EFFICEINCY WITH WHITE FINISH AND WIDE DECORATIVE 48" REFLECTOR WITH UPLIGHT.	LITHONIA CLX-L48-5000LM-HEF-FDL-MVOLT-EZ1-40K-80CRI-WH-CLXRWU48WH-ZACVH	EATON METALUX 4ILED-LD5-5-W-FL/UPL-UNV-L840-CD1-U AYC-CHAIN/SET-U	HUBBELL COLUMBIA EQUAL	MOUNT WITH BOTTOM AT +12'-0" AFF UNLESS OTHERWISE NOTED.
F5	LED	32 W	277 V	4' LED SURFACE STRIPLIGHT WITH FLAT DIFFUSE LENS, 5000 LUMENS, 80CRI, 4000K COLOR, GENERAL DISTRIBUTION, PREMIUM EFFICEINCY WITH WHITE FINISH AND WIDE DECORATIVE 48" REFLECTOR.	LITHONIA CLX-L48-5000LM-HEF-FDL-MVOLT-EZ1-40K-80CRI-WH-CLXRW48WH-ZACVH	EATON METALUX 4ILED-LD5-5-W-FL-UNV-L840-CD1-U AYC-CHAIN/SET-U	HUBBELL COLUMBIA EQUAL	FIXTURE TO BE SURFACE MOUNTED ON BOTTOM OF FLOOR, PRECAST, STRUCTURE, ETC.
F6	LED	32 W	277 V	4' LED SURFACE STRIPLIGHT WITH FLAT DIFFUSE LENS, 7000 LUMENS, 80CRI, 4000K COLOR, GENERAL DISTRIBUTION, PREMIUM EFFICEINCY WITH WHITE FINISH AND WIDE DECORATIVE 48" REFLECTOR WITH UPLIGHT.	LITHONIA CLX-L48-7000LM-HEF-FDL-MVOLT-EZ1-40K-80CRI-WH-CLXRWU48WH-ZACVH	EATON METALUX 4ILED-LD5-7-W-FL/UPL-UNV-L840-CD1-U AYC-CHAIN/SET-U	HUBBELL COLUMBIA EQUAL	MOUNT WITH BOTTOM AT +11'-0" AFF UNLESS OTHERWISE NOTED.
FF1	LED		277 V	DECORATIVE ADA COMPLIANT UP/DOWN LIGHT, 21W, 1078 LUMENS, 80CRI, 3000K COLOR, VERY NARROW 9 DEGREE OPTICS, 277V WITH FUSE AND FINISH AS SELECTED BY ARCHITECT.	LUMINIS LIGHTING SY302-L2L15NR-R9-277V-XX-FS-2K3	LIGMAN LIGHTING UMV-30031-2X10W-N-W30-XX-12/277 / FUSE	G LIGHTING GL-6540-C-R2-R2	MOUNT ON WALL WALL WITH BOTTOM AT +6'-9" AFG UNLESS OTHERWISE NOTED.
G1	LED	20 W	277 V	2' X 2' LED LAY IN GRID BASKET STYLE TROFFER, 2000 LUMENS, 4000K COLOR, 1 DRIVER, UNIVERSAL VOLTAGE, METAL DIFFUSER WITH .075' DIA. ROUND HOLES, ACRYLIC DIFFUSER BACKING	LITHONIA 2AVL2G-20L-MDR-MVOLT-EZ1-LP840	EATON METALUX 22RDI-20-UNV-L840-CD1-U	HUBBELL COLUMBIA LSTE-22-40-MW-G-MPO-ED1-U	LAY IN
G2	LED	31 W 21 W	277 V	2' X 2' LED LAY IN GRID BASKET STYLE TROFFER, 3000 LUMENS, 4000K COLOR, 1 DRIVER, UNIVERSAL VOLTAGE, METAL DIFFUSER WITH .075' DIA. ROUND HOLES, ACRYLIC DIFFUSER BACKING	LITHONIA 2AVL2G-30L-MDR-MVOLT-EZ1-LP840	EATON METALUX 22RDI-30-UNV-L840-CD1-U	HUBBELL COLUMBIA LSTE-22-40-ML-G-MPO-ED1-U	LAY IN
G3	LED	41 W	277 V	2' X 2' LED LAY IN GRID BASKET STYLE TROFFER, 4000 LUMENS, 4000K COLOR, 1 DRIVER, UNIVERSAL VOLTAGE, METAL DIFFUSER WITH .075' DIA. ROUND HOLES, ACRYLIC DIFFUSER BACKING	LITHONIA 2AVL2G-40L-MDR-MVOLT-EZ1-LP840	EATON METALUX 22RDI-40-UNV-L840-CD1-U	HUBBELL COLUMBIA LSTE-22-40-VL-G-MPO-ED1-U	LAY IN
GG1	LED		277 V	4' LONG EXTERIOR LINEAR SURFACE MOUNTED LIGHT, 7W / FT, 2950 LUMENS, 82 CRI, 3000K COLOR, 100 DEGREE X 100 DEGREE DISTRIBUTION, 277V, NO DIMINNG WITH FINISH AS SELECTED BY ARCHITECT.	INSIGHT LIGHTING MVWII-7-30K-100 DEGREE-SMS-48-277-NO-XX	CALIFORNIA ACCENT LIGHTING ALS450T-F-XX-3.0K-9W-BF-WET-277V-4FT / ALS450T-MC-1	LUMENPULSE LOG SERIES AS AN APPROVED EQUAL	FIXTURE TO BE SURFACE MOUNTED ON TOP OF VESTIBULE AND AIMED AT CENTER OF LOGO.
J1	LED	33 W	277 V	8" x 54", ROUGH SERVICE FIXTURE, SURFACE MOUNT, 4000 LUMENS, 3500K COLOR, CLEAR POLYCARBONATE LENS, MEDIUM DISTRIBUTION, UL LISTED FOR WET LOCATION, STAINLESS STEEL TAMPER RESISTANT LATCHES, IP65/66 RATED.	LITHONIA VAP-4000LM-PCL-MD-MVOLT-GZ10-35K-80CRI-STSL	EATON METALUX 4VT3-LD5-4-WPC-UNV-L840-CD1-SSL-U	HUBBELL COLUMBIA LXEM-4-40-LW-RP-ED-U-SSL	FIXTURE TO BE SURFACE MOUNTED U.O.N.
L1	LED	50 W 21 W	277 V	2' X 4', GRID LAYIN IMPACT AND VANDAL RESISTANT FIXTURE, 45 WATT, 4000K, 0.125" PRISMATIC POLYCARBONATE INNER LENS, 0.500" CLEAR POLYCARBONATE OUTER LENS, CONTINUOUS CONCEALED PIANO HINGE, 14 GUAGE COLD ROLLED STEEL HOUSING WITH WHITE POWDER COAT FINISH. TAMPER RESISTANT TORX SCREWS WITH SCREWDRIVER ACCESSORY.	KENALL RMCD4-TG-0/0-45L40K-DCC-1-DV-2/J-1	EATON FAIL-SAFE FSR-TG-X-24-4-LD4-3LO-40-UNV-81/88-EDD1 / VRSD	NEWSTAR LIGHTING 57-R-24-B/B-L2(MOD 4300LMS)-40-1C-4/B-UN	INSTALL IN SECURITY GRID
L1B	LED	74 W	277 V	2' X 4', GRID LAYIN IMPACT AND VANDAL RESISTANT FIXTURE, 67 WATT, 4000K, 0.125" PRISMATIC POLYCARBONATE INNER LENS, 0.500" CLEAR POLYCARBONATE OUTER LENS, CONTINUOUS CONCEALED PIANO HINGE, 14 GUAGE COLD ROLLED STEEL HOUSING WITH WHITE POWDER COAT FINISH. TAMPER RESISTANT TORX SCREWS WITH SCREWDRIVER ACCESSORY.	KENALL RMCD4-TG-0/0-67L40K-DCC-1-DV-2/J-1	EATON FAIL-SAFE FSR-TG-X-24-4-LD4-3STD-40-UNV-81/88-EDD1 / VRSD	NEWSTAR LIGHTING 57-R-24-B/B-L-40-1C-4/B-UN	INSTALL IN SECURITY GRID
L2	LED	51 W	277 V	2' X 2', GRID LAYIN IMPACT AND VANDAL RESISTANT FIXTURE, 45 WATT, 4000K, 0.125" PRISMATIC POLYCARBONATE INNER LENS, 0.500" CLEAR POLYCARBONATE OUTER LENS, CONTINUOUS CONCEALED PIANO HINGE, 14 GUAGE COLD ROLLED STEEL HOUSING WITH WHITE POWDER COAT FINISH. TAMPER RESISTANT TORX SCREWS WITH SCREWDRIVER ACCESSORY.	KENALL RMCD2-TG-0/0-45L40K-DCC-1-DV-2/J-1	EATON FAIL-SAFE FSR-TG-X-24-2-LD4-3STD-40-UNV-81/88-EDD1 / VRSD	NEWSTAR LIGHTING 57-R-22-B/B-L2(MOD 3700LMS)-40-1C-4/B-UN	INSTALL IN SECURITY GRID
L2B	LED	74 W	277 V	2' X 2', GRID LAYIN IMPACT AND VANDAL RESISTANT FIXTURE, 67 WATT, 4000K, 0.125" PRISMATIC POLYCARBONATE INNER LENS, 0.500" CLEAR POLYCARBONATE OUTER LENS, CONTINUOUS CONCEALED PIANO HINGE, 14 GUAGE COLD ROLLED STEEL HOUSING WITH WHITE POWDER COAT FINISH. TAMPER RESISTANT TORX SCREWS WITH SCREWDRIVER ACCESSORY.	KENALL RMCD2-TG-0/0-67L40K-DCC-1-DV-2/J-1	EATON FAIL-SAFE FSR-TG-X-24-2-LD4-4STD-40-UNV-81/88-EDD1 / VRSD	NEWSTAR LIGHTING 57-R-22-B/B-L2(MOD 5300LMS)-40-1C-4/B-UN	INSTALL IN SECURITY GRID
M1	LED	50 W	277 V	12" X 48", SURFACE CEILING MOUNT, IMPACT AND VANDAL RESISTANT FIXTURE, 45 WATT, 4000K, 0.125" PRISMATIC POLYCARBONATE INNER LENS, 0.500" CLEAR POLYCARBONATE OUTER LENS, CONTINUOUS HINGED LENS FRAME WITH WHITE POWDER COAT FINISH, 14 GUAGE COLD ROLLED STEEL HOUSING WITH WHITE POWDER COATE FINISH. TAMPER RESISTANT TORX SCREWS WITH SCREWDRIVER ACCESSORY. REMOVABLE GEAR TRAY. UL LISTED FOR DAMP LOCATION.	KENALL SDSA-4-0/0-45L40K-DDC-DV-2/J-1	EATON FAIL-SAFE FUSL-X-12-4-LD4-2STD-40-UNV-81/88-EDD1-SSP	NEWSTAR LIGHTING WARN4-H-L2(MOD 4000LMS)-40-1-4/B-UN-TH	ALL JOINTS IN FIXTURE AND BETWEEN FIXTURE AND MOUNTING SURFACE SHALL BE FILLED COMPLETELY. FIXTURE TO BE SURFACE MOUNTED ON BOTTOM OF PRECAST WHERE INDICATED ON PLANS.
M1A	LED	50 W	277 V	12" X 48", SURFACE CEILING MOUNT, IMPACT AND VANDAL RESISTANT FIXTURE, 45 WATT, 4000K, 0.125" PRISMATIC POLYCARBONATE INNER LENS, 0.500" CLEAR POLYCARBONATE OUTER LENS, CONTINUOUS HINGED LENS FRAME WITH WHITE POWDER COAT FINISH, 14 GUAGE STAINLESS STEEL HOUSING WITH WHITE POWDER COATE FINISH. TAMPER RESISTANT TORX SCREWS WITH SCREWDRIVER ACCESSORY. REMOVABLE GEAR TRAY. UL LISTED FOR WET LOCATION	KENALL SDSA-4-3/3-45L40K-DDC-DV-2/J-1-WL	EATON FAIL-SAFE FUSL-X-12-4-LD4-2STD-40-UNV-81/88-EDD1-WL-SSP	NEWSTAR LIGHTING WARN4-H-L2(MOD 4000LMS)-40-1-4/B-UN-TH-WL	ALL JOINTS IN FIXTURE AND BETWEEN FIXTURE AND MOUNTING SURFACE SHALL BE FILLED COMPLETELY. FIXTURE TO BE SURFACE MOUNTED ON BOTTOM OF PRECAST WHERE INDICATED ON PLANS.
M1N	LED	50 W	277 V	12" X 48", SURFACE CEILING MOUNT, IMPACT AND VANDAL RESISTANT FIXTURE, 45 WATT, 4000K, 0.125" PRISMATIC POLYCARBONATE INNER LENS, 0.500" CLEAR POLYCARBONATE OUTER LENS, CONTINUOUS HINGED LENS FRAME WITH WHITE POWDER COAT FINISH, 14 GUAGE COLD ROLLED STEEL HOUSING WITH WHITE POWDER COATE FINISH. TAMPER RESISTANT TORX SCREWS WITH SCREWDRIVER ACCESSORY. REMOVABLE GEAR TRAY. UL LISTED FOR DAMP LOCATION, LED NIGHT LIGHT.	KENALL SDSA-4-0/0-45L40K-DDC-DV-2/J-1-DLN	EATON FAIL-SAFE FUSL-X-12-4-LD4-2STD-40-UNV-81/88-EDD1-LLNDL	NEWSTAR LIGHTING WARN4-B-L2(MOD 4000LMS)-40-1-4/B-UN-TH-DLN	ALL JOINTS IN FIXTURE AND BETWEEN FIXTURE AND MOUNTING SURFACE SHALL BE FILLED COMPLETELY. FIXTURE TO BE SURFACE MOUNTED ON BOTTOM OF PRECAST WHERE INDICATED ON PLANS.
N1N	LED	50 W	277 V	8" X 48", SURFACE CORNER WALL MOUNT, IMPACT AND VANDAL RESISTANT FIXTURE, 45 WATT, 4000K, 0.125" PRISMATIC POLYCARBONATE INNER LENS, 0.500" CLEAR POLYCARBONATE OUTER LENS, CONTINUOUS HINGED LENS FRAME WITH WHITE POWDER COATE FINISH, 14 GUAGE COLD ROLLED STEEL HOUSING WITH WHITE POWDER COAT FINISH. LED NIGHT LIGHT, TAMPER RESISTANT TORX SCREWS WITH SCREWDRIVER ACCESSORY. REMOVABLE GEAR TRAY. UL LISTED FOR DAMP LOCATION.	KENALL CD4-0/0-45L40K-DCC-DV-2/J-1-RGT-DLN	EATON FAIL-SAFE FCC-X-4-LD4-2LO-40-UNV-81/88-EDD1-LLNL	NEWSTAR LIGHTING 554-B-L2(MOD 3700LMS)-40-1-4/B-UN-TH-DLN-RGT	ALL JOINTS IN FIXTURE AND BETWEEN FIXTURE AND MOUNTING SURFACE SHALL BE FILLED COMPLETELY. FIXTURE TO BE SURFACE MOUNTED BELOW PRECAST IN CORNER WHERE INDICATED ON PLANS.
N2	LED	74 W	277 V	8" X 48", IMPACT AND VANDAL RESISTANT FIXTURE, 67 WATT, 5000K, SURFACE CORNER WALL MOUNT, 0.125" PRISMATIC POLYCARBONATE INNER LENS, 0.500" CLEAR POLYCARBONATE OUTER LENS, CONTINUOUS HINGED LENS FRAME WITH WHITE POWDER COATE FINISH, 14 GUAGE COLD ROLLED STEEL HOUSING WITH WHITE POWDER COAT FINISH. TAMPER RESISTANT TORX SCREWS WITH SCREWDRIVER ACCESSORY. REMOVABLE GEAR TRAY. UL LISTED FOR DAMP LOCATION.	KENALL CD4-0/0-1-67L50K-DCC-1-DV-2/J-1-RGT	EATON FAIL-SAFE FCC-X-4-LD4-2STD-40-UNV-81/88-EDD1	NEWSTAR LIGHTING 554-B-L2-40-1-4/B-UN-TH-RGT	ALL JOINTS IN FIXTURE AND BETWEEN FIXTURE AND MOUNTING SURFACE SHALL BE FILLED COMPLETELY. FIXTURE TO BE SURFACE MOUNTED BELOW PRECAST IN CORNER WHERE INDICATED ON PLANS.
N2N	LED	74 W	277 V	8" X 48", SURFACE CORNER WALL MOUNT, IMPACT AND VANDAL RESISTANT FIXTURE, 67 WATT, 4000K, 0.125" PRISMATIC POLYCARBONATE INNER LENS, 0.500" CLEAR POLYCARBONATE OUTER LENS, CONTINUOUS HINGED LENS FRAME WITH WHITE POWDER COATE FINISH, 14 GUAGE COLD ROLLED STEEL HOUSING WITH WHITE POWDER COAT FINISH. TAMPER RESISTANT TORX SCREWS WITH SCREWDRIVER ACCESSORY. LED NIGHT LIGHT. REMOVABLE GEAR TRAY. UL LISTED FOR DAMP LOCATION.	KENALL CD4-0/0-67L40K-DCC-DV-2/J-1-RGT-DLN	EATON FAIL-SAFE FCC-X-4-LD4-2STD-40-UNV-81/88-EDD1-LLNL	NEWSTAR LIGHTING 554-B-L2-40-1-4/B-UN-TH-DLN-RGT	ALL JOINTS IN FIXTURE AND BETWEEN FIXTURE AND MOUNTING SURFACE SHALL BE FILLED COMPLETELY. FIXTURE TO BE SURFACE MOUNTED BELOW PRECAST IN CORNER WHERE INDICATED ON PLANS.
N3N	LED	99 W	277 V	8" X 48", SURFACE CORNER WALL MOUNT, IMPACT AND VANDAL RESISTANT FIXTURE, 90 WATT, 4000K, 0.125" PRISMATIC POLYCARBONATE INNER LENS, 0.500" CLEAR POLYCARBONATE OUTER LENS, CONTINUOUS HINGED LENS FRAME WITH WHITE POWDER COATE FINISH, 14 GUAGE COLD ROLLED STEEL HOUSING WITH WHITE POWDER COAT FINISH. TAMPER RESISTANT TORX SCREWS WITH SCREWDRIVER ACCESSORY. LED NIGHT LIGHT. REMOVABLE GEAR TRAY. UL LISTED FOR DAMP LOCATION.	KENALL CD4-0/0-90L40K-DCC-DV-2/J-1-RGT-DLN	EATON FAIL-SAFE FCC-X-4-LD4-2HI-40-UNV-81/88-EDD1-LLNL	NEWSTAR LIGHTING 554-B-L3(MOD 6800 LMS)-40-1-4/B-UN-TH-DLN-RGT	ALL JOINTS IN FIXTURE AND BETWEEN FIXTURE AND MOUNTING SURFACE SHALL BE FILLED COMPLETELY. FIXTURE TO BE SURFACE MOUNTED BELOW PRECAST IN CORNER WHERE INDICATED ON PLANS.
P1	LED	31 W	277 V	4' INDUSTRIAL LED LINEAR BAY, 31 WATT, 4000K COLOR, 4000 LUMENS, WIDE DISTRIBUTION, HEAVY DUTY WIREGUARD, UNIVSERSAL VOLTAGE, ONE 0-10V DIMMING DRIVER, COLD ROLLED STEEL FULL BODY HOUSING.	EATON METALUX 4-ILED-LD5-5-W-WG-UNV-L840-CD1	LITHONIA LIGHTING UFIT-L48-4000LM-SEF-MVOLT-GZ10-40K-80CRI-WH-WGMS8Z	HUBBELL COLUMBIA RLW-4-40-ML-FA-W-ED-U-RLWWG4	FIXTURE TO BE CHAIN MOUNTED WITH BOTTOM AT +14'-0" AFF.
R1	LED	44 W	277 V	8" X 48", SURFACE MOUNT, VANDAL RESISTANT FIXTURE, 4489 LUMENS, 4000K COLOR, OPAL POLYCARBONATE LENS, ELECTRONIC NON-DIMMABLE DRIVER, TAMPER RESISTANT TORX SCREWS AND INTEGRATED MOTION/OCCUPANCY SENSOR. FINISH TO BY ARCHITECT.	EATON FAIL-SAFE HVSL8-4-LD4-1-HI-40-UNV-O-EDC-1-XX-VRSD-OS1(277V)	KENALL MLHA8-48-F-MW-PP-45L40K-DCC-DV-MS	NEWSTAR LIGHTING VIC-4-N-L2-40-1C-RW-UN-XX-OC-TH	FIXTURE TO BE SURFACE MOUNTED ON WALL AT +8'-0" AFF.
SA	LED	59 W	277 V	SINGLE ARCHITECTURAL AREA LIGHT ON 30' POLE, 59W, 5414 LUMENS, 80CRI, 3000K COLOR, 277V, 01 LIGHT SQUARES, TYPE II DISTRIBUTION, FINISH PER ARCHITECT, ARM MOUNT AND IP66 RATED. POLE: 30' SQUARE STRAIGHT ALUMINUM POLE, 6" SHAFT SIZE, 0.250" THICK WITH FINISH PER ARCHITECT TO MATCH FIXTURE.	EATON McGRAW EDISON GLEON-AF(1A)-01-LED-E1-T2-XX-8030-F277 POLE: EATON McGRAW EDISON SSA6X30W-XX	LITHONIA DSX SERIES AS AN APPROVED EQUAL.	HUBBELL BEACON VPS SERIES AS AN APPROVED EQUAL.	REFER TO LIGHT POLE FOUNDATION DETAIL #5 ON SHEET E-802 FOR POLE BASE DETAIL.
SB	LED	113 W	277 V	SINGLE ARCHITECTURAL AREA LIGHT ON 30' POLE, 113W, 10579 LUMENS, 80CRI, 3000K COLOR, 277V, 02 LIGHT SQUARES, TYPE II DISTRIBUTION, FINISH PER ARCHITECT, ARM MOUNT AND IP66 RATED. POLE: 20' SQUARE STRAIGHT ALUMINUM POLE, 6" SHAFT SIZE, 0.250" THICK WITH FINISH PER ARCHITECT TO MATCH FIXTURE.	EATON McGRAW EDISON GLEON-AF(1A)-02-LED-E1-T2-XX-8030-F277 POLE: EATON McGRAW EDISON SSA6X30W-XX	LITHONIA DSX SERIES AS AN APPROVED EQUAL.	HUBBELL BEACON VPS SERIES AS AN APPROVED EQUAL.	REFER TO LIGHT POLE FOUNDATION DETAIL #5 ON SHEET E-802 FOR POLE BASE DETAIL.
SC	LED	59 W	277 V	SINGLE ARCHITECTURAL AREA LIGHT ON 30' POLE, 59W, 5550 LUMENS, 80CRI, 3000K COLOR, 277V, 01 LIGHT SQUARES, TYPE IV FORWARD THROW DISTRIBUTION, FINISH PER ARCHITECT, ARM MOUNT AND IP66 RATED. POLE: 30' SQUARE STRAIGHT ALUMINUM POLE, 6" SHAFT SIZE, 0.250" THICK WITH FINISH PER ARCHITECT TO MATCH FIXTURE.	EATON McGRAW EDISON GLEON-AF(1A)-01-LED-E1-T4FT-XX-8030-F277 POLE: EATON McGRAW EDISON SSA6X30W-XX	LITHONIA DSX SERIES AS AN APPROVED EQUAL.	HUBBELL BEACON VPS SERIES AS AN APPROVED EQUAL.	REFER TO LIGHT POLE FOUNDATION DETAIL #5 ON SHEET E-802 FOR POLE BASE DETAIL.
SD	LED	118 W	277 V	TWIN ARCHITECTURAL AREA LIGHT ON 30' POLE, 59W, 5550 LUMENS, 80CRI, 3000K COLOR PER HEAD, 277V, 01 LIGHT SQUARES, TYPE IV FORWARD THROW DISTRIBUTION, FINISH PER ARCHITECT, ARM MOUNT AND IP66 RATED. POLE: 30' SQUARE STRAIGHT ALUMINUM POLE, 6-3/4" SHAFT SIZE, 0.250" THICK WITH FINISH PER ARCHITECT TO MATCH FIXTURE.	EATON McGRAW EDISON GLEON-AF(1A)-01-LED-E1-T4FT-XX-8030-F277 POLE: EATON McGRAW EDISON SSA9X30W-XX	LITHONIA DSX SERIES AS AN APPROVED EQUAL.	HUBBELL BEACON VPS SERIES AS AN APPROVED EQUAL.	REFER TO LIGHT POLE FOUNDATION DETAIL #5 ON SHEET E-802 FOR POLE BASE DETAIL.
SE	LED	225 W	277 V	SINGLE ARCHITECTURAL AREA LIGHT ON 30' POLE, 225W, 21383 LUMENS, 80CRI, 3000K COLOR, 277V, 04 LIGHT SQUARES, TYPE V WIDE SQUARE DISTRIBUTION, FINISH PER ARCHITECT, ARM MOUNT AND IP66 RATED. POLE: 30' SQUARE STRAIGHT ALUMINUM POLE, 6" SHAFT SIZE, 0.250" THICK WITH FINISH PER ARCHITECT TO MATCH FIXTURE.	EATON McGRAW EDISON GLEON-AF(1A)-04-LED-E1-5WQ-XX-8030-F277 POLE: EATON McGRAW EDISON SSA4M20W-XX	LITHONIA DSX SERIES AS AN APPROVED EQUAL.	HUBBELL BEACON VPS SERIES AS AN APPROVED EQUAL.	REFER TO LIGHT POLE FOUNDATION DETAIL #5 ON SHEET E-802 FOR POLE BASE DETAIL.
SF	LED	113 W	277 V	SINGLE ARCHITECTURAL AREA LIGHT ON 35' POLE, 113W, 10845 LUMENS, 80CRI, 3000K COLOR, 277V, 02 LIGHT SQUARES, TYPE IV FORWARD THROW DISTRIBUTION, FINISH PER ARCHITECT, ARM MOUNT AND IP66 RATED. POLE: 35' SQUARE STRAIGHT ALUMINUM POLE, 6-3/4" SHAFT SIZE, 0.250" THICK WITH FINISH PER ARCHITECT TO MATCH FIXTURE.	EATON McGRAW EDISON GLEON-AF(1A)-02-LED-E1-T4FT-XX-8030-F277 POLE: EATON McGRAW EDISON SSA9X35W-XX	LITHONIA DSX SERIES AS AN APPROVED EQUAL.	HUBBELL BEACON VPS SERIES AS AN APPROVED EQUAL.	REFER TO LIGHT POLE FOUNDATION DETAIL #5 ON SHEET E-802 FOR POLE BASE DETAIL.
SG	LED	75 W	277 V	SINGLE ROUND ARCHITECTURAL AREA LIGHT ON 15' POLE, 75W, 7336 LUMENS, 80CRI, 3000K COLOR, 277V, 03 LIGHT SQUARES, TYPE II DISTRIBUTION WITH SPILL CONTROL, FINISH PER ARCHITECT AND IP66 RATED. POLE: 15' ROUND STRAIGHT ALUMINUM POLE, 4" SHAFT SIZE, 0.125" THICK WITH FINISH PER ARCHITECT TO MATCH FIXTURE.	EATON INVUE MSA-E03-LED-E1-SL2-XX-8030 POLE: EATON INVUE ARX-4-T-15-N-XX	OR APPROVED PERFORMANCE EQUAL	OR APPROVED PERFORMANCE EQUAL.	REFER TO LIGHT POLE FOUNDATION DETAIL #5 ON SHEET E-802 FOR POLE BASE DETAIL.
SH	LED	75 W	277 V	SINGLE ROUND ARCHITECTURAL AREA LIGHT ON 15' POLE, 75W, 7128 LUMENS, 80CRI, 3000K COLOR, 277V, 03 LIGHT SQUARES, TYPE IV DISTRIBUTION WITH SPILL CONTROL, FINISH PER ARCHITECT AND IP66 RATED. POLE: 15' ROUND STRAIGHT ALUMINUM POLE, 4" SHAFT SIZE, 0.125" THICK WITH FINISH PER ARCHITECT TO MATCH FIXTURE.	EATON INVUE MSA-EO3-LED-E1-SL4-XX-8030 POLE: EATON INVUE ARX-4-T-15-N-XX	OR APPROVED PERFORMANCE EQUAL	OR APPROVED PERFORMANCE EQUAL.	REFER TO LIGHT POLE FOUNDATION DETAIL #5 ON SHEET E-802 FOR POLE BASE DETAIL.
SJ	LED	25 W	277 V	ARCHITECTURAL FLOOD LIGHT, DIE-CAST ALUMINUM HOUSING, 4000K COLOR, 70CRI, 2511 LUMENS, 25 WATTS, ELECTRONIC BALLAST, 4X4 DISTRIBUTION, VANDAL RESISTANT POLYCARBONATE LENS, TOP/BOTTOM VISOR, 5 YEAR WARRANTY WITH DARK BRONZE FINISH.	HUBBELL OUTDOOR LIGHTING FSL-10L-25-4K-7-M-4-K-DB-F; FSL-SPC; FSL-VISOR-XX	LITHONIA DSXF SERIES AS AN APPROVED EQUAL.	EATON INVUE LIGHTING VFS SERIES AS AN APPROVED EQUAL.	FIXTURE TO MOUNTED ON CONCRETE BASE, REFER TO DETAIL #3 ON SHEET E-802.
T1	LED	12 W	277 V	4" X 48" DIRECT RECESSED LINEAR FIXTURE, 350 LUMENS / FT, 4000K COLOR, 80 CRI, UNIVERSAL VOLTAGE, 0-10V DIMMING DRIVER, EXTRUDED ALUMINUM HOUSING IN MATTE WHITE FINISH WITH SATIN FLUSH DIFFUSER.	FOCAL POINT FSM4L-FL-375LF-40K-1C-UNC-LD1-G1-WH-12	LITHONIA SL4L-LOP-4FT-FLP-XX-80CRI-40-400LMF-MIN1-277V-ZT	HUBBELL LITECONTROL 4L-LG-D-4-4-SOF-C1-40K-040-D01-1C-UNV-W1	FLUSH MOUNT IN CEILING
V1	LED	18 W	277 V	2' X 2', SURFACE MOUNT TROFFER WITH FLAT 0.156 ACRYLIC LENS, 2000 LUMENS, 4000K, COLD ROLLED STEEL HOUSING, FRAME AND HOUSING WITH WHITE POWDER COAT FINISH. PAINTED AFTER FABRICATION	LITHONIA 2TLX2-20L-FW-A12-MVOLT-EZ1-LP840	EATON METALUX 22GR SERIES AS AN APPROVED EQUAL.	HUBBELL COLUMBIA LJT SERIES AS AN APPROVED EQUAL.	SURFACE MOUNTED
W1	LED		277 V	4.5" X 48" STRAIGHT AND NARROW DIRECT/INDIRECT LED WALL MOUNT FIXTURE, EXTRUDED ALUMINUM HOUSING, 566.5 LUMENS / 7 WATTS PER FOOT UP AND DOWN, 85+ CRI, 4000K COLOR, SINGLE CIRCUIT, UNIVERSAL VOLTAGE, 0-10V DIMMING DRIVER AND SATIN LAY-IN LENS. FINISH TO BE SELECTED BY ARCHITECT.	EATON NEORAY S23-DI-W-1L40-SR-4-DD-U-SI-S93-XX	PRUDENTIAL P46-LED4-LO-LO-4'-XX-SAL-D1-SYM-SC-UNV-WM-XX-DM10	HUBBELL LITECONTROL 4L-W-ID-LPA-4-04-SOF-XX-40K-1055-D055-D01-1C-UNV-W1	WALL MOUNT WITH BOTTOM AT +12'-0" AFF.
W2	LED		277 V	4.5" X 48" STRAIGHT AND NARROW DIRECT/INDIRECT LED WALL MOUNT FIXTURE, EXTRUDED ALUMINUM HOUSING, 616 LUMENS / 9 WATTS PER FOOT UP AND DOWN, 85+ CRI, 4000K COLOR, SINGLE CIRCUIT, UNIVERSAL VOLTAGE, 0-10V DIMMING DRIVER AND SATIN LAY-IN LENS. FINISH TO BE SELECTED BY	EATON NEORAY S23-DI-W-2L40-SR-4-DD-U-SI-S93-XX	PRUDENTIAL P46-LED4-MO-MO-4'-XX-SAL-D1-SYM-SC-UNV-WM-XX-DM10	HUBBELL LITECONTROL	WALL MOUNT WITH BOTTOM AT +12'-0" AFF.
X1	LED	1 W		VANDAL RESISTANT SINGLE FACE LED EXIT FIXTURE, RED LETTERS, POLYCARBONATE HOUSING, MATTE WHITE FINISH, UNIVERSAL MOUNTING ACCESSORIES. TAMPER RESISTANT TORX SCREWS WITH SCREWDRIVER ACCESSORY, UL LISTED FOR WET LOCATION. WHITE WIREGUARD.	KENALL #METSU-MW-R-DT-XAC-9500-WIREGUARD (WHITE)	EATON SURE-LITES UX6 SERIES EQUAL	NEWSTAR LIGHTING 620-SF-LED-UN-RW-WIREGUARD	CEILING, END OR WALL MOUNT AS REQUIRED. PROVIDE ARROWS AS SHOWN ON PLANS. FOR WALL MOUNTED EXITS, MOUNT 8'-0" AFF U.O.N.
X2	LED	1 W		ARCHITECTURAL LED EXIT FIXTURE, RED LETTERS, DIE-CAST ALUMINUM HOUSING, WHITE FINISH, UNIVERSAL MOUNTING ACCESSORIES. UL LISTED FOR DAMP LOCATION. CEILING, END OR WALL MOUNT AS REQUIRED. PROVIDE ARROWS AS SHOWN ON PLANS.	LITHONIA #LES-W-X-R-120/277	EATON SURE-LITES CX7X	DUAL-LITE SE-X-R-W	CEILING, END OR WALL MOUNT AS REQUIRED. PROVIDE ARROWS AS SHOWN ON PLANS. FOR WALL MOUNTED EXITS, MOUNT 8'-0" AFF U.O.N.
X3A	LED	1 W	277 V	RECESSED ARCHITECTURAL EDGE LIT LED EXIT FIXTURE, RED LETTERS, CLEAR BACKGROUND, EXTRUDED ALUMINUM HOUSING WITH WHITE FINISH, SINGLE FACE. PROVIDE ARROWS AS SHOWN ON PLAN.	LITHONIA #EDGR-W-1-R	EATON SURE-LITES EU-R-6-0-R	HUBBELL DUAL-LITE LE-C-S-R-X-W-A	AS SHOWN ON PLANS
X3B	LED	1 W	277 V	RECESSED ARCHITECTURAL EDGE LIT LED EXIT FIXTURE, RED LETTERS, CLEAR BACKGROUND, EXTRUDED ALUMINUM HOUSING WITH WHITE FINISH, SINGLE FACE. PROVIDE ARROWS AS SHOWN ON PLAN.	LITHONIA #EDGR-W-1-R	EATON SURE-LITES EU-R-6-O-R	HUBBELL DUAL-LITE LE-C-D-R-X-W-A	AS SHOWN ON PLANS
Y1	LED	19 W	277 V	4" X 48" DIRECT/INDIRECT LINEAR PENDANT FIXTURE, 275 LUMENS / FT UP, 275 LUMENS / FT DOWN, 4000K COLOR, 80 CRI, UNIVERSAL VOLTAGE, 0-10V DIMMING DRIVER, EXTRUDED ALUMINUM HOUSING IN MATTE WHITE FINISH WITH FLUSH DIFFUSER UP AND DOWN.	FOCAL POINT FSM4BS-FLFL-275DN-275UP-4000K-1C-UNV-LD1-CXXWH-WH-XX	MARK ARCHITECTURAL LIGHTING SLOT 4 LED S4LID SERIES AS APPROVED EQUAL	HUBBELL LITECONTROL 4L-P-ID-STD-4-4-SOF-C1-40K-1030-D030-1C-UNV-FAX-W1	PENDANT MOUNT WITH BOTTOM AT +12'-0" AFF.
Z1	LED	15 W	120 V	ADJUSTABLE BEAM LED TRACK FIXTURE, 15W ADJUSTABLE BEAM, 3500K COLOR, DIMMING DRIVER WITH WHITE FINISH.	CONTECT LIGHTING CTL-844-35-D-P	LF ILLUMINATION TRA19B-J-13C-8035-M-D11-WW	BRUCK 250430-21LM-35K-90-120-ELV-WH-ECOWH	TRACK MOUNT
Z1A	---			SINGLE CIRCUIT LINE VOLTAGE TRACK, 120V, WHITE FINISH, LEGTH AS SHOWN ON PLANS.	CONTECT LT-X-S	JUNO LIGHTING R SERIES TRACK	BRUCK ECO TRACK, WHITE	SURFACE MOUNT

Steel Cell Lighting Fixture Schedule

TYPE	LAMP	WATTAGE	VOLTAGE	DESCRIPTION	BASIS OF DESIGN	EQUAL MANUFACTURER AS APPROVED BY ENGINEER	EQUAL MANUFACTURER AS APPROVED BY ENGINEER	TYPE COMMENTS
M1A-SC	LED	50 W		12" X 48", IMPACT AND VANDAL RESISTANT FIXTURE, 45 WATT, 5000K, SURFACE CEILING MOUNT, 0.125" PRISMATIC POLYCARBONATE INNER LENS, 0.500" CLEAR POLYCARBONATE OUTER LENS, CONTINUOUS HINGED LENS FRAME WITH WHITE POWDER COAT FINISH, 14 GUAGE STAINLESS STEEL HOUSING WITH WHITE POWDER COATE FINISH. TAMPER RESISTANT TORX SCREWS WITH SCREWDRIVER ACCESSORY. REMOVABLE GEAR TRAY. UL LISTED FOR WET LOCATION WITH LED NIGHT LIGHT.	KENALL SDSA-4-3/3-1-45L50K-DDC-1-DV-2/J-1-WL-DLN	EATON FAIL-SAFE AS AN APPROVED EQUAL.	NEWSTAR LIGHTING AS AN APPROVED EQUAL.	ALL JOINTS IN FIXTURE AND BETWEEN FIXTURE AND MOUNTING SURFACE SHALL BE FILLED COMPLETELY. FIXTURE TO BE SURFACE MOUNTED ON BOTTOM OF PRECAST WHERE INDICATED ON PLANS.
M1N-SC	LED	50 W		12" X 48", IMPACT AND VANDAL RESISTANT FIXTURE, 45 WATT, 4000K, SURFACE CEILING MOUNT, 0.125" PRISMATIC POLYCARBONATE INNER LENS, 0.500" CLEAR POLYCARBONATE OUTER LENS, CONTINUOUS HINGED LENS FRAME WITH WHITE POWDER COAT FINISH, 14 GUAGE COLD ROLLED STEEL HOUSING WITH WHITE POWDER COATE FINISH. TAMPER RESISTANT TORX SCREWS WITH SCREWDRIVER ACCESSORY. REMOVABLE GEAR TRAY. UL LISTED FOR DAMP LOCATION, LED NIGHT LIGHT.	KENALL SDSA-4-0/0-1-45L40K-DDC-1-DV-2/J-1-DLN	EATON FAIL-SAFE AS AN APPROVED EQUAL.	NEWSTAR LIGHTING AS AN APPROVED EQUAL.	ALL JOINTS IN FIXTURE AND BETWEEN FIXTURE AND MOUNTING SURFACE SHALL BE FILLED COMPLETELY. FIXTURE TO BE SURFACE MOUNTED ON BOTTOM OF PRECAST WHERE INDICATED ON PLANS.

LIGHT FIXTURE SCHEDULE NOTES:

A. ALL LAY-IN FIXTURES TO HAVE EARTHQUAKE CLIPS AND BE SUPPORTED WITH SAFETY CHAIN, SEE SPECIFICATIONS.

B. ALL FIXTURES SHALL BE U.L. LISTED.

C. VERIFY WITH UTILITY AND APPLY FOR ANY REBATES AVAILABLE FOR THE USE OF LED LIGHTING ON PROJECT. REBATES TO BE GIVEN TO OWNER.

DLZ
ARCHITECTURE • ENGINEERING • PLANNING
SURVEYING • CONSTRUCTION SERVICES
DLZ INDIANA, LLC

MARVIN L. HITCHCOCK
REGISTERED No. PE60018676
STATE OF INDIANA
PROFESSIONAL ENGINEER

NO.	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: MHK,RDW CHK'D: MLH
DESIGNED: MHK,RDW
APPRV'D: MLH
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER
1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

LIGHT FIXTURE SCHEDULES

DRAWING NUMBER
1
E-606
ELECTRICAL

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Switchboard: ODPA

Location: MECHANICAL C1053 | **Volts:** 480/277 Wye | **A.I.C. Rating:** 42k AIC
Supply From: MDPA | **Phases:** 3 | **Mains Type:** MCB
Mounting: Floor | **Wires:** 4 | **Mains Rating:** 1600 A
Enclosure: 1 | **MCB Rating:** 1600 A

Notes:

CKT	Circuit Description	# of Poles	Frame Size	Trip Rating	Load	Remarks
1	Panel 'E1PA' & 'E1PB' via Transformer 'TR-1A'	3	400 A	250 A	90992 VA	
2	Panel 'K1H' - Rm C1059	3	400 A	400 A	201772 VA	
3	Panel 'E2HA' - Rm B1024	3	225 A	200 A	92071 VA	
4	Panel 'E3H' - Rm A1003	3	225 A	200 A	81965 VA	
5						
6	Panel 'E1HA' - Rm C1053	3	225 A	200 A	64646 VA	
7	Panel 'E1HB' - Rm C1004	3	225 A	200 A	91725 VA	
8	Uniterruptible Power Supply 'UPS-1' via Tranformer 'TR-U1' - Rm B1024	3	125 A	70 A	36540 VA	
9	Uniterruptible Power Supply 'UPS-2' via Tranformer 'TR-U2' - Rm B1024	3	125 A	70 A	25710 VA	
10	Domestic Booster Pump 'DWBP-1' - Rm C1053	3	125 A	80 A	53184 VA	
11	Surge Protective Device 'SPD-DPOA' - Rm C1053	3	125 A	100 A	0 VA	
12						
13						
14						
15						
16						
17						
18						
19						
20						
				Total Conn. Load:	719582 VA	
				Total Amps:	866 A	

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
HVAC	79425 VA	100.00%	79425 VA		
Lighting	30866 VA	100.00%	30866 VA	**Total Conn. Load:**	719582 VA
Motor	176988 VA	107.51%	190284 VA	**Total Est. Demand:**	590624 VA
Other	4160 VA	100.00%	4160 VA	**Total Conn. Current:**	866 A
Receptacle	167640 VA	52.98%	88820 VA	**Total Est. Demand Current:**	710 A
Cooling	37122 VA	100.00%	37122 VA		
Electric Clothes Dryer	9840 VA	100.00%	9840 VA		
Heating	5892 VA	100.00%	5892 VA		
Equipment	46000 VA	100.00%	46000 VA		
Kitchen Equipment - Non-Dwelling Unit	117844 VA	65.00%	76599 VA		
Misc.	22620 VA	100.00%	22620 VA		
Misc. Non-Continuous	22200 VA	0.01%	2 VA		

Notes:

Switchboard: ODPB

Location: MECHANICAL B2000 | **Volts:** 480/277 Wye | **A.I.C. Rating:** 42k AIC
Supply From: MDPA | **Phases:** 3 | **Mains Type:** MCB
Mounting: Floor | **Wires:** 4 | **Mains Rating:** 1200 A
Enclosure: 1 | **MCB Rating:** 1200 A

Notes:

CKT	Circuit Description	# of Poles	Frame Size	Trip Rating	Load	Remarks
1	Panel 'E5H' - Mechanical B2000 (Penthouse)	3	200 A	200 A	103889 VA	
2	Panel 'E2HB' - Electrical B1028 (First Floor)	3	200 A	200 A	102237 VA	
3	Panel 'E4H' - Storage E1016B (First Floor)	3	200 A	200 A	106116 VA	
4	Spare	3	200 A	0 A	0 VA	
5	AHU-2 Supply Fan - Mechanical B2000 (Penthouse)	3	125 A	100 A	61494 VA	
6	AHU-2 Return Fan - Mechanical B2000 (Penthouse)	3	125 A	30 A	19279 VA	
7	AHU-3 Supply Fan - Mechanical B2000 (Penthouse)	3	125 A	70 A	45290 VA	
8	AHU-3 Return Fan - Mechanical B2000 (Penthouse)	3	125 A	35 A	22271 VA	
9	AHU-1 Supply Fan - Mechanical B2000 (Penthouse)	3	125 A	125 A	55095 VA	
10	AHU-1 Return Fan - Mechanical B2000 (Penthouse)	3	125 A	70 A	28254 VA	
11	AHU-4 Supply Fan - Mechanical B2000 (Penthouse)	3	125 A	70 A	45290 VA	
12	AHU-4 Return Fan - Mechanical B2000 (Penthouse)	3	125 A	35 A	22271 VA	
13	Computer Room Unit 'CRAC-3' - Security B2001 (Penthouse)	3	125 A	30 A	16869 VA	
14	Spare	3	125 A	0 A	0 VA	
15	Future Housing Pod Panel 'E6H'	3	200 A	0 A	0 VA	
16	Future Housing Pod Panel 'E7H'	3	200 A	0 A	0 VA	
17						
18						
19						
20						
				Total Conn. Load:	628344 VA	
				Total Amps:	756 A	

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
HVAC	48671 VA	100.00%	48671 VA		
Lighting	50661 VA	100.00%	50661 VA	**Total Conn. Load:**	628344 VA
Motor	315687 VA	104.87%	331061 VA	**Total Est. Demand:**	591509 VA
Receptacle	106820 VA	54.88%	58610 VA	**Total Conn. Current:**	756 A
Cooling	67070 VA	100.00%	67070 VA	**Total Est. Demand Current:**	711 A
Electric Clothes Dryer	4800 VA	100.00%	4800 VA		
Heating	9000 VA	100.00%	9000 VA		
Equipment	10500 VA	100.00%	10500 VA		
Misc.	11444 VA	100.00%	11444 VA		
Misc. Non-Continuous	3800 VA	0.01%	0 VA		

Notes:

Branch Panel: DP-L

Location: ELECTRICAL C1054 | **Volts:** 480/277 Wye | **A.I.C. Rating:** 42k AIC
Supply From: MDPA | **Phases:** 3 | **Mains Type:** MCB
Mounting: Surface | **Wires:** 4 | **Mains Rating:** 200 A
Enclosure: 1 | **MCB Rating:** 200 A

Notes:
NEW SURFACE MOUNTED PANEL.

CKT	Circuit Description	Trip	Poles	A (VA)		B (VA)		C (VA)		Poles	Trip	Circuit Description	CKT
1	SPARE	20 A	1	0	0					1	20 A	SPARE	2
3	SPARE	20 A	1			0	0			1	20 A	SPARE	4
5	SPARE	20 A	1					0	0	1	20 A	SPARE	6
7	SPARE	20 A	1	0	3546					3	20 A	Dedicated Outdoor Air System 'DOAS-1' - on Roof	8
9	EM Lighting - Admin Area	20 A	1			901	3546			--	--	--	10
11	EM Lighting - Exterior Facade (Roof C) [via GTD4]	20 A	1					68	3546	--	--	--	12
13	SPARE	20 A	1	0	0					1	20 A	SPARE	14
15	SPARE	20 A	1			0	0			1	20 A	SPARE	16
17	SPARE	20 A	1					0	0	1	20 A	SPARE	18
19	Panel 'L1P' via Transformer 'TR-L1P'	30 A	3	1000	1881					3	100 A	Panel 'L1H' - Electrical B1024	20
21	--	--	--			1000	221			--	--	--	22
23	--	--	--					750	199	--	--	--	24
25	Panel 'L2H' - Electrical B2002 (Penthouse)	100 A	3	13768	0					3	60 A	Surge Protective Device 'SPD-DPL'	26
27	--	--	--			13350	0			--	--	--	28
29	--	--	--					13736	0	--	--	--	30
		Total Load:		20149 VA		18992 VA		18272 VA					
		Total Amps:		73 A		69 A		66 A					

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
HVAC	21274 VA	100.00%	21274 VA		
Lighting	3419 VA	100.00%	3419 VA	**Total Conn. Load:**	55162 VA
Motor	24024 VA	101.82%	24460 VA	**Total Est. Demand:**	55598 VA
Power	4032 VA	100.00%	4032 VA	**Total Conn. Current:**	66 A
Equipment	2000 VA	100.00%	2000 VA	**Total Est. Demand Current:**	67 A
Misc	500 VA	100.00%	500 VA		

Notes:

Branch Panel: L1H

Location: ELECTRICAL B1024 | **Volts:** 480/277 Wye | **A.I.C. Rating:** 10kA
Supply From: DP-L | **Phases:** 3 | **Mains Type:** MLO
Mounting: Surface | **Wires:** 4 | **Mains Rating:** 125 A
Enclosure: 1

Notes:
NEW SURFACE MOUNTED PANEL.

CKT	Circuit Description	Trip	Poles	A (VA)		B (VA)		C (VA)		Poles	Trip	Circuit Description	CKT
1	SPARE	20 A	1	0	0					1	20 A	SPARE	2
3	SPARE	20 A	1			0	0			1	20 A	SPARE	4
5	SPARE	20 A	1					0	0	1	20 A	SPARE	6
7	Lighting Inverter 'L1E' - Rm B1024	20 A	1	1881	0					1	20 A	SPARE	8
9	EM Lighting - Lobby	20 A	1			221	0			1	20 A	SPARE	10
11	EM Lighting - Exterior Facade (Pods) [via GTD4]	20 A	1					97	102	1	20 A	EM Lighting - Exterior Facade (Sallyport) [via...	12
13	SPARE	20 A	1	0	0					1	20 A	SPARE	14
15	SPACE	20 A	1			0	0			1	20 A	SPACE	16
17	SPARE	20 A	1					0	0	1	20 A	SPARE	18
19	SPACE	--	--	0	0					--	--	SPACE	20
21	SPACE	--	--			0	0			--	--	SPACE	22
23	SPACE	--	--					0	0	--	--	SPACE	24
25	SPACE	--	--	0	0					--	--	SPACE	26
27	SPACE	--	--			0	0			--	--	SPACE	28
29	SPACE	--	--					0	0	--	--	SPACE	30
		Total Load:		1881 VA		221 VA		199 VA					
		Total Amps:		7 A		1 A		1 A					

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Lighting	2297 VA	100.00%	2297 VA		
				Total Conn. Load:	2297 VA
				Total Est. Demand:	2297 VA
				Total Conn. Current:	3 A
				Total Est. Demand Current:	3 A

Notes:

Branch Panel: L2H

Location: ELECTRICAL B2002 | **Volts:** 480/277 Wye | **A.I.C. Rating:** 10kA
Supply From: DP-L | **Phases:** 3 | **Mains Type:** MLO
Mounting: Surface | **Wires:** 4 | **Mains Rating:** 125 A
Enclosure: 1

Notes:
NEW SURFACE MOUNTED PANEL.

CKT	Circuit Description	Trip	Poles	A (VA)		B (VA)		C (VA)		Poles	Trip	Circuit Description	CKT
1	SPARE	20 A	1	0	0					1	20 A	SPARE	2
3	SPARE	20 A	1			0	0			1	20 A	SPARE	4
5	SPARE	20 A	1					0	0	1	20 A	SPARE	6
7	Lighting Inverter 'L2E' - Rm B2000	50 A	1	0	582					3	20 A	Smoke Exhaust Fan 'SEF-1-1' - Roof	8
9	SPARE	20 A	1			0	582			--	--	--	10
11	Lighting MECHANICAL B2000	20 A	1					160	582	--	--	--	12
13	Smoke Exhaust Fan 'SEF-1-6' - Roof	20 A	3	443	443					3	20 A	Smoke Exhaust Fan 'SEF-1-2' - Roof	14
15	--	--	--			443	443			--	--	--	16
17	--	--	--					443	443	--	--	--	18
19	Smoke Exhaust Fan 'SEF-1-5' - Roof	20 A	3	582	443					3	20 A	Smoke Exhaust Fan 'SEF-1-4' - Roof	20
21	--	--	--			582	443			--	--	--	22
23	--	--	--					582	443	--	--	--	24
25	Smoke Exhaust Fan 'SEF-2-1' - Roof	20 A	3	582	443					3	20 A	Smoke Exhaust Fan 'SEF-2-6' - Roof	26
27	--	--	--			582	443			--	--	--	28
29	--	--	--					582	443	--	--	--	30
31	Smoke Exhaust Fan 'SEF-2-2' - Roof	20 A	3	443	582					3	20 A	Smoke Exhaust Fan 'SEF-2-5' - Roof	32
33	--	--	--			443	582			--	--	--	34
35	--	--	--					443	582	--	--	--	36
37	Smoke Exhaust Fan 'SEF-2-4' - Roof	20 A	3	443	443					3	20 A	Smoke Exhaust Fan 'SEF-6C' - Roof	38
39	--	--	--			443	443			--	--	--	40
41	--	--	--					443	443	--	--	--	42
43	Smoke Exhaust Fan 'SEF-3' - Roof	20 A	3	443	443					3	20 A	Smoke Exhaust Fan 'SEF-6B' - Roof	44
45	--	--	--			443	443			--	--	--	46
47	--	--	--					443	443	--	--	--	48
49	Dedicated Outdoor Air System 'DOAS-2' - on Roof	20 A	3	3546	443					3	20 A	Smoke Exhaust Fan 'SEF-6A' - Roof	50
51	--	--	--			3546	443			--	--	--	52
53	--	--	--					3546	443	--	--	--	54
55	SPARE	20 A	1	0	0					1	20 A	SPARE	56
57	SPARE	20 A	1			0	0			1	20 A	SPARE	58
59	SPARE	20 A	1					0	0	1	20 A	SPARE	60
61	SPACE	--	--	0	0					--	--	SPACE	62
63	SPACE	--	--			0	0			--	--	SPACE	64
65	SPACE	--	--					0	0	--	--	SPACE	66
67	Panel 'L2P' via Transformer 'TR-L2P'	30 A	3	3462	0					--	--	SPACE	68
69	--	--	--			3044	0			--	--	SPACE	70
71	--	--	--					3270	0	--	--	SPACE	72
		Total Load:		13768 VA		13350 VA		13736 VA					
		Total Amps:		50 A		48 A		50 A					

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
HVAC	10637 VA	100.00%	10637 VA		
Lighting	160 VA	100.00%	160 VA	**Total Conn. Load:**	39853 VA
Motor	24024 VA	101.82%	24460 VA	**Total Est. Demand:**	40289 VA
Power	4032 VA	100.00%	4032 VA	**Total Conn. Current:**	48 A
Equipment	500 VA	100.00%	500 VA	**Total Est. Demand Current:**	48 A
Misc	500 VA	100.00%	500 VA		

Notes:

DLZ
ARCHITECTURE • ENGINEERING • PLANNING
SURVEYING • CONSTRUCTION SERVICES
DLZ INDIANA, LLC

MARVIN R. HITCHCOCK 10675 STATE OF INDIANA REGISTERED PROFESSIONAL ENGINEER

NO.	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: RDW | CHK'D: MLH
DESIGNED: RDW
APPRV'D: MLH
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

PANELBOARD SCHEDULES

DRAWING NUMBER E-701 | ELECTRICAL

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Branch Panel: E1HA

Location: MECHANICAL C1053 | Supply From: ODPA | Mounting: Surface | Enclosure: 1
Volts: 480/277 Wye | Phases: 3 | Wires: 4
A.I.C. Rating: 42k AIC | Mains Type: MLO | Mains Rating: 250 A

Notes:
NEW SURFACE MOUNTED PANEL.

CKT	Circuit Description	Trip	Poles	A		B		C		Poles	Trip	Circuit Description	CKT
1	SPARE	20 A	1	0	0					1	20 A	SPARE	2
3	SPARE	20 A	1			0	0			1	20 A	SPARE	4
5	SPARE	20 A	1					0	0	1	20 A	SPARE	6
7	Fan Powered VAV Box 'FPV-1-15' - Rm C1031	20 A	1	2715	238					1	20 A	Exterior Wall Mounted Lighting - Area C	8
9	Lighting - Mech C1053, Receiving	20 A	1			2858	568			1	20 A	Exterior Area/Drive Lighting - Employee Parking	10
11	SPARE	20 A	1					0	634	1	20 A	Exterior Area/Drive Lighting - East Drive	12
13	Exhaust Fan 'EF-8' - Rm C1056B	20 A	3	651	498					3	20 A	Hot Water Recirc Pump 'HWRP-1' - Rm C1053	14
15	--	--	--			651	498			--	--	--	16
17	--	--	--					651	498	--	--	--	18
19	Door Air Curtain 'DAC-1' - Rm C1052	20 A	3	1773	498					3	20 A	Hot Water Recirc Pump 'HWRP-2' - Rm C1053	20
21	--	--	--			1773	498			--	--	--	22
23	--	--	--					1773	498	--	--	--	24
25	Future Cold Water Pump 'CWP-FTR' - Rm C1053	30 A	3	0	0					3	20 A	Future Hot Water Pump 'HWP-FTR' - Rm C1053	26
27	--	--	--			0	0			--	--	--	28
29	--	--	--					0	0	--	--	--	30
31	Cold Water Pump 'CWP-1' - Rm C1053	30 A	3	5817	2105					3	20 A	Hot Water Pump 'HWP-1' - Rm C1053	32
33	--	--	--			5817	2105			--	--	--	34
35	--	--	--					5817	2105	--	--	--	36
37	Cold Water Pump 'CWP-2' - Rm C1053	30 A	3	5817	2105					3	20 A	Hot Water Pump 'HWP-2' - Rm C1053	38
39	--	--	--			5817	2105			--	--	--	40
41	--	--	--					5817	2105	--	--	--	42
			Total Load:	22194 VA		22618 VA		19837 VA					
			Total Amps:	81 A		83 A		72 A					

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
HVAC	8033 VA	100.00%	8033 VA		
Lighting	4249 VA	100.00%	4249 VA	Total Conn. Load:	64646 VA
Motor	52475 VA	108.31%	56838 VA	Total Est. Demand:	69008 VA
Other	0 VA	0.00%	0 VA	Total Conn. Current:	78 A
				Total Est. Demand Current:	83 A

Notes:

Branch Panel: E1PA

Location: MECHANICAL C1053 | Supply From: TR-1A | Mounting: Surface | Enclosure: 1
Volts: 120/208 Wye | Phases: 3 | Wires: 4
A.I.C. Rating: 10k AIC | Mains Type: MCB | Mains Rating: 400 A | MCB Rating: 250 A

Notes:
NEW SURFACE MOUNTED PANEL.

CKT	Circuit Description	Trip	Poles	A		B		C		Poles	Trip	Circuit Description	CKT
1	SPARE	20 A	1	0	0					1	20 A	SPARE	2
3	SPARE	20 A	1			0	0			1	20 A	SPARE	4
5	SPARE	20 A	1					0	0	1	20 A	SPARE	6
7	Recepts - Rms C1032 & C1033	20 A	1	1080	1080					1	20 A	Floor Box Recepts- Rm C1034	8
9	Hand Dryer - Rm C1032	20 A	1			1500	900			1	20 A	Floor Box & Recepts- Rm C1034	10
11	Hand Dryer - Rm C1032	20 A	1					1500	1080	1	20 A	Floor Box Recepts- Rm C1034	12
13	Hand Dryer - Rm C1033	20 A	1	1500	900					1	20 A	Floor Box & Recepts- Rm C1034	14
15	Hand Dryer - Rm C1033	20 A	1			1500	1080			1	20 A	Floor Box Recepts- Rm C1034	16
17	Auto. Flush Valves - Rms C1032 & C1033	20 A	1					1200	1080	1	20 A	Floor Box & Recepts- Rm C1034	18
19	Elec. Water Cooler 'EWC-1' - Rm C1031	20 A	1	700	1080					1	20 A	Floor Box Recepts- Rm C1034	20
21	Recepts - Rms C1031, C1036 & Exterior	20 A	1			900	900			1	20 A	Floor Box & Recepts- Rm C1034	22
23	Recepts - Rms C1023C, C1030, C1031 & C1035	20 A	1					720	1080	1	20 A	Floor Box Recepts- Rm C1034	24
25	Garbage Disposal 'WD-1' - Rm C1030	20 A	1	1656	900					1	20 A	Floor Box & Recepts- Rm C1034	26
27	Refrig - Rm C1030	20 A	1			1000	720			1	20 A	Receptacle TRAINING ROOM C1034	28
29	Micro - Rm C1030	20 A	1					1200	900	1	20 A	Receptacle TRAINING ROOM C1034	30
31	Recepts - Rm C1029	20 A	1	900	360					1	20 A	Recepts - Rm C1030	32
33	Recepts - Rms C1027 & C1029	20 A	1			1080	900			1	20 A	Recepts - Rm C1030 & Exterior	34
35	Recepts - Rms C1027	20 A	1					1080	900	1	20 A	Recepts - Rm C1030 & Exterior	36
37	Recepts - Rms C1027	20 A	1	1080	1080					1	20 A	Recepts - Rm C1028	38
39	Recepts - Rms C1027	20 A	1			900	1080			1	20 A	Recepts - Rm C1028	40
41	Recepts - Rms C1027	20 A	1					900	1080	1	20 A	Recepts - Rm C1028 & Exterior	42
43	SPARE	20 A	1	0	900					1	20 A	Recepts - Rm C1023C & C1028	44
45	SPARE	20 A	1			0	876			1	20 A	Exhaust Fan 'EF-1' - on Roof	46
47	SPARE	20 A	1					0	0	1	20 A	Time Clock 'TC1' - Rm C1053	48
49	Panel 'E1PB'	200 A	3	18064	0					3	60 A	Surge Protective Deivce 'SPD-E1PA'	50
51	--	--	--			15996	0			--	--	--	52
53	--	--	--					17660	0	--	--	--	54
			Total Load:	31280 VA		29332 VA		30380 VA					
			Total Amps:	262 A		244 A		255 A					

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
HVAC	11200 VA	100.00%	11200 VA		
Motor	9704 VA	110.72%	10744 VA	Total Conn. Load:	90992 VA
Other	4160 VA	100.00%	4160 VA	Total Est. Demand:	65643 VA
Receptacle	48380 VA	60.33%	29190 VA	Total Conn. Current:	253 A
Heating	528 VA	100.00%	528 VA	Total Est. Demand Current:	182 A
Misc.	9820 VA	100.00%	9820 VA		
Misc. Non-Continuous	7200 VA	0.01%	1 VA		

Notes:

Branch Panel: E1PB

Location: MECHANICAL C1053 | Supply From: E1PA | Mounting: Surface | Enclosure: 1
Volts: 120/208 Wye | Phases: 3 | Wires: 4
A.I.C. Rating: 10k AIC | Mains Type: MLO | Mains Rating: 250 A

Notes:
NEW SURFACE MOUNTED PANEL.

CKT	Circuit Description	Trip	Poles	A		B		C		Poles	Trip	Circuit Description	CKT
1	SPARE	20 A	1	0	0					1	20 A	SPARE	2
3	SPARE	20 A	1			0	0			1	20 A	SPARE	4
5	SPARE	20 A	1					0	0	1	20 A	SPARE	6
7	Portable Welder - Rm C1056B	30 A	2	0	900					1	20 A	Recepts - Rms C1047, C1051	8
9	--	--	--			0	1260			1	20 A	Recepts - Rm C1047C	10
11	Recepts - Rms C1056, C1056B & C1057	20 A	1					1080	1080	1	20 A	Recepts - Rm C1047	12
13	Recepts - Rm C1056	20 A	1	900	1000					1	20 A	Refrig - Rm C1047	14
15	Air Compressor Recept - Rm C1056	20 A	1			1000	1000			1	20 A	Refrig - Rm C1047	16
17	Recepts - Rms C1049 & C1057	20 A	1					900	1000	1	20 A	Refrig - Rm C1047	18
19	Recepts - Rm C1049	20 A	1	900	1000					1	20 A	Refrig - Rm C1047	20
21	Refrig - Rm C1049	20 A	1			1000	1080			1	20 A	Recepts - Rms C1045, C1047 & C1085	22
23	Recepts - Rms C1049, C1050 & C1052A	20 A	1					900	720	1	20 A	Recepts - Rms C1047 & C1052A	24
25	Recepts - Rm C1055	20 A	1	1260	840					1	20 A	Fume Hood - Rm C1047	26
27	Hot Water Unit Heater 'HUH-2' - Rm C1052	20 A	1			264	1080			1	20 A	Floor Boxes - Rm C1047	28
29	Recepts - Rm C1052 & Exterior	20 A	1					1080	720	1	20 A	Recepts - Rms C1047 & C1052A	30
31	Hot Water Unit Heater 'HUH-1' - Rm C1052	20 A	1	264	900					1	20 A	Recepts - Rms C1052A, C1054 & C1082	32
33	Water Softener 'WS-1' and Recepts - Rm C1053	20 A	1			900	960			1	20 A	Chiller 'CH-1 Receptacles - Exterior	34
35	Gas Water Heater 'WH-1' - Rm C1053	20 A	1					1080	960	1	20 A	Chiller 'CH-2' Receptacles - Exterior	36
37	Gas Water Heater 'WH-2' - Rm C1053	20 A	1	1080	0					1	20 A	Remote Evaporator 'REV-1' - Rm C1053	38
39	Gas Water Heater 'WH-3' - Rm C1053	20 A	1			1080	0			1	20 A	Remote Evaporator 'REV-2' - Rm C1053	40
41	Future Gas Water Hater 'WH-FTR' - Rm C1053	20 A	1					0	0	1	20 A	Future Remote Evaporator 'REV-FTR' - Rm C1053	42
43	Mixing Valve and Recepts - Rm C1053	20 A	1	900	372					1	20 A	Fan Coil Unit 'FCU-14' - Rm C1053	44
45	Recept & Trap Primer 'TP-1' - Rm C1053	20 A	1			548	372			1	20 A	Fan Coil Unit 'FCU-13' - Rm C1053	46
47	Recepts - Rm C1053	20 A	1					540	548	1	20 A	Recepts & Trap Primer 'TP-2' - Rm C1053	48
49	Exhaust Fan 'EF-4' - on Roof	20 A	1	492	696					1	20 A	Exhaust Fan 'EF-9' - on Roof	50
51	Exhaust Fan 'EF-7' - on Roof	20 A	1			1356	696			1	20 A	Exhaust Fan 'EF-10' - on Roof	52
53	Exhaust Fan 'EF-2' - on Roof	20 A	1					492	2080	2	30 A	Reverse Osmosis Smart Guard 'RO-1' - Rm C1053	54
55	Future Boiler 'B-FTR' - Rm C1053	20 A	3	0	2080					--	--	--	56
57	--	--	--			0	1000			1	20 A	RO Backwashing Tank/Head - Rm C1053	58
59	--	--	--					0	2080	2	30 A	Station Battery Charger - Rm C1053	60
61	Boiler 'B-1' - Rm C1053	20 A	3	1200	2080					--	--	--	62
63	--	--	--			1200	0			1	20 A	CCTV Enclosure - Employee Parking Lot	64
65	--	--	--					1200	0	1	20 A	CCTV Enclosure - Employee Parking Lot	66
67	Boiler 'B-2' - Rm C1053	20 A	3	1200	0					3	60 A	Surge Protective Device 'SPD-E1PB'	68
69	--	--	--			1200	0			--	--	--	70
71	--	--	--					1200	0	--	--	--	72
			Total Load:	18064 VA		15996 VA		17660 VA					
			Total Amps:	153 A		133 A		149 A					

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
HVAC	11200 VA	100.00%	11200 VA		
Motor	7352 VA	114.15%	8392 VA	Total Conn. Load:	51720 VA
Other	4160 VA	100.00%	4160 VA	Total Est. Demand:	46980 VA
Receptacle	21560 VA	73.19%	15780 VA	Total Conn. Current:	144 A
Heating	528 VA	100.00%	528 VA	Total Est. Demand Current:	130 A
Misc.	6920 VA	100.00%	6920 VA		

Notes:

Branch Panel: E1HB

Location: | Supply From: ODPA | Mounting: Surface | Enclosure: 1
Volts: 480/277 Wye | Phases: 3 | Wires: 4
A.I.C. Rating: 42k AIC | Mains Type: MLO | Mains Rating: 250 A

Notes:
NEW SURFACE MOUNTED PANEL.

CKT	Circuit Description	Trip	Poles	A (VA)		B (VA)		C (VA)		Poles	Trip	Circuit Description	CKT
1	SPARE	20 A	1	0	0					1	20 A	SPARE	2
3	SPARE	20 A	1			0	0			1	20 A	SPARE	4
5	SPARE	20 A	1					0	0	1	20 A	SPARE	6
7	Fan Powered VAV Box 'FPV-1-02' - Rm B1001	20 A	1	2715	0					--	--	SPACE	8
9	Lighting - Area C North Offices	20 A	1			3158	0			--	--	SPACE	10
11	Lighting - Training Room C1034	20 A	1					4032	0	--	--	SPACE	12
13	Lighting - Fitness C1028, Area C Central	20 A	1	2993	0					--	--	SPACE	14
15	Lighting - Area C West	20 A	1			1905	0			--	--	SPACE	16
17	SPARE	20 A	1					0	0	--	--	SPACE	18
19	SPACE	--	--	0	0					--	--	SPACE	20
21	SPACE	--	--			0	0			--	--	SPACE	22
23	SPACE	--	--					0	0	--	--	SPACE	24
25	SPACE	--	--	0	25756					3	70 A	Panels 'E1PC' & 'E1PD' via Transformer 'TR-1B'	26
27	SPACE	--	--			0	26020			--	--	--	28
29	SPACE	--	--					0	25507	--	--	--	30
			Total Load:	31329 VA		30893 VA		29539 VA					
			Total Amps:	114 A		112 A		107 A					

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
HVAC	3298 VA	100.00%	3298 VA		
Lighting	12034 VA	100.00%	12034 VA	Total Conn. Load:	91725 VA
Motor	1104 VA	117.93%	1302 VA	Total Est. Demand:	60724 VA
Other	0 VA	0.00%	0 VA	Total Conn. Current:	110 A
Receptacle	55260 VA	59.05%	32630 VA	Total Est. Demand Current:	73 A
Cooling	1830 VA	100.00%	1830 VA		
Misc.	10000 VA	100.00%	10000 VA		
Misc. Non-Continuous	8600 VA	0.01%	1 VA		

Notes:

Branch Panel: E1PC

Location: | Supply From: TR-1C | Mounting: Surface | Enclosure: 1
Volts: 120/208 Wye | Phases: 3 | Wires: 4
A.I.C. Rating: 10k AIC | Mains Type: MCB | Mains Rating: 175 A | MCB Rating: 175 A

Notes:
NEW SURFACE MOUNTED PANEL.

CKT	Circuit Description	Trip	Poles	A		B		C		Poles	Trip	Circuit Description	CKT
1	SPARE	20 A	1	0	0					1	20 A	SPARE	2
3	SPARE	20 A	1			0	0			1	20 A	SPARE	4
5	SPARE	20 A	1					0	0	1	20 A	SPARE	6
7	Recepts - Rms C1004 & C1005	20 A	1	900	1000					1	20 A	Kiosk - Rm B1000	8
9	Recepts - Rm C1001	20 A	1			900	1000			1	20 A	Kiosk - Rm B1000	10
11	Recepts - Rms C1000 & C1001	20 A	1					900	1000	1	20 A	Kiosk - Rm B1000	12
13	Recepts - Rms C1001 & C1002	20 A	1	900	1000					1	20 A	Kiosk - Rm B1000	14
15	Receptacle SEX OFFENDER AND EVICTION...	20 A	1			540	720			1	20 A	Recepts - Rms B1000, B1001 & Exterior	16
17	Recepts - Rms C1044 & C1045	20 A	1					540	1080	1	20 A	Recepts - Rms B1003	18
19	Recepts - Rm C1002	20 A	1	900	1080					1	20 A	Recepts - Rms B1003	20
21	Recepts - Rm B1001 & B1017	20 A	1			1000	1080			1	20 A	Recepts - Rms B1003, B1004 & B1005	22
23	Hand Dryer - Rm B1017	20 A	1					1500	900	1	20 A	Recepts - Rm B1002 & B1006	24
25	Recepts - Rms B1001 & B1013	20 A	1	900	700					1	20 A	Elec. Water Cooler 'EWC-1' - Rm B1002	26
27	Recepts - Rms B1010, B1011 & B1012	20 A	1			1080	1000			1	20 A	*,Vending Machine - Rm B1002	28
29	Recepts - Rms B1008 & B1009	20 A	1					900	1000	1	20 A	*,Vending Machine - Rm B1002	30
31	Recept - Rm B1007 and Flush Valves	20 A	1	1160	915					2	30 A	Air Cooled Cond. Unit 'ACC-C' - on Roof	32
33	Hand Dryer - Rm B1008	20 A	1			1500	915			--	--	--	34
35	Hand Dryer - Rm B1008	20 A	1					1500	312	1	20 A	Exhaust Fan 'EF-5' - on Roof	36
37	Hand Dryer - Rm B1009	20 A	1	1500	225					1	20 A	Track Lighting Corridor C1031	38
39	Hand Dryer - Rm B1009	20 A	1			1500	525			1	20 A	Lighting	40
41	Auto Doors - Doors 'B100B' & 'B1000D'	20 A	1					792	0	1	20 A	SPARE	42
43	SPARE	20 A	1	0	0					1	20 A	SPARE	44
45	SPARE	20 A	1			0	0			1	20 A	SPARE	46
47	SPARE	20 A	1					0	0	1	20 A	SPARE	48
49	Panel 'E1PD'	200 A	3	14800	0					3	60 A	Surge Protective Deivce 'SPD-E1PC'	50
51	--	--	--			14780	0			--	--	--	52
53	--	--	--					15083	0	--	--	--	54
			Total Load:	25756 VA		26020 VA		25507 VA					
			Total Amps:	215 A		217 A		213 A					

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
HVAC	583 VA	100.00%	583 VA		
Lighting	750 VA	100.00%	750 VA	Total Conn. Load:	77281 VA
Motor	1104 VA	117.93%	1302 VA	Total Est. Demand:	46352 VA
Other	0 VA	0.00%	0 VA	Total Conn. Current:	215 A
Receptacle	55260 VA	59.05%	32630 VA	Total Est. Demand Current:	129 A
Cooling	1830 VA	100.00%	1830 VA		
Misc.	10000 VA	100.00%	10000 VA		
Misc. Non-Continuous	8500 VA	0.01%	1 VA		

Notes:
* - PROVIDE GROUND FAULT CURRENT INTERRUPTING (GFCI) BREAKER

Branch Panel: E1PD

Location: | Supply From: E1PC | Mounting: Surface | Enclosure: 1
Volts: 120/208 Wye | Phases: 3 | Wires: 4
A.I.C. Rating: 10k AIC | Mains Type: MLO | Mains Rating: 250 A

Notes:
NEW SURFACE MOUNTED PANEL.

CKT	Circuit Description	Trip	Poles	A		B		C		Poles	Trip	Circuit Description	CKT
1	SPARE	20 A	1	0	0					1	20 A	SPARE	2
3	SPARE	20 A	1			0	0			1	20 A	SPARE	4
5	SPARE	20 A	1					0	0	1	20 A	SPARE	6
7	Recepts - Rm C1043	20 A	1	900	900					1	20 A	Recepts - Rm B1001 & C1000	8
9	Recepts - Rm C1006, C1037 & C1043	20 A	1			720	900			1	20 A	Recepts - Rm B1001 & C1000	10
11	Recepts - C1006 & C1037	20 A	1					900	1080	1	20 A	Recepts - Rm C1014	12
13	Recepts - C1003 & C1007	20 A	1	900	720					1	20 A	Recepts - Rms C1003 & C1014	14
15	Recepts - Rms C1003, C1007 & C1039	20 A	1			720	900			1	20 A	Recepts - Rms C1009 & C1014	16
17	Recepts - Rms C1009 & C1012	20 A	1					1080	900	1	20 A	Recepts - Rm C1014	18
19	Recepts - C1008 & C1038	20 A	1	1080	900					1	20 A	Receptacle WORK ROOM C1013	20
21	Refrig - Rm C1008A	20 A	1			1000	900			1	20 A	Receptacle WORK ROOM C1013	22
23	Recepts - Rms C1008A, C1023B, C1024 & C1033	20 A	1					900	1000	1	20 A	Copier - Rm C1013	24
25	Recepts - Rms C1025 & C1026	20 A	1	1020	1000					1	20 A	Refrig - Rm C1015	26
27	Recepts - Rm C1022	20 A	1			1080	1260			1	20 A	Recepts - Rm C1015	28
29	Recepts - Rm C1022	20 A	1					1080	1080	1	20 A	Recepts - Rm C1015	30
31	Recepts - Rm C1022	20 A	1	1080	900					1	20 A	Recepts - Rms C1016	32
33	Recepts - C1009 & C1022	20 A	1			900	1000			1	20 A	Recepts - Rms C1016 & C1017	34
35	Recepts - Rm C1021	20 A	1					1080	900	1	20 A	Recepts - Rms C1016	36
37	Recepts - Rm C1021	20 A	1	1080	1260					1	20 A	Recepts - Rms C1010 & C1018	38
39	Recepts - Rm C1021	20 A	1			1080	1260			1	20 A	Recepts - Rms C1018 & C1010	40
41	Recepts - Rms C1020 & C1021	20 A	1					1080	1260	1	20 A	Floor Box & Recepts - Rm C1040	42
43	Recepts - Rm C1020	20 A	1	1080	1080					1	20 A	Floor Box Recepts - Rm C1040	44
45	Recepts - Rm C1019	20 A	1			720	1080			1	20 A	Floor Box Recepts - Rm C1040	46
47	Recepts - Rms C1009 & C1019	20 A	1					1080	1080	1	20 A	Recepts - Rms C1040 & C1054	48
49	Surge Protective Device 'SPD-E1PD'	60 A	3	0	900					1	20 A	Recepts - Rms C1040 & C1041	50
51	--	--	--			0	1260			1	20 A	Recepts - Rm C1048	52
53	--	--	--					0	583	1	20 A	Fan Coil Unit 'FCU-15' - Rm B1000	54
			Total Load:	14800 VA		14780 VA		15083 VA					
			Total Amps:	123 A		123 A		126 A					

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
HVAC	583 VA	100.00%	583 VA		
Receptacle	40680 VA	62.29%	25340 VA	Total Conn. Load:	44663 VA
Misc.	2400 VA	100.00%	2400 VA	Total Est. Demand:	28323 VA
Misc. Non-Continuous	1000 VA	0.01%	0 VA	Total Conn. Current:	124 A
				Total Est. Demand Current:	79 A

Notes:

DLZ
ARCHITECTURE • ENGINEERING • PLANNING
SURVEYING • CONSTRUCTION SERVICES
DLZ INDIANA, LLC

MARVIN L. HITCHCOCK
REGISTERED
STATE OF INDIANA
PROFESSIONAL ENGINEER

NO.	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: RDW CHK'D: MLH
DESIGNED: RDW
APPR'VD: MLH
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER
1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

PANELBOARD SCHEDULES

DRAWING NUMBER
E-702
ELECTRICAL

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9/11/2019 4:21:02 PM

Branch Panel: E2HA

Location: ELECTRICAL B1024
Supply From: ODPA
Mounting: Surface
Enclosure: 1

Volts: 480/277 Wye
Phases: 3
Wires: 4

A.I.C. Rating: 42k AIC
Mains Type: MLO
Mains Rating: 250 A

Notes:
NEW SURFACE MOUNTED PANEL.

CKT	Circuit Description	Trip	Poles	A	B	C	Poles	Trip	Circuit Description	CKT
1	SPARE	20 A	1	0 0			1	20 A	SPARE	2
3	SPARE	20 A	1		0 0		1	20 A	SPARE	4
5	SPARE	20 A	1			0 0	1	20 A	SPARE	6
7	Fan Powered Box 'FPV-2-04' - Rm B1029	20 A	1	886 637			1	20 A	Fan Powered Box 'FPV-2-07' - Rm B1053	8
9	Fan Powered Box 'FPV-2-03' - Rm B1053	20 A	1		895 637		1	20 A	Fan Powered Box 'FPV-2-02'- Rm B1061	10
11	Fan Powered Box 'FPV-2-08' - Cell B1044	20 A	1			637 2909	1	20 A	Air Cooled Condensing Unit 'ACC-2' - on Roof	12
13	Computer Room Unit 'CRAC-2' - Rm C1046	20 A	1	4543 1497			1	20 A	Lighting - Intake Center, Dynamo B1032	14
15	Lighting - Intake Center Cells	20 A	1		1350 2041		1	20 A	Lighting - Lobby, Visitor Mgmt. Cntr., Main Corridor	16
17	Lighting - Pretrial Offices, Transp, Detox, Testing	20 A	1			2358 282	1	20 A	Exterior Wall Mounted - Area B	18
19	Air Cooled Condensing Unit 'ACC-4' - on Roof	20 A	3	2853 315			1	20 A	Exterior Flagpole & Sign Lighting	20
21	--	--	--		2853 909		1	20 A	Exterior Area/Drive Lighting - North	22
23	--	--	--			2853 944	1	20 A	Exterior Area/Drive Lighting - Visitor Parking	24
25	Computer Room Unit 'CRAC-1' - Rm B1060	30 A	3	5817 0			--	--	SPACE	26
27	--	--	--		5817 0		--	--	SPACE	28
29	--	--	--			5817 0	--	--	SPACE	30
31	SPACE	--	--	0 0			--	--	SPACE	32
33	SPACE	--	--		0 0		--	--	SPACE	34
35	SPACE	--	--			0 0	--	--	SPACE	36
37	SPACE	--	--	0 15747			3	70 A	Panels 'E2PA' & 'E2PB' via Transformer 'TR-2A'	38
39	SPACE	--	--		0 16147		--	--	--	40
41	SPACE	--	--			0 13748	--	--	--	42
		Total Load:		32161 VA	30511 VA	29401 VA				
		Total Amps:		117 A	111 A	106 A				

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
HVAC	3692 VA	100.00%	3692 VA		
Lighting	9599 VA	100.00%	9599 VA	**Total Conn. Load:**	92071 VA
Motor	2772 VA	103.57%	2871 VA	**Total Est. Demand:**	75559 VA
Other	0 VA	0.00%	0 VA	**Total Conn. Current:**	111 A
Receptacle	30440 VA	66.43%	20220 VA	**Total Est. Demand Current:**	91 A
Cooling	35292 VA	100.00%	35292 VA		
Heating	1500 VA	100.00%	1500 VA		
Misc.	2700 VA	100.00%	2700 VA		
Misc. Non-Continuous	6400 VA	0.01%	1 VA		

Notes:

Branch Panel: E2PA

Location: ELECTRICAL B1024
Supply From: TR-2A...
Mounting: Surface
Enclosure: 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating: 10k AIC
Mains Type: MCB
Mains Rating: 250 A
MCB Rating: 175 A

Notes:
NEW SURFACE MOUNTED PANEL.

CKT	Circuit Description	Trip	Poles	A (VA)	B (VA)	C (VA)	Poles	Trip	Circuit Description	CKT
1	SPARE	20 A	1	0 0			1	20 A	SPARE	2
3	SPARE	20 A	1		0 0		1	20 A	SPARE	4
5	SPARE	20 A	1			0 0	1	20 A	SPARE	6
7	Receipts - Rms B1024 & B1025	20 A	1	900 900			1	20 A	Receipts - Rms B1084, B1085 & Exterior	8
9	Receipts - Rms B1029 & B1031	20 A	1		820 900		1	20 A	Receipts - Rm B1053 (Chases)	10
11	Receipts - Rms B1026 & B1027	20 A	1			740 1120	1	20 A	Receipts - Rms B1075 & B1076	12
13	Sliding Door 'B1029'	20 A	1	396 1000			1	20 A	Refrig- Rm B1074	14
15	Receipts - Rms B1037 & B1038	20 A	1		540 1200		1	20 A	Micro- Rm B1074	16
17	Receipts - Rm B1038	20 A	1			360 1000	1	20 A	Copier - Rm B1074	18
19	Body Scanner - Rm B1035	20 A	1	1100 720			1	20 A	Receipts - Rm B1074	20
21	Receipts - Rm B1035	20 A	1		720 1260		1	20 A	Receipts - Rm B1073	22
23	Sliding Door 'B1015B'	20 A	1			396 1260	1	20 A	Receipts - Rm B1072	24
25	Sliding Door 'B1019'	20 A	1	396 1260			1	20 A	Receipts - Rm B1071	26
27	Sliding Door 'B1018'	20 A	1		396 1260		1	20 A	Receipts - Rm B1070	28
29	Sliding Door 'B1015A'	20 A	1			396 900	1	20 A	Receipts - Rm B1062, B1067, B1068 & B1069	30
31	Receipts - Rm B1015 & B1018	20 A	1	720 915			2	30 A	Air Cooled Cond. Unit 'ACC-A' - on Roof	32
33	Receipts - Rm B1018	20 A	1		540 915		--	--	--	34
35	Time Clock 'TC2' - Rm B1024	20 A	1			0 0	1	20 A	Area B - Cell Valve Controllers	36
37	Panel 'E2PB'	200 A	3	7440 0			3	60 A	Surge Protective Device 'SPD-E2PA'	38
39	--	--	--		7596 0		--	--	--	40
41	--	--	--			7576 0	--	--	--	42
		Total Load:		15747 VA	16147 VA	13748 VA				
		Total Amps:		134 A	137 A	115 A				

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Motor	2772 VA	103.57%	2871 VA		
Receptacle	30440 VA	66.43%	20220 VA	**Total Conn. Load:**	45642 VA
Cooling	1830 VA	100.00%	1830 VA	**Total Est. Demand:**	29122 VA
Heating	1500 VA	100.00%	1500 VA	**Total Conn. Current:**	127 A
Misc.	2700 VA	100.00%	2700 VA	**Total Est. Demand Current:**	81 A
Misc. Non-Continuous	6400 VA	0.01%	1 VA		

Notes:

Branch Panel: E2PB

Location: ELECTRICAL B1024
Supply From: E2PA
Mounting: Surface
Enclosure: 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating: 10k AIC
Mains Type: MLO
Mains Rating: 200 A

Notes:
NEW SURFACE MOUNTED PANEL.

CKT	Circuit Description	Trip	Poles	A (VA)	B (VA)	C (VA)	Poles	Trip	Circuit Description	CKT
1	SPARE	20 A	1	0 0			1	20 A	SPARE	2
3	SPARE	20 A	1		0 0		1	20 A	SPARE	4
5	SPARE	20 A	1			0 0	1	20 A	SPARE	6
7	Recepts - Rm B1053A	20 A	1	540 540			1	20 A	Recepts - Rm B1053A	8
9	Recepts - Rm B1053A	20 A	1		720 540		1	20 A	Recepts - Rm B1053A	10
11	Recepts - Rm B1053A	20 A	1			540 540	1	20 A	Recepts - Rm B1053A	12
13	Recepts - Rm B1053A	20 A	1	540 540			1	20 A	Recepts - Rm B1053A	14
15	Recepts - Rm B1053A	20 A	1		540 540		1	20 A	Recepts - Rm B1053A	16
17	Recepts - Rm B1053	20 A	1			900 900	1	20 A	Recepts - Rm B1053	18
19	Recepts - Rm B1053	20 A	1	1080 1080			1	20 A	Recepts - Rms B1055 & B1058	20
21	Recepts - Rms B1062 & B1063	20 A	1		720 396		1	20 A	Sliding Door 'B1055B'	22
23	Sliding Door 'B1063B'	20 A	1			396 1080	1	20 A	Recepts - Rms B1055 & B1057	24
25	Recepts - Rms B1135 & B1064	20 A	1	720 900			1	20 A	Recepts - Rm B1056	26
27	Recepts - Rm B1064	20 A	1		720 720		1	20 A	Recepts - Rms B1055 & B1060	28
29	Elec. Wall Heater 'EWH-2' - Rm B1063	20 A	1			1500 720	1	20 A	Recepts - Rm B1060	30
31	Area B - Cell Valve Controllers	20 A	1	0 1500			1	20 A	Hand Dryer - Rm B1066	32
33	Micro - Rm B1016	20 A	1		1200 1500		1	20 A	Hand Dryer - Rm B1065	34
35	Refrig - Rm B1016	20 A	1			1000 0	1	20 A	SPARE	36
37	CCTV Enclosure - Visitor Parking Lot	20 A	1	0 0			3	60 A	Surge Protective Device 'SPD-E2PB'	38
39	CCTV Enclosure - Visitor Parking Lot	20 A	1		0 0		--	--	--	40
41	SPARE	20 A	1			0 0	--	--	--	42
		Total Load:		7440 VA	7596 VA	7576 VA				
		Total Amps:		62 A	63 A	63 A				

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Motor	792 VA	112.50%	891 VA		
Receptacle	15120 VA	83.07%	12560 VA	**Total Conn. Load:**	22612 VA
Heating	1500 VA	100.00%	1500 VA	**Total Est. Demand:**	15951 VA
Misc.	1000 VA	100.00%	1000 VA	**Total Conn. Current:**	63 A
Misc. Non-Continuous	4200 VA	0.01%	0 VA	**Total Est. Demand Current:**	44 A

Notes:

Branch Panel: E2HB

Location: ELECTRICAL B1028
Supply From: ODPB
Mounting: Surface
Enclosure: 1

Volts: 480/277 Wye
Phases: 3
Wires: 4

A.I.C. Rating: 42k AIC
Mains Type: MLO
Mains Rating: 250 A

Notes:
NEW SURFACE MOUNTED PANEL.

CKT	Circuit Description	Trip	Poles	A	B	C	Poles	Trip	Circuit Description	CKT
1	SPARE	20 A	1	0 0			--	--	--	2
3	SPARE	20 A	1		0 0		1	20 A	SPARE	4
5	SPARE	20 A	1			0 3096	--	--	--	6
7	Fan Powered VAV Box 'FPV-2-12' - Rm B1121	20 A	1	609 5014			3	30 A	Air Cooled Condensing Unit 'ACC-3' - on Roof	8
9	Fan Powered VAV Box 'FPV-2-09' - Cell B1118	20 A	1		609 5014		--	--	--	10
11	Lighting - Medical Services, Medical Dayrooms	20 A	1			2394 5014	--	--	--	12
13	Lighting - Medical Center Cells	20 A	1	850 5817			3	30 A	Computer Room Unit 'CRAC-1' - Rm C1079	14
15	Lighting - Medical Records, Inmate Storage,...	20 A	1		1355 5817		--	--	--	16
17	SPARE	20 A	1			0 5817	--	--	--	18
19	SPACE	--	--	0 0			--	--	SPACE	20
21	SPACE	--	--		0 0		--	--	SPACE	22
23	SPACE	--	--			0 0	--	--	SPACE	24
25	SPACE	--	--	0 0			--	--	SPACE	26
27	SPACE	--	--		0 0		--	--	SPACE	28
29	SPACE	--	--			0 0	--	--	SPACE	30
31	SPACE	--	--	0 3960			3	30 A	Panel 'E2PE' via Transformer 'TR-2E'	32
33	SPACE	--	--		0 2916		--	--	--	34
35	SPACE	--	--			0 3096	--	--	--	36
37	Panels 'E2PC' via Transformer 'TR-2C'	50 A	3	9508 8256			3	50 A	Panels 'E2PD' via Transformer 'TR-2D'	38
39	--	--	--		10448 7995		--	--	--	40
41	--	--	--			9936 7995	--	--	--	42
		Total Load:		34014 VA	34094 VA	34133 VA				
		Total Amps:		123 A	123 A	123 A				

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
HVAC	1218 VA	100.00%	1218 VA		
Lighting	4564 VA	100.00%	4564 VA	**Total Conn. Load:**	102237 VA
Motor	2376 VA	104.17%	2475 VA	**Total Est. Demand:**	85607 VA
Receptacle	41060 VA	62.18%	25530 VA	**Total Conn. Current:**	123 A
Cooling	34322 VA	100.00%	34322 VA	**Total Est. Demand Current:**	103 A
Electric Clothes Dryer	4800 VA	100.00%	4800 VA		
Equipment	6000 VA	100.00%	6000 VA		
Misc.	6844 VA	100.00%	6844 VA		
Misc. Non-Continuous	1200 VA	0.01%	0 VA		

Notes:

Branch Panel: E2PC

Location: ELECTRICAL B1028
Supply From: TR-2C
Mounting: Surface
Enclosure: 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating: 10k AIC
Mains Type: MCB
Mains Rating: 125 A
MCB Rating: 110 A

Notes:
NEW SURFACE MOUNTED PANEL.

CKT	Circuit Description	Trip	Poles	A (VA)	B (VA)	C (VA)	Poles	Trip	Circuit Description	CKT
1	SPARE	20 A	1	0 0			1	20 A	SPARE	2
3	SPARE	20 A	1		0 0		1	20 A	SPARE	4
5	SPARE	20 A	1			0 0	1	20 A	SPARE	6
7	Recepts - Rm B1133	20 A	1	1080 1080			1	20 A	Recepts - Rm B1032	8
9	Recepts - Rm B1133	20 A	1		1080 1080		1	20 A	Recepts - Rms B1025, B1030 & B1032	10
11	Recepts - Rm B1133	20 A	1			1080 1080	1	20 A	Recepts - Rm B1043	12
13	Recepts - Rms B1131 & B1132	20 A	1	1080 1872			2	30 A	Guardian - Rm B1043	14
15	Recepts - Rms B1122 & B1130	20 A	1		900 1872		--	--	--	16
17	Recepts - Rms B1129	20 A	1			900 1000	1	20 A	Guardian - Rm B1043	18
19	Micro - Rm B1124	20 A	1	1200 900			1	20 A	Recepts - Rm B1128	20
21	Refrig - Rm B1124	20 A	1		1000 820		1	20 A	Recepts - Rms B1121, B1122 & B1125	22
23	Refrig - Rm B1124	20 A	1			1000 1080	1	20 A	Recepts - Rms B1126, B1127 & B1128	24
25	Recepts - Rms B1122 & B1124	20 A	1	900 1000			1	20 A	Washer - Rm B1043	26
27	Recepts - Rms B1123 & B1124	20 A	1		900 2400		2	30 A	Electric Clothes Dryer - Rm B1043	28
29	Refrig - Rm B1123	20 A	1			1000 2400	--	--	--	30
31	Area B - Cell Valve Controllers	20 A	1	0 396			1	20 A	Sliding Door 'B1121A'	32
33	SPARE	20 A	1		0 396		1	20 A	Sliding Door 'B1121C'	34
35	SPARE	20 A	1			0 396	1	20 A	Sliding Door 'B1121B'	36
37	SPACE	--	--	0 0			3	60 A	Surge Protective Device 'SPD-E2PC'	38
39	SPACE	--	--		0 0		--	--	--	40
41	SPACE	--	--			0 0	--	--	--	42
		Total Load:		9508 VA	10448 VA	9936 VA				
		Total Amps:		79 A	88 A	83 A				

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Motor	1188 VA	108.33%	1287 VA		
Receptacle	15860 VA	81.53%	12930 VA	**Total Conn. Load:**	29892 VA
Electric Clothes Dryer	4800 VA	100.00%	4800 VA	**Total Est. Demand:**	25861 VA
Misc.	6844 VA	100.00%	6844 VA	**Total Conn. Current:**	83 A
Misc. Non-Continuous	1200 VA	0.01%	0 VA	**Total Est. Demand Current:**	72 A

Notes:

Branch Panel: E2PD

Location: ELECTRICAL B1028
Supply From: TR-2D
Mounting: Surface
Enclosure: 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating: 10k AIC
Mains Type: MCB
Mains Rating: 125 A
MCB Rating: 110 A

Notes:
NEW SURFACE MOUNTED PANEL.

CKT	Circuit Description	Trip	Poles	A (VA)	B (VA)	C (VA)	Poles	Trip	Circuit Description	CKT
1	SPARE	20 A	1	0 0			1	20 A	SPARE	2
3	SPARE	20 A	1		0 0		1	20 A	SPARE	4
5	SPARE	20 A	1			0 0	1	20 A	SPARE	6
7	Recepts - Rm C1080	20 A	1	720 900			1	20 A	Recepts - Rms C1067 & C1071	8
9	Recepts - Rm C1080	20 A	1		720 900		1	20 A	Recepts - Rm C1071	10
11	Recepts - Rm C1078	20 A	1			900 720	1	20 A	Receptacle ATTORNEY C1068	12
13	Recepts - Rm C1077	20 A	1	900 720			1	20 A	Receptacle ATTORNEY C1068	14
15	Recepts - Rms C1025 & C1076	20 A	1		720 720		1	20 A	Recepts - Rm C1069	16
17	Recepts - Rms C1077 & C1078	20 A	1			1080 900	1	20 A	Recepts - Rm C1069	18
19	Recepts - Rms C1073 & C1075	20 A	1	900 720			1	20 A	Recept - Rm C1070	20
21	Recepts - Rms C1073 & C1074	20 A	1		720 900		1	20 A	Recept - Rm C1070	22
23	Recepts - Rms C1072 & C1073	20 A	1			900 1080	1	20 A	Floor Boxes - Rm C1070	24
25	Sliding Door 'B1025'	20 A	1	396 1500			1	20 A	Security Data Rack 'SQE#1' - Rm C1079	26
27	Air Cooled Cond. Unit 'ACC-B' - on Roof	30 A	2		915 1500		1	20 A	Security Data Rack 'SQE#1' - Rm C1079	28
29	--	--	--			915 1500	1	20 A	Security Data Rack 'SQE#1' - Rm C1079	30
31	SPARE	20 A	1	0 1500			1	20 A	Security Data Rack 'SQE#1' - Rm C1079	32
33	SPARE	20 A	1		0 900		1	20 A	Recepts - Rm C1079	34
35	SPARE	20 A	1			0 0	1	20 A	SPARE	36
37	SPACE	--	--	0 0			3	60 A	Surge Protective Deivce 'SPD-E2PD'	38
39	SPACE	--	--		0 0		--	--	--	40
41	SPACE	--	--			0 0	--	--	--	42
		Total Load:		8256 VA	7995 VA	7995 VA				
		Total Amps:		69 A	67 A	67 A				

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Motor	396 VA	125.00%	495 VA		
Receptacle	16020 VA	81.21%	13010 VA	**Total Conn. Load:**	24246 VA
Cooling	1830 VA	100.00%	1830 VA	**Total Est. Demand:**	21335 VA
Equipment	6000 VA	100.00%	6000 VA	**Total Conn. Current:**	67 A
				Total Est. Demand Current:	59 A

Notes:

DLZ
ARCHITECTURE • ENGINEERING • PLANNING
SURVEYING • CONSTRUCTION SERVICES
DLZ INDIANA, LLC

MARVIN L. HITCHCOCK
STATE OF INDIANA
PE001867S
REGISTERED PROFESSIONAL ENGINEER

NO.	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: ROW
DESIGNED: ROW
APPRVD: MLH
DATE: SEPTEMBER 5, 2019
CHKD: MLH
PROJECT NUMBER 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

PANELBOARD SCHEDULES

DRAWING NUMBER
E-703
ELECTRICAL

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Branch Panel: E2PE

Location: JANITOR B1108 **Supply From:** TR-2E **Mounting:** Surface **Enclosure:** 1
Volts: 120/208 Wye **Phases:** 3 **Wires:** 4
A.I.C. Rating: 10k AIC **Mains Type:** MCB **Mains Rating:** 125 A **MCB Rating:** 60 A

Notes:
NEW SURFACE MOUNTED PANEL.

CKT	Circuit Description	Trip	Poles	A		B		C		Poles	Trip	Circuit Description	CKT
1	SPARE	20 A	1	0	0					1	20 A	SPARE	2
3	SPARE	20 A	1			0	0			1	20 A	SPARE	4
5	SPARE	20 A	1					0	0	1	20 A	SPARE	6
7	Recepts - Rm B1096	20 A	1	720	900					1	20 A	Recepts - Male Dayroom Chases	8
9	Recepts - Rm B1096	20 A	1			720	900			1	20 A	Recepts - Cells B1102-B1106	10
11	Recepts - Rms B1094, B1095 & B1096	20 A	1					900	900	1	20 A	Recepts - Cells B1096-B1101	12
13	Recepts - Rms B105, B1108, B1134 & Exterior	20 A	1	1080	1080					1	20 A	Recepts - Rms B1095 & B1112	14
15	Sliding Door 'B1093B'	20 A	1			396	900			1	20 A	Recepts - Female Dayroom Chases	16
17	Sliding Door 'B1093A'	20 A	1					396	900	1	20 A	Recepts - Cells B1114-B1118	18
19	Recept on Roof	20 A	1	180	0					1	20 A	SPARE	20
21	Area B - Cell Valve Controllers	20 A	1			0	0			1	20 A	SPARE	22
23	SPARE	20 A	1					0	0	1	20 A	SPARE	24
25	SPACE	--	--	0	0					3	60 A	Surge Protective Device 'SPD-E2PE'	26
27	SPACE	--	--			0	0			--	--	--	28
29	SPACE	--	--					0	0	--	--	--	30
			Total Load:	3960 VA		2916 VA		3096 VA					
			Total Amps:	33 A		24 A		26 A					

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Motor	792 VA	112.50%	891 VA		
Receptacle	9180 VA	100.00%	9180 VA	Total Conn. Load:	9972 VA
				Total Est. Demand:	10071 VA
				Total Conn. Current:	28 A
				Total Est. Demand Current:	28 A

Notes:

Branch Panel: L1P

Location: ELECTRICAL C1054 **Supply From:** TR-1L **Mounting:** Surface **Enclosure:** 1
Volts: 120/208 Wye **Phases:** 3 **Wires:** 4
A.I.C. Rating: 10k AIC **Mains Type:** MCB **Mains Rating:** 125 A **MCB Rating:** 60 A

Notes:
NEW SURFACE MOUNTED PANEL.

CKT	Circuit Description	Trip	Poles	A (VA)		B (VA)		C (VA)		Poles	Trip	Circuit Description	CKT
1	SPARE	20 A	1	0	0					1	20 A	SPARE	2
3	SPARE	20 A	1			0	0			1	20 A	SPARE	4
5	SPARE	20 A	1					0	0	1	20 A	SPARE	6
7	*, Fire Alarm Control Panel 'FACP-1' - Rm C1054	20 A	1	250	250					1	20 A	Temperature Control Panel - Rm C1053	8
9	*, Fire Alarm Graphic Panel 'FA-GAP' - Rm C1055	20 A	1			250	250			1	20 A	Temperature Control Panel - Rm C1005	10
11	SPARE	20 A	1					0	250	1	20 A	Temperature Control Panel - Rm B1030	12
13	Self Contained Dry Powder System - Rm C1052A	20 A	1	500	0					1	20 A	SPARE	14
15	Self Contained Dry Powder System - Rm C1046	20 A	1			500	0			1	20 A	SPARE	16
17	Self Contained Dry Powder System - Rm B1024	20 A	1					500	0	1	20 A	SPARE	18
19	SPARE	20 A	1	0	0					1	20 A	SPARE	20
21	SPARE	20 A	1			0	0			1	20 A	SPARE	22
23	SPARE	20 A	1					0	0	1	20 A	SPARE	24
25	SPACE	--	--	0	0					3	60 A	Surge Protective Device 'SPD-L1P'	26
27	SPACE	--	--			0	0			--	--	--	28
29	SPACE	--	--					0	0	--	--	--	30
			Total Load:	1000 VA		1000 VA		750 VA					
			Total Amps:	9 A		9 A		6 A					

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Equipment	1500 VA	100.00%	1500 VA		
				Total Conn. Load:	1500 VA
				Total Est. Demand:	1500 VA
				Total Conn. Current:	4 A
				Total Est. Demand Current:	4 A

Notes:
* = PROVIDE RED BREAKER LOCK KIT FOR MAINTAINING BREAKER IN THE CLOSED POSITION.

Branch Panel: U1R

Location: ELECTRICAL B1028 **Supply From:** TR-U1 **Mounting:** Surface **Enclosure:** 1
Volts: 120/208 Wye **Phases:** 3 **Wires:** 4
A.I.C. Rating: 10k AIC **Mains Type:** MCB **Mains Rating:** 250 A **MCB Rating:** 175 A

Notes:
NEW SURFACE MOUNTED PANEL WITH 200% NEUTRAL.

CKT	Circuit Description	Trip	Poles	A		B		C		Poles	Trip	Circuit Description	CKT
1	SPARE	20 A	1	0	0					1	20 A	SPARE	2
3	SPARE	20 A	1			0	0			1	20 A	SPARE	4
5	SPARE	20 A	1					0	0	1	20 A	SPARE	6
7	Floor Box - Rm D1000	20 A	1	540	540					1	20 A	Floor Box - Rm E1000	8
9	Floor Box - Rm D1000	20 A	1			540	540			1	20 A	Floor Box - Rm E1000	10
11	Recepts - Rm D1000	20 A	1					720	720	1	20 A	Recepts - Rm E1000	12
13	Recepts - Rm D1000	20 A	1	360	360					1	20 A	Recepts - Rm E1000	14
15	Security Relay Panel 'SQE#11' - Rm B1028	20 A	1			250	250			1	20 A	Security Relay Panel 'SQE#7a' - Rm B1108	16
17	Recepts - Rm B1096	20 A	1					720	250	1	20 A	Security Relay Panel 'SQE#7b' - Rm B1108	18
19	Security Data Rack 'SQE#1' - Rm C1079	20 A	1	1500	1500					1	20 A	Security Data Rack 'SQE#1' - Rm C1079	20
21	Security Data Rack 'SQE#1' - Rm C1079	20 A	1			1500	1500			1	20 A	Security Data Rack 'SQE#1' - Rm C1079	22
23	Security Data Rack 'SQE#1' - Rm C1079	20 A	1					1500	1500	1	20 A	Security Data Rack 'SQE#1' - Rm C1079	24
25	Security Data Rack 'SQE#1' - Rm C1079	20 A	1	1500	1500					1	20 A	Security Data Rack 'SQE#1' - Rm C1079	26
27	Security Data Rack 'SQE#1' - Rm C1079	20 A	1			1500	1500			1	20 A	Security Data Rack 'SQE#3' - Rm B2001	28
29	Security Data Rack 'SQE#1' - Rm C1079	20 A	1					1500	1500	1	20 A	Security Data Rack 'SQE#3' - Rm B2001	30
31	Security Wall Rack 'SQE#14' - Rm D1014	20 A	1	1500	1500					1	20 A	Security Data Rack 'SQE#3' - Rm B2001	32
33	Security Wall Rack 'SQE#15' - Rm E1014	20 A	1			1500	1500			1	20 A	Security Data Rack 'SQE#3' - Rm B2001	34
35	Security Relay Panel 'SQE#12' - Rm B2000	20 A	1					250	1500	1	20 A	Security Data Rack 'SQE#3' - Rm B2001	36
37	Security Relay Panel 'SQE#9a' - Rm E1016B	20 A	1	250	250					1	20 A	Security Relay Panel 'SQE#8' - Rm D1014	38
39	Security Relay Panel 'SQE#9b' - Rm E1016B	20 A	1			250	1000			1	20 A	IT Cabinet - Rm D1010	40
41	Security Relay Panel 'SQE#10' - Rm E1014	20 A	1					250	1000	1	20 A	IT Cabinet - Rm E1004	42
43	SPACE	--	--	0	1000					1	20 A	IT Cabinet - Rm E1015	44
45	SPACE	--	--			0	1000			1	20 A	IT Cabinet - Rm D1015	46
47	SPACE	--	--					0	0	--	--	SPACE	48
49	SPACE	--	--	0	0					3	60 A	Surge Protective Device 'SPD-U1R'	50
51	SPACE	--	--			0	0			--	--	--	52
53	SPACE	--	--					0	0	--	--	--	54
			Total Load:	12300 VA		12830 VA		11410 VA					
			Total Amps:	104 A		108 A		95 A					

1 (revision mark)

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Receptacle	5040 VA	100.00%	5040 VA		
Equipment	29500 VA	100.00%	29500 VA	Total Conn. Load:	34540 VA
				Total Est. Demand:	34540 VA
				Total Conn. Current:	96 A
				Total Est. Demand Current:	96 A

Notes:

Branch Panel: U2R

Location: ELECTRICAL B1024 **Supply From:** TR-U2... **Mounting:** Surface **Enclosure:** 1
Volts: 120/208 Wye **Phases:** 3 **Wires:** 4
A.I.C. Rating: 10k AIC **Mains Type:** MCB **Mains Rating:** 250 A **MCB Rating:** 175 A

Notes:
NEW SURFACE MOUNTED PANEL WITH 200% NEUTRAL.

CKT	Circuit Description	Trip	Poles	A		B		C		Poles	Trip	Circuit Description	CKT
1	SPARE	20 A	1	0	0					1	20 A	SPARE	2
3	SPARE	20 A	1			0	0			1	20 A	SPARE	4
5	SPARE	20 A	1					0	0	1	20 A	SPARE	6
7	Floor Box - Rm B1016	20 A	1	540	900					1	20 A	Recepts - Rm B1016	8
9	Floor Box - Rm B1016	20 A	1			540	540			1	20 A	Floor Box - Rm B1016	10
11	TV Recepts - Rm B1016	20 A	1					720	540	1	20 A	Floor Box - Rm B1016	12
13	Radio Charging Recept - Rm B1016	20 A	1	360	360					1	20 A	Recepts - Rm B1053A	14
15	Radio Charging Recept - Rm B1016	20 A	1			360	360			1	20 A	Recepts - Rm B1053A	16
17	Radio Charging Recept - Rm B1016	20 A	1					360	360	1	20 A	Recepts - Rm B1053A	18
19	Recepts - Rm B1053A	20 A	1	360	360					1	20 A	Recepts - Rm B1053A	20
21	Recepts - Rm B1053A	20 A	1			360	360			1	20 A	Recepts - Rm B1053A	22
23	Recept - Telephone Terminal Board - Rm B1060	20 A	1					360	360	1	20 A	Recepts - Rm B1053A	24
25	Security Wall Rack 'SQE#4' - Rm C1046	20 A	1	1500	250					1	20 A	Security Relay Panel 'SQE#13' - Rm B1060	26
27	Security Wall Rack 'SQE#5' - Rm B1137	20 A	1			1500	250			1	20 A	Security Relay Panel 'SQE#6a' - Rm B1024	28
29	Security Wall Rack 'SQE#2' - Rm C1104	20 A	1					1500	250	1	20 A	Security Relay Panel 'SQE#6b' - Rm B1024	30
31	Emplyee Parking Lot Camera - Exterior	20 A	1	500	1500					1	20 A	Communication/Data Rack - Rm B1060	32
33	Emplyee Parking Lot Camera - Exterior	20 A	1			500	1500			1	20 A	Communication/Data Rack - Rm B1060	34
35	Emplyee Parking Lot Camera - Exterior	20 A	1					500	1500	1	20 A	Communication/Data Rack - Rm B1060	36
37	Visitor Parking Lot Camera - Exterior	20 A	1	500	1500					1	20 A	Communication/Data Rack - Rm B1060	38
39	Visitor Parking Lot Camera - Exterior	20 A	1			500	1500			1	20 A	Communication/Data Rack - Rm B1060	40
41	Visitor Parking Lot Camera - Exterior	20 A	1					500	1500	1	20 A	Communication/Data Rack - Rm B1060	42
43	Recepts - Rm C1016	20 A	1	360	0					1	20 A	SPARE	44
45	SPARE	20 A	1			0	0			1	20 A	SPARE	46
47	SPARE	20 A	1					0	0	1	20 A	SPARE	48
49	SPACE	--	--	0	0					3	60 A	Surge Protective Device 'SPD-U2R'	50
51	SPACE	--	--			0	0			--	--	--	52
53	SPACE	--	--					0	0	--	--	--	54
			Total Load:	8990 VA		8270 VA		8450 VA					
			Total Amps:	75 A		69 A		71 A					

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Receptacle	8460 VA	100.00%	8460 VA		
Equipment	16500 VA	100.00%	16500 VA	Total Conn. Load:	24960 VA
				Total Est. Demand:	24960 VA
				Total Conn. Current:	69 A
				Total Est. Demand Current:	69 A

Notes:

Branch Panel: L2P

Location: ELECTRICAL B2002 **Supply From:** TR-L2P **Mounting:** Surface **Enclosure:** 1
Volts: 120/208 Wye **Phases:** 3 **Wires:** 4
A.I.C. Rating: 10kA **Mains Type:** MCB **Mains Rating:** 125 A **MCB Rating:** 60 A

Notes:
NEW SURFACE MOUNTED PANEL.

CKT	Circuit Description	Trip	Poles	A (VA)		B (VA)		C (VA)		Poles	Trip	Circuit Description	CKT
1	SPARE	20 A	1	0	0					1	20 A	SPARE	2
3	SPARE	20 A	1			0	0			1	20 A	SPARE	4
5	SPARE	20 A	1					0	0	1	20 A	SPARE	6
7	Self-Contained Dry Powder System - Rm B2002	20 A	1	500	696					1	20 A	Smoke Exhaust Fan 'SEF-2-4' - Roof	8
9	Smoke Exhaust Fan 'SEF-1-3' - Roof	20 A	1			1176	696			1	20 A	Smoke Exhaust Fan 'SEF-2-5' - Roof	10
11	Smoke Exhaust Fan 'SEF-2-3' - Roof	20 A	1					1176	672	1	20 A	*, Vesda Control Panel - Rm E1016	12
13	*, Vesda Control Panel - Rm E1016	20 A	1	672	672					1	20 A	*, Vesda Control Panel - Rm D1015	14
15	*, Vesda Control Panel - Rm E1015	20 A	1			672	250			1	20 A	Temperature Control Panel - Rm D1015B	16
17	Temperature Control Panel - Rm E1015	20 A	1					250	672	1	20 A	*, Vesda Control Panel - Rm D1014	18
19	*, Vesda Control Panel - Rm E1014	20 A	1	672	250					1	20 A	*, Fire Alarm Control Panel 'FACP-2' - Rm B1028	20
21	Area 'D' Fire Smoke Dampers	20 A	1			0	250			1	20 A	Temperature Control Panel - Rm B2000	22
23	Area 'E' Fire Smoke Dampers	20 A	1					0	500	1	20 A	Self Contained Dry Powder System - Rm B2000	24
25	Area 'B' Fire Smoke Dampers	20 A	1	0	0					3	60 A	Surge Protective Device 'SPD-L2P'	26
27	SPARE	20 A	1			0	0			--	--	--	28
29	SPARE	20 A	1					0	0	--	--	--	30
			Total Load:	3462 VA		3044 VA		3270 VA					
			Total Amps:	29 A		25 A		28 A					

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Motor	3744 VA	107.85%	4038 VA		
Power	4032 VA	100.00%	4032 VA	Total Conn. Load:	8776 VA
Equipment	500 VA	100.00%	500 VA	Total Est. Demand:	9070 VA
Misc	500 VA	100.00%	500 VA	Total Conn. Current:	24 A
				Total Est. Demand Current:	25 A

Notes:
* = PROVIDE RED BREAKER LOCK KIT FOR MAINTAINING BREAKER IN THE CLOSED POSITION.

DLZ
ARCHITECTURE • ENGINEERING • PLANNING
SURVEYING • CONSTRUCTION SERVICES
DLZ INDIANA, LLC

NO.	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: RDW CHK'D: MLH
DESIGNED: RDW
APPRV'D: MLH
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER
1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

PANELBOARD SCHEDULES

DRAWING NUMBER
E-704
ELECTRICAL

Branch Panel: E4H

Location: STORAGE E1016B | Supply From: ODPB | Mounting: Surface | Enclosure: 1
Volts: 480/277 Wye | Phases: 3 | Wires: 4
A.I.C. Rating: 42k AIC | Mains Type: MLO | Mains Rating: 200 A

Notes:
NEW SURFACE MOUNTED PANEL.

CKT	Circuit Description	Trip	Poles	A (VA)		B (VA)		C (VA)		Poles	Trip	Circuit Description	CKT
1	SPARE	20 A	1	0	0					1	20 A	SPARE	2
3	SPARE	20 A	1			0	0			1	20 A	SPARE	4
5	SPARE	20 A	1					0	0	1	20 A	SPARE	6
7	Lighting - Dayrooms 1-B, 1-C, 1-D	20 A	1	3118	1959					1	20 A	Lighting - Dayrooms 1-E, 1-F, Corridor	8
9	Lighting - Dayrooms 1-G, 1-H, 1-J	20 A	1			3044	2200			1	20 A	Lighting - 2nd Floor Area D South Cells	10
11	Lighting - Dayrooms 2-B, 2-C, 2-D	20 A	1					3138	1959	1	20 A	Lighting 2 - Dayrooms 2-E, 2-4, Corridor	12
13	Lighting - Dayrooms 2-G, 2-H, 2-J	20 A	1	3118	2200					1	20 A	Lighting - First Floor Area E South Cells	14
15	Lighting - 1st Floor Area D South Cells	20 A	1			2200	2200			1	20 A	Lighting - 2nd Floor Area E South Cells	16
17	Lighting - Plumbing Chase	20 A	1					2132	0	1	20 A	SPARE	18
19	Fan Powered Box 'FPV-4-02'	20 A	1	895	895					1	20 A	Fan Powered Box 'FPV-4-09'	20
21	Fan Powered Box 'FPV-4-04'	20 A	1			895	895			1	20 A	Fan Powered Box 'FPV-4-10'	22
23	Fan Powered Box 'FPV-4-03'	20 A	1					895	895	1	20 A	Fan Powered Box 'FPV-4-12'	24
25	Fan Powered Box 'FPV-4-05'	20 A	1	2715	895					1	20 A	Fan Powered Box 'FPV-4-01'	26
27	Fan Powered Box 'FPV-4-06'	20 A	1			2715	895			1	20 A	Fan Powered Box 'FPV-4-16'	28
29	Fan Powered Box 'FPV-4-08'	20 A	1					2715	895	1	20 A	Fan Powered Box 'FPV-4-11'	30
31	Fan Powered Box 'FPV-4-07'	20 A	1	2715	2105					3	20 A	Grinder Pump - Exterior/South Drive	32
33	Exterior Wall Mounted Lighting - Areas D & E	20 A	1			348	2105			--	--	--	34
35	Exterior Area Lighting - West Yard	20 A	1					452	2105	--	--	--	36
37	Exterior Area Lighting - East Yard	20 A	1	452	0					--	--	SPACE	38
39	Exterior Area/Drive Lighting - South	20 A	1			796	0			--	--	SPACE	40
41	SPACE	--	--					0	0	--	--	SPACE	42
43	SPACE	--	--	0	9283					3	50 A	Panels 'E4PB' via Transformer 'TR-4B'	44
45	SPACE	--	--			0	8887			--	--	--	46
47	SPACE	--	--					0	8784	--	--	--	48
49	SPACE	--	--	0	8352					3	50 A	Panels 'E4PA' via Transformer 'TR-4A'	50
51	SPACE	--	--			0	8352			--	--	--	52
53	SPACE	--	--					0	8112	--	--	--	54
			Total Load:	38658 VA		35421 VA		32038 VA					
			Total Amps:	141 A		130 A		116 A					

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
HVAC	21147 VA	100.00%	21147 VA		
Lighting	29127 VA	100.00%	29127 VA	Total Conn. Load:	106116 VA
Motor	9243 VA	117.08%	10822 VA	Total Est. Demand:	93855 VA
Receptacle	35280 VA	64.17%	22640 VA	Total Conn. Current:	128 A
Cooling	1830 VA	100.00%	1830 VA	Total Est. Demand Current:	113 A
Heating	6000 VA	100.00%	6000 VA		
Misc.	2300 VA	100.00%	2300 VA		
Misc. Non-Continuous	1200 VA	0.01%	0 VA		

Notes:

Branch Panel: E4PA

Location: STORAGE E1016B | Supply From: TR-4A... | Mounting: Surface | Enclosure: 1
Volts: 120/208 Wye | Phases: 3 | Wires: 4
A.I.C. Rating: 10k AIC | Mains Type: MCB | Mains Rating: 125 A | MCB Rating: 110 A

Notes:
NEW SURFACE MOUNTED PANEL.

CKT	Circuit Description	Trip	Poles	A (VA)		B (VA)		C (VA)		Poles	Trip	Circuit Description	CKT
1	SPARE	20 A	1	0	0					1	20 A	SPARE	2
3	SPARE	20 A	1			0	0			1	20 A	SPARE	4
5	SPARE	20 A	1					0	0	1	20 A	SPARE	6
7	Recepts - Rm D1020	20 A	1	540	540					1	20 A	Recepts - Rm D1050	8
9	Recepts - Rm D1030	20 A	1			540	900			1	20 A	TV Recepts Rms D1020, 1030, 1040, 1050, 1060	10
11	Recepts - Rm D1040	20 A	1					540	540	1	20 A	Recepts - Rm D1060	12
13	Recepts - Rms D1015 & Exterior	20 A	1	720	372					1	20 A	Fan Coil Unit 'FC-5' - Rm #E1016B	14
15	Recepts - Rms E1015 & Exterior	20 A	1			720	372			1	20 A	Fan Coil Unit 'FC-4' - Rm #D1015	16
17	Recepts - Rms E1016B, E1016C, E1016D	20 A	1					900	372	1	20 A	Fan Coil Unit 'FC-7' - Rm #E1015	18
19	Recepts - Rm E1016	20 A	1	720	540					1	20 A	Recepts - Rm E1120	20
21	Recepts D Cells 1024, 2024 E Cells 1121, 2121	20 A	1			720	540			1	20 A	Recepts - Rm E1110	22
23	Recepts D Cells 1041, 2041, E Cells 1093, 2093	20 A	1					720	540	1	20 A	Recepts - Rm E1090	24
25	Recepts D Cells 1032, 2032, E Cells 1111, 2111	20 A	1	720	540					1	20 A	Recepts - Rm E1080	26
27	Recepts - D Cells 1054, 1061, 2054, 2061	20 A	1			720	540			1	20 A	Recepts - Rm E1070	28
29	Recepts - E Cells 1072, 1081, E Cells 2072, 2081	20 A	1					720	900	1	20 A	TV Recepts Rms E1070, 1090, 1090, 1110, 1120	30
31	Recepts Rms D1020 & D1011	20 A	1	1080	900					1	20 A	Recepts - Rm E1003 & E1120	32
33	Recepts - Rms D1030 & D1040	20 A	1			900	900			1	20 A	Recepts - Rms E1090 & E1110	34
35	Recepts - Rms D1050 & D1060	20 A	1					1260	1260	1	20 A	Recepts - Rms E1070 & E1080	36
37	Area D - Cell Valve Controllers	20 A	1	0	1500					1	20 A	Elec. Wall Heater - Rm E1017	38
39	Area E - Cell Valve Controllers	20 A	1			0	1500			1	20 A	Elec. Wall Heater - Rm D1016	40
41	Recepts - Rm E1016B	20 A	1					360	0	1	20 A	Time Clock 'TC4' - Rm E1016B	42
43	SPARE	20 A	1	0	180					1	20 A	Recept - Exterior at Muffin Monster	44
45	SPARE	20 A	1			0	0			1	20 A	SPARE	46
47	SPARE	20 A	1					0	0	1	20 A	SPARE	48
49	SPACE	--	--	0	0					3	60 A	Surge Protective Device 'SPD-E4PA'	50
51	SPACE	--	--			0	0			--	--	--	52
53	SPACE	--	--					0	0	--	--	--	54
			Total Load:	8352 VA		8352 VA		8112 VA					
			Total Amps:	70 A		70 A		68 A					

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
HVAC	1116 VA	100.00%	1116 VA		
Receptacle	20700 VA	74.15%	15350 VA	Total Conn. Load:	24816 VA
Heating	3000 VA	100.00%	3000 VA	Total Est. Demand:	19466 VA
				Total Conn. Current:	69 A
				Total Est. Demand Current:	54 A

Notes:

Branch Panel: E4PB

Location: CHASE 303 | Supply From: TR-4B | Mounting: Surface | Enclosure: 1
Volts: 120/208 Wye | Phases: 3 | Wires: 4
A.I.C. Rating: 10k AIC | Mains Type: MCB | Mains Rating: 125 A | MCB Rating: 110 A

Notes:
NEW SURFACE MOUNTED PANEL.

CKT	Circuit Description	Trip	Poles	A (VA)		B (VA)		C (VA)		Poles	Trip	Circuit Description	CKT
1	SPARE	20 A	1	0	0					1	20 A	SPARE	2
3	SPARE	20 A	1			0	0			1	20 A	SPARE	4
5	SPARE	20 A	1					0	0	1	20 A	SPARE	6
7	TV Recepts Rms E1020, 1030, 1040, 1050, 1060	20 A	1	900	540					1	20 A	Recepts - E Cells 1026, 1032, 1041	8
9	Recepts - Rm E1020	20 A	1			540	540			1	20 A	Recepts - E Cells 2026, 2032, 2041	10
11	Recepts - Rm E1030	20 A	1					540	720	1	20 A	Recepts - E Cells 1054, 1061, 2054, 2061	12
13	Recepts - Rm E1040	20 A	1	540	900					1	20 A	Recepts - Rm E1015	14
15	Recepts - Rm E1050	20 A	1			540	900			1	20 A	Recepts - Rm E1014	16
17	Recepts - Rm E1060	20 A	1					540	900	1	20 A	Recepts - Rms E1011, E1012 & E1013	18
19	Recepts - Rms E1050 & E1060	20 A	1	1260	372					1	20 A	Fan Coil Unit 'FCU-10' - Rm E1014	20
21	Recepts - Rms E1030 & E1040	20 A	1			900	372			1	20 A	Fan Coil Unit 'FCU-9' - Rm E1014	22
23	Recepts - Rms E1010 & E1020	20 A	1					900	372	1	20 A	Fan Coil Unit 'FCU-8' - Rm E1015	24
25	Recepts - Rms E1001A/B & E1002A/B	20 A	1	720	396					1	20 A	Sliding Door 'E1012'	26
27	Recepts - Rm E1009	20 A	1			720	396			1	20 A	Sliding Door 'E1010A'	28
29	Recepts - Rms E1005, E1008 & E1009	20 A	1					540	396	1	20 A	Sliding Door 'E1010B'	30
31	Recepts - Rm E1009 & E1012	20 A	1	900	640					1	20 A	Receps - Rms E0001 & E0002	32
33	Elec Wall Heater 'EWH-3' - Rm E1013	20 A	1			1500	564			1	20 A	Sump Pump 'SP-1' - Rm E0002	34
35	Overhead Coiling Door 'E1008C' - Rm E1009	20 A	1					1176	1200	1	20 A	Sump Pump 'SP-2' - Rm E0002	36
37	Micro - Rm E1000	20 A	1	1200	915					2	30 A	Air Cooled Cond. Unit 'ACC-G' - on Roof	38
39	Refrig - Rm E1000	20 A	1			1000	915			--	--	--	40
41	Area E - Cell Valve Controllers	20 A	1					0	1500	1	20 A	Elec Wall Heater 'EWH-5' - Rm E0001	42
43	SPARE	20 A	1	0	0					1	20 A	SPARE	44
45	SPARE	20 A	1			0	0			1	20 A	SPARE	46
47	SPARE	20 A	1					0	0	1	20 A	SPARE	48
49	SPACE	--	--	0	0					3	60 A	Surge Protective Device 'SPD-E4PB'	50
51	SPACE	--	--			0	0			--	--	--	52
53	SPACE	--	--					0	0	--	--	--	54
			Total Load:	9283 VA		8887 VA		8784 VA					
			Total Amps:	77 A		74 A		73 A					

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
HVAC	1116 VA	100.00%	1116 VA		
Motor	2928 VA	110.04%	3222 VA	Total Conn. Load:	26954 VA
Receptacle	14580 VA	84.29%	12290 VA	Total Est. Demand:	23758 VA
Cooling	1830 VA	100.00%	1830 VA	Total Conn. Current:	75 A
Heating	3000 VA	100.00%	3000 VA	Total Est. Demand Current:	66 A
Misc.	2300 VA	100.00%	2300 VA		
Misc. Non-Continuous	1200 VA	0.01%	0 VA		

Notes:

Branch Panel: E5H

Location: MECHANICAL B2000 | Supply From: ODPB | Mounting: Surface | Enclosure: 1
Volts: 480/277 Wye | Phases: 3 | Wires: 4
A.I.C. Rating: 42k AIC | Mains Type: MLO | Mains Rating: 200 A

Notes:
NEW SURFACE MOUNTED PANEL.

CKT	Circuit Description	Trip	Poles	A (VA)		B (VA)		C (VA)		Poles	Trip	Circuit Description	CKT
1	SPARE	20 A	1	0	0					1	20 A	SPARE	2
3	SPARE	20 A	1			0	0			1	20 A	SPARE	4
5	SPARE	20 A	1					0	0	1	20 A	SPARE	6
7	Lighting - Area D 1st & 2nd Floor North Cells	20 A	1	2000	2000					1	20 A	Lighting - Area E 1st & 2nd Floor North Cells	8
9	Lighting - Dayrooms 1-A, 1-K	20 A	1			2580	2580			1	20 A	Lighting - Dayrooms 2-A, 2-K	10
11	Lighting - Area E North	20 A	1					2212	2416	1	20 A	Lighting - Area D North	12
13	Lighting Mechanical B2000	20 A	1	1202	534					1	20 A	Lighting - Corridor B1025, D1012, E1012	14
15	SPARE	20 A	1			0	0			1	20 A	SPARE	16
17	SPARE	20 A	1					0	895	1	20 A	Fan Powered Box 'FPV-3-10'	18
19	Fan Powered Box 'FPV-3-04'	20 A	1	895	895					1	20 A	Fan Powered Box 'FPV-3-03'	20
21	Fan Powered Box 'FPV-3-02'	20 A	1			895	2715			1	20 A	Fan Powered Box 'FPV-3-05'	22
23	Fan Powered Box 'FPV-3-01'	20 A	1					895	2715	1	20 A	Fan Powered Box 'FPV-3-06'	24
25	Fan Powered Box 'FPV-3-16'	20 A	1	895	2715					1	20 A	Fan Powered Box 'FPV-3-08'	26
27	Fan Powered Box 'FPV-3-11'	20 A	1			895	2715			1	20 A	Fan Powered Box 'FPV-3-07'	28
29	Fan Powered Box 'FPV-3-12'	20 A	1					895	895	1	20 A	Fan Powered Box 'FPV-3-09'	30
31	AHU-2 Energy Wheel - Mechanical B2000	20 A	3	421	474					3	20 A	AHU-4 Energy Wheel - Mechanical B2000	32
33	--	--	--			421	474			--	--	--	34
35	--	--	--					421	474	--	--	--	36
37	AHU-3 Energy Wheel - Mechanical B2000	20 A	3	474	2853					3	20 A	Air Cooled Condensing Unit 'ACC-3' - on Roof	38
39	--	--	--			474	2853			--	--	--	40
41	--	--	--					474	2853	--	--	--	42
43	SPACE	--	--	0	0					--	--	SPACE	44
45	SPACE	--	--			0	0			--	--	SPACE	46
47	SPACE	--	--					0	0	--	--	SPACE	48
49	Panels 'E5PA' via transformer 'TR-5A'	50 A	3	10448	9283					3	50 A	Panels 'E5PB' via transformer 'TR-5B'	50
51	--	--	--			9559	9067			--	--	--	52
53	--	--	--					9637	8964	--	--	--	54
			Total Load:	35062 VA		35227 VA		33612 VA					
			Total Amps:	127 A		128 A		121 A					

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
HVAC	26306 VA	100.00%	26306 VA		
Lighting	17075 VA	100.00%	17075 VA	Total Conn. Load:	103889 VA
Motor	4824 VA	106.09%	5118 VA	Total Est. Demand:	92544 VA
Receptacle	30480 VA	66.40%	20240 VA	Total Conn. Current:	125 A
Cooling	14049 VA	100.00%	14049 VA	Total Est. Demand Current:	111 A
Heating	3000 VA	100.00%	3000 VA		
Equipment	4500 VA	100.00%	4500 VA		
Misc.	2300 VA	100.00%	2300 VA		
Misc. Non-Continuous	1400 VA	0.01%	0 VA		

Notes:

Branch Panel: E5PA

Location: MECHANICAL B2000 | Supply From: TR-5A | Mounting: Surface | Enclosure: 1
Volts: 120/208 Wye | Phases: 3 | Wires: 4
A.I.C. Rating: 10k AIC | Mains Type: MCB | Mains Rating: 125 A | MCB Rating: 110 A

Notes:
NEW SURFACE MOUNTED PANEL.

CKT	Circuit Description	Trip	Poles	A (VA)		B (VA)		C (VA)		Poles	Trip	Circuit Description	CKT
1	SPARE	20 A	1	0	0					1	20 A	SPARE	2
3	SPARE	20 A	1			0	0			1	20 A	SPARE	4
5	SPARE	20 A	1					0	0	1	20 A	SPARE	6
7					960					1	20 A	AHU-1 - Recepts - Mechanical B2000	8
9	AHU-2 - Lights - Mechanical B2000	20 A	1			626	960			1	20 A	AHU-2 - Recepts - Mechanical B2000	10
11	AHU-3 - Lights - Mechanical B2000	20 A	1					626	960	1	20 A	AHU-3 - Recepts - Mechanical B2000	12
13	AHU-4 - Lights - Mechanical B2000	20 A	1	626	960					1	20 A	AHU-4 - Recepts - Mechanical B2000	14
15	Fan Coil Unit 'FC-11' - Mech B2000	20 A	1			895	895			1	20 A	Fan Coil Unit 'FC-12' - Mech B2000	16
17	Recepts - Rm B2000 & Exterior	20 A	1					720	908	1	20 A	Recepts - Rm B2000 & Exterior	18
19	Recepts - Rms B2001 & B2002	20 A	1	720	540					1	20 A	Recepts - Roof Area 'D'	20
21	Recepts - Rms B2000 & B2001	20 A	1			900	312			1	20 A	Exhaust Fan 'EF-3' - Roof	22
23	Recepts - Rm B2000 & Exterior	20 A	1					1080	540	1	20 A	Recepts - Roof Area 'E'	24
25	Recepts - Rm D1009	20 A	1	1080	396					1	20 A	Sliding Door 'D1011A'	26
27	Recepts - Rm D1006	20 A	1			1260	396			1	20 A	Sliding Door 'D1011'	28
29	Recepts - Rm E1008	20 A	1					1260	360	1	20 A	Recepts - Rm D1010	30
31	Recepts - Rm E1009	20 A	1	1080	396					1	20 A	Sliding Door 'E1003A'	32
33	Recepts - Rms D1012A, E1012 & E1016	20 A	1			540	360			1	20 A	Recepts - Rm E1004	34
35	Fan Coil Unit 'FCU-6' - Rm E1016	20 A	1					372	396	1	20 A	Sliding Door 'E1003B'	36
37	Air Cooled Cond. Unit 'ACC-D' - on Roof	30 A	2	915	360					1	20 A	Recepts - Exterior	38
39	--	--	--			915	0			1	20 A	SPARE	40
41	Air Cooled Cond. Unit 'ACC-E' - on Roof	30 A	2					915	0	1	20 A	SPARE	42
43	--	--	--	915	0					1	20 A	SPARE	44
45	Area D - Cell Valve Controllers	20 A	1			0	0			1	20 A	SPARE	46
47	Area E - Cell Valve Controllers	20 A	1					0	0	1	20 A	SPARE	48
49	Security Data Rack 'SQE#3' - Rm B2001	20 A	1	1500	0					3	60 A	Surge Protective Device 'SPD-E5PA'	50
51	Security Data Rack 'SQE#3' - Rm B2001	20 A	1			1500	0			--	--	--	52
53	Security Data Rack 'SQE#3' - Rm B2001	20 A	1					1500	0	--	--	--	54
			Total Load:	10448 VA		9559 VA		9637 VA					
			Total Amps:	87 A		80 A		80 A					

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
HVAC	2170 VA	100.00%	2170 VA		
Lighting	1878 VA	100.00%	1878 VA	Total Conn. Load:	29644 VA
Motor	1896 VA	105.22%	1995 VA	Total Est. Demand:	26973 VA
Receptacle	15540 VA	82.18%	12770 VA	Total Conn. Current:	82 A
Cooling	3660 VA	100.00%	3660 VA	Total Est. Demand Current:	75 A
Equipment	4500 VA	100.00%	4500 VA		

Notes:

Branch Panel: E5PB

Location: CHASE D1014 | Supply From: TR-5B | Mounting: Surface | Enclosure: 1
Volts: 120/208 Wye | Phases: 3 | Wires: 4
A.I.C. Rating: 10k AIC | Mains Type: MCB | Mains Rating: 125 A | MCB Rating: 110 A

Notes:
NEW SURFACE MOUNTED PANEL.

CKT	Circuit Description	Trip	Poles	A (VA)		B (VA)		C (VA)		Poles	Trip	Circuit Description	CKT
1	SPARE	20 A	1	0	0					1	20 A	SPARE	2
3	SPARE	20 A	1			0	0			1	20 A	SPARE	4
5	SPARE	20 A	1					0	0	1	20 A	SPARE	6
7	TV Recepts Rms D1070, 1080, 1090, 1110, 1120	20 A	1	900	540					1	20 A	Recepts - D Cells 1093, 1111, 1121	8
9	Recepts - Rm D1120	20 A	1			540	540			1	20 A	Recepts - D Cells 2093, 2111, 2121	10
11	Recepts - Rm D1110	20 A	1					540	720	1	20 A	Recepts - D Cells 1072 1081, 2072, 2081	12
13	Recepts - Rm D1090	20 A	1	540	900					1	20 A	Recepts - Rm D1015	14
15	Recepts - Rm D1080	20 A	1			540	900			1	20 A	Recepts - Rm D1014	16
17	Recepts - Rm D1070	20 A	1					540	900	1	20 A	Recepts - Rms D1004, D1012 & D1013	18
19	Recepts - Rms D1070 & D1080	20 A	1	1260	372					1	20 A	Fan Coil Unit 'FCU-1' - Rm D1014	20
21	Recepts - Rms D1090 & D1110	20 A	1			900	372			1	20 A	Fan Coil Unit 'FCU-2' - Rm D1014	22
23	Recepts - Rms D1003 & D1120	20 A	1					1080	372	1	20 A	Fan Coil Unit 'FCU-3' - Rm D1015	24
25	Recepts - Rms D1001A/B & D1002A/B	20 A	1	720	396					1	20 A	Sliding Door 'D1012'	26
27	Recepts - Rm D1005	20 A	1			900	396			1	20 A	Sliding Door 'D1003A'	28
29	Recepts - Rms D1005, D1006 & D1009	20 A	1					540	396	1	20 A	Sliding Door 'D1003B'	30
31	Recepts - Rms D1005 & D1012	20 A	1	900	640					1	20 A	Recepts - Rms D0001 & D0002	32
33	Elec Wall Heater 'EWH-1' - Rm D1013	20 A	1			1500	564			1	20 A	Sump Pump 'SP-1' - Rm D0002	34
35	Overhead Coiling Door 'D1008C' - Rm D1005	20 A	1					1176	1200	1	20 A	Sump Pump 'SP-2' - Rm D0002	36
37	Micro - Rm D1000	20 A	1	1200	915					2	30 A	Air Cooled Cond. Unit 'ACC-F' - on Roof	38
39	Refrig - Rm D1000	20 A	1			1000	915			--	--	--	40
41	Area D - Cell Valve Controllers	20 A	1					0	1500	1	20 A	Elec Wall Heater 'EWH-4' - Rm D0001	42
43	SPARE	20 A	1	0	0					1	20 A	SPARE	44
45	SPARE	20 A	1			0	0			1	20 A	SPARE	46
47	SPARE	20 A	1					0	0	1	20 A	SPARE	48
49	SPACE	--	--	0	0					3	60 A	Surge Protective Device 'SPD-E5PB'	50
51	SPACE	--	--			0	0			--	--	--	52
53	SPACE	--	--					0	0	--	--	--	54
			Total Load:	9283 VA		9067 VA		8964 VA					
			Total Amps:	77 A		76 A		75 A					

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
HVAC	1116 VA	100.00%	1116 VA		
Motor	2928 VA	110.04%	3222 VA	Total Conn. Load:	27314 VA
Receptacle	14940 VA	83.47%	12470 VA	Total Est. Demand:	23938 VA
Cooling	1830 VA	100.00%	1830 VA	Total Conn. Current:	76 A
Heating	3000 VA	100.00%	3000 VA	Total Est. Demand Current:	66 A
Misc.	2300 VA	100.00%	2300 VA		
Misc. Non-Continuous	1200 VA	0.01%	0 VA		

Notes:

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DLZ INDIANA, LLC

STATE OF INDIANA
PROFESSIONAL ENGINEER

NO.	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: RDW CHK'D: MLH
DESIGNED: RDW
APPR'D: MLH
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER
1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA
PANELBOARD SCHEDULES

DRAWING NUMBER
E-705
ELECTRICAL

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Branch Panel: K1H

Location: KITCHEN C1059
Supply From: ODPA
Mounting: Flush
Enclosure: 4X STAINLESS STEEL

Volts: 480/277 Wye
Phases: 3
Wires: 4

A.I.C. Rating: 10kA
Mains Type: MLO
Mains Rating: 400 A

Notes:
NEW FLUSH MOUNTED PANEL. PROVIDE WITH STAINLESS STEEL GASKETED COVER.
PROVIDE THREE (3) EMPTY 1"C. STUBBED OUT ABOVE CEILING FOR FUTURE USE.

CKT	Circuit Description	Trip	Poles	A (VA)		B (VA)		C (VA)		Poles	Trip	Circuit Description	CKT
1	SPARE	20 A	1	0	0					1	20 A	SPARE	2
3	SPARE	20 A	1			0	0			1	20 A	SPARE	4
5	SPARE	20 A	1					0	0	1	20 A	SPARE	6
7	Lighting - Kitchen C1059	20 A	1	2415	2715					1	20 A	Fan Powered Box 'FPV-1-24'	8
9	SPARE	20 A	1			0	609			1	20 A	Fan Powered Box 'FPV-1-25'	10
11	SPARE	20 A	1					0	0	1	20 A	SPARE	12
13	Item #E28 - Sink Heater	50 A	3	4487	10249					3	50 A	Item #E61 - Tank Heater	14
15	--	--	--			4487	10249			--	--	--	16
17	--	--	--					4487	10249	--	--	--	18
19	Item #E40 - Hood Make-Up Air Unit on Roof	20 A	3	5817	6925					3	40 A	Item #E61 - Booster	20
21	--	--	--			5817	6925			--	--	--	22
23	--	--	--					5817	6925	--	--	--	24
25	Item #E40 - Hood Exhaust Fan on Roof	20 A	3	3047	0					--	--	SPACE	26
27	--	--	--			3047	0			--	--	SPACE	28
29	--	--	--					3047	0	--	--	SPACE	30
31	Make-Up Air Unit 'MAU-1' on Roof	20 A	3	1967	0					--	--	SPACE	32
33	--	--	--			1967	0			--	--	SPACE	34
35	--	--	--					1967	0	--	--	SPACE	36
37	Panel 'K3L' via Transformer 'TR-K2'	50 A	3	9164	23179					3	110 A	Panels 'K1L' & 'K2L' via Transformer 'TR-K1'	38
39	--	--	--			10384	23182			--	--	--	40
41	--	--	--					9484	23291	--	--	--	42
		Total Load:		69842 VA		66667 VA		65267 VA					
		Total Amps:		253 A		241 A		236 A					

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
HVAC	9224 VA	100.00%	9224 VA		
Lighting	2415 VA	100.00%	2415 VA	**Total Conn. Load:**	185560 VA
Motor	36403 VA	111.98%	40766 VA	**Total Est. Demand:**	148678 VA
Receptacle	9860 VA	100.00%	9860 VA	**Total Conn. Current:**	223 A
Electric Clothes Dryer	9840 VA	100.00%	9840 VA	**Total Est. Demand Current:**	179 A
Kitchen Equipment - Non-Dwelling Unit	117844 VA	65.00%	76599 VA		
Misc.	100 VA	100.00%	100 VA		

Notes:
SHUNT-TRIP SPACE = SHUNT TRIPS UPON KITCHEN ANSUL ACTIVATION, SEE DETAIL #3 ON SHEET E8.1.
* = PROVIDE WITH RED BREAKER LOCK KIT TO HOLD THE FEEDER BREAKER HANDLE IN THE CLOSED POSITION.

Branch Panel: K1L

Location: KITCHEN C1059
Supply From: TR-K1
Mounting: Flush
Enclosure: 4X STAINLESS STEEL

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating: 10kA
Mains Type: MCB
Mains Rating: 400 A
MCB Rating: 250 A

Notes:
NEW FLUSH MOUNTED PANEL. PROVIDE WITH STAINLESS STEEL GASKETED COVER.
PROVIDE THREE (3) EMPTY 1"C. STUBBED OUT ABOVE CEILING FOR FUTURE USE.

CKT	Circuit Description	Trip	Poles	A (VA)		B (VA)		C (VA)		Poles	Trip	Circuit Description	CKT
1	SPARE	20 A	1	0	0					1	20 A	SPARE	2
3	SPARE	20 A	1			0	0			1	20 A	SPARE	4
5	SPARE	20 A	1					0	0	1	20 A	SPARE	6
7	Area C - Cell Valve Controllers	20 A	1	0	1404					2	20 A	Item #E37 - Roll-In Freezer	8
9	SPARE	20 A	1			0	1404			--	--	--	10
11	SPARE	20 A	1					0	1435	2	20 A	Item #E35 - Roll-In Heated Cabinet	12
13	Item #E54 - Drop-In Hot Wells	20 A	2	1560	1435					--	--	--	14
15	--	--	--			1560	1300			2	20 A	Item #E25 - Ice Maker	16
17	Item #E54 - Drop-In Hot Wells	20 A	2					1560	1300	--	--	--	18
19	--	--	--	1560	1848					1	20 A	Item #E36 - Roll-In Refrigerator	20
21	Item #E35 - Roll-In Heated Cabinet	20 A	2			1435	1848			1	20 A	Item #E36 - Roll-In Refrigerator	22
23	--	--	--					1435	540	1	20 A	Conv. Outlets - Rm C1059	24
25	Item #E56 - Roll-In Refrigerator	20 A	1	780	900					1	20 A	Recepts - Rms C1059 & C1062	26
27	Item #E57 - Roll-In Freezer	20 A	1			1308	1000			1	20 A	Recepts - Rms C1059, C1061 & C1062	28
29	Item #E36 - Roll-In Refrigerator	20 A	1					1848	396	1	20 A	Sliding Door 'C1059'	30
31	Item #E47 - Hood Supply Fan Input	20 A	1	0	0					1	20 A	Motorized Dampers	32
33	**,Gas Solenoid Valve	20 A	1			0	1000			1	20 A	Item #E47 - Hood Fire Suppression System	34
35	Shunt Trip Space	--	--					0	1000	1	20 A	Item #E47 - Hood Lights	36
37	Item #E43 - Utility Control Panel	100 A	3	3333	10358					3	200 A	Panel 'K2L'	38
39	--	--	--			3333	8993			--	--	--	40
41	--	--	--					3333	10443	--	--	--	42
		Total Load:		23179 VA		23182 VA		23291 VA					
		Total Amps:		193 A		193 A		194 A					

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Motor	9811 VA	110.09%	10801 VA		
Receptacle	6880 VA	100.00%	6880 VA	**Total Conn. Load:**	69651 VA
Kitchen Equipment - Non-Dwelling Unit	52860 VA	65.00%	34359 VA	**Total Est. Demand:**	52140 VA
Misc.	100 VA	100.00%	100 VA	**Total Conn. Current:**	193 A
				Total Est. Demand Current:	145 A

Notes:
SHUNT-TRIP SPACE = SHUNT TRIPS UPON KITCHEN ANSUL ACTIVATION, SEE DETAIL #3 ON SHEET E-801.
* = GROUND FAULT EQUIPMENT PROTECTION TYPE BREAKER WITH 30mA TRIP.
** = PROVIDE WITH RED BREAKER LOCK KIT TO HOLD THE FEEDER BREAKER HANDLE IN THE CLOSED POSITION.

Branch Panel: K2L

Location: KITCHEN C1059
Supply From: K1L
Mounting: Flush
Enclosure: 4X STAINLESS STEEL

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating: 10kA
Mains Type: MLO
Mains Rating: 200 A

1

Notes:
NEW FLUSH MOUNTED PANEL. PROVIDE WITH STAINLESS STEEL GASKETED COVER.
PROVIDE THREE (3) EMPTY 1"C. STUBBED OUT ABOVE CEILING FOR FUTURE USE.

CKT	Circuit Description	Trip	Poles	A (VA)		B (VA)		C (VA)		Poles	Trip	Circuit Description	CKT
1	SPARE	20 A	1	0	0					1	20 A	SPARE	2
3	SPARE	20 A	1			0	0			1	20 A	SPARE	4
5	SPARE	20 A	1					0	0	1	20 A	SPARE	6
7	Item #9 - Cooler Lights & Door Heater	20 A	1	1000	180					1	20 A	Item #9.1 - Cooler Evaporator Coil	8
9	Item #9 - Freezer Lights & Door Heater	20 A	1			1000	468			2	20 A	Item #9.3 - Freezer Evaporator Coil	10
11	Item #4 - Freezer Lights & Door Heater	20 A	1					1000	468	--	--	--	12
13	Item #4 - Cooler Lights & Door Heater	20 A	1	1000	915					2	20 A	Item #4.3 - Freezer Evaporator Coil	14
15	*,Item #9.3 - Freezer Drain Line Heat Tape	20 A	1			1000	915			--	--	--	16
17	*,Item #4.3 - Freezer Drain Line Heat Tape	20 A	1					1000	1000	1	20 A	Dedicated Conv. Outlet - Kitchen	18
19	Dedicated Conv. Outlet - Kitchen	20 A	1	1000	432					1	20 A	Item #4.1 - Cooler Evaporator Coils	20
21	Dedicated Conv. Outlet - Kitchen	20 A	1			1000	840			1	20 A	Item #E18 - Slicer	22
23	Dedicated Conv. Outlet - Kitchen	20 A	1					1000	2391	2	30 A	Item #E22 - Mixer	24
25	Sliding Door 'C1063A'	20 A	1	396	2391					--	--	--	26
27	Sliding Door 'C1063B'	20 A	1			396	840			1	20 A	Item #E18 - Slicer	28
29	Recept - Rm C1063	20 A	1					540	510	2	20 A	Item #E9.2 - Cooler Condensing Unit on Roof	30
31	Item #E9.4 - Freezer Condensing Unit on Roof	20 A	3	497	510					--	--	--	32
33	--	--	--			497	0			1	20 A	SPARE	34
35	--	--	--					497	0	1	20 A	SPARE	36
37	Item #E4.4 - Freezer Condensing Unit on Roof	20 A	3	1320	718					3	20 A	Item #E4.2 - Cooler Condensing Unit on Roof	38
39	--	--	--			1320	718			--	--	--	40
41	--	--	--					1320	718	--	--	--	42
		Total Load:		10358 VA		8993 VA		10443 VA					
		Total Amps:		88 A		75 A		89 A					

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Motor	9415 VA	110.52%	10405 VA		
Receptacle	4540 VA	100.00%	4540 VA	**Total Conn. Load:**	29795 VA
Kitchen Equipment - Non-Dwelling Unit	15840 VA	65.00%	10296 VA	**Total Est. Demand:**	25241 VA
				Total Conn. Current:	83 A
				Total Est. Demand Current:	70 A

Notes:
SHUNT-TRIP SPACE = SHUNT TRIPS UPON KITCHEN ANSUL ACTIVATION, SEE DETAIL #3 ON SHEET E-801.
* = GROUND FAULT EQUIPMENT PROTECTION TYPE BREAKER WITH 30mA TRIP.
** = PROVIDE WITH RED BREAKER LOCK KIT TO HOLD THE FEEDER BREAKER HANDLE IN THE CLOSED POSITION.

Branch Panel: K3L

Location: LAUNDRY C1065
Supply From: TR-K2
Mounting: Flush
Enclosure: 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating: 10kA
Mains Type: MCB
Mains Rating: 125 A
MCB Rating: 110 A

Notes:
NEW FLUSH MOUNTED PANEL. PROVIDE WITH STAINLESS STEEL GASKETED COVER.
PROVIDE THREE (3) EMPTY 1"C. STUBBED OUT ABOVE CEILING FOR FUTURE USE.

CKT	Circuit Description	Trip	Poles	A (VA)		B (VA)		C (VA)		Poles	Trip	Circuit Description	CKT
1	SPARE	20 A	1	0	0					1	20 A	SPARE	2
3	SPARE	20 A	1			0	0			1	20 A	SPARE	4
5	SPARE	20 A	1					0	0	1	20 A	SPARE	6
7	Washer - Rm C1065	20 A	1	1000	1080					1	20 A	Recepts - Rm C1065 & Exterior	8
9	Electric Clothes Dryer - Rm C1065	30 A	2			2400	900			1	20 A	Recepts - Rms C1065 & C1065B	10
11	--	--	--					2400	0	1	20 A	SPARE	12
13	Washer - Rm C1065	30 A	3	1801	1680					1	25 A	Dryer - Rm C1065	14
15	--	--	--			1801	1680			1	25 A	Dryer - Rm C1065	16
17	--	--	--					1801	1680	1	25 A	Dryer - Rm C1065	18
19	Washer - Rm C1065	30 A	3	1801	0					--	--	SPACE	20
21	--	--	--			1801	0			--	--	SPACE	22
23	--	--	--					1801	0	--	--	SPACE	24
25	Washer - Rm C1065	30 A	3	1801	0					--	--	SPACE	26
27	--	--	--			1801	0			--	--	SPACE	28
29	--	--	--					1801	0	--	--	SPACE	30
		Total Load:		9164 VA		10384 VA		9484 VA					
		Total Amps:		76 A		87 A		79 A					

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Receptacle	2980 VA	100.00%	2980 VA		
Electric Clothes Dryer	9840 VA	100.00%	9840 VA	**Total Conn. Load:**	12820 VA
				Total Est. Demand:	12820 VA
				Total Conn. Current:	36 A
				Total Est. Demand Current:	36 A

Notes:

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SURVEYING • CONSTRUCTION SERVICES
DLZ INDIANA, LLC

MARVIN L. HITCHCOCK
PE60018675
STATE OF INDIANA
PROFESSIONAL ENGINEER

NO.	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: RDW | CHK'D: MLH
DESIGNED: RDW
APPRV'D: MLH
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

PANELBOARD SCHEDULES

DRAWING NUMBER E-706
ELECTRICAL

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BASE BID SCHEDULE

Branch Panel: E3H

Location: VEHICLE SALLYPORT C100 | **Volts:** 480/277 Wye | **A.I.C. Rating:** 42k AIC
Supply From: ODPA | **Phases:** 3 | **Mains Type:** MLO
Mounting: Flush | **Wires:** 4 | **Mains Rating:** 250 A
Enclosure: 1

Notes:
NEW FLUSH MOUNTED PANEL - BASE BID LAYOUT.
PROVIDE THREE (3) EMPTY 1"C. STUBBED OUT INTO VEHICLE SALLYPORT AT +17'-0" AFF FOR FUTURE USE.

CKT	Circuit Description	Trip	Poles	A (VA)		B (VA)		C (VA)		Poles	Trip	Circuit Description	CKT
1	SPARE	20 A	1	0	0					1	20 A	SPARE	2
3	SPARE	20 A	1			0	0			1	20 A	SPARE	4
5	SPARE	20 A	1					0	0	1	20 A	SPARE	6
7	Exterior Area/Drive Lighting - West	20 A	1	629	1762					1	20 A	Lighting - Vehicle Sallyport	8
9	Exterior Wall Mounted - Sallyport	20 A	1			259							10
11													12
13	Roof Top Unit 'RTU-1' - on Roof	20 A	3	2659									14
15	--	--	--			2659							16
17	--	--	--					2659					18
19	Exhaust Fan 'EF-6A' - on Roof	20 A	3	942	942					3	20 A	Exhaust Fan 'EF-6B' - on Roof	20
21	--	--	--			942	942			--	--	--	22
23	--	--	--					942	942	--	--	--	24
25	Instantaneous Water Heater 'IWH-1' - Rm A1003	60 A	3	12000	9820					3	50 A	Panel 'E3PA' via Transformer 'TR-3'	26
27	--	--	--			12000	9880			--	--	--	28
29	--	--	--					12000	10060	--	--	--	30
			Total Load:	28692 VA		26671 VA		26603 VA					
			Total Amps:	104 A		96 A		96 A					

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
HVAC	43978 VA	100.00%	43978 VA		
Lighting	2600 VA	100.00%	2600 VA	**Total Conn. Load:**	81965 VA
Motor	21346 VA	103.31%	22052 VA	**Total Est. Demand:**	82571 VA
Other	0 VA	0.00%	0 VA	**Total Conn. Current:**	99 A
Receptacle	10200 VA	99.02%	10100 VA	**Total Est. Demand Current:**	99 A
Heating	3864 VA	100.00%	3864 VA		

Notes:

BASE BID SCHEDULE

Branch Panel: E3PA

Location: VEHICLE SALLYPORT C100 | **Volts:** 120/208 Wye | **A.I.C. Rating:** 10k AIC
Supply From: TR-3 | **Phases:** 3 | **Mains Type:** MCB
Mounting: Flush | **Wires:** 4 | **Mains Rating:** 125 A
Enclosure: 1 | **MCB Rating:** 110 A

Notes:
NEW FLUSH MOUNTED PANEL - BASE BID LAYOUT.
PROVIDE THREE (3) EMPTY 1"C. STUBBED OUT INTO VEHICLE SALLYPORT AT +17'-0" AFF FOR FUTURE USE.

CKT	Circuit Description	Trip	Poles	A (VA)		B (VA)		C (VA)		Poles	Trip	Circuit Description	CKT
1	SPARE	20 A	1	0	0					1	20 A	SPARE	2
3	SPARE	20 A	1			0	0			1	20 A	SPARE	4
5	SPARE	20 A	1					0	0	1	20 A	SPARE	6
7	Overhead Door 'A1003B' - Rm A1003	20 A	1	1656	1080					1	20 A	Recepts - Rms A1000, A1002 & A1003	8
9	Overhead Door 'A1000H' - Rm A1000	20 A	1			1656	1080			1	20 A	Recepts - Rms A1000 & Exterior	10
11	Overhead Door 'A1000E' - Rm A1000	20 A	1					1656	1080	1	20 A	Recepts - Rms A1000 & Exterior	12
13	Overhead Door 'A1000'I - Rm A1000	20 A	1	1656	1080					1	20 A	Recepts - Rms A1000 & Exterior	14
15	Overhead Door 'A1000D' - Rm A1000	20 A	1			1656	900			1	20 A	Recepts - Rms A1000 & Exterior	16
17	Overhead Door 'A1000J' - Rm A1000	20 A	1					1656	900	1	20 A	Recepts - Rms A1001, A1002 & Exterior	18
19	Overhead Door 'A1000C' - Rm A1000	20 A	1	1656	1080					1	20 A	Recepts - Rm A2000 & A2001	20
21	Overhead Door 'A1000K' - Rm A1000	20 A	1			1656	216			1	20 A	Infrared Heater 'IR-4' - Rm A1000	22
23	Overhead Door 'A1000B' - Rm A1000	20 A	1					1656	216	1	20 A	Infrared Heater 'IR-2' - Rm A1000	24
25	Sliding Door 'B1063A'	20 A	1	396	216					1	20 A	Infrared Heater 'IR-3' - Rm A1000	26
27	Elec. Unit Heater 'EUH-1' - Rm A2000	20 A	2			1500	216			1	20 A	Infrared Heater 'IR-1' - Rm A1000	28
29	--	--	--					1500	396	1	20 A	Sliding Door 'B1055A'	30
31	Time Clock 'TC3' - Rm A1000	20 A	1	0	1000					1	20 A	Air Compressor Recept - Rm A1003	32
33	SPARE	20 A	1			0	1000			1	20 A	Recept Cord Reel - Rm A1003	34
35	SPARE	20 A	1					0	1000	1	20 A	Recept Cord Reel - Rm A1003	36
37	SPACE	--	--	0	0					3	60 A	Surge Protective Deivce 'SPD-E3PA'	38
39	SPACE	--	--			0	0			--	--	--	40
41	SPACE	--	--					0	0	--	--	--	42
			Total Load:	9820 VA		9880 VA		10060 VA					
			Total Amps:	82 A		82 A		84 A					

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Motor	15696 VA	102.64%	16110 VA		
Receptacle	10200 VA	99.02%	10100 VA	**Total Conn. Load:**	29760 VA
Heating	3864 VA	100.00%	3864 VA	**Total Est. Demand:**	30074 VA
				Total Conn. Current:	83 A
				Total Est. Demand Current:	83 A

Notes:

ALTERNATE BID SCHEDULE

Branch Panel: E3H

Location: VEHICLE SALLYPORT C100 | **Volts:** 480/277 Wye | **A.I.C. Rating:** 42k AIC
Supply From: | **Phases:** 3 | **Mains Type:** MLO
Mounting: Flush | **Wires:** 4 | **Mains Rating:** 250 A
Enclosure: 1

Notes:
NEW FLUSH MOUNTED PANEL - ALTERNATE BID LAYOUT.
PROVIDE THREE (3) EMPTY 1"C. STUBBED OUT INTO VEHICLE SALLYPORT AT +17'-0" AFF FOR FUTURE USE.

CKT	Circuit Description	Trip	Poles	A (VA)		B (VA)		C (VA)		Poles	Trip	Circuit Description	CKT
1	SPARE	20 A	1	0	0					1	20 A	SPARE	2
3	SPARE	20 A	1			0	0			1	20 A	SPARE	4
5	SPARE	20 A	1					0	0	1	20 A	SPARE	6
7	*, (BASE BID) Exterior Area/Drive Lighting - West	20 A	1	0	0					1	20 A	*,(BASE BID) Lighting - Vehicle Sallyport	8
9	*,(BASE BID) Exterior Wall Mounted - Sallyport	20 A	1			102							10
11													12
13	*,(BASE BID) Roof Top Unit 'RTU-1' - on Roof	20 A	3	0									14
15	--	--	--			0							16
17	--	--	--					0					18
19	Exhaust Fan 'EF-ALT-A' - on Roof	20 A	3	0	0					3	20 A	Exhaust Fan 'EF-ALT-B' - on Roof	20
21	--	--	--			0	0			--	--	--	22
23	--	--	--					0	0	--	--	--	24
25	*,(BASE BID) Ins. Water Heater 'IWH-1' - Rm...	60 A	3	12000	4456					3	50 A	*,(BASE BID) Panel 'E3PA' via Trans. 'TR-3'	26
27	--	--	--			12000	3040			--	--	--	28
29	--	--	--					12000	3400	--	--	--	30
			Total Load:	16456 VA		15132 VA		15400 VA					
			Total Amps:	60 A		55 A		56 A					

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
HVAC	36000 VA	100.00%	36000 VA		
Lighting	102 VA	100.00%	102 VA	**Total Conn. Load:**	46988 VA
Motor	1656 VA	125.00%	2070 VA	**Total Est. Demand:**	47402 VA
Receptacle	6240 VA	100.00%	6240 VA	**Total Conn. Current:**	57 A
Heating	3000 VA	100.00%	3000 VA	**Total Est. Demand Current:**	57 A

Notes:

ALTERNATE BID SCHEDULE

Branch Panel: E3PA

Location: VEHICLE SALLYPORT C100 | **Volts:** 120/208 Wye | **A.I.C. Rating:** 10k AIC
Supply From: TR-3 | **Phases:** 3 | **Mains Type:** MCB
Mounting: Flush | **Wires:** 4 | **Mains Rating:** 125 A
Enclosure: 1 | **MCB Rating:** 110 A

Notes:
NEW FLUSH MOUNTED PANEL - ALTERNATE BID LAYOUT
PROVIDE THREE (3) EMPTY 1"C. STUBBED OUT INTO VEHICLE SALLYPORT AT +17'-0" AFF FOR FUTURE USE.

CKT	Circuit Description	Trip	Poles	A (VA)		B (VA)		C (VA)		Poles	Trip	Circuit Description	CKT
1	SPARE	20 A	1	0	0					1	20 A	SPARE	2
3	SPARE	20 A	1			0	0			1	20 A	SPARE	4
5	SPARE	20 A	1					0	0	1	20 A	SPARE	6
7	Overhead Door 'A1003B' - Rm A1003	20 A	1	1656	1080					1	20 A	Recepts - Rms A1000, A1002 & A1003	8
9	SPARE	20 A	1			0	540			1	20 A	Recepts - Rms A1000 & Exterior	10
11	SPARE	20 A	1					0	0	1	20 A	*,(BASE BID) Recepts - Rms A1000 & Exterior	12
13	SPARE	20 A	1	0	0					1	20 A	*,(BASE BID) Recepts - Rms A1000 & Exterior	14
15	SPARE	20 A	1			0	0			1	20 A	*,(BASE BID) Recepts - Rms A1000 & Exterior	16
17	*,(BASE BID) Overhead Door 'A1000J' - Rm A1000	20 A	1					0	900	1	20 A	Recepts - Rms A1000, A1001 & A1002	18
19	*,(BASE BID) Overhead Door 'A1000C' - Rm...	20 A	1	0	720					1	20 A	Recepts - Rm A2000 & A2001	20
21	*,(BASE BID) Overhead Door 'A1000K' - Rm...	20 A	1			0	0			1	20 A	SPARE	22
23	*,(BASE BID) Overhead Door 'A1000B' - Rm...	20 A	1					0	0	1	20 A	*,(BASE BID) Infrared Heater 'IR-1' - Rm A1000	24
25	*,(BASE BID) Sliding Door 'B1063A'	20 A	1	0	0					1	20 A	SPARE	26
27	*,(BASE BID) Elec. Unit Heater 'EUH-1' - Rm...	20 A	2			1500	0			1	20 A	*,(BASE BID) Infrared Heater 'IR-2' - Rm A1000	28
29	--	--	--					1500	0	1	20 A	*,(BASE BID) Sliding Door 'B1055A'	30
31	Time Clock 'TC3' - Rm A1000	20 A	1	0	1000					1	20 A	Air Compressor Recept - Rm A1003	32
33	SPARE	20 A	1			0	1000			1	20 A	Recept Cord Reel - Rm A1003	34
35	SPARE	20 A	1					0	1000	1	20 A	Recept Cord Reel - Rm A1003	36
37	SPACE	--	--	0	0					3	20 A	*,(BASE BID) Surge Protective Deivce 'SPD-E3PA'	38
39	SPACE	--	--			0	0			--	--	--	40
41	SPACE	--	--					0	0	--	--	--	42
			Total Load:	4456 VA		3040 VA		3400 VA					
			Total Amps:	38 A		25 A		29 A					

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Motor	1656 VA	125.00%	2070 VA		
Receptacle	6240 VA	100.00%	6240 VA	**Total Conn. Load:**	10896 VA
Heating	3000 VA	100.00%	3000 VA	**Total Est. Demand:**	11310 VA
				Total Conn. Current:	30 A
				Total Est. Demand Current:	31 A

Notes:

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DLZ INDIANA, LLC

MARVIN L. HITCHCOCK REGISTERED No. PE60018676 STATE OF INDIANA PROFESSIONAL ENGINEER

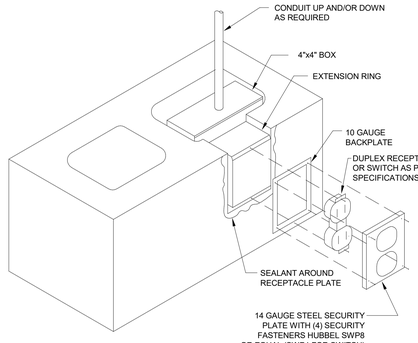
NO.	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: RDW | CHK'D: MLH
DESIGNED: RDW
APPRV'D: MLH
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER
1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

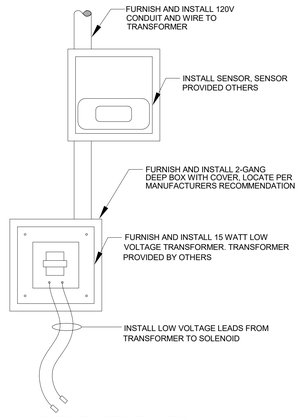
PANELBOARD SCHEDULES

DRAWING NUMBER
E-707
ELECTRICAL



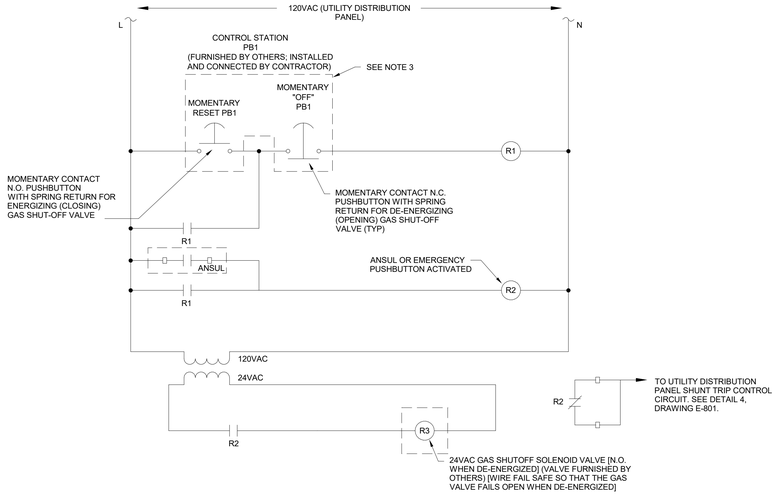
NOTES:
1. SEALANT SHALL BE NONPERMANENT ADHESIVE WHICH WILL ALLOW REMOVAL OF WIRING DEVICE.
2. SECURITY FASTENERS SHALL BE CENTER PIN REJECTION TORX.

1 VANDALPROOF STYLE RECEPTACLE DETAIL
E-801 SCALE: N.T.S.



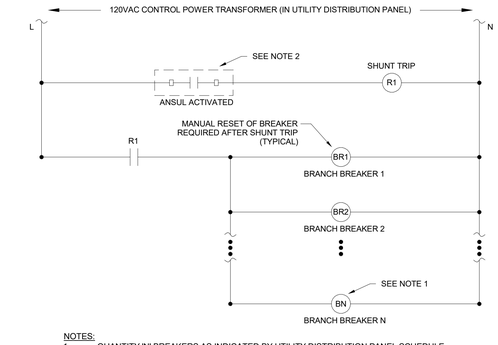
*COORDINATE LOCATION OF ALL ITEMS WITH ALL TRADES AND MANUFACTURERS RECOMMENDATION

2 AUTOMATIC ELECTRONIC FLUSH VALVE DETAIL
E-801 SCALE: N.T.S.



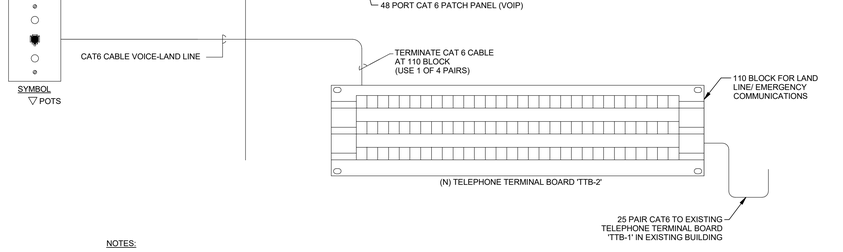
NOTES:
1. REFER TO MECHANICAL/PLUMBING FOR ADDITIONAL REQUIREMENTS.
2. REFER TO DRAWING E-201-K, NOTE 260638 FOR PB1 CONTROL STATION LOCATION.
3. PROVIDE INSTRUCTION SIGN ABOVE PB1 CONTROL STATION FOR OPERATION INSTRUCTIONS FOR A KITCHEN FIRE EVENT.

3 ANSUL OR EMERGENCY PUSHBUTTON CONTROL WIRING DIAGRAM
E-801 SCALE: N.T.S.



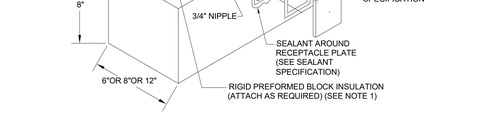
NOTES:
1. QUANTITY 'N' BREAKERS AS INDICATED BY UTILITY DISTRIBUTION PANEL SCHEDULE.
2. REFER TO DETAIL #3 ON DRAWING E-801.

4 SHUNT-TRIP BREAKER WIRING DIAGRAM
E-801 SCALE: N.T.S.



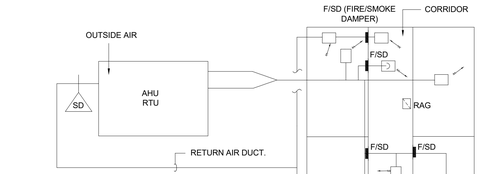
NOTES:
1. CONTRACTOR SHALL FURNISH AND INSTALL MUTOA OUTLETS, CONDUIT,PATCH CORDS, STRUCTURED CABLING, PATCH PANELS ,J-HOOKS, CABLE TRAY, 2-POST OPEN EQUIPMENT RACKS AND RACK ACCESSORIES, ETC...FOR A COMPLETE FUNCTIONING AND CERTIFIED DATA-COMMUNICATION SYSTEM. RACK HEAD-END ELECTRONIC EQUIPMENT (I.E. ROUTERS, POE SWITCHES, POE INJECTORS) SHALL BE FURNISHED AND INSTALLED BY THE OWNER.
2. DOCUMENTS REFLECT BASIS-OF-DESIGN AND SYSTEM PERFORMANCE REQUIREMENTS. PROVIDE SYSTEM COMPONENTS COMPATIBLE WITH EACH OTHER AND OVERALL SYSTEM.
3. PROPOSED SUBSTITUTIONS SHALL BE SUBMITTED AND REVIEWED IN ACCORDANCE WITH DIVISION 00 AND DIVISION 01 OF THE SPECIFICATIONS.
4. BICSI INSTALLER LEVEL 2 CERTIFICATION IS REQUIRED FOR INSTALLING CONTRACTOR. TELECOMM DESIGNER SHALL HAVE RCDD CERTIFICATION. PROVIDE DOCUMENTATION OF ALL CERTIFICATIONS FOR ENGINEER REVIEW/APPROVAL PRIOR TO PROCUREMENT/INSTALLATION.
5. SEE ELECTRICAL SYSTEMS PLANS FOR DEVICE(S) LOCATIONS AND MUTOA OUTLETS REQUIRED.
6. OWNER CURRENTLY USED EDGE TECHNOLOGY AND INNOVATIVE COMMUNICATIONS SOLUTIONS FOR COMMUNICATIONS NEEDS. EDGE TECHNOLOGY CONTACT: RYAN EDGE, PHONE: 812-514-8127. INNOVATIVE COMMUNICATIONS SOLUTIONS CONTACT: STEVE CLARK, PHONE: 812-232-8600.

5 TYPICAL HORIZONTAL WIRING DIAGRAM
E-801 SCALE: N.T.S.



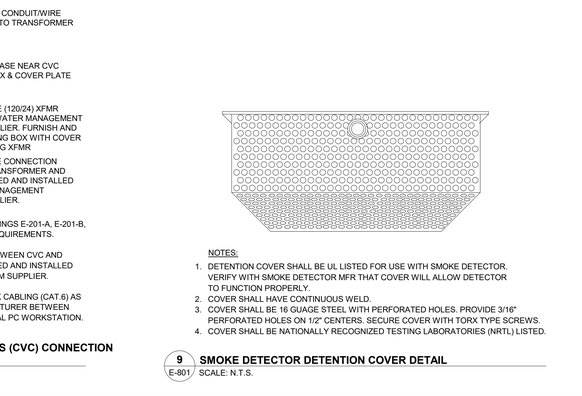
NOTES:
1. ADJACENT BOXES FOR TWO ROOMS SHALL BE INSULATED COMPLETELY AROUND BOX AIR SPACE AS INDICATED TO REDUCE SOUND TRANSMISSION THROUGH WALLS.

6 BACK TO BACK OUTLET SOUNDPROOFING DETAIL
E-801 SCALE: N.T.S.



NOTES:
1. F/SD ACTUATORS, 120V, TO BE "POWER OPEN - FAIL CLOSED". POWER SUPPLY BY E.C. CONNECT TO CIRCUIT L2P-19, L2P-21 OR L2P-23 USING 2#12+G. IN 3/4"C.
2. DUCT SMOKE DETECTOR(S) IN AHU(S):
   A. CABLING PROVIDED BY CONTRACTOR. CABLING. TERMINATIONS TO AHU BY T.C.C. INTERLOCK TO SHUT-DOWN AHU UPON SMOKE DETECTION.
   B. CLOSE F/SD UPON SMOKE DETECTION AT AHU.
   C. SHUT-DOWN AHU REFRIGERATION.
   D. DUCT DETECTOR(S) AND REMOTE TEST STATION(S) FOR EACH AHU PROVIDED BY EQUIPMENT SUPPLIER.
3. WIRING
   A. ALL 120V POWER WIRING BY CONTRACTOR.
4. SMOKE DAMPER
   A. CONNECT TO LEGALLY REQUIRED 120VAC BRANCH CIRCUIT. DAMPER SHALL OPEN UPON ENERGIZATION (OR FAIL CLOSED UPON DE-ENERGIZATION). POWER TO SMOKE DAMPER(S) ASSOCIATED WITH AHU SHALL BE CONTROLLED BY THE FIRE ALARM CONTROL PANEL - I.E. THE 120VAC CIRCUIT SHALL BE WIRED VIA THE DRY, FORM C ISOLATION CONTACT (IN THE IAM). UPON DUCT DETECTOR SMOKE DETECTION AS AHU ASSOCIATED DAMPER(S) SHALL BLOSE (BE DE-ENERGIZED). REFER TO DRAWINGS E-203 AND E-204 FOR LOCATIONS OF AHU(S) REQUIRING DUCT SMOKE DETECTOR(S). REFER TO HVAC PLANS FOR SMOKE DAMPER/DUCTWORK LOCATIONS.

7 TYPICAL FIRE-SMOKE DAMPER WIRING DETAIL
E-801 SCALE: N.T.S.

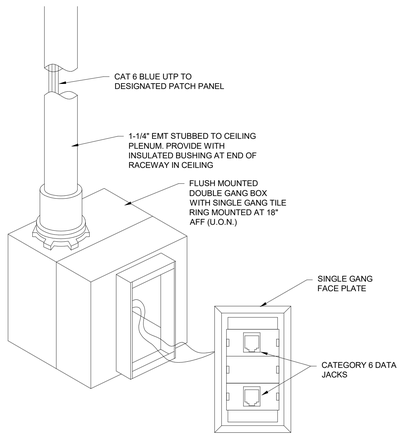


NOTES:
1. SEE GENERAL NOTE G ON DRAWINGS E-201-A, E-201-B, AND E-201-C FOR CIRCUITING REQUIREMENTS.
2. LOW VOLTAGE CONNECTION BETWEEN CVC AND EACH VAVLE SHALL BE FURNISHED AND INSTALLED BY WATER MANAGEMENT SYSTEM SUPPLIER.
3. FURNISH AND INSTALL NETWORK CABLING (CAT.6) AS REQUIRED BY SYSTEM MANUFACTURER BETWEEN EACH CONTROLLER AND CENTRAL PC WORKSTATION.

8 CELL VALVE CONTROLLERS (CVC) CONNECTION DETAIL
E-801 SCALE: N.T.S.

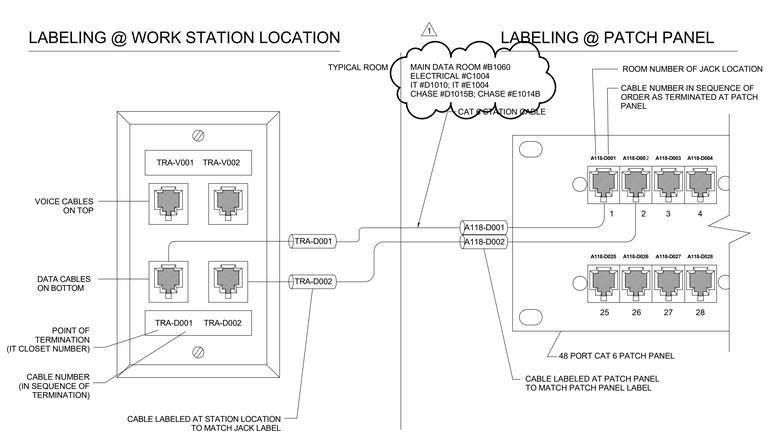
NOTES:
1. DETENTION COVER SHALL BE UL LISTED FOR USE WITH SMOKE DETECTOR. VERIFY WITH SMOKE DETECTOR MFR THAT COVER WILL ALLOW DETECTOR TO FUNCTION PROPERLY.
2. COVER SHALL HAVE CONTINUOUS WELD.
3. COVER SHALL BE 16 GUAGE STEEL WITH PERFORATED HOLES. PROVIDE 3/16" PERFORATED HOLES ON 1/2" CENTERS. SECURE COVER WITH TORX TYPE SCREWS.
4. COVER SHALL BE NATIONALLY RECOGNIZED TESTING LABORATORIES (NRTL) LISTED.

9 SMOKE DETECTOR DETENTION COVER DETAIL
E-801 SCALE: N.T.S.



NOTE:
CONTRACTOR SHALL PROVIDE AND INSTALL ALL ACCESSORIES REQUIRED FOR A COMPLETE AND FUNCTIONAL SYSTEM

10 TYPICAL 2-PORT DATA DETAIL
E-801 SCALE: N.T.S.



11 TYPICAL JACK CABLE AND PATCH PANEL LABELING DIAGRAM
E-801 SCALE: N.T.S.

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NO.	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: RDW CHKD: MLH
DESIGNED: RDW
APPRVD: MLH
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER: 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

ELECTRICAL DETAILS

DRAWING NUMBER: E-801 ELECTRICAL

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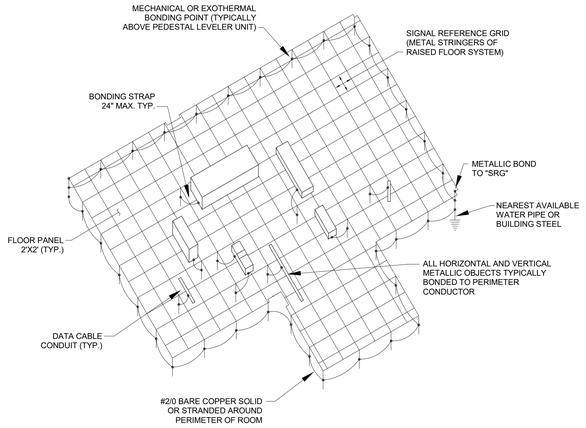
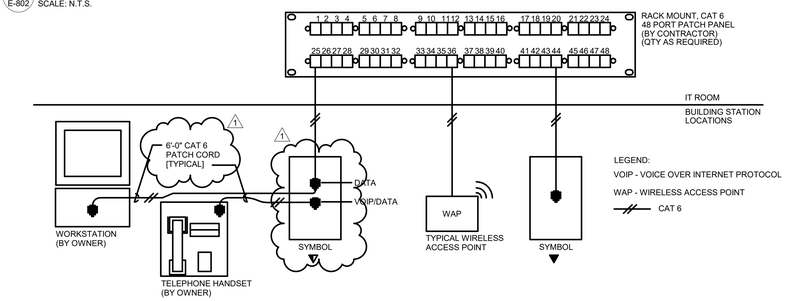


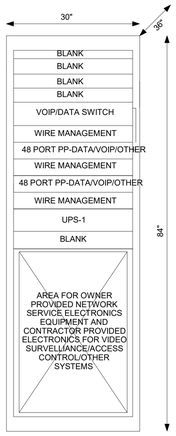
10 RAISED FLOOR GROUDING DETAIL
E-802 SCALE: N.T.S.



NOTES:

1. RECEPTACLES (TELEPHONE AND/OR DATA/TELEPHONE), CONDUIT, PATH CABLES, PATCH PANELS, FLOOR STANDING CABINETS, ETC. A COMPLETE FUNCTIONING AND CERTIFIED DATA-COMMUNICATION SYSTEM SHALL BE PROVIDED AND INSTALLED AS REQUIRED.
2. DOCUMENTS REFLECT BASIS-OF-DESIGN AND SYSTEM PERFORMANCE REQUIREMENTS. PROVIDE SYSTEM COMPONENTS COMPATIBLE WITH EACH OTHER AND OVERALL SYSTEM.
3. PROPOSED SUBSTITUTIONS SHALL BE SUBMITTED AND REVIEWED IN ACCORDANCE WITH DIVISION 00 AND DIVISION 01 OF THE PROJECT MANUAL.
4. BICSI/RCDD CERTIFICATION IS REQUIRED FOR CABLING LAYOUT AND INSTALLATION. CONTRACTOR SHALL PROVIDE DOCUMENTATION.
5. PROVIDE TWO (2) DEDICATED POTS LINES FOR FIRE ALARM CONTROL PANEL. PROVIDE ADDITIONAL POTS LINES AS REQUIRED FOR BMS, SECURITY, ETC. FIELD COORDINATE WITH COMMUNICATION UTILITY ON REQUIREMENTS PRIOR TO CONSTRUCTION.
6. FOR DETAILED REQUIREMENTS FOR COMMUNICATIONS HORIZONTAL CABLING, REFER TO SPECIFICATIONS.

9 STRUCTURED CABLING DETAIL - TYPICAL FOR EACH INTERMEDIATE DISTRIBUTION FRAME
E-802 SCALE: N.T.S.



RACK - #1

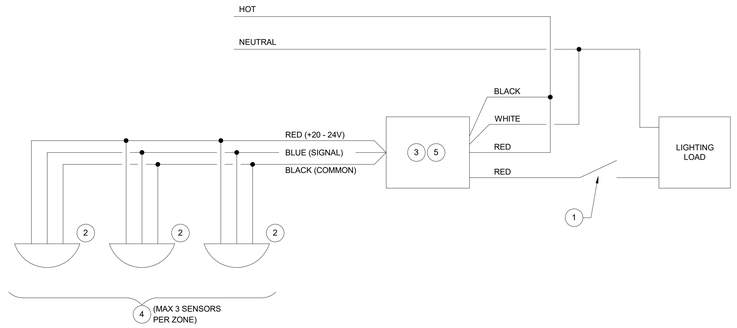
TELECOM EQUIPMENT SCHEDULE			
Mfr	Qty	Part No.	Device Description
MOHAWK	AS REQ'D	M58281	CAT 6 - BLUE - 1.000 FT BOX
PANDUIT	AS REQ'D	DP48688TG	48 PORT PATCH PANEL (CAT 6)
PANDUIT	AS REQ'D	UTPSP4xxx	CAT 6 PATCH CORD - BLUE - 48"
PANDUIT	AS REQ'D	UTPSP10xxx	CAT 6 PATCH CORD - BLUE - 10 FT
PANDUIT	AS REQ'D	CFPS4EI	FACE PLATE
PANDUIT	AS REQ'D	CHS2IW-X	SLOPED PORT MODULE
PANDUIT	AS REQ'D	CHB2IW-X	BLANK INSERT
PANDUIT	AS REQ'D	KWP6PY	PHONE OUTLET
PANDUIT	AS REQ'D	CJ688TGBU	CAT 6 JACK - BLUE
PANDUIT	AS REQ'D	CJ688TGOR	CAT 6 JACK - ORANGE (PHONE)
PANDUIT	AS REQ'D	CMBIW-X	SNAP IN BLANK. 10 PACK
CADDY	AS REQ'D	CAT3224	J-HOOK
MAP	1	R4CN-4536B	OPEN EQUIPMENT RACK (84"Hx36"D)
MAP	2	PD-2X620J	POWER STRIP
MAP	1	MRK-Z4	SEISMIC COMPLIANCY FLOOR ANCHOR BOLTS
PANDUIT	AS REQ'D	-	WIRING DUCT (COLOR: BLACK)
MAP	AS REQ'D	-	ACCESSORIES (RAILS, SHELVES, HARDWARE, FASTENERS, CABLE MANAGEMENT) AS REQUIRED
LIEBERT	AS REQ'D	-	UNINTERRUPTIBLE POWER SUPPLY

GENERAL NOTES:

1. TOTAL CABLES FOR THIS RACK ARE BASED ON TOTAL DATA AND PHONE CABLES FOR EACH DEVICE AS NOTED ON THE SYSTEM PLANS.
2. EXACT RACK LAYOUT TO BE REVIEWED AND DISCUSSED WITH OWNER REPRESENTATIVE PRIOR TO MOUNTING DEVICES WITHIN FLOOR MOUNTED RACK.
3. DOCUMENTS REFLECT BASIS-OF-DESIGN AND SYSTEM PERFORMANCE REQUIREMENTS. PROVIDE SYSTEM COMPONENTS COMPATIBLE WITH EACH OTHER AND OVERALL SYSTEM.
4. PROPOSED SUBSTITUTIONS SHALL BE SUBMITTED AND REVIEWED IN ACCORDANCE WITH DIVISION 00 AND DIVISION 01 OF THE PROJECT MANUAL.
5. BICSI/RCDD CERTIFICATION IS REQUIRED FOR CONTRACTOR SHALL PROVIDE DOCUMENTATION.
6. OWNER CURRENTLY USES EDGE TECHNOLOGY AND INNOVATIVE COMMUNICATIONS SOLUTIONS (ICS). EDGE TECHNOLOGY CONTACT IS RYAN EDGE, PHONE: 812-514-8127. ICS CONTACT IS STEVE CLARK, PHONE: 812-232-8600.
7. FOR RACK MOUNTED EQUIPMENT, PROVIDE SPACE IN RACK TO ACCOMMODATE EQUIPMENT. CONTRACTOR SHALL FURNISH ALL NECESSARY EQUIPMENT INCLUDING POWER STRIPS (POWER DISTRIBUTION UNITS NO. 1 AND NO. 2 WITH SURGE PROTECTION, CABLE MANAGEMENT, PATCH CORDS, ETC) FOR A COMPLETE AND FUNCTIONAL SYSTEM.

8 INTERMEDIATE DISTRIBUTION FRAME (IDF) (DATA RACK) (TYPICAL EACH IT ROOM)
E-802 SCALE: N.T.S.

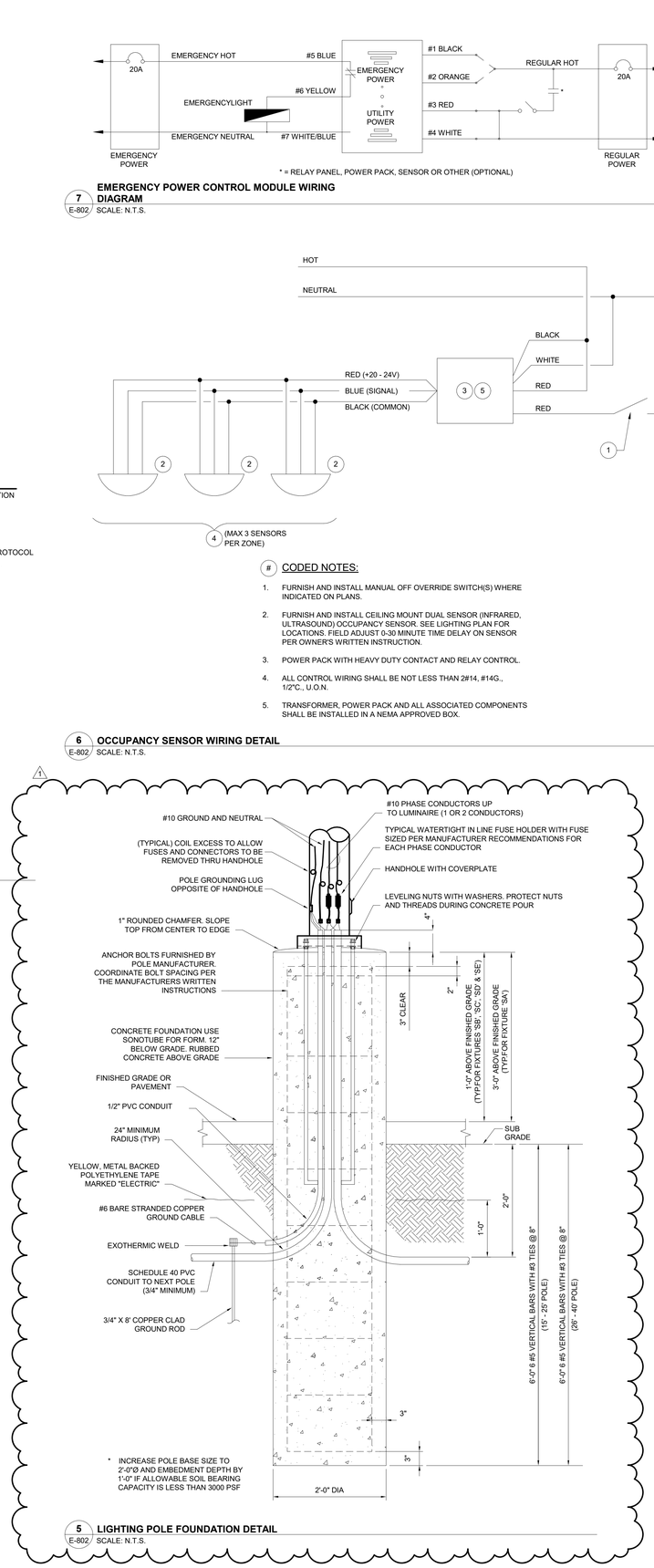
7 EMERGENCY POWER CONTROL MODULE WIRING DIAGRAM
E-802 SCALE: N.T.S.



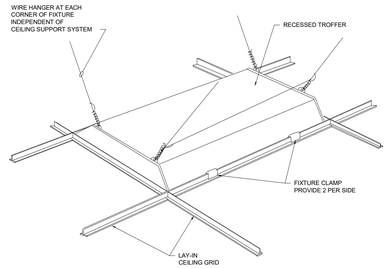
 # CODED NOTES:

1. FURNISH AND INSTALL MANUAL OFF OVERRIDE SWITCH(S) WHERE INDICATED ON PLANS.
2. FURNISH AND INSTALL CEILING MOUNT DUAL SENSOR (INFRARED, ULTRASOUND) OCCUPANCY SENSOR. SEE LIGHTING PLAN FOR LOCATIONS. FIELD ADJUST 0-30 MINUTE TIME DELAY ON SENSOR PER OWNER'S WRITTEN INSTRUCTION.
3. POWER PACK WITH HEAVY DUTY CONTACT AND RELAY CONTROL.
4. ALL CONTROL WIRING SHALL BE NOT LESS THAN 2#14, #14G., 1/2"C., U.O.N.
5. TRANSFORMER, POWER PACK AND ALL ASSOCIATED COMPONENTS SHALL BE INSTALLED IN A NEMA APPROVED BOX.

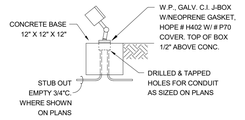
6 OCCUPANCY SENSOR WIRING DETAIL
E-802 SCALE: N.T.S.



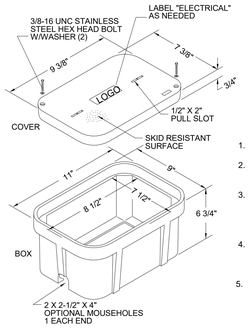
5 LIGHTING POLE FOUNDATION DETAIL
E-802 SCALE: N.T.S.



4 TYPICAL RECESSED FIXTURE MOUNTING DETAIL
E-802 SCALE: N.T.S.



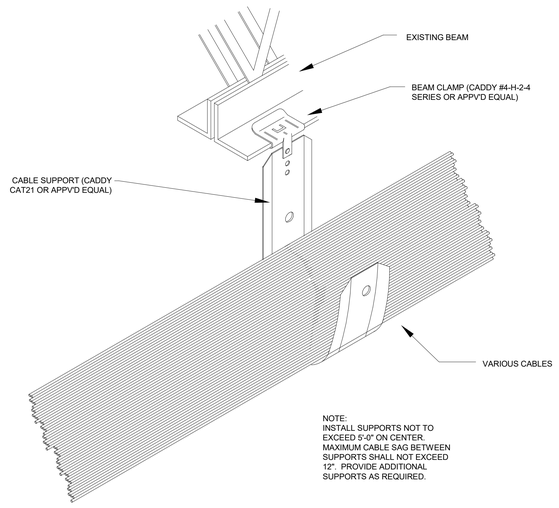
3 TYPICAL FLOOD LIGHT CONCRETE BASE DETAIL
E-802 SCALE: N.T.S.



GENERAL NOTES:

1. COVER LOGO TO STATE "ELECTRICAL" OR "COMMUNICATIONS".
2. TIER 22 BOX AND COVER TO BE MANUFACTURER BY HUBBELL/QUAZITE (OR EXACT EQUAL APPROVED BY ENGINEER).
3. POWER CABLE SPLICES (AS APPROVED BY ENGINEER) SHALL BE WATER RESISTANT. USE GEL FILL WIRE NUTS (I.E. IDEAL OR APPROVED EQUAL) WITH MASTIC TAPE WRAPPED AROUND SPLICES FOR WATERTIGHT SEAL (I.E. 3M OR APPROVED EQUAL).
4. PROVIDE SOLID BOTTOM FOR RODENT RESISTANCE. HANDHOLE SHALL HAVE BITUMINOUS COATING ON THE EXTERIOR TO MINIMIZE WATER PENETRATION.
5. REFER TO DRAWING E-101 FOR PULLBOX LOCATIONS.

2 ELECTRIC HANDHOLE DETAIL
E-802 SCALE: N.T.S.



1 TYPICAL J-HOOK CABLE SUPPORT DETAIL
E-802 SCALE: N.T.S.

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DLZ INDIANA, LLC

MARVIN L. HITCHCOCK
REGISTERED PROFESSIONAL ENGINEER
PE60018675
STATE OF INDIANA

NO.	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: ROW CHK'D: MLH
DESIGNED: ROW
APPV'D: MLH
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

ELECTRICAL DETAILS

DRAWING NUMBER E-802 ELECTRICAL

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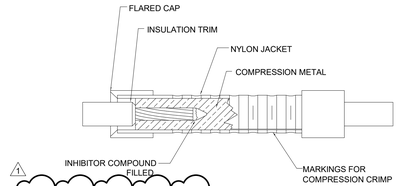
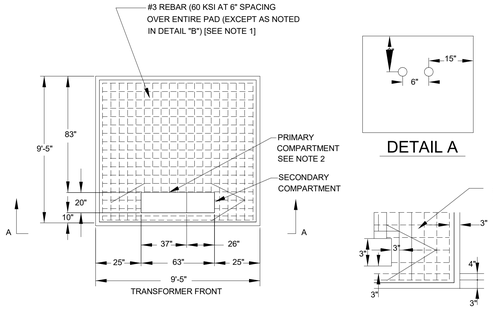
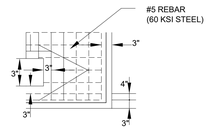


7 INSULATING LINK DETAIL
E-806 SCALE: N.T.S.

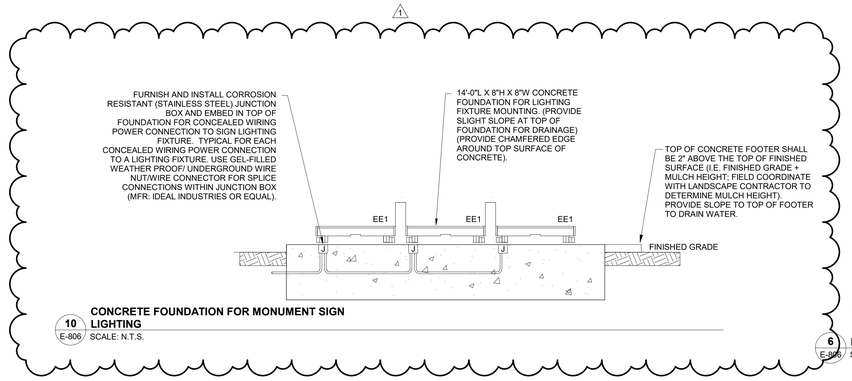


PLAN

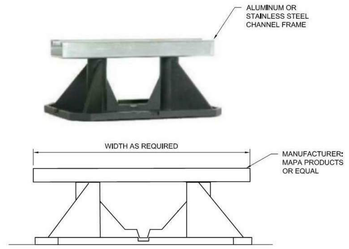
DETAIL A



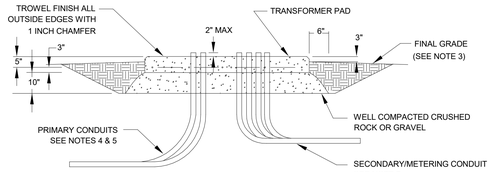
DETAIL B



10 CONCRETE FOUNDATION FOR MONUMENT SIGN LIGHTING
E-806 SCALE: N.T.S.



6 ROOF CONDUIT SUPPORT DETAIL
E-806 SCALE: N.T.S.



SECTION A-A

NOTES:

1. PROVIDE 3,500 PSI CONCRETE WITH A MINIMUM 3 INCH COVER OVER ALL REBAR. WIRE MESH WITH A MINIMUM CROSS SECTIONAL AREA OF 0.176 SQUARE INCHES PER FOOT OF PAD WIDTH MAY BE USED IN PLACE OF REBAR.
2. FOR PRIMARY COMPARTMENT CONDUIT PLACEMENT DIMENSIONS FOR RADIAL FEED TRANSFORMERS. REFER TO DETAIL "A".
3. FINAL GRADE SHALL BE ESTABLISHED BEFORE INSTALLATION OF PAD.
4. CONDUIT SHALL BE FLEXIBLE (REF. NO. 2115). TYPE EB (REF. NO. 2100) OR DB (REF. NO.2121) PVC CONDUIT WITH 90° 38 INCH RADIUS BENDS (REF. NO. 2152). TO AVOID DISTURBING THE GROUND UNDER THE REAR OF THE PAD AND TO MINIMIZE SETTLING. BRING CONDUITS TO THE FRONT OR SIDES WHENEVER POSSIBLE AND MARK THE CONDUIT END LOCATIONS.
5. BURIAL DEPTH IS DEFINED AS THE DISTANCE BETWEEN FINAL GRADE AND THE TOP OF THE BURIED CABLE OR CONDUIT. PRIMARY CABLES SHALL BE INSTALLED AT A BURIAL DEPTH OF NOT LESS THAN 3'-0" AND SECONDARY CABLES SHALL BE INSTALLED AT A BURIAL DEPTH OF NOT LESS THAN 2'-6". IT IS RECOMMENDED THAT PRIMARY CABLES AND SECONDARY CABLES MAINTAIN BURIAL DEPTHS OF 2'-6" AND 2'-0" RESPECTIVELY: THE INTIAL 3'-0" AND 2'-6" BURIAL DEPTHS ARE TO ALLOW FOR CHANGES IN SURFACE CONDITIONS.
6. CONTACT TYLER ANGLE, DUKE ENERGY 48 HOURS PRIOR TO POURING CONCRETE TO INSPECT THE PAD. TELEPHONE #(812-231-8721)
7. DUKE ENERGY SUPPLIES: (CONTRACTOR PICKS UP AND INSTALLS)
   1-METER SOCKET
   2-4" PVC ELBOWS 90° 36" RADIUS
   2-10' SECTIONS SCH. 80 PVC

NOTES:

1. PROVIDE SUFFICIENT CONDUCTOR SLACK TO PERMIT WITHDRAWAL OF THE CONDUCTOR THROUGH THE HANDHOLE.
2. ADD BAYONET FUSE CONNECTOR.

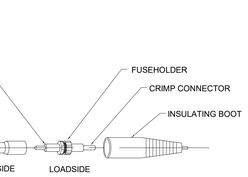
12 POLE WIRING DETAIL - 1
E-806 SCALE: N.T.S.

NOTES:

1. COORDINATE LOCATION AND SIZE OF EQUIPMENT PAD WITH SIGN LIGHTING. SEE DETAIL 1 THIS SHEET.

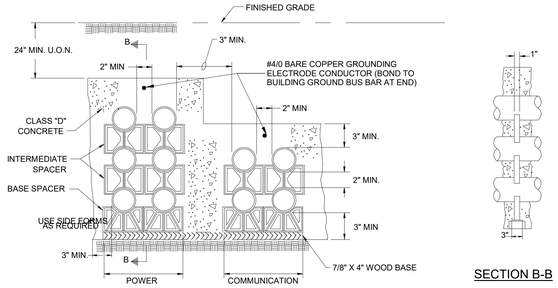
9 SIGN LIGHTING EQUIPMENT PAD DETAIL - MONUMENT SIGN
E-806 SCALE: N.T.S.

5 DIRECT BURIED CONDUIT DETAIL
E-806 SCALE: N.T.S.



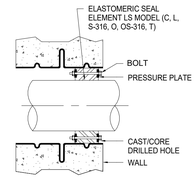
3 BAYONET FUSE CONNECTOR DETAIL
E-806 SCALE: N.T.S.

4 SERVICE TRANSFORMER UT1 CONCRETE PAD INSTALLATION DETAIL
E-806 SCALE: N.T.S.

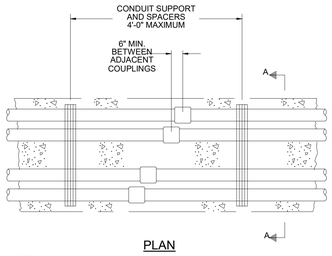


SECTION A-A

SECTION B-B



2 LINK SEAL DETAIL - OUTDOOR PENETRATIONS THROUGH BELOW GRADE EXTERIOR WALL
E-806 SCALE: N.T.S.



PLAN

NOTES:

1. SEE PLANS FOR SIZE AND NUMBER OF CONDUITS AND DUCT BANK ARRANGEMENT.
2. REINFORCING BARS SHALL BE ASTM A-615, GRADE 60.
3. ALL CONCRETE SHALL BE STONE CONCRETE (45 PCF MIN.) AND SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI AT 28 DAYS.

8 CONCRETE ENCASED DUCTBANK DETAIL
E-806 SCALE: N.T.S.

NOTES:

1. PROVIDE SUFFICIENT CONDUCTOR SLACK TO PERMIT WITHDRAWAL OF THE CONDUCTOR THROUGH THE HANDHOLE.
2. ADD BAYONET FUSE CONNECTOR.

11 POLE WIRING DETAIL - 2
E-806 SCALE: N.T.S.

1 VESTIBULE B1000 AND LOBBY B1001
E-806 SCALE: N.T.S.

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MARVIN L. HITCHCOCK — REG. NO. PE20018675 — STATE OF INDIANA — PROFESSIONAL ENGINEER

NO.	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: RDW
DESIGNED: RDW
APPRVD: MLH
CHK'D: MLH
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

ELECTRICAL DETAILS

DRAWING NUMBER E-806 ELECTRICAL

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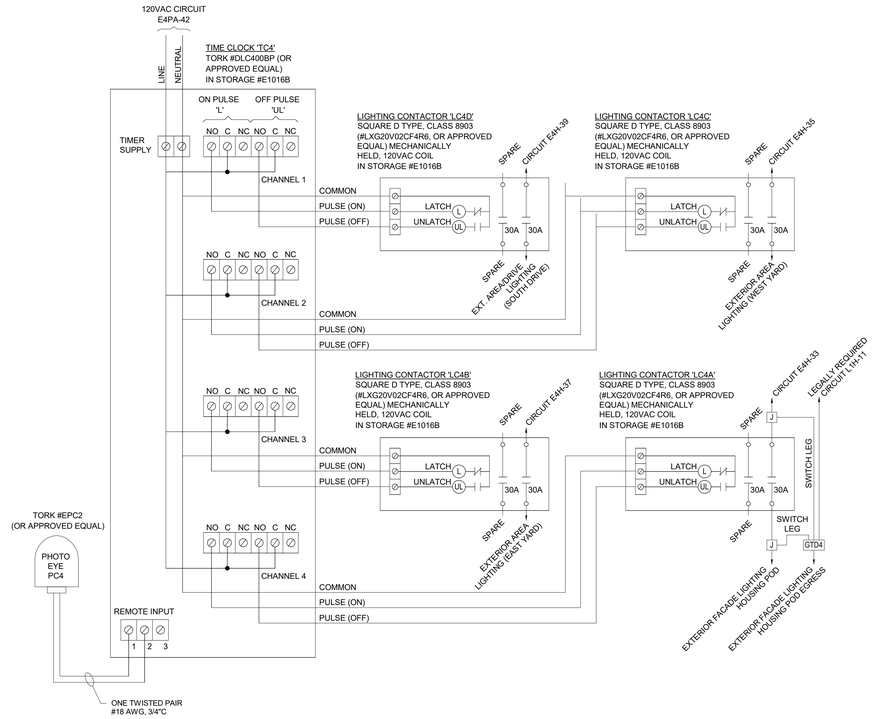
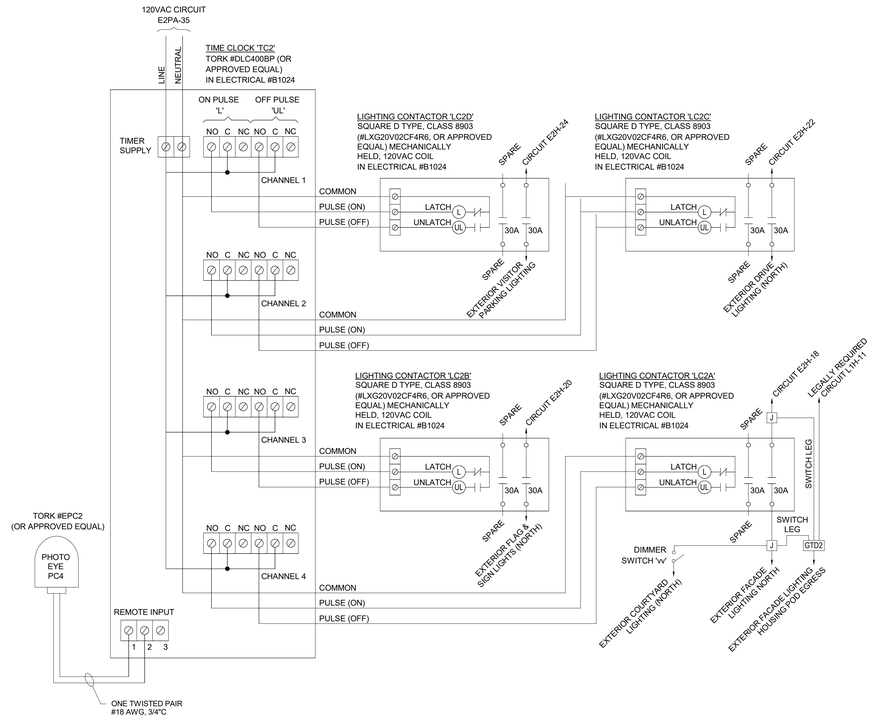
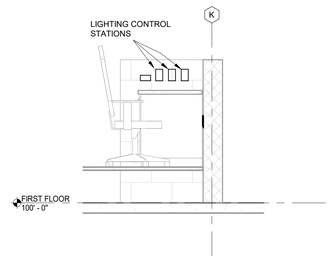


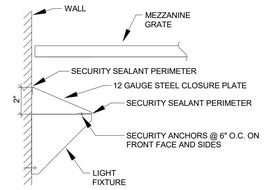
6 E-807 **EXTERIOR LIGHTING WIRING DIAGRAM - ZONE 4**
SCALE: N.T.S.



2 E-807 **EXTERIOR LIGHTING WIRING DIAGRAM - ZONE 2**
SCALE: N.T.S.

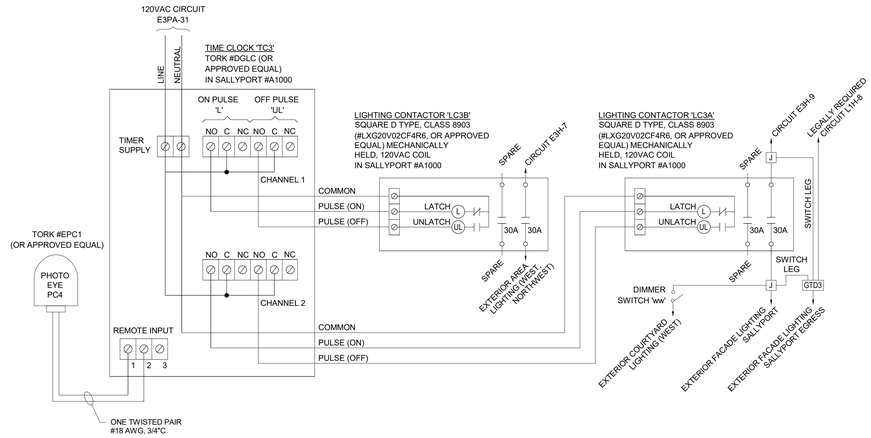


5 E-807 **INTAKE CENTER LIGHTING CONTROLS**
SCALE: 1/2" = 1'-0"

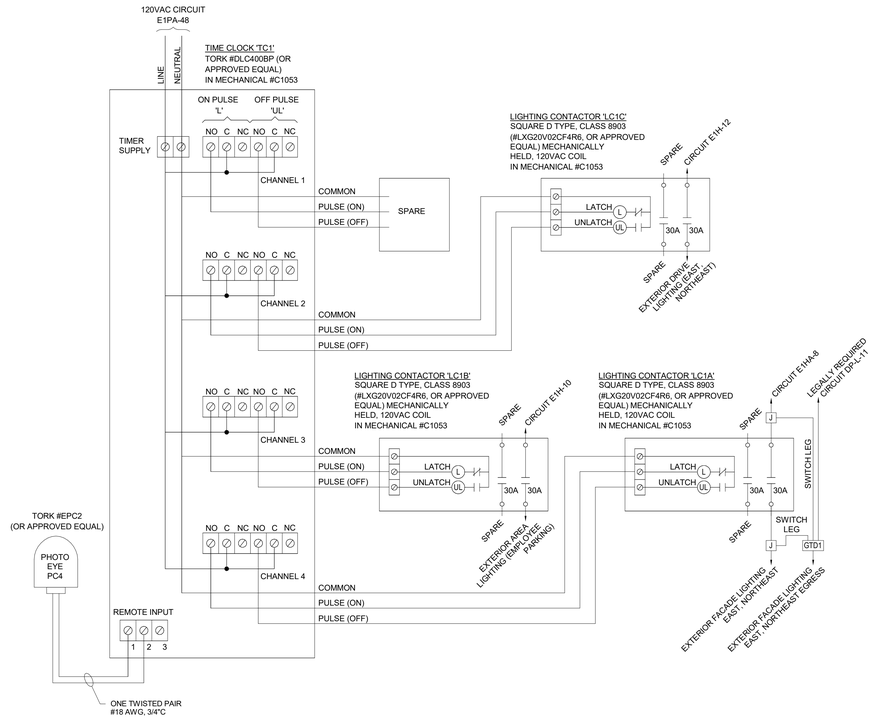


NOTES:
1. PAINT CLOSURE PLATE TO MATCH FIXTURE

4 E-807 **FIXTURE BELOW GRATING MOUNTING DETAIL**
SCALE: N.T.S.



3 E-807 **EXTERIOR LIGHTING WIRING DIAGRAM - ZONE 3**
SCALE: N.T.S.



1 E-807 **EXTERIOR LIGHTING WIRING DIAGRAM - ZONE 1**
SCALE: N.T.S.

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DLZ INDIANA, LLC

MARVIN L. HITCHCOCK
STATE OF INDIANA
PE0018675
REGISTERED PROFESSIONAL ENGINEER

NO.	REVISION	DATE
1	Addendum #01	09/12/19

DRAWN: RDW | CHK'D: MLH
DESIGNED: RDW
APPRV'D: MLH
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

ELECTRICAL DETAILS

DRAWING NUMBER E-807 ELECTRICAL

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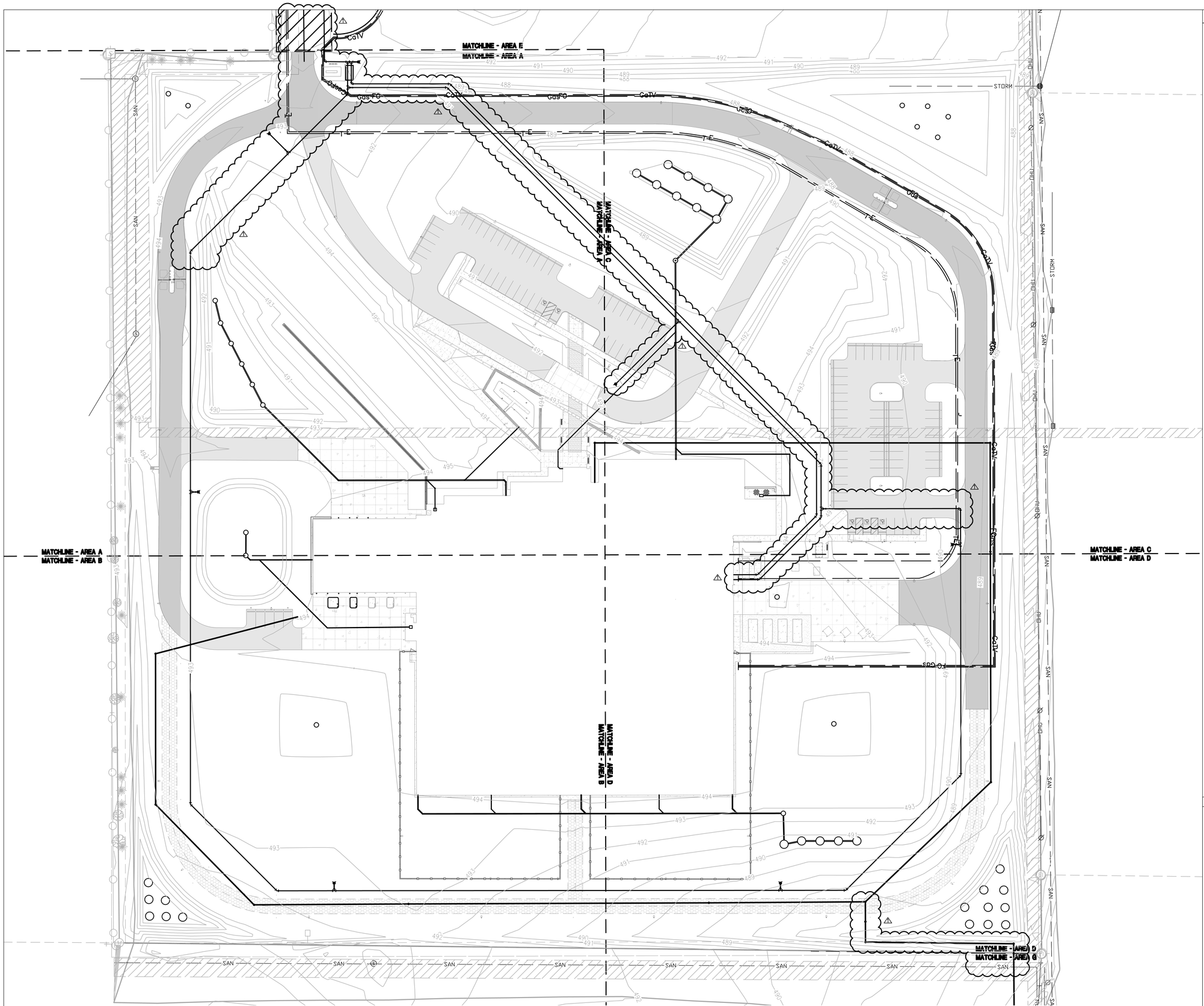
VIGO CIVIL ADDENDUM 1



1 SD-401 OVERALL SITE UTILITY PLAN

NORTH

SCALE – 1" = 40'

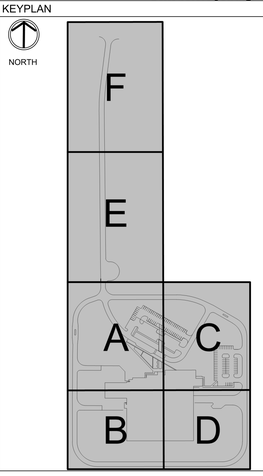
SCALE IN FEET
40 0 20 40 80

GENERAL NOTES

1. UTILITIES AND UNDERGROUND OBSTACLES SHOWN ARE APPROXIMATE. FIELD VERIFY UTILITY LOCATIONS PRIOR TO COMMENCEMENT OF EARTHWORK AND/OR UTILITY ACTIVITIES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE TO OBSTRUCTION AND UTILITY LINES ENCOUNTERED DURING CONSTRUCTION. CONTRACTOR SHALL NOTIFY AND HAVE THE UTILITY LOCATED AT LEAST 48 HOURS IN ADVANCE PRIOR TO EXCAVATING.
2. CONSTRUCTION LIMITS SHOWN ARE APPROXIMATE. ADJUSTMENTS TO THE LIMITS INCIDENTAL TO CONSTRUCTION ACTIVITIES MAY BE PERMITTED WITH THE APPROVAL OF THE ENGINEER. CONTRACTOR SHALL FIELD MARK ANY PROPOSED CHANGES TO THE CONSTRUCTION LIMITS FOR ENGINEER APPROVAL PRIOR TO BEGINNING CONSTRUCTION.
3. CONTRACTOR IS RESPONSIBLE FOR COORDINATION OF ALL APPROPRIATE JURISDICTION REGARDING R.O.W WORK AND UTILITY COMPANIES.
4. ALL WATER MAIN PIPING SHALL HAVE A MINIMUM COVER OF 60". MAINTAIN ELEVATION ON PIPE BETWEEN VALVES AND FITTINGS.
5. CONTRACTOR TO COORDINATE EXISTING WATER MAIN CONNECTION WITH UTILITY. CONTRACTOR SHALL VERIFY EXISTING WATER MAIN ELEVATION AND LOCATION.
6. NO OPEN TRENCHES WILL BE ALLOWED IN THE EVENING AFTER DAILY CONSTRUCTION OPERATIONS HAVE FINISHED, EXCEPT IN THE AREA OF THE TRENCHING BOX. CONTRACTOR TO PROVIDE CONSTRUCTION FENCING AROUND TRENCHING BOX AREA FOR PUBLIC SAFETY.
7. ALL BURIED WATER MAIN GREATER THAN OR EQUAL TO 4" DIAMETER SHALL BE SUPPORTED WITH CONCRETE THRUST BLOCKING AND RESTRAINED JOINTS AT ALL JOINTS, BENDS, TEES, CROSSES AND VALVES.
8. IF VALVE IS GREATER THAN 10 FEET BELOW FINAL GRADE, CONTRACTOR SHALL SUPPLY EXTENDED VALVE BOX AND VALVE ROD.
9. COORDINATE GAS METER WITH UTILITY.
10. WATER MAIN PIPING SHALL MAINTAIN AT LEAST 10 FEET HORIZONTAL AND 18 INCHES VERTICAL SEPARATION FROM ALL OTHER UTILITIES.

Indiana 811 Know what's below. Call before you dig.

KEYPLAN



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SURVEYING • CONSTRUCTION SERVICES

DANIEL L. PRZEKAY REGISTERED PROFESSIONAL ENGINEER 19900533 STATE OF INDIANA 9/12/19
DANIEL D. DOYLE REGISTERED PROFESSIONAL ENGINEER No. PE10505380 STATE OF INDIANA 9/12/19

NO.	REVISION	DATE
1	ADDENDUM NO. 1	9/12/19

DRAWN: JNJ CHK'D: KRD
DESIGNED: JLP
APPRV'D: JLP
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

OVERALL SITE UTILITY PLAN

DRAWING NUMBER SD-401

SITE DEVELOPMENT

GENERAL NOTES

1. UTILITIES AND UNDERGROUND OBSTACLES SHOWN ARE APPROXIMATE. FIELD VERIFY UTILITY LOCATIONS PRIOR TO COMMENCEMENT OF EARTHWORK AND/OR UTILITY ACTIVITIES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE TO OBSTRUCTION AND UTILITY LINES ENCOUNTERED DURING CONSTRUCTION. CONTRACTOR SHALL NOTIFY AND HAVE THE UTILITY LOCATED AT LEAST 48 HOURS IN ADVANCE PRIOR TO EXCAVATING.
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10. WATER MAIN PIPING SHALL MAINTAIN AT LEAST 10 FEET HORIZONTAL AND 18 INCHES VERTICAL SEPARATION FROM ALL OTHER UTILITIES.

8" TEE
N=1522506.51
E=2855329.82

FIRE HYDRANT ASSEMBLY
N=1522506.41
E=2855341.65

8" TEE
N=1522506.47
E=2855333.82

90° BEND (8")
N=1522506.80
E=2855304.72

90° BEND (8")
N=1522482.63
E=2855333.82

45° BEND (8")
N=1522478.63
E=2855437.68

45° BEND (8")
N=1522482.63
E=2855440.75

8" TEE
N=1522478.63
E=2855329.82

45° BEND (8")
N=1522471.56
E=2855329.82

STR NO. 200
4' DRYWELL (10' DEPTH)
RIM=488.65
N=1522471.93
E=2855135.43

STR NO. 201
4' DRYWELL (10' DEPTH)
RIM=488.65
N=1522459.02
E=2855156.83

8"X6" TEE AND FIRE HYDRANT ASSEMBLY
N=1522407.57
E=2855265.83

45° BEND (8")
N=1522301.07
E=2855159.33

STR NO. 202
4' DRYWELL (13' DEPTH)
RIM=489.14
N=1522247.72
E=2855186.22

26 LFT OF 12" PVC PIPE @ 0.50%
INV. UP=485.39; INV. DOWN=485.26

STR NO. 203
4' DRYWELL (13' DEPTH)
RIM=489.14
N=152223.41
E=2855192.08

STR NO. 204
4' DRYWELL (13' DEPTH)
RIM=489.14
N=1522201.20
E=2855203.55

25 LFT OF 12" PVC PIPE @ 0.50%
INV. UP=485.52; INV. DOWN=485.39

STR NO. 205
4' DRYWELL (13' DEPTH)
RIM=489.14
N=1522178.98
E=2855215.01

25 LFT OF 12" PVC PIPE @ 0.50%
INV. UP=485.64; INV. DOWN=485.52

STR NO. 206
4' DRYWELL (13' DEPTH)
RIM=489.14
N=1522156.77
E=2855226.48

25 LFT OF 12" PVC PIPE @ 0.50%
INV. UP=485.76; INV. DOWN=485.64

25 LFT OF 12" PVC PIPE @ 0.50%
INV. UP=485.89; INV. DOWN=485.76

STR NO. 207
4' DRYWELL (13' DEPTH)
RIM=489.14
N=1522134.56
E=2855237.95

118 LFT OF 12" PVC PIPE @ 1.72%
INV. UP=487.89; INV. DOWN=485.89

PROPOSED 8" WATER MAIN

41 LFT OF 12" PVC PIPE @ 1.00%
INV. UP=489.22; INV. DOWN=488.81

83 LFT OF 4" PVC PIPE @ 7.33%
INV. UP=492.00; INV. DOWN=489.22

REFER TO DETAIL 8
SHEET SD-803
FOR CONNECTION

183 LFT OF 6" PVC PIPE @ 1.00%
INV. UP=489.58; INV. DOWN=487.75

6" SAN SEWER PVC SDR35 @ 1.00% MIN. SLOPE

19 LFT OF 3" PVC PIPE @ 1.00%
INV. UP=489.77; INV. DOWN=489.59

CONNECT TO
BUILDING
ROOF DRAIN

3 LFT OF 3" PVC PIPE @ 1.00%
INV. UP=489.80; INV. DOWN=489.77

C/O REQ'D.

STR NO. 493
RIM=493.61
N=1522093.50
E=2855597.83
6" S (IN)=488.20
8" E (OUT)=487.83

4 LFT OF 3" PVC PIPE @ 1.00%
INV. UP=489.83; INV. DOWN=489.80

C/O REQ'D.

3 LFT OF 12" PVC PIPE @ 1.00%
INV. UP=489.68; INV. DOWN=489.65

C/O REQ'D.

15 LFT OF 12" PVC PIPE @ 1.00%
INV. UP=489.83; INV. DOWN=489.68

CONNECT TO
BUILDING
ROOF DRAIN

97 LFT OF 12" PVC PIPE @ 1.00%
INV. UP=488.81; INV. DOWN=487.85

C/O REQ'D.

13 LFT OF 4" PVC PIPE @ 7.12%
INV. UP=489.70; INV. DOWN=488.81

43 LFT OF 12" PVC PIPE @ 1.00%
INV. UP=489.65; INV. DOWN=489.22

23 LFT OF 4" PVC PIPE @ 7.12%
INV. UP=491.33; INV. DOWN=489.70

C/O REQ'D.

8"X6" TEE AND FIRE
HYDRANT ASSEMBLY
N=1522040.29
E=2855159.33

STR NO. 300
INLINE BASIN
RIM=494.22
N=1522021.31
E=2855424.62

STR NO. 208
4' DRYWELL (9' DEPTH)
RIM=490.51
N=1521996.39
E=2855219.52

STR NO. 209
4' DRYWELL (9' DEPTH)
RIM=490.51
N=1521971.39
E=2855219.45

26 LFT OF 8" PVC PIPE @ 0.50%
INV. UP=487.26; INV. DOWN=487.14

1 SITE UTILITY PLAN - AREA A
D-401-A
SCALE – 1" = 20'

NORTH

SCALE IN FEET
20 0 10 20 40

KEYPLAN

NORTH

F
E
A C
B D

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SURVEYING • CONSTRUCTION SERVICES

MATTHEW D. DOYLE ★ REGISTERED PROFESSIONAL ENGINEER ★ STATE OF INDIANA ★ No. PE10505380 ★ 9/12/19

MATTHEW J. PRZEKAY ★ REGISTERED LAND SURVEYOR ★ STATE OF INDIANA ★ 19900533 ★ PROFESSIONAL ★ 9/12/19

NO.	REVISION	DATE
1	ADDENDUM NO. 1	9/12/19

DRAWN: JNJ CHK'D: KRD
DESIGNED: JLP
APPR'VD: JLP
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

SITE UTILITY PLAN - AREA A

DRAWING NUMBER SD-401-A

SITE DEVELOPMENT

GENERAL NOTES

1. UTILITIES AND UNDERGROUND OBSTACLES SHOWN ARE APPROXIMATE. FIELD VERIFY UTILITY LOCATIONS PRIOR TO COMMENCEMENT OF EARTHWORK AND/OR UTILITY ACTIVITIES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE TO OBSTRUCTION AND UTILITY LINES ENCOUNTERED DURING CONSTRUCTION. CONTRACTOR SHALL NOTIFY AND HAVE THE UTILITY LOCATED AT LEAST 48 HOURS IN ADVANCE PRIOR TO EXCAVATING.
2. CONSTRUCTION LIMITS SHOWN ARE APPROXIMATE. ADJUSTMENTS TO THE LIMITS INCIDENTAL TO CONSTRUCTION ACTIVITIES MAY BE PERMITTED WITH THE APPROVAL OF THE ENGINEER. CONTRACTOR SHALL FIELD MARK ANY PROPOSED CHANGES TO THE CONSTRUCTION LIMITS FOR ENGINEER APPROVAL PRIOR TO BEGINNING CONSTRUCTION.
3. CONTRACTOR IS RESPONSIBLE FOR COORDINATION OF ALL APPROPRIATE JURISDICTION REGARDING R.O.W WORK AND UTILITY COMPANIES.
4. ALL WATER MAIN PIPING SHALL HAVE A MINIMUM COVER OF 60". MAINTAIN ELEVATION ON PIPE BETWEEN VALVES AND FITTINGS.
5. CONTRACTOR TO COORDINATE EXISTING WATER MAIN CONNECTION WITH UTILITY. CONTRACTOR SHALL VERIFY EXISTING WATER MAIN ELEVATION AND LOCATION.
6. NO OPEN TRENCHES WILL BE ALLOWED IN THE EVENING AFTER DAILY CONSTRUCTION OPERATIONS HAVE FINISHED, EXCEPT IN THE AREA OF THE TRENCHING BOX. CONTRACTOR TO PROVIDE CONSTRUCTION FENCING AROUND TRENCHING BOX AREA FOR PUBLIC SAFETY.
7. ALL BURIED WATER MAIN GREATER THAN OR EQUAL TO 4" DIAMETER SHALL BE SUPPORTED WITH CONCRETE THRUST BLOCKING AND RESTRAINED JOINTS AT ALL JOINTS, BENDS, TEES, CROSSES AND VALVES.
8. IF VALVE IS GREATER THAN 10 FEET BELOW FINAL GRADE, CONTRACTOR SHALL SUPPLY EXTENDED VALVE BOX AND VALVE ROD.
9. COORDINATE GAS METER WITH UTILITY.
10. WATER MAIN PIPING SHALL MAINTAIN AT LEAST 10 FEET HORIZONTAL AND 18 INCHES VERTICAL SEPARATION FROM ALL OTHER UTILITIES.

STR NO. 225
4' DRYWELL (13" DEPTH)
RIM=484.21
N=1522459.28
E=2855931.26

STR NO. 228
4' DRYWELL (13" DEPTH)
RIM=484.21
N=1522458.39
E=2855958.83

STR NO. 229
4' DRYWELL (13" DEPTH)
RIM=484.21
N=1522447.02
E=2855981.09

STR NO. 226
4' DRYWELL (13" DEPTH)
RIM=484.21
N=1522436.13
E=2855947.46

STR NO. 227
4' DRYWELL (13" DEPTH)
RIM=484.21
N=1522424.76
E=2855969.72

STR NO. 221
8' DRYWELL (12' DEPTH)
RIM=483.93
N=1522395.03
E=2855677.33

26 LFT OF 12" PVC PIPE @ 0.50%
INV. UP=480.30; INV. DOWN=480.17

26 LFT OF 12" PVC PIPE @ 0.50%
INV. UP=480.30; INV. DOWN=480.18

STR NO. 222
8' DRYWELL (12' DEPTH)
RIM=483.93
N=1522382.61
E=2855699.03

STR NO. 216
8' DRYWELL (12' DEPTH)
RIM=483.93
N=1522385.76
E=2855643.21

26 LFT OF 12" PVC PIPE @ 0.50%
INV. UP=480.43; INV. DOWN=480.30

STR NO. 223
8' DRYWELL (12' DEPTH)
RIM=483.93
N=1522370.19
E=2855720.72

STR NO. 217
8' DRYWELL (12' DEPTH)
RIM=483.93
N=1522373.14
E=2855664.91

26 LFT OF 12" PVC PIPE @ 0.50%
INV. UP=480.56; INV. DOWN=480.43

STR NO. 224
8' DRYWELL (12' DEPTH)
RIM=483.93
N=1522357.77
E=2855742.42

26 LFT OF 12" PVC PIPE @ 0.50%
INV. UP=480.42; INV. DOWN=480.29

STR NO. 218
8' DRYWELL (12' DEPTH)
RIM=483.93
N=1522360.91
E=2855686.61

25 LFT OF 12" PVC PIPE @ 0.50%
INV. UP=480.68; INV. DOWN=480.56

STR NO. 220
8' DRYWELL (12' DEPTH)
RIM=483.93
N=1522336.07
E=2855730.00

26 LFT OF 12" PVC PIPE @ 0.50%
INV. UP=480.54; INV. DOWN=480.42

STR NO. 219
8' DRYWELL (12' DEPTH)
RIM=483.93
N=1522348.49
E=2855708.30

64 LFT OF 12" PVC PIPE @ 0.50%
INV. UP=481.00; INV. DOWN=480.68

26 LFT OF 12" PVC PIPE @ 0.50%
INV. UP=480.67; INV. DOWN=480.54

STR NO. 350
MANHOLE C4
RIM=489.26
N=1522291.16
E=2855685.31

181 LFT OF 12" PVC PIPE @ 1.00%
INV. UP=489.59; INV. DOWN=487.78

127 LFT OF 12" PVC PIPE @ 1.37%
INV. UP=489.50; INV. DOWN=487.78

8"X6" TEE AND FIRE HYDRANT ASSEMBLY
N=1522225.52
E=2855689.08

PROPOSED 8" WATER MAIN

PROPOSED 8" WATER MAIN

90° BEND (8")
N=1522124.74
E=2855994.26

STR NO. 495
STA. 84+28.74
RIM=488.88
N=1522093.50
E=2856026.57
8" W (IN)=484.98
8" S (OUT)=484.88

81+00 82+00 83+00 84+00

244 LFT OF 8" SAN SEWER PVC SDR35 @ 0.45%

C/O REQ'D.

STR NO. 493
STA. 80+00.00
RIM=493.61
N=1522093.50
E=2855597.83
6" S (IN)=488.20
8" E (OUT)=487.83

118 LFT OF 6" PVC PIPE @ 1.00%
INV. UP=490.76; INV. DOWN=489.59

9 LFT OF 6" PVC PIPE @ 1.00%
INV. UP=489.59; INV. DOWN=489.50

12 LFT OF 12" PVC PIPE @ 2.77%
INV. UP=489.83; INV. DOWN=489.50

CONNECT TO BUILDING ROOF DRAIN

STR NO. 302
INLINE BASIN
RIM=494.07
N=1522036.45
E=2855778.47

45 LFT OF 6" PVC PIPE @ 1.00%
INV. UP=491.21; INV. DOWN=490.76

31 LFT OF 6" PVC PIPE @ 1.00%
INV. UP=491.52; INV. DOWN=491.21

45° BEND (8")
N=1522082.47
E=2855838.22

45° BEND (8")
N=1522070.32
E=2855843.23

8" TEE
N=1522022.12
E=2855843.30

90° BEND (8")
N=1522022.33
E=2855994.42

PROPOSED 8" WATER MAIN

45° BEND (8")
N=1522014.72
E=2855838.31

45° BEND (8")
N=1522012.66
E=2855843.32

PROPOSED 8" WATER MAIN

PROPOSED 8" WATER MAIN

118 LFT OF 8" SAN SEWER PVC SDR35 @ 0.45%

8"X6" TEE AND FIRE HYDRANT ASSEMBLY
N=1521983.29
E=2855994.48

MATCHLINE - AREA C
MATCHLINE - AREA A

MATCHLINE - AREA C
MATCHLINE - AREA D

1 SITE UTILITY PLAN - AREA C
SD-401-C
SCALE – 1" = 20'
NORTH
SCALE IN FEET
20 0 10 20 40

KEYPLAN
NORTH
F
E
A C
B D

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SURVEYING • CONSTRUCTION SERVICES

LINETTE L. PICKLE-KAY
REGISTERED
LANDSCAPE ARCHITECT
NO. LA19900533
STATE OF INDIANA
PROFESSIONAL
9/12/19

REGISTERED
JAMES J. DOYLE
NO. PE10505380
STATE OF
PROFESSIONAL ENGINEER
9/12/19

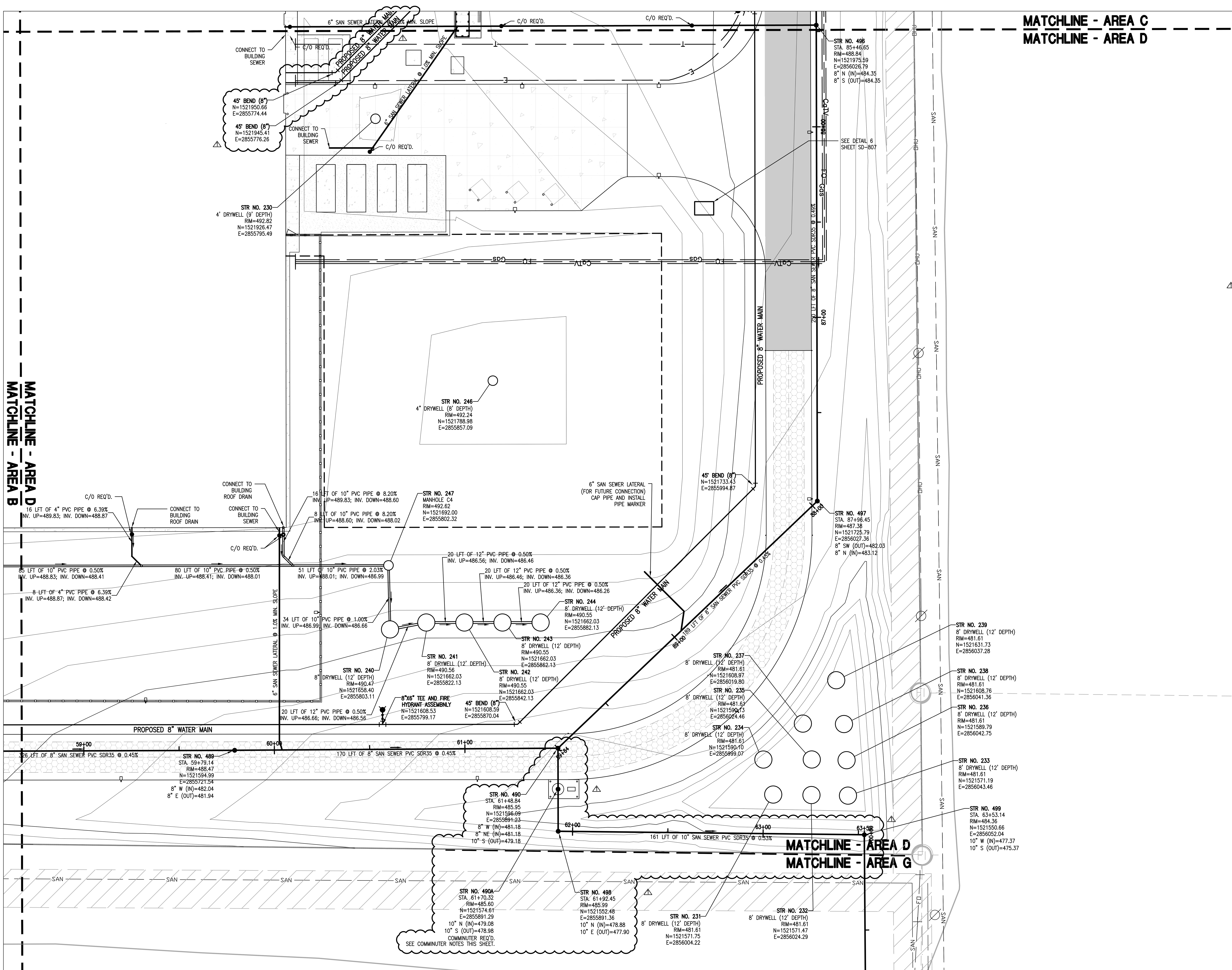
NO.	REVISION	DATE
1	ADDENDUM NO. 1	9/12/19

DRAWN: JNJ CHK'D: KRD
DESIGNED: JLP
APPRV'D: JLP
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

SITE UTILITY PLAN - AREA C

DRAWING NUMBER SD-401-C
SITE DEVELOPMENT



1 SITE UTILITY PLAN - AREA D

SCALE - 1" = 20'

SCALE IN FEET 20 0 10 20 40

GENERAL NOTES

1. UTILITIES AND UNDERGROUND OBSTACLES SHOWN ARE APPROXIMATE. FIELD VERIFY UTILITY LOCATIONS PRIOR TO COMMENCEMENT OF EARTHWORK AND/OR UTILITY ACTIVITIES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE TO OBSTRUCTION AND UTILITY LINES ENCOUNTERED DURING CONSTRUCTION. CONTRACTOR SHALL NOTIFY AND HAVE THE UTILITY LOCATED AT LEAST 48 HOURS IN ADVANCE PRIOR TO EXCAVATING.
2. CONSTRUCTION LIMITS SHOWN ARE APPROXIMATE. ADJUSTMENTS TO THE LIMITS INCIDENTAL TO CONSTRUCTION ACTIVITIES MAY BE PERMITTED WITH THE APPROVAL OF THE ENGINEER. CONTRACTOR SHALL FIELD MARK ANY PROPOSED CHANGES TO THE CONSTRUCTION LIMITS FOR ENGINEER APPROVAL PRIOR TO BEGINNING CONSTRUCTION.
3. CONTRACTOR IS RESPONSIBLE FOR COORDINATION OF ALL APPROPRIATE JURISDICTION REGARDING R.O.W WORK AND UTILITY COMPANIES.
4. ALL WATER MAIN PIPING SHALL HAVE A MINIMUM COVER OF 60". MAINTAIN ELEVATION ON PIPE BETWEEN VALVES AND FITTINGS.
5. CONTRACTOR TO COORDINATE EXISTING WATER MAIN CONNECTION WITH UTILITY. CONTRACTOR SHALL VERIFY EXISTING WATER MAIN ELEVATION AND LOCATION.
6. NO OPEN TRENCHES WILL BE ALLOWED IN THE EVENING AFTER DAILY CONSTRUCTION OPERATIONS HAVE FINISHED, EXCEPT IN THE AREA OF THE TRENCHING BOX. CONTRACTOR TO PROVIDE CONSTRUCTION FENCING AROUND TRENCHING BOX AREA FOR PUBLIC SAFETY.
7. ALL BURIED WATER MAIN GREATER THAN OR EQUAL TO 4" DIAMETER SHALL BE SUPPORTED WITH CONCRETE THRUST BLOCKING AND RESTRAINED JOINTS AT ALL JOINTS, BENDS, TEES, CROSSES AND VALVES.
8. IF VALVE IS GREATER THAN 10 FEET BELOW FINAL GRADE, CONTRACTOR SHALL SUPPLY EXTENDED VALVE BOX AND VALVE ROD.
9. COORDINATE GAS METER WITH UTILITY.
10. WATER MAIN PIPING SHALL MAINTAIN AT LEAST 10 FEET HORIZONTAL AND 18 INCHES VERTICAL SEPARATION FROM ALL OTHER UTILITIES.

COMMINUTER NOTES

1. REFER TO SPECIFICATION SECTION 333245 FOR COMMINUTER SPECIFICATIONS.
2. INSTALL 8'x8'x2' BASE SLAB REINFORCED W/#5@12" EACH WAY TOP AND BOTTOM.
3. REFER TO ELECTRICAL DRAWINGS FOR CONNECTION DETAILS.

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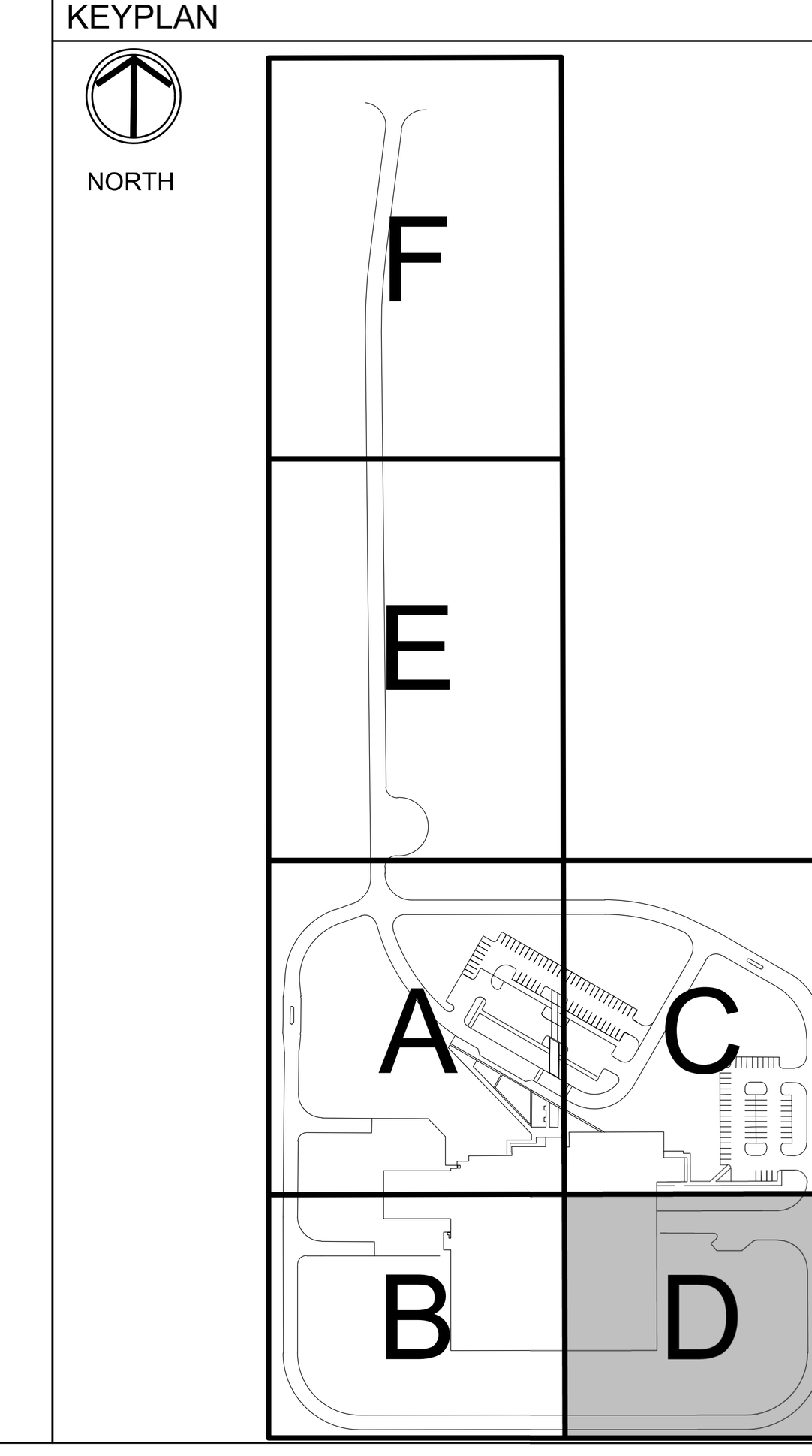
KEYPLAN



NO.	REVISION	DATE
1	ADDENDUM NO. 1	9/12/19

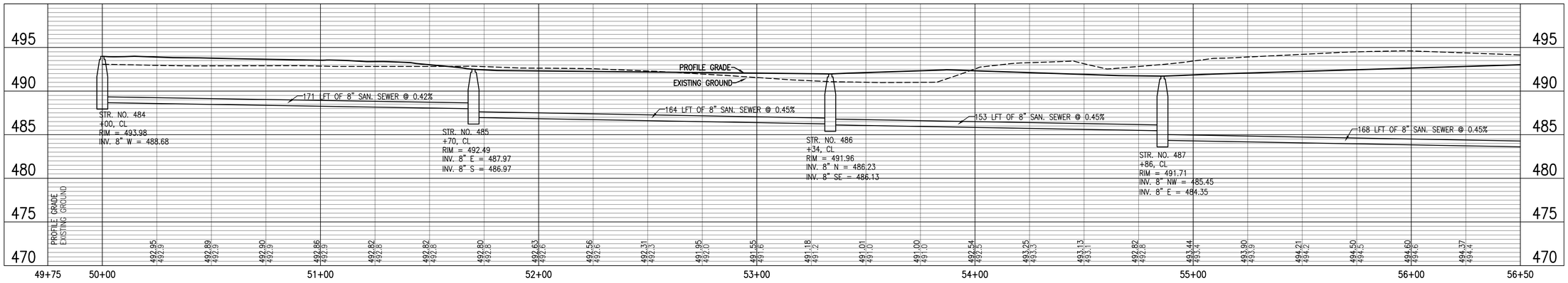
DRAWN: JNJ CHK'D: KRD
DESIGNED: JLP
APPRV'D: JLP
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER 1663-1190-90

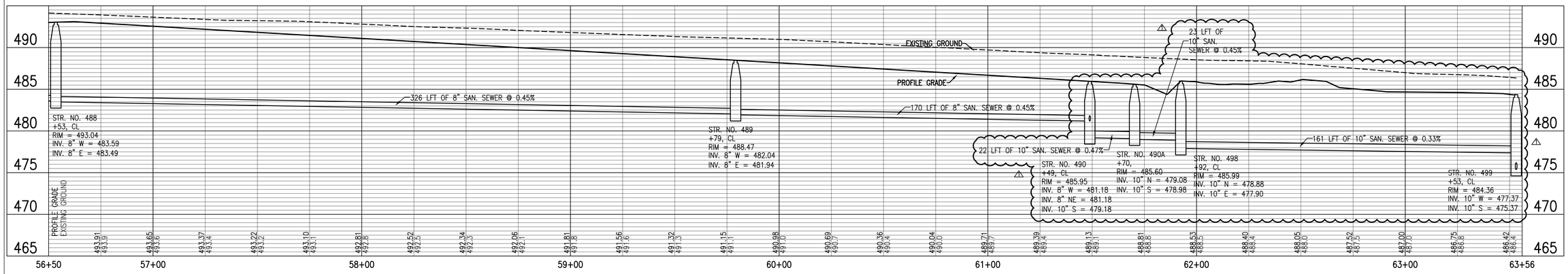
A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

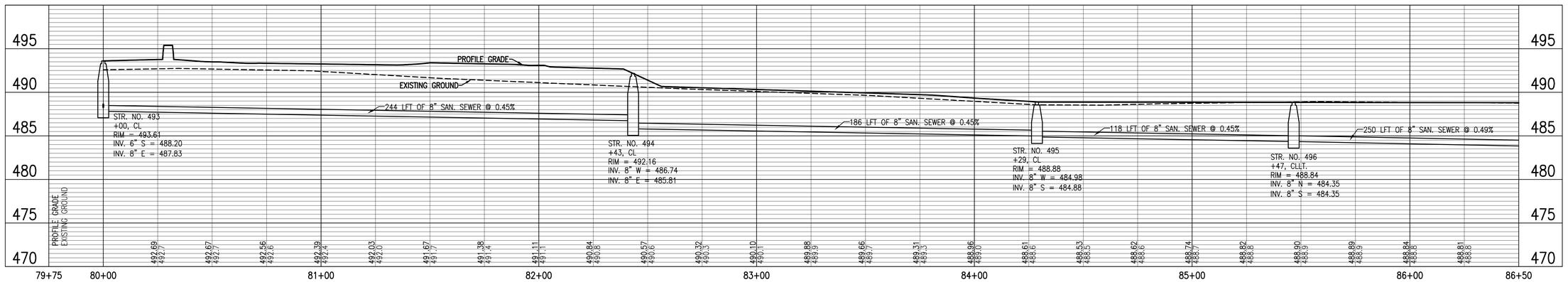
SITE UTILITY PLAN - AREA D

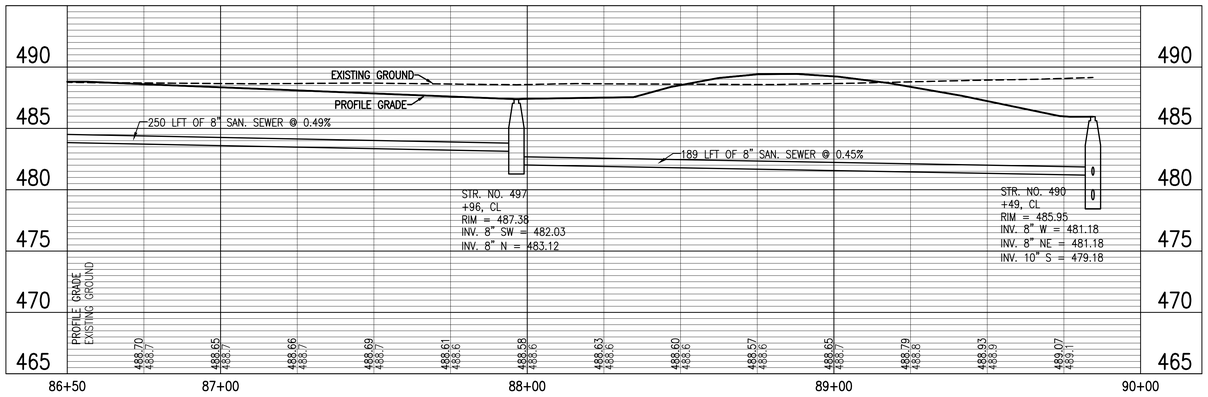
DRAWING NUMBER SD-401-D

SITE DEVELOPMENT









SEE SHEET SD-701 FOR
CONTINUATION OF SANITARY SEWER

1 SD-402 ON-SITE SANITARY SEWER PROFILES

HORIZ. SCALE – 1" = 20'
VERT. SCALE – 1" = 5'

HORIZ. SCALE IN FEET
20 0 10 20 40

VERT. SCALE IN FEET
5 0 2.5 5 10

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SURVEYING · CONSTRUCTION SERVICES
DLZ INDIANA, LLC

LANCE K. PRZYKAY
REGISTERED
LAND SURVEYOR
19900033
STATE OF INDIANA
PROFESSIONAL
9/12/19

REGISTERED
J. DOYLE ★ WA
No. PE0505380
STATE OF
PROFESSIONAL
9/12/19

NO.	REVISION	DATE
1	ADDENDUM NO. 1	9/12/19

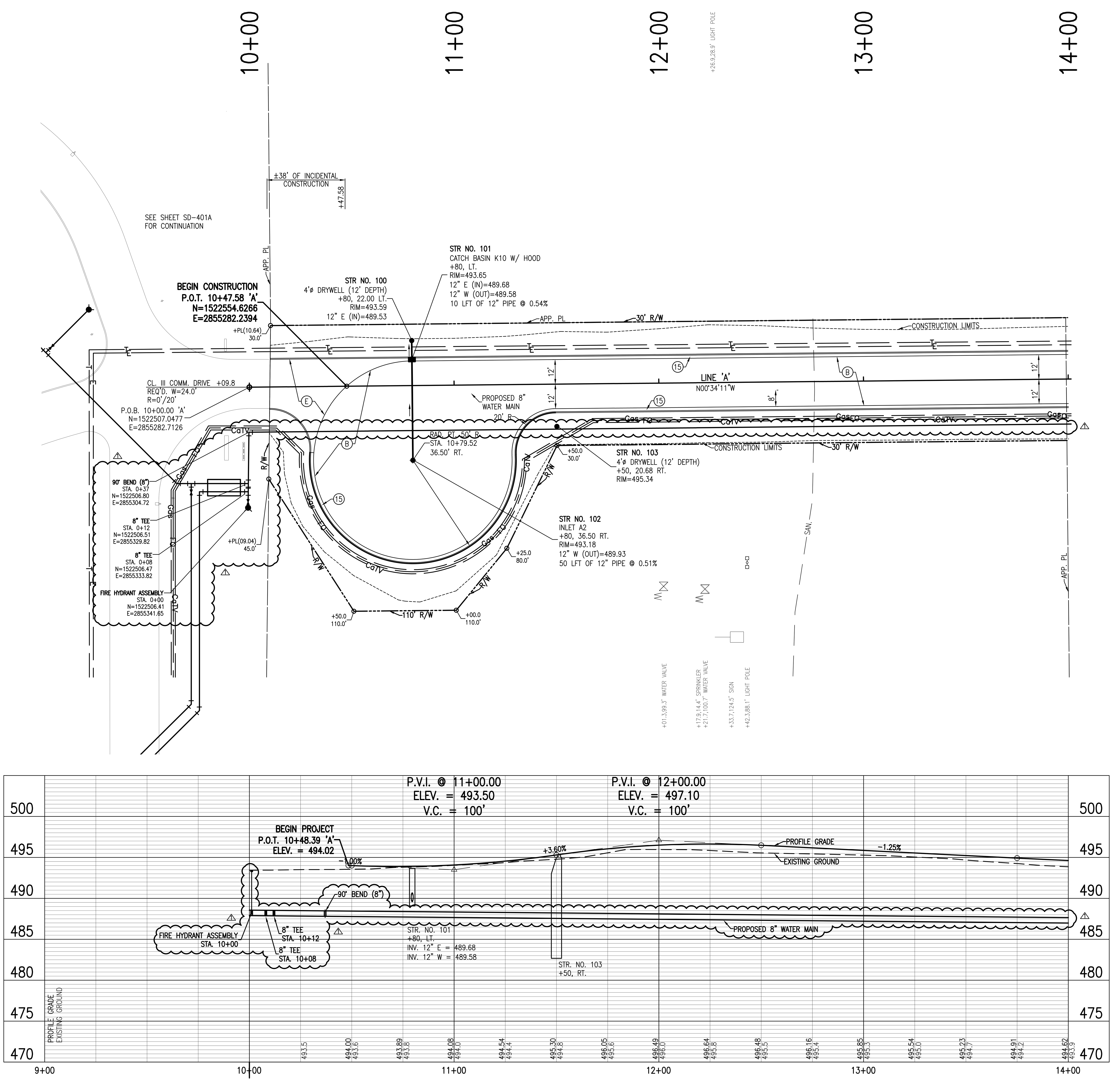
DRAWN: JNJ
DESIGNED:
APPRVD:
DATE: SEPTEMBER 5, 2019
CHK'D: KRD JLP JLP
PROJECT NUMBER 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

ON-SITE SANITARY SEWER PROFILES

DRAWING NUMBER SD-402

SITE DEVELOPMENT



1 PLAN AND PROFILE
HORIZ. SCALE - 1" = 20'
VERT. SCALE - 1" = 5'

HORIZ. SCALE IN FEET
VERT. SCALE IN FEET

WATER UTILITY INSTALLATION NOTES

1. INSTALLATION OF WATER MAIN, FITTINGS, VALVES, FIRE HYDRANTS, AND APPURTENANCES SHALL BE IN ACCORDANCE WITH INDIANA AMERICAN WATER STANDARDS AND SPECIFICATIONS, LATEST REVISION.
2. IT IS THE CONTRACTOR'S RESPONSIBILITY TO FIELD VERIFY THE LOCATION, SIZE AND MATERIAL OF THE EXISTING WATER MAIN PRIOR TO CONSTRUCTION.
3. FOR PVC C900 PIPE INSTALLATION: DR14 PIPE IS REQUIRED. DEFLECTION OF PIPE JOINTS AND BENDING OF PIPES ARE NOT PERMITTED. ALL ANGLES SHALL BE MADE WITH PROPER FITTINGS. WHEN RESTRAINT OF PIPE–TO–PIPE JOINTS ARE REQUIRED, ALL JOINTS SHALL BE RESTRAINED WITH EXTERNAL SPLIT SERRATED RESTRAINT HARNESSES. SELECT FILL MATERIAL REQUIRED FOR BEDDING AND EMBEDMENT REGARDLESS OF PIPE'S PROXIMITY TO PAVEMENT.
4. FOR DUCTILE IRON PIPE INSTALLATION: THICKNESS CLASS 52 FOR TYPICAL DISTRIBUTION MAINS 12–INCH NOMINAL SIZE AND SMALLER. WHEN RESTRAINT OF PIPE–TO–PIPE JOINTS ARE REQUIRED, PUSH–ON RESTRAINING GASKETS WITH INTEGRAL STAINLESS STEEL LOCKING SEGMENTS ARE PERMITTED ON PIPE–TO–PIPE CONNECTIONS 12–INCH NOMINAL SIZE AND SMALLER ONLY. PIPE–TO–PIPE CONNECTIONS GREATER THAN 12–INCH NOMINAL SIZE SHALL BE RESTRAINED PER SPECIFICATION SECTION 15105.
5. ENCASE ALL DUCTILE IRON PIPING, DUCTILE IRON FITTINGS, VALVES, HYDRANTS, AND ALL OTHER METALLIC APPURTENANCES IN 12MIL POLYETHYLENE.
6. ALL FIRE HYDRANT LATERALS SHALL BE DUCTILE IRON PIPE.
7. ALL MJ T–BOLTS AND FLANGE BOLTS SHALL HAVE XYLAN OR FLUOROKOTE #1 CORROSION RESISTANT COATING.
8. ALL FITTINGS SHALL BE RESTRAINED USING MJ RETAINER GLANDS OR POURED CONCRETE THRUST BLOCKS.
9. COPPER–CLAD STEEL TRACER WIRE REQUIRED ON INSTALLATION OF ALL PIPE. TRACER WIRE SHALL BE TAPED TO PIPE OR POLYETHYLENE ENCASEMENT AT A MINIMUM SPACING OF 10–FEET. SPLICES SHALL BE ENCASED IN WATERPROOF CONNECTORS. CONTINUITY SHALL BE TESTED AFTER COMPLETION OF BACKFILL.
10. SELECT FILL MATERIAL REQUIRED FOR FINAL BACKFILL WHEN WITHIN 5–FEET OF PAVEMENT PER SPECIFICATION SECTION 02210.
11. MAINTAIN THE REQUIRED 10–FEET OF HORIZONTAL SEPARATION AND 18–INCHES OF VERTICAL SEPARATION FROM SANITARY AND STORM SEWERS. MAINTAIN 8–FEET OF HORIZONTAL SEPARATION FROM SANITARY AND STORM STRUCTURES. SEE 327 IAC 8–3.2–9 OF THE INDIANA ADMINISTRATIVE CODE FOR MORE INFORMATION.
12. MAINTAIN MINIMUM COVER DEPTH OF 60" AND A MAXIMUM OF 60"+24".

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LEGEND

(15) COMBINED CONCRETE CURB AND GUTTER
(B) 165#/SYD HMA, SURFACE, ON 495#/SYD HMA, INTERMEDIATE, ON 6" COMPACTED AGGREGATE, NO. 53, BASE, ON SUBGRADE TREATMENT TO BE: 10" OF SUBGRADE SCARIFIED AND COMPACTED

Indiana 811
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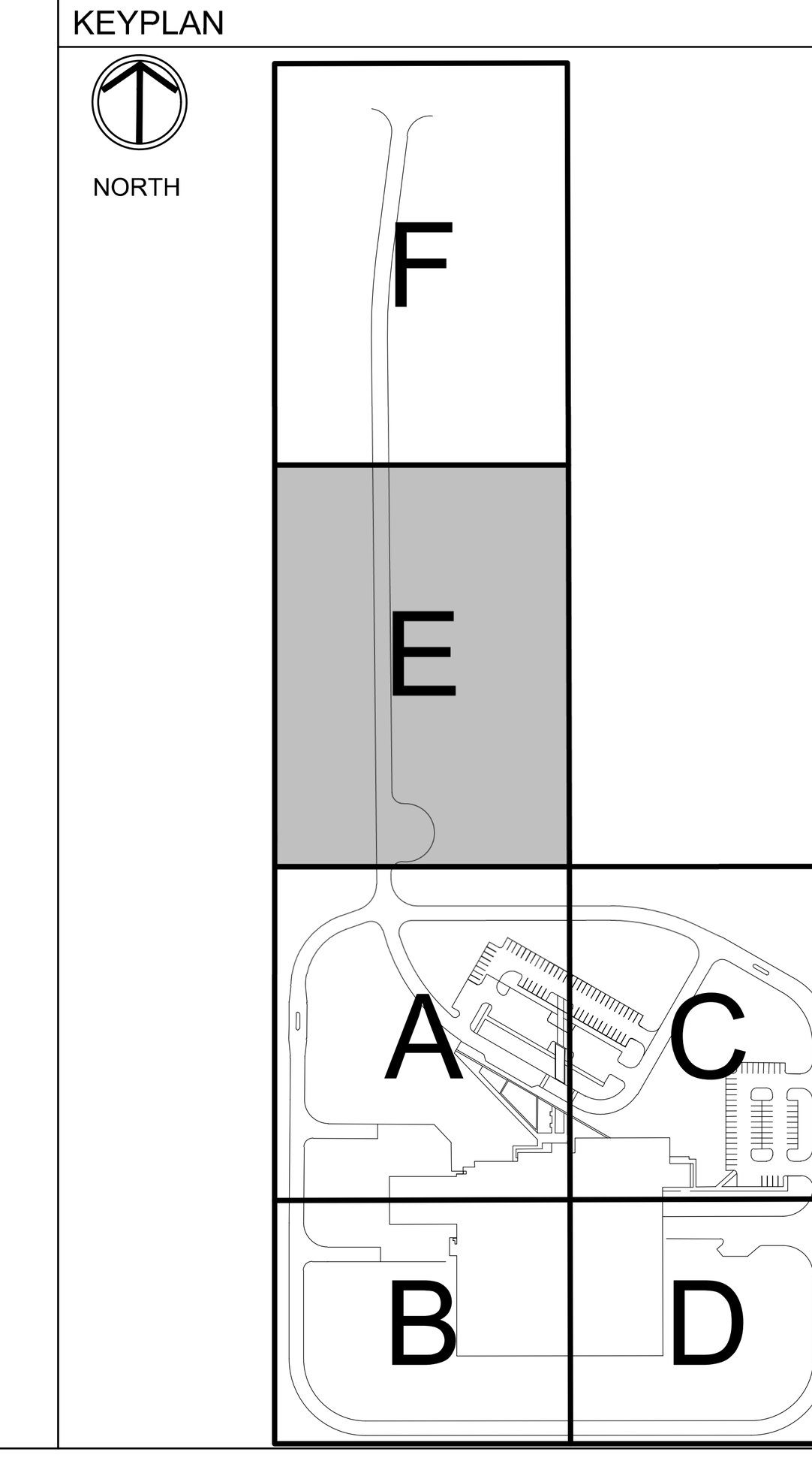
KEYPLAN



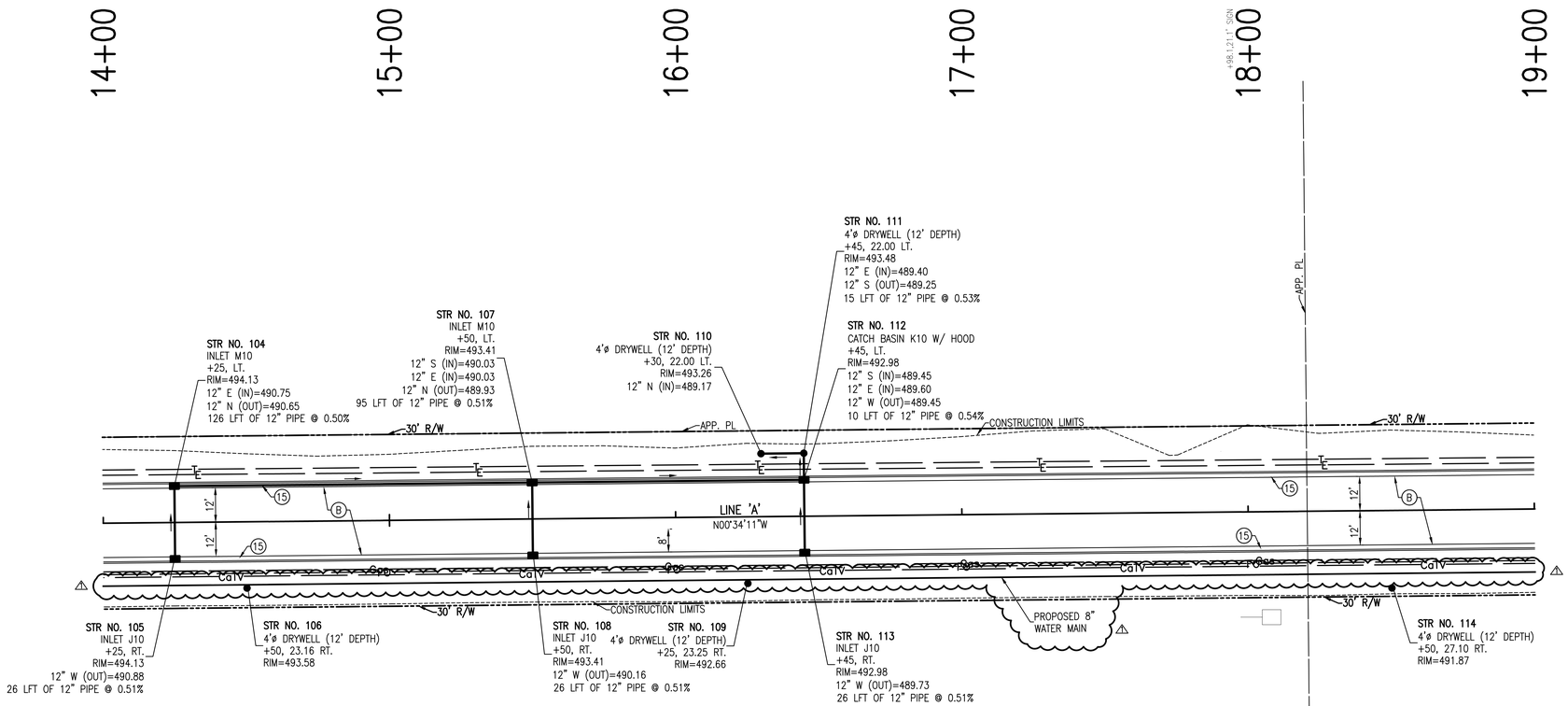
NO.	REVISION	DATE
1	ADDENDUM NO. 1	9/12/19

DRAWN: TH CHK'D: PDF
DESIGNED: MDD
APPRV'D: MDD
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER
1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

PLAN AND PROFILE

DRAWING NUMBER
SD-601
SITE DEVELOPMENT



PLAN AND PROFILE

1 / SD-602

HORIZ. SCALE – 1" = 20'
VERT. SCALE – 1" = 5'

HORIZ. SCALE IN FEET
20 0 10 20 40

VERT. SCALE IN FEET
5 0 2.5 5 10

WATER UTILITY INSTALLATION NOTES

1. INSTALLATION OF WATER MAIN, FITTINGS, VALVES, FIRE HYDRANTS, AND APPURTENANCES SHALL BE IN ACCORDANCE WITH INDIANA AMERICAN WATER STANDARDS AND SPECIFICATIONS, LATEST REVISION.
2. IT IS THE CONTRACTOR'S RESPONSIBILITY TO FIELD VERIFY THE LOCATION, SIZE AND MATERIAL OF THE EXISTING WATER MAIN PRIOR TO CONSTRUCTION.
3. FOR PVC C900 PIPE INSTALLATION: DR14 PIPE IS REQUIRED. DEFLECTION OF PIPE JOINTS AND BENDING OF PIPES ARE NOT PERMITTED. ALL ANGLES SHALL BE MADE WITH PROPER FITTINGS. WHEN RESTRAINT OF PIPE-TO-PIPE JOINTS ARE REQUIRED, ALL JOINTS SHALL BE RESTRAINED WITH EXTERNAL SPLIT SERRATED RESTRAINT HARNESSES. SELECT FILL MATERIAL REQUIRED FOR BEDDING AND EMBEDMENT REGARDLESS OF PIPE'S PROXIMITY TO PAVEMENT.
4. FOR DUCTILE IRON PIPE INSTALLATION: THICKNESS CLASS 52 FOR TYPICAL DISTRIBUTION MAINS 12-INCH NOMINAL SIZE AND SMALLER. WHEN RESTRAINT OF PIPE-TO-PIPE JOINTS ARE REQUIRED, PUSH-ON RESTRAINING GASKETS WITH INTEGRAL STAINLESS STEEL LOCKING SEGMENTS ARE PERMITTED ON PIPE-TO-PIPE CONNECTIONS 12-INCH NOMINAL SIZE AND SMALLER ONLY. PIPE-TO-PIPE CONNECTIONS GREATER THAN 12-INCH NOMINAL SIZE SHALL BE RESTRAINED PER SPECIFICATION SECTION 15105.
5. ENCASE ALL DUCTILE IRON PIPING, DUCTILE IRON FITTINGS, VALVES, HYDRANTS, AND ALL OTHER METALLIC APPURTENANCES IN 12MIL POLYETHYLENE.
6. ALL FIRE HYDRANT LATERALS SHALL BE DUCTILE IRON PIPE.
7. ALL MJ T-BOLTS AND FLANGE BOLTS SHALL HAVE XYLAN OR FLUOROKOTE #1 CORROSION RESISTANT COATING.
8. ALL FITTINGS SHALL BE RESTRAINED USING MJ RETAINER GLANDS OR POURED CONCRETE THRUST BLOCKS.
9. COPPER-CLAD STEEL TRACER WIRE REQUIRED ON INSTALLATION OF ALL PIPE. TRACER WIRE SHALL BE TAPED TO PIPE OR POLYETHYLENE ENCASEMENT AT A MINIMUM SPACING OF 10-FEET. SPLICES SHALL BE ENCASED IN WATERPROOF CONNECTORS. CONTINUITY SHALL BE TESTED AFTER COMPLETION OF BACKFILL.
10. SELECT FILL MATERIAL REQUIRED FOR FINAL BACKFILL WHEN WITHIN 5-FEET OF PAVEMENT PER SPECIFICATION SECTION 02210.
11. MAINTAIN THE REQUIRED 10-FEET OF HORIZONTAL SEPARATION AND 18-INCHES OF VERTICAL SEPARATION FROM SANITARY AND STORM SEWERS. MAINTAIN 8-FEET OF HORIZONTAL SEPARATION FROM SANITARY AND STORM STRUCTURES. SEE 327 IAC 8-3.2-9 OF THE INDIANA ADMINISTRATIVE CODE FOR MORE INFORMATION.
12. MAINTAIN MINIMUM COVER DEPTH OF 60" AND A MAXIMUM OF 60"+24".

LEGEND

(15) COMBINED CONCRETE CURB AND GUTTER
(B) 165#/SYD HMA, SURFACE, ON
495#/SYD HMA, INTERMEDIATE, ON
6" COMPACTED AGGREGATE, NO. 53, BASE, ON
SUBGRADE TREATMENT TO BE:
10" OF SUBGRADE SCARIFIED AND COMPACTED

Indiana 811 Know what's below. Call before you dig.

KEYPLAN

NORTH

F
E
A
C
B
D

DLZ
ARCHITECTURE • ENGINEERING • PLANNING
SURVEYING • CONSTRUCTION SERVICES
DLZ INDIANA, LLC

FIELD D. DOYLE ★ REGISTERED ★ PROFESSIONAL ENGINEER ★ STATE OF INDIANA ★ No. PE10505380 ★ 9/12/19

PAUL T. KAY ★ REGISTERED ★ PROFESSIONAL ENGINEER ★ STATE OF INDIANA ★ No. 19900533 ★ 9/12/19

NO.	REVISION	DATE
1	ADDENDUM NO. 1	9/12/19

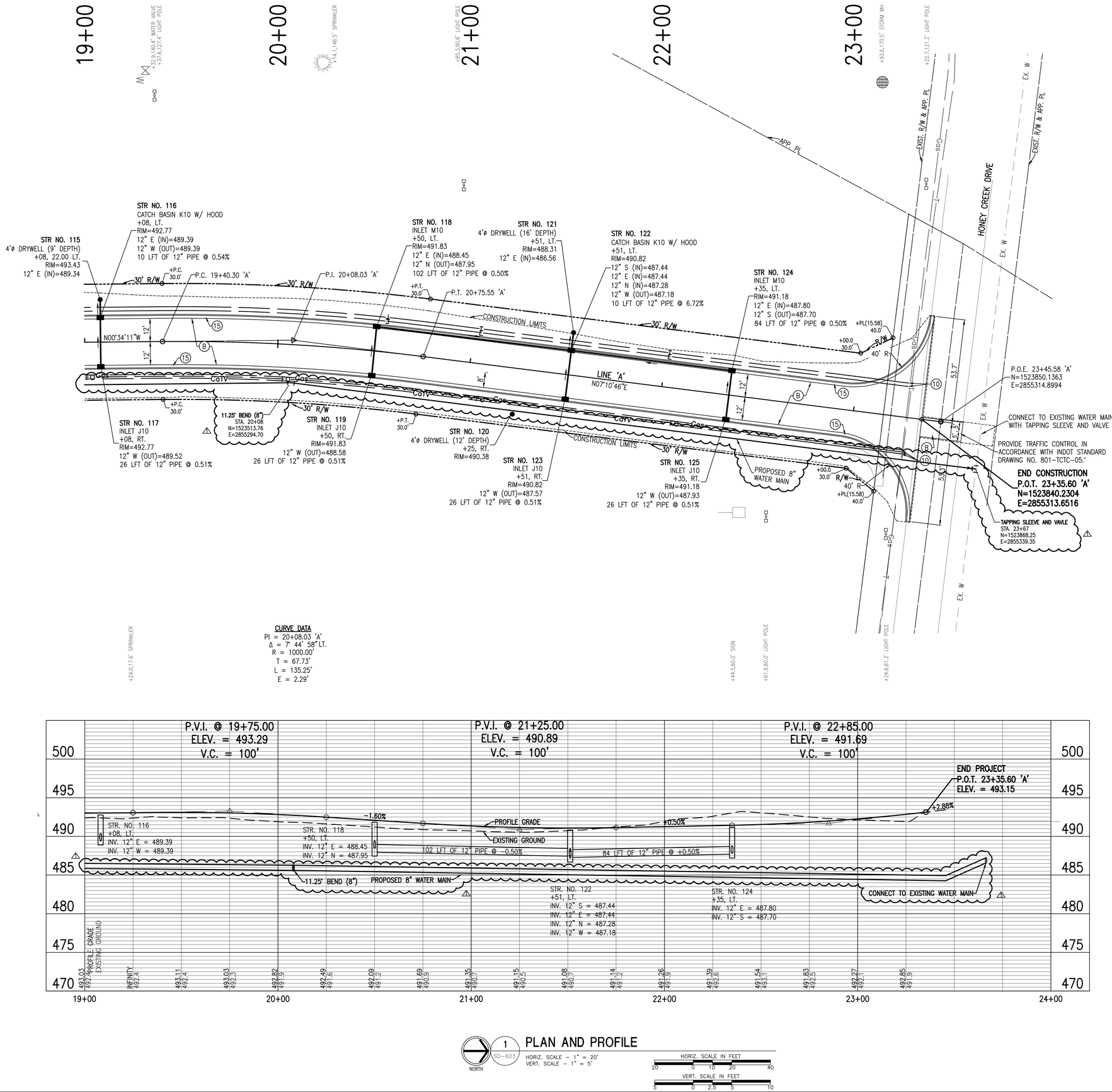
DRAWN: TH CHK'D: PDP
DESIGNED: MDD
APPRVD: MDD
DATE: SEPTEMBER 6, 2019
PROJECT NUMBER 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

PLAN AND PROFILE

DRAWING NUMBER SD-602

SITE DEVELOPMENT



CURVE DATA
PI = 20+08.03 'A'
Δ = 7° 44' 58" LT.
R = 1000.00'
T = 67.73'
L = 135.25'
E = 2.29'

1 SD-603 NORTH
PLAN AND PROFILE
HORIZ. SCALE – 1" = 20'
VERT. SCALE – 1" = 5'
HORIZ. SCALE IN FEET
20 0 10 20 40
VERT. SCALE IN FEET
5 0 2.5 5 10

WATER UTILITY INSTALLATION NOTES

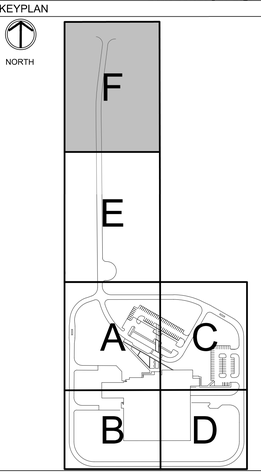
1. INSTALLATION OF WATER MAIN, FITTINGS, VALVES, FIRE HYDRANTS, AND APPURTENANCES SHALL BE IN ACCORDANCE WITH INDIANA AMERICAN WATER STANDARDS AND SPECIFICATIONS, LATEST REVISION.
2. IT IS THE CONTRACTOR'S RESPONSIBILITY TO FIELD VERIFY THE LOCATION, SIZE AND MATERIAL OF THE EXISTING WATER MAIN PRIOR TO CONSTRUCTION.
3. FOR PVC C900 PIPE INSTALLATION: DR14 PIPE IS REQUIRED. DEFLECTION OF PIPE JOINTS AND BENDING OF PIPES ARE NOT PERMITTED. ALL ANGLES SHALL BE MADE WITH PROPER FITTINGS. WHEN RESTRAINT OF PIPE-TO-PIPE JOINTS ARE REQUIRED, ALL JOINTS SHALL BE RESTRAINED WITH EXTERNAL SPLIT SERRATED RESTRAINT HARNESSES. SELECT FILL MATERIAL REQUIRED FOR BEDDING AND EMBEDMENT REGARDLESS OF PIPE'S PROXIMITY TO PAVEMENT.
4. FOR DUCTILE IRON PIPE INSTALLATION: THICKNESS CLASS 52 FOR TYPICAL DISTRIBUTION MAINS 12-INCH NOMINAL SIZE AND SMALLER. WHEN RESTRAINT OF PIPE-TO-PIPE JOINTS ARE REQUIRED, PUSH-ON RESTRAINING GASKETS WITH INTEGRAL STAINLESS STEEL LOCKING SEGMENTS ARE PERMITTED ON PIPE-TO-PIPE CONNECTIONS 12-INCH NOMINAL SIZE AND SMALLER ONLY. PIPE-TO-PIPE CONNECTIONS GREATER THAN 12-INCH NOMINAL SIZE SHALL BE RESTRAINED PER SPECIFICATION SECTION 15105.
5. ENCASE ALL DUCTILE IRON PIPING, DUCTILE IRON FITTINGS, VALVES, HYDRANTS, AND ALL OTHER METALLIC APPURTENANCES IN 12MIL POLYETHYLENE.
6. ALL FIRE HYDRANT LATERALS SHALL BE DUCTILE IRON PIPE.
7. ALL MJ T-BOLTS AND FLANGE BOLTS SHALL HAVE XYLAN OR FLUOROKOTE #1 CORROSION RESISTANT COATING.
8. ALL FITTINGS SHALL BE RESTRAINED USING MJ RETAINER GLANDS OR POURED CONCRETE THRUST BLOCKS.
9. COPPER-CLAD STEEL TRACER WIRE REQUIRED ON INSTALLATION OF ALL PIPE. TRACER WIRE SHALL BE TAPED TO PIPE OR POLYETHYLENE ENCASEMENT AT A MINIMUM SPACING OF 10-FEET. SPLICES SHALL BE ENCASED IN WATERPROOF CONNECTORS. CONTINUITY SHALL BE TESTED AFTER COMPLETION OF BACKFILL.
10. SELECT FILL MATERIAL REQUIRED FOR FINAL BACKFILL WHEN WITHIN 5-FEET OF PAVEMENT PER SPECIFICATION SECTION 02210.
11. MAINTAIN THE REQUIRED 10-FEET OF HORIZONTAL SEPARATION AND 18-INCHES OF VERTICAL SEPARATION FROM SANITARY AND STORM SEWERS. MAINTAIN 8-FEET OF HORIZONTAL SEPARATION FROM SANITARY AND STORM STRUCTURES. SEE 327 IAC 8-3.2-9 OF THE INDIANA ADMINISTRATIVE CODE FOR MORE INFORMATION.
12. MAINTAIN MINIMUM COVER DEPTH OF 60" AND A MAXIMUM OF 60"+24".

LEGEND

(10) COORDINATE WITH UTILITY COMPANIES FOR CONNECTION
(15) COMBINED CONCRETE CURB AND GUTTER
(B) 165#/SYD HMA, SURFACE, ON
495#/SYD HMA, INTERMEDIATE, ON
6" COMPACTED AGGREGATE, NO. 53, BASE, ON
SUBGRADE TREATMENT TO BE:
10" OF SUBGRADE SCARIFIED AND COMPACTED

Indiana 811 Know what's below. Call before you dig.

KEYPLAN



DLZ
ARCHITECTURE • ENGINEERING • PLANNING
SURVEYING • CONSTRUCTION SERVICES
DLZ INDIANA, LLC

NO.	REVISION	DATE
1	ADDENDUM NO. 1	9/12/19

DRAWN: TH | CHK'D: PDF
DESIGNED: MDD | APPRV'D: MDD
DATE: SEPTEMBER 5, 2019
PROJECT NUMBER 1663-1190-90

A NEW
VIGO COUNTY SECURITY CENTER
TERRE HAUTE, INDIANA

PLAN AND PROFILE

DRAWING NUMBER SD-603
SITE DEVELOPMENT

PROJECT MANUAL VOLUME 1 (3)

SPECIFICATIONS TABLE OF CONTENTS

DIVISION 06 – WOOD, PLASTICS AND COMPOSITES

DIVISION 07 – THERMAL AND MOISTURE PROTECTION

DIVISION 08 – OPENINGS

DIVISION 09 – FINISHES

DIVISION 10 – SPECIALTIES

DIVISION 11 – EQUIPMENT

VOLUME 4 OF 4: DIVISIONS 26 – 33

DIVISION 26 – ELECTRICAL

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PROJECT MANUAL VOLUME 2 (1)

SPECIFICATIONS TABLE OF CONTENTS

DIVISION 06 – WOOD, PLASTICS AND COMPOSITES

DIVISION 07 – THERMAL AND MOISTURE PROTECTION

DIVISION 08 – OPENINGS

DIVISION 09 – FINISHES

DIVISION 10 – SPECIALTIES

DIVISION 11 – EQUIPMENT

VOLUME 4 OF 4: DIVISIONS 26 – 33

DIVISION 26 – ELECTRICAL

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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. Section includes:

1. Mechanical and electrified door hardware for:

    a. Swinging doors.

2. Electronic access control system components.

B. Exclusions: Unless specifically listed in hardware sets, hardware is not specified in this section for:

1. Windows
2. Cabinets (casework), including locks in cabinets
3. Signage
4. Toilet accessories
5. Overhead and coiling doors
6. Sliding aluminum doors
7. Folding Partitions
8. Chain link and wire mesh doors and gates

C. Related Sections:

1. Division 01 Section “Alternates” for alternates affecting this section.
2. Division 06 Section “Rough Carpentry”
3. Division 06 Section “Finish Carpentry: Installation of Finish Hardware”
4. Division 07 Section “Joint Sealants” for sealant requirements applicable to threshold installation specified in this section.
5. Division 08 Section “Hollow Metal Doors and Frames”
6. Division 08 Section “Access Doors and Frames”
7. Division 08 Section “Detention Door Hardware”
8. Division 08 Section “Aluminum Framed Entrances and Storefronts”
9. Division 11 Section “Detention Doors and Frames”
10. Division 26 sections for connections to electrical power system and for low-voltage wiring.
11. Division 28 sections for coordination with other components of electronic access control system.

1.3 REFERENCES

A. UL - Underwriters Laboratories

1. UL 10B - Fire Test of Door Assemblies
2. UL 10C - Positive Pressure Test of Fire Door Assemblies
3. UL 1784 - Air Leakage Tests of Door Assemblies
4. UL 305 - Panic Hardware

B. DHI - Door and Hardware Institute

1. Sequence and Format for the Hardware Schedule
2. Recommended Locations for Builders Hardware
3. Key Systems and Nomenclature

C. ANSI - American National Standards Institute

1. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties

1.4 SUBMITTALS

A. General:

1. Submit in accordance with Conditions of Contract and Division 01 requirements.
2. Highlight, encircle, or otherwise specifically identify on submittals deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.
3. Prior to forwarding submittal, comply with procedures for verifying existing door and frame compatibility for new hardware, as specified in PART 3, “EXAMINATION” article, herein.

B. Action Submittals:

1. Product Data: Product data including manufacturers’ technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:

a. Wiring Diagrams: For power, signal, and control wiring and including:
1) Details of interface of electrified door hardware and building safety and security systems.
2) Schematic diagram of systems that interface with electrified door hardware.
3) Point-to-point wiring.
4) Risers.

3. Samples for Verification: If requested by Architect, submit production sample or sample installations of each type of exposed hardware unit in finish indicated, and tagged with full description for coordination with schedule.

    a. Samples will be returned to supplier in like-new condition. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.

4. Door Hardware Schedule: Submit schedule with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule as published by the Door and Hardware Institute. Indicate complete designations of each item required for each door or opening, include:

    a. Door Index; include door number, heading number, and Architects hardware set number.
    b. Opening Lock Function Spreadsheet: List locking device and function for each opening.
    c. Type, style, function, size, and finish of each hardware item.
    d. Name and manufacturer of each item.
    e. Fastenings and other pertinent information.
    f. Location of each hardware set cross-referenced to indications on Drawings.
    g. Explanation of all abbreviations, symbols, and codes contained in schedule.
    h. Mounting locations for hardware.
    i. Door and frame sizes and materials.
    j. Name and phone number for local manufacturer's representative for each product.
    k. Operational Description of openings with any electrified hardware (locks, exits, electromagnetic locks, electric strikes, automatic operators, door position switches, magnetic holders or closer/holder units, and access control components). Operational description should include how door will operate on egress, ingress, and fire and smoke alarm connection.
    l. Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work that is critical in Project construction schedule.

5. Key Schedule:

    a. After Keying Conference, provide keying schedule listing levels of keying as well as explanation of key system's function, key symbols used and door numbers controlled.
    b. Use ANSI/BHMA A156.28 “Recommended Practices for Keying Systems” as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
    c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
    d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
    e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion.

1) Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.

f. Prepare key schedule by or under supervision of supplier, detailing Owner's final keying instructions for locks.

6. Templates: After final approval of hardware schedule, provide templates for doors, frames and other work specified to be factory prepared for door hardware installation.

C. Informational Submittals:

1. Qualification Data: For Supplier, Installer and Architectural Hardware Consultant.
2. Product Certificates, signed by manufacturer:

a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.

3. Certificates of Compliance:

a. Certificates of compliance for fire-rated hardware and installation instructions if requested by Architect or Authority Having Jurisdiction.
b. Installer Training Meeting Certification: Letter of compliance, signed by Contractor, attesting to completion of installer training meeting specified in "QUALITY ASSURANCE" article, herein.
c. Electrified Hardware Coordination Conference Certification: Letter of compliance, signed by Contractor, attesting to completion of electrified hardware coordination conference, specified in "QUALITY ASSURANCE" article, herein.

4. Product Test Reports: For compliance with accessibility requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by qualified testing agency, for door hardware on doors located in accessible routes.
5. Warranty: Special warranty specified in this Section.

D. Closeout Submittals:

1. Operations and Maintenance Data : Provide in accordance with Division 01 and include:

a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
b. Catalog pages for each product.
c. Name, address, and phone number of local representative for each manufacturer.
d. Parts list for each product.
e. Final approved hardware schedule, edited to reflect conditions as-installed.
f. Final keying schedule
g. Copies of floor plans with keying nomenclature
h. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.
i. Copy of warranties including appropriate reference numbers for manufacturers to identify project.

1.5 QUALITY ASSURANCE

A. Product Substitutions: Comply with product requirements stated in Division 01 and as specified herein.

1. Where specific manufacturer's product is named and accompanied by "No Substitute," including make or model number or other designation, provide product specified. (Note: Certain products have been selected for their unique characteristics and particular project suitability.)

a. Where no additional products or manufacturers are listed in product category, requirements for "No Substitute" govern product selection.

2. Where products indicate "acceptable manufacturers" or "acceptable manufacturers and products", provide product from specified manufacturers, subject to compliance with specified requirements and "Single Source Responsibility" requirements stated herein.

B. Supplier Qualifications and Responsibilities: Recognized architectural hardware supplier with record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that provides certified Architectural Hardware Consultant (AHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.

1. Distributor must be a factory authorized dealer for all materials required.
2. Facility with warehouse, inventory, and qualified personal on staff within 100 miles of project.
3. Scheduling Responsibility: Preparation of door hardware and keying schedules.
4. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
5. Coordination Responsibility: Coordinate installation of electronic security hardware with Architect and electrical engineers and provide installation and technical data to Architect and other related subcontractors.

a. Upon completion of electronic security hardware installation, inspect and verify that all components are working properly.

C. Installer Qualifications: Qualified tradesmen, skilled in application of commercial grade hardware with record of successful in-service performance for installing door hardware similar in quantity, type, and quality to that indicated for this Project.

D. Architectural Hardware Consultant Qualifications: Person 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 and meets these requirements:

1. For door hardware, DHI-certified, Architectural Hardware Consultant (AHC).
2. Can provide installation and technical data to Architect and other related subcontractors.
3. Can inspect and verify components are in working order upon completion of installation.
4. Capable of producing wiring diagrams.

5. Capable of coordinating installation of electrified hardware with Architect and electrical engineers.

E. Single Source Responsibility: Obtain each type of door hardware (locksets, exit devices, closers, etc) from single manufacturer.

1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated.
2. Manufacturers that perform electrical modifications and that are listed by testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.

F. Fire-Rated Door Openings: Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by Underwriters Laboratories, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.

G. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.

1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.

H. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.

I. Means of Egress Doors: Latches do not require more than 15 lbf (67 N) to release latch. Locks do not require use of key, tool, or special knowledge for operation.

J. Accessibility Requirements: For door hardware on doors in an accessible route, comply with governing accessibility regulations cited in “REFERENCES” article, herein.

1. Provide operating devices that do not require tight grasping, pinching, or twisting of wrist.
2. 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 slope of not more than 1:2. Provide thresholds not more than 1/2- inch (13 mm) high.
4. Adjust door closer sweep periods so that, from open position of 70 degrees, door will take at least 3 seconds to move to 3 inches (75 mm) from latch, measured to leading edge of door.

K. Keying Conference: Conduct conference at Project site to comply with requirements in Division 01.

1. Attendees: Owner or Owner Representative, Contractor, Architect, Installer, and Supplier's Architectural Hardware Consultant.
2. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:

a. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
b. Door locking function.
c. Preliminary key system schematic diagram.
d. Requirements for key control system.
e. Requirements for access control.
f. Address for delivery of keys and permanent cores.

L. Pre-installation Conference: Conduct conference at Project site.

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Inspect and discuss preparatory work performed by other trades.
3. Inspect and discuss electrical roughing-in for electrified door hardware.
4. Review sequence of operation for each type of electrified door hardware.
5. Review required testing, inspecting, and certifying procedures.

M. Coordination Conferences:

1. Installation Coordination Conference: Prior to hardware installation, schedule and hold meeting to review questions or concerns related to proper installation and adjustment of door hardware.

a. Attendees: Door hardware supplier, door hardware installer, Contractor.
b. After meeting, provide letter of compliance to Architect, indicating when meeting was held and who was in attendance.

2. Electrified Hardware Coordination Conference: Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

a. Attendees: electrified door hardware supplier, doors and frames supplier, electrified door hardware installer, electrical subcontractor, Owner or Owner representative, Architect and Contractor.
b. After meeting, provide letter of compliance to Architect, indicating when coordination conference was held and who was in attendance.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site.

B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.

1. Deliver each article of hardware in manufacturer’s original packaging.

C. Project Conditions:

1. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.
2. Provide secure lock-up for door hardware delivered to Project, but not yet installed. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.

D. Protection and Damage:

1. Promptly replace products damaged during shipping.
2. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work.
3. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.

E. Deliver keys and permanent cores to Owner by registered mail or overnight package service.

1.7 COORDINATION

A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

C. Security: Coordinate installation of door hardware, including access control and keying, with Owner's security consultant.

D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

E. Direct shipments not permitted, unless approved by Contractor.

1.8 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. Warranty Period: Years from date of Substantial Completion, for durations indicated.
   a. Closers:
      1) Mechanical: 30 years.
   b. Automatic Operators: 2 years.
   c. Exit Devices:
      1) Mechanical: 3 years.
      2) Electrified: 1 year.
   d. Locksets:
      1) Mechanical: 3 years.
      2) Electrified: 1 year.
   e. Continuous Hinges: Lifetime warranty
   f. Key Blanks: Lifetime

2. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.

1.9 MAINTENANCE

A. Maintenance Tools:

1. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Approval of manufacturers and/or products other than those listed as “Scheduled Manufacturer” or “Acceptable Manufacturers” in the individual article for the product category shall be in accordance with QUALITY ASSURANCE article, herein.

B. Approval of products from manufacturers indicated in “Acceptable Manufacturers” is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer’s product.

C. Hand of Door: Drawings show direction of slide, swing, or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.

D. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

2.2 MATERIALS

A. Fasteners

1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
2. Furnish screws for installation with each hardware item. Finish exposed (exposed under any condition) screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
3. Provide concealed fasteners for hardware units exposed when door is closed except when no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless thru-bolts are required to fasten hardware securely. Review door specification and advise Architect if thru-bolts are required.
4. Install hardware with fasteners provided by hardware manufacturer.

B. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.

1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

C. Security Fasteners:

1. All hardware products shall have security fasteners with TORX heads.

2.3 HINGES

A. Provide five-knuckle, ball bearing hinges.

1. Manufacturers and Products:

a. Scheduled Manufacturer and Product: Ives 5BB series
b. Acceptable Manufacturers and Products: Hager BB series, Bommer BB5000

B. Requirements:

1. Provide three hinges per door leaf for doors 90 inches or less in height, and one additional hinge for each 30 inches of additional door height.
2. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:

a. Steel Hinges: Steel pins
b. Non-Ferrous Hinges: Stainless steel pins
c. Out-Swinging Exterior Doors: Non-removable pins
d. Out-Swinging Interior Lockable Doors: Non-removable pins
e. Interior Non-lockable Doors: Non-rising pins

3. Width of hinges: 4-1/2 inches at 1-3/4 inch thick doors, and 5 inches at 2 inches or thicker doors. Adjust hinge width as required for door, frame, and wall conditions to allow proper degree of opening.
4. Doors 36 inches wide or less furnish hinges 4-1/2 inches high; doors greater than 36 inches wide furnish hinges 5 inches high, heavy weight or standard weight as specified.

2.4 CONTINUOUS HINGES

A. Aluminum Geared

1. Manufacturers:

a. Scheduled Manufacturer: Ives.
b. Acceptable Manufacturers: Pemko, Select.

2. Requirements:

a. Provide aluminum geared continuous hinges conforming to ANSI/BHMA A156.25, Grade 2.
b. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum, with 0.25-inch diameter Teflon coated stainless steel hinge pin.
c. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
d. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
e. On fire-rated doors, provide aluminum geared continuous hinges that are classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
f. Provide aluminum geared continuous hinges with electrified option scheduled in the hardware sets. Provide with sufficient number and wire gage to accommodate electric function of specified hardware.
g. Install hinges with fasteners supplied by manufacturer.
h. Provide hinges with symmetrical hole pattern.

2.5 ELECTRIC POWER TRANSFER

A. Manufacturers:

a. Scheduled Manufacturer: Von Duprin
b. Acceptable Manufacturers: No Substitute

B. Provide power transfer with electrified options as scheduled in the hardware sets. Provide with number and gage of wires sufficient to accommodate electric function of specified hardware.

C. Locate electric power transfer per manufacturer’s template and UL requirements, unless interference with operation of door or other hardware items.

2.6 FLUSH BOLTS

A. Manufacturers:

1. Scheduled Manufacturer: Ives
2. Acceptable Manufacturers: Rockwood, Trimco

B. Requirements:

1. Provide automatic, constant latching, and manual flush bolts with forged bronze or stainless-steel face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12-inch steel or brass rods at doors up to 90-inches in height. For doors over 90-inches in height increase top rods by 6-inches for each additional 6-inches of door height. Provide flush bolts designed, tested, and warranted for door material and door manufacturer. Provide dust-proof strikes at each bottom flush bolt.

2.7 COORDINATORS

A. Manufacturers:

1. Scheduled Manufacturer: Ives
2. Acceptable Manufacturers: Rockwood, Trimco

B. Requirements:

1. Where pairs of doors are equipped with automatic flush bolts, an astragal, or other hardware that requires synchronized closing of the doors, provide bar-type coordinating device, surface applied to underside of stop at frame head.
2. Provide filler bar of correct length for unit to span entire width of opening, and appropriate brackets for parallel arm door closers and surface vertical rod exit device strikes. Factory-prep coordinators for vertical rod devices if required.

2.8 MORTISE LOCKS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Schlage L9000 series
2. Acceptable Manufacturers and Products: No Substitute

B. Requirements:

1. Provide mortise locks conforming to ANSI/BHMA A156.13 Series 1000, Grade 1 Operational, Grade 1 Security, and manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance. Provide lock case that is multi-function and field reversible for handing without opening case. Cylinders: Refer to “KEYING” article, herein.
2. Provide locks with standard 2-3/4-inches (70 mm) backset with full 3/4- inch (19 mm) throw stainless steel mechanical anti-friction latchbolt. Provide deadbolt with full 1 inch (25 mm) throw, constructed of stainless steel.
3. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
4. Verify lock functions with owner prior to ordering.
5. Provide electrified options as scheduled in the hardware sets. Where scheduled, provide a request to exit (RX) switch that is actuated with rotation of inside lever.

6. Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.

    a. Lever Design: Schlage 06A.
    b. Tactile Warning (Knurling): Where required by authority having jurisdiction. Provide on levers on exterior (secure side) of doors serving rooms considered to be hazardous.

2.9 AUXILIARY LOCKS

A. Deadlocks:

1. Manufacturers and Products:

    a. Scheduled Manufacturer and Product: Schlage L400 series
    b. Acceptable Manufacturers and Products: No Substitute

2. Requirements:

    a. Provide mortise deadlock series conforming to ANSI/BHMA A156 and function as specified. Cylinders: Refer to “KEYING” article, herein.
    b. Provide deadlocks with standard 2-3/4 inches (70 mm) backset. Provide deadbolt with full 1 inch (25 mm) throw, constructed of stainless steel.
    c. Provide manufacturer’s standard strike.
    d. Verify deadbolt functions with owner prior to ordering.

2.10 EXIT DEVICES

A. Manufacturer and Product:

1. Scheduled Manufacturer: Von Duprin 99/33 series
2. Acceptable Manufacturers and Products: No Substitute.

B. Requirements:

1. Provide exit devices tested to ANSI/BHMA A156.3-2014 Grade 1, and UL listed for Panic Exit or Fire Exit Hardware. Cylinders: Refer to “KEYING” article, herein.
2. Provide touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
3. Quiet Operation: Incorporate fluid damper or other device that eliminates noise of exit device operation.
4. Touchpad: Extend minimum of one half of door width, but not the full length of exit device rail. Provide end-cap with two-point attachment to door. Match exit device finish, stainless steel for US26, US26D, US28, US32, and US32D finishes; and for all other finishes, provide compatible finish to exit device. Provide compression springs in devices, latches, and outside trims or controls; tension springs prohibited.

5. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrical requirements.
6. Provide exit devices with manufacturer's approved strikes.
7. Provide exit devices cut to door width and height. Locate exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
8. Mount mechanism case flush on face of doors, or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
9. Provide cylinder dogging at non-fire-rated exit devices, unless specified less dogging.
10. Removable Mullions: 2-inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion that is removed by use of a keyed cylinder, which is self-locking when re-installed.
11. Verify exit device functions with owner prior to ordering.
12. Where lever handles are specified as outside trim for exit devices, provide heavy-duty lever trims with forged or cast escutcheon plates. Provide vandal-resistant levers that will travel to 90-degree down position when more than 35 pounds of torque are applied, and which can easily be re-set.

    a. Lever Style: Match lever style of locksets.
    b. Tactile Warning (Knurling): Where required by authority having jurisdiction. Provide on levers on exterior (secure side) of doors serving rooms considered to be hazardous.

13. Provide UL labeled fire exit hardware for fire rated openings.
14. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
15. Provide electrified options as scheduled in the hardware sets.

2.11 CYLINDERS

A. Manufacturers:

1. Scheduled Manufacturer: Schlage
2. Acceptable Manufacturers: No Substitute

B. Requirements:

1. Provide cylinders/cores, from the same manufacturer of locksets, compliant with ANSI/BHMA A156.5; latest revision, Section 12, Grade 1; permanent cylinders; cylinder face finished to match lockset, manufacturer's series as indicated. Refer to "KEYING" article, herein.
2. Provide cylinders in the below-listed configuration(s), distributed throughout the Project as indicated.

    a. Cylinder/Core Type: Large Format or Full Size Interchangeable Core (LFIC/FSIC).
    b. Keyway/Security Type: Restricted/Patented.

3. Nickel silver bottom pins.
4. Replaceable Construction Cores.

a. Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
   1) 2 construction control keys.
   2) 12 construction change (day) keys.

5. Verify with owner where permanent cores are to be shipped to.

2.12 KEYING

A. Provide a factory registered keying system, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.

B. Requirements:

1. Provide keying system capable of multiplex master keying.
2. Permanent cylinders/cores keyed by the manufacturer according to the following key system.

   a. Keying system as directed by the Owner.
   b. (Great)Grand Master Key System: Cylinders/cores operated by change (day) keys and subsequent masters (including grand/great grand) keys.

3. Forward bitting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements shall be cause for replacement of cylinders/cores involved at no additional cost to Owner.
4. Provide keys with the following features:

   a. Material: Nickel silver; minimum thickness of .107-inch (2.3mm).
   b. Restricted/Patented.

5. Identification:

   a. Mark permanent cylinders/cores and keys with applicable blind code per DHI publication “Keying Systems and Nomenclature” for identification. Blind code marks shall not include actual key cuts.
   b. Identification stamping provisions must be approved by the Architect and Owner.
   c. Stamp keys with Owner’s unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with “DO NOT DUPLICATE” along with the “PATENTED” or patent number to enforce the patent protection.
   d. Failure to comply with stamping requirements shall be cause for replacement of keys involved at no additional cost to Owner.

6. Quantity: Furnish in the following quantities.

   a. Change (Day) Keys: 3 per cylinder/core.
   b. Permanent Control Keys: 3 (if required).
   c. Master Keys: 6 per master.
   d. Unused balance of key blanks shall be furnished to Owner with the cut keys.
   e. Blanks: 2 Boxes Of Key Blanks (100 total).

7. Verify with owner where permanent keys are to be shipped to.

2.13 KEY CONTROL SYSTEM

A. Provide key control system, including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, all as recommended by system manufacturer.

1. Provide complete cross index system set up by hardware supplier, and place keys on markers and hooks in cabinet as determined by final key schedule.

B. Key Cabinet. Key cabinet provided by Section 087163 Detention Door Hardware.

2.14 DOOR CLOSERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: LCN 4040XP series.
2. Acceptable Manufacturers and Products: No Substitute.

B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
3. Cylinder Body: 1-1/2-inch (38 mm) diameter with 3/4-inch (19 mm) diameter double heat-treated pinion journal.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.
7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers.
8. Pressure Relief Valve (PRV) Technology: Not permitted.
9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.15 ELECTRO-HYDRAULIC AUTOMATIC OPERATORS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: LCN 4600 series
2. Acceptable Manufacturers and Products: No Substitute

B. Requirements:

1. Provide low energy automatic operator units with hydraulic closer complying with ANSI/BHMA A156.19.
2. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
3. Provide units with conventional door closer opening and closing forces unless power operator motor is activated. Provide door closer assembly with adjustable spring size, back-check, and opening and closing speed adjustment valves to control door
4. Provide units with on/off switch for manual operation, motor start up delay, vestibule interface delay, electric lock delay, and door hold open delay.
5. Provide units with conventional door closer opening and closing forces unless power operator motor is activated. Provide door closer assembly with adjustable spring size, back-check valve, sweep valve, latch valve to control door.
6. Provide drop plates, brackets, or adapters for arms as required for details.
7. Provide hard-wired actuator switches for operation as specified.
8. Provide weather-resistant actuators at exterior applications.
9. Provide key switches with LED’s, recommended and approved by manufacturer of automatic operator as required for function described in operation description of hardware group below. Cylinders: Refer to “KEYING” article, herein.
10. Provide complete assemblies of controls, switches, power supplies, relays, and parts/material recommended and approved by manufacturer of automatic operator for each individual leaf. Actuators control both doors simultaneously at pairs. Sequence operation of exterior and vestibule doors with automatic operators to allow ingress or egress through both sets of openings as directed by Architect. Locate actuators, key switches, and other controls as directed by Architect.
11. Provide units with vestibule inputs that allow sequencing operation of two units, and SPDT relay for interfacing with latching or locking devices.

2.16 DOOR TRIM

A. Manufacturers:

1. Scheduled Manufacturer: Ives
2. Acceptable Manufacturers: Rockwood, Trimco

B. Requirements:

1. Provide push plates 4-inches (102 mm) wide by 16-inches (406 mm) high by 0.050-inch (1 mm) thick and beveled 4 edges. Where width of door stile prevents use of 4-inches (102 mm) wide plate, adjust width to fit.

2. Provide pull plates 4-inches (102 mm) wide by 16-inches (406 mm) high by 0.050-inch (1 mm) thick, beveled 4 edges, and prepped for pull. Where width of door stile prevents use of 4-inches (102 mm) wide plate, adjust width to fit.

2.17 PROTECTION PLATES

A. Manufacturers:

1. Scheduled Manufacturer: Ives
2. Acceptable Manufacturers: Rockwood, Trimco

B. Requirements:

1. Provide kick plates, mop plates, and armor plates minimum of 0.050-inch thick, beveled four edges as scheduled. Furnish with countersunk sheet metal screws, finished to match plates.
2. Adjust width accordingly for other conflicting hardware (astragals, mullions, etc).
3. Sizes of plates:

   a. Kick Plates: 10 inches high by 1-1/2-inches less width of door on push side of single doors, 1-inch less width of door on push side of pairs
   b. Mop Plates: 4-inches high by 1-inches less width of door on pull side of single and paired doors
   c. Armor Plates: 35 inches high by 1 -1/2-inches less width of door on push side of single doors, 1-inch less width of door on push side of pairs

2.18 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

A. Manufacturers:

1. Scheduled Manufacturers: Glynn-Johnson
2. Acceptable Manufacturers: No Substitute

B. Requirements:

1. Provide heavy duty concealed mounted overhead stop or holder as specified for exterior and interior vestibule single acting doors.
2. Provide heavy duty concealed mounted overhead stop or holder as specified for double acting doors.
3. Provide heavy or medium duty and concealed or surface mounted overhead stop or holder for interior doors as specified. Provide medium duty surface mounted overhead stop for interior doors and at any door that swings more than 140 degrees before striking wall, open against equipment, casework, sidelights, and where conditions do not allow wall stop or floor stop presents tripping hazard.
4. Where overhead holders are specified provide friction type at doors without closer and positive type at doors with closer.

2.19 DOOR STOPS AND HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer: Ives
2. Acceptable Manufacturers: Rockwood, Trimco

B. Provide door stops at each door leaf:

1. Provide wall stops wherever possible. Provide convex type where mortise type locks are used and concave type where cylindrical type locks are used.
2. Where a wall stop cannot be used, provide universal floor stops for low or high rise options.
3. Where wall or floor stop cannot be used, provide medium duty surface mounted overhead stop.

2.20 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Manufacturers:

1. Scheduled Manufacturer: Zero
2. Acceptable Manufacturers: National Guard, Reese, Pemko

B. Requirements:

1. Provide thresholds, weather-stripping (including door sweeps, seals, and astragals) and gasketing systems (including smoke, sound, and light) as specified and per architectural details. Match finish of other items.
2. Size threshold width for full wall width when frames are recessed.
3. Cope thresholds at jambs and in front of mullions if thresholds project beyond door faces.
4. Furnish thresholds with non-ferrous stainless steel screws and lead anchors.
5. Furnish thresholds with slip resistant coating at exterior openings and where moisture is present.
6. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.

2.21 SILENCERS

A. Manufacturers:

1. Scheduled Manufacturer: Ives
2. Acceptable Manufacturers: Rockwood, Trimco

B. Requirements:

1. Provide "push-in" type silencers for hollow metal or wood frames.

2. Provide one silencer per 30 inches of height on each single frame, and two for each pair frame.
3. Omit where gasketing is specified.

2.22 DOOR POSITION SWITCHES

A. Manufacturers:

1. Scheduled Manufacturer: Detex
2. Acceptable Manufacturers: No Substitute

B. Requirements:

1. Provide recessed or surface mounted type door position switches as specified.
2. Coordinate door and frame preparations with door and frame suppliers. If switches are being used with magnetic locking device, provide minimum of 4 inches between switch and magnetic locking device.

2.23 FINSHES

A. Provide finish for each item as indicated in the sets.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated 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 door hardware installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.

1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
2. Custom Steel Doors and Frames: HMMA 831.
3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.

C. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.

D. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

E. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

F. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.

G. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated or one hinge for every 30 inches (750 mm) of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.

H. Lock Cylinders: Install construction cores to secure building and areas during construction period.

1. Replace construction cores with permanent cores as indicated in keying section.

I. Wiring: Coordinate with Division 26, ELECTRICAL sections for:

1. Conduit, junction boxes and wire pulls.
2. Connections to and from power supplies to electrified hardware.
3. Connections to fire/smoke alarm system and smoke evacuation system.
4. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
5. Testing and labeling wires with Architect's opening number.

J. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

K. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Closers shall not be visible in corridors, lobbies and other public spaces unless noted otherwise or approved by Architect.

L. Closer/Holders: Mount closer/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.

M. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

N. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.

O. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

P. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

Q. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.3 FIELD QUALITY CONTROL

A. Architectural Hardware Consultant: Engage qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.

1. Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

3.4 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: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

B. Occupancy Adjustment: Approximately six months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.5 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.6 DEMONSTRATION

A. Provide training for Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Refer to Division 01 Section "Demonstration and Training."

3.7 DOOR HARDWARE SCHEDULE

A. Locksets, exit devices, and other hardware items are referenced in the following hardware sets for series, type and function. Refer to the above-specifications for special features, options, cylinders/keying, and other requirements.

B. Hardware Sets:

HARDWARE GROUP NO. 01

FOR USE ON DOOR #(S):

B1130 B1132 C1074 C1075

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	PASSAGE SET	L9010 06A	626	SCH
1	EA	OH STOP	450S	652	GLY
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 02 - NOT USED

HARDWARE GROUP NO. 02A - NOT USED

HARDWARE GROUP NO. 03

FOR USE ON DOOR #(S):

C1066

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC LOCKSET (W/ RX)	L9092TEU 06A RX CON 12/24 VDC	626	SCH
1	EA	SURFACE CLOSER	4040XP EDA MC	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS401/402CVX	626	IVE
1	EA	GASKETING	488SBR PSA	BR	ZER
1	EA	CREDENTIAL READER	BY DIV 28		
1	EA	POWER SUPPLY	BY DIV 28		
1	EA	DOOR POSITION SWITCH	MS2049F		DET

DOOR NORMALLY CLOSED AND LOCKED. PRESTNTING VALID CREDENTIAL TO READER WILL MOMENTARILY UNLOCK LOCKSET, ALLOWING ACCESS. DOOR REMAINS LOCKED UPON LOSS OF POWER. FREE EGRESS AT ALL TIMES.

HARDWARE GROUP NO. 04

FOR USE ON DOOR #(S):

C1030A

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	PUSH PLATE	8200 4" X 16"	630	IVE
1	EA	PULL PLATE	8303 10" 4" X 16"	630	IVE
1	EA	SURFACE CLOSER	4040XP REG MC	689	LCN
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS	630	IVE
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS401/402CVX	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 05

FOR USE ON DOOR #(S):

B1008 B1009 C1032 C1033 C1036A

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	PUSH PLATE	8200 4" X 16"	630	IVE
1	EA	PULL PLATE	8303 10" 4" X 16"	630	IVE
1	EA	SURFACE CLOSER	4040XP EDA MC	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS401/402CVX	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 06

FOR USE ON DOOR #(S):

B1000B

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY	628	IVE
2	EA	DUMMY PUSH BAR X PULL TRIM	330 X 990DT	626	VON
1	EA	OH STOP	90S -> @ AUTO OP LEAF	630	GLY
1	EA	SURFACE CLOSER (W/ SPRING STOP)	4040XP SCUSH MC	689	LCN
1	EA	SURF. AUTO OPERATOR	4642 WMS 120 VAC -> FLUSH CEILING MOUNT	689	LCN
2	EA	ACTUATOR, WALL MOUNT	8310-853T	630	LCN
1	EA	PA MOUNTING PLATE	4040XP-18PA	689	LCN
1	EA	BLADE STOP SPACER	4040XP-61	689	LCN
1	EA	CUSH SHOE SUPPORT	4040XP-30	689	LCN
2	EA	FLUSH MOUNT BOX	8310-867F	689	LCN
1	EA	WEATHER RING	8310-801 -> @ EXTERIOR	PLA	LCN
1	EA	WEATHERSTRIPPING	BY DOOR/FRAME MANUFACTURER		B/O
2	EA	DOOR SWEEP, BRUSH W/ DRIP	8198AA	AA	ZER
1	EA	THRESHOLD, 1/2"	655A	A	ZER

BOTH AUTO OPERATOR ACTUATORS ENABLED AT ALL TIMES. PUSHING EITHER ACTUATOR SIGNALS AUTO OPERATOR TO MOMENTARILY OPEN DOOR. FREE EGRESS AT ALL TIMES.

HARDWARE GROUP NO. 07

FOR USE ON DOOR #(S):

B1000A

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY	628	IVE
2	EA	DUMMY PUSH BAR X PULL TRIM	330 X 990DT	626	VON
2	EA	SURFACE CLOSER (W/ SPRING STOP)	4040XP SCUSH MC	689	LCN
2	EA	BLADE STOP SPACER	4040XP-61	689	LCN
2	EA	PA MOUNTING PLATE	4040XP-18PA	689	LCN
2	EA	CUSH SHOE SUPPORT	4040XP-30	689	LCN
1	EA	WEATHERSTRIPPING	BY DOOR/FRAME MANUFACTURER		B/O
2	EA	DOOR SWEEP, BRUSH W/ DRIP	8198AA	AA	ZER
1	EA	THRESHOLD, 1/2"	655A	A	ZER

HARDWARE GROUP NO. 08

FOR USE ON DOOR #(S):

C1034A C1034B

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	CYL X TURN DEAD LOCK	L460T L583-363	626	SCH
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	PUSH PLATE	8200 4" X 16"	630	IVE
1	EA	PULL PLATE	8303 10" 4" X 16"	630	IVE
1	EA	SURFACE CLOSER	4040XP EDA MC	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS401/402CVX	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 09

FOR USE ON DOOR #(S):

C1017

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	PRIVACY LOCK	L9040 06A L583-363 L283-722	626	SCH
1	EA	WALL STOP	WS401/402CVX	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 10

FOR USE ON DOOR #(S):

B1065 B1075 B1131 C1060

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	PRIVACY LOCK	L9040 06A L583-363 L283-722	626	SCH
1	EA	SURFACE CLOSER (W/ SPRING STOP)	4040XP SCUSH MC	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 10A

FOR USE ON DOOR #(S):

B1026 B1027

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	PRIVACY LOCK	L9040 06A L583-363 L283-722	626	SCH
1	EA	SURFACE CLOSER (W/ SPRING STOP)	4040XP SCUSH MC	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	GASKETING	488SBR PSA	BR	ZER

HARDWARE GROUP NO. 11

FOR USE ON DOOR #(S):

B1017 C1008A C1024 C1025 C1026

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	PRIVACY LOCK	L9040 06A L583-363 L283-722	626	SCH
1	EA	SURFACE CLOSER	4040XP REG MC	689	LCN
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS	630	IVE
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS401/402CVX	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 12

FOR USE ON DOOR #(S):

B1066 B1076 D0001 E0001

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	PRIVACY LOCK	L9040 06A L583-363 L283-722	626	SCH
1	EA	SURFACE CLOSER	4040XP EDA MC	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS401/402CVX	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 13

FOR USE ON DOOR #(S):

B1070	B1071	B1072	B1073	B1128	C1016
C1018	C1019	C1020	C1021	C1022	C1029
C1043	C1068	C1069			

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	OFFICE/ENTRY LOCK	L9050T 06A L583-363	626	SCH
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	WALL STOP	WS401/402CVX	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 13A

FOR USE ON DOOR #(S):

B1064

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	OFFICE/ENTRY LOCK	L9050T 06A L583-363	626	SCH
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	FLOOR STOP	FS436/FS438	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 13B

FOR USE ON DOOR #(S):

C1047C

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	OFFICE/ENTRY LOCK	L9050T 06A L583-363	626	SCH
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	WALL STOP	WS401/402CVX	626	IVE
1	EA	SOUND SEAL	870AA-S	AA	ZER
1	EA	AUTO DR BTM, MORTISE (SOUND)	360AA-LS	AA	ZER

HARDWARE GROUP NO. 14

FOR USE ON DOOR #(S):

C1062

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	OFFICE/ENTRY LOCK	L9050T 06A L583-363	626	SCH
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	SURFACE CLOSER	4040XP EDA MC	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS33/WS33X (MOUNT ON SIDELITE MULLION OR BACK OF DOOR TO AVOID GLASS)	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 15 - NOT USED

HARDWARE GROUP NO. 16

FOR USE ON DOOR #(S):

C1015

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	OFFICE/ENTRY LOCK	L9050T 06A L583-363	626	SCH
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	SURFACE CLOSER	4040XP REG MC	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS401/402CVX	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 17

FOR USE ON DOOR #(S):

C1046 C1072

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	OFFICE/ENTRY LOCK	L9050T 06A L583-363	626	SCH
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	SURFACE CLOSER	4040XP EDA MC	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS401/402CVX	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 18

FOR USE ON DOOR #(S):

C1077 C1078

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	OFFICE/ENTRY LOCK	L9050T 06A L583-363	626	SCH
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	SURFACE CLOSER	4040XP REG MC	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS401/402CVX	626	IVE
1	EA	GASKETING	488SBR PSA	BR	ZER

HARDWARE GROUP NO. 19

FOR USE ON DOOR #(S):

B1069

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	CLASSROOM LOCK	L9070T 06A	626	SCH
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	WALL STOP	WS401/402CVX	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 20

FOR USE ON DOOR #(S):

B1035

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	CLASSROOM LOCK	L9070T 06A	626	SCH
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	SURFACE CLOSER (W/ SPRING STOP)	4040XP SCUSH MC	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 21

FOR USE ON DOOR #(S):

B1074

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	CLASSROOM LOCK	L9070T 06A	626	SCH
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	SURFACE CLOSER	4040XP REG MC	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS401/402CVX	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 21A

FOR USE ON DOOR #(S):

C1027

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	CLASSROOM LOCK	L9070T 06A	626	SCH
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	SURFACE CLOSER	4040XP EDA MC	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS401/402CVX	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 22

FOR USE ON DOOR #(S):

C1028

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	CLASSROOM LOCK	L9070T 06A	626	SCH
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	SURFACE CLOSER	4040XP REG MC	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS401/402CVX	626	IVE
1	EA	SOUND SEAL	870AA-S	AA	ZER
1	EA	AUTO DR BTM, MORTISE (SOUND)	360AA-LS	AA	ZER

HARDWARE GROUP NO. 23

FOR USE ON DOOR #(S):

C1035

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	CONST LATCHING BOLT (HM)	FB51T	630	IVE
1	EA	STOREROOM LOCK	L9080T 06A	626	SCH
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	OH STOP	450S	652	GLY
1	EA	WALL STOP	WS401/402CVX	626	IVE
2	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 24

FOR USE ON DOOR #(S):

C1008

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	STOREROOM LOCK	L9080T 06A	626	SCH
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	OH STOP	450S	652	GLY
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 25

FOR USE ON DOOR #(S):

C1002B C1004 C1005 C1012 C1041 D0002
E0002

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	STOREROOM LOCK	L9080T 06A	626	SCH
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	WALL STOP	WS401/402CVX	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 26

FOR USE ON DOOR #(S):

B1004 B1011 B1012 B1013
C1000A C1006B C1007B C1031B

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC LOCKSET (W/ RX)	L9092TEU 06A RX CON 12/24 VDC	626	SCH
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	SURFACE CLOSER (W/ SPRING STOP)	4040XP SCUSH MC	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1	EA	POWER SUPPLY	BY DIV 28		B/O
1	EA	CREDENTIAL READER	BY DIV 28		B/O
1	EA	DOOR POSITION SWITCH	MS2049F		DET

DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO READER WILL MOMENTARILY UNLOCK LOCKSET, ALLOWING ACCESS. DOOR REMAINS LOCKED UPON LOSS OF POWER. FREE EGRESS AT ALL TIMES.

HARDWARE GROUP NO. 27

FOR USE ON DOOR #(S):

A2001

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC LOCKSET (W/ RX)	L9092TEU 06A RX CON 12/24 VDC	626	SCH
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	SURFACE CLOSER (W/ SPRING STOP)	4040XP SCUSH MC	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1	EA	CREDENTIAL READER	BY DIV 28		B/O
1	EA	POWER SUPPLY	BY DIV 28		B/O
1	EA	DOOR POSITION SWITCH	MS2049F		DET

DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO READER WILL MOMENTARILY UNLOCK LOCKSET, ALLOWING ACCESS. DOOR REMAINS LOCKED UPON LOSS OF POWER. FREE EGRESS AT ALL TIMES.

HARDWARE GROUP NO. 28

FOR USE ON DOOR #(S):

C1038

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC LOCKSET (W/ RX)	L9092TEU 06A RX CON 12/24 VDC	626	SCH
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	SURFACE TRACK CLOSER (W/ STOP)	4040XPT BUMP MC	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1	EA	POWER SUPPLY	BY DIV 28		B/O
1	EA	CREDENTIAL READER	BY DIV 28		B/O
1	EA	DOOR POSITION SWITCH	MS2049F		DET

DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO READER WILL MOMENTARILY UNLOCK LOCKSET, ALLOWING ACCESS. DOOR REMAINS LOCKED UPON LOSS OF POWER. FREE EGRESS AT ALL TIMES.

HARDWARE GROUP NO. 29

FOR USE ON DOOR #(S):

B1126	C1001	C1002A	C1006A	C1007A	C1039
C1040	C1045	C1048	C1050	C1055	C1070A
C1071A					

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC LOCKSET (W/ RX)	L9092TEU 06A RX CON 12/24 VDC	626	SCH
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	SURFACE CLOSER	4040XP REG MC	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS401/402CVX	626	IVE
3	EA	SILENCER	SR64	GRY	IVE
1	EA	POWER SUPPLY	BY DIV 28		B/O
1	EA	CREDENTIAL READER	BY DIV 28		B/O
1	EA	DOOR POSITION SWITCH	MS2049F		DET

DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO READER WILL MOMENTARILY UNLOCK LOCKSET, ALLOWING ACCESS. DOOR REMAINS LOCKED UPON LOSS OF POWER. FREE EGRESS AT ALL TIMES.

HARDWARE GROUP NO. 30

FOR USE ON DOOR #(S):

C1047A C1052C C1056

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC LOCKSET (W/ RX)	L9092TEU 06A RX CON 12/24 VDC	626	SCH
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	SURFACE CLOSER	4040XP REG MC	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS401/402CVX	626	IVE
3	EA	SILENCER	SR64	GRY	IVE
1	EA	CREDENTIAL READER	BY DIV 28		B/O
1	EA	POWER SUPPLY	BY DIV 28		B/O
1	EA	DOOR POSITION SWITCH	MS2049F		DET

DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO READER WILL MOMENTARILY UNLOCK LOCKSET, ALLOWING ACCESS. DOOR REMAINS LOCKED UPON LOSS OF POWER. FREE EGRESS AT ALL TIMES.

HARDWARE GROUP NO. 31

FOR USE ON DOOR #(S):

B1005 B1006 B1010 B1124 B1127 B1129
C1031A C1037 C1051 C1070B C1071B

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC LOCKSET (W/ RX)	L9092TEU 06A RX CON 12/24 VDC	626	SCH
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	SURFACE CLOSER	4040XP EDA MC	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS401/402CVX	626	IVE
3	EA	SILENCER	SR64	GRY	IVE
1	EA	POWER SUPPLY	BY DIV 28		B/O
1	EA	CREDENTIAL READER	BY DIV 28		B/O
1	EA	DOOR POSITION SWITCH	MS2049F		DET

DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO READER WILL MOMENTARILY UNLOCK LOCKSET, ALLOWING ACCESS. DOOR REMAINS LOCKED UPON LOSS OF POWER. FREE EGRESS AT ALL TIMES.

HARDWARE GROUP NO. 32

FOR USE ON DOOR #(S):

C1000B C1000C

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC LOCKSET (W/ RX)	L9092TEU 06A RX CON 12/24 VDC	626	SCH
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	SURFACE CLOSER	4040XP EDA MC	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS401/402CVX	626	IVE
3	EA	SILENCER	SR64	GRY	IVE
1	EA	POWER SUPPLY	BY DIV 28		B/O
1	EA	CREDENTIAL READER	BY DIV 28		B/O
1	EA	DOOR POSITION SWITCH	MS2049F		DET
1	EA	DESK MOUNT BUTTON	660-PB	628	SCE

DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO READER, OR PUSH BUTTON AT DESK, WILL MOMENTARILY UNLOCK LOCKSET, ALLOWING ACCESS. DOOR REMAINS LOCKED UPON LOSS OF POWER. FREE EGRESS AT ALL TIMES.

HARDWARE GROUP NO. 33

FOR USE ON DOOR #(S):

A1002 A1003A C1047B C1085

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC LOCKSET (W/ RX)	L9092TEU 06A RX CON 12/24 VDC	626	SCH
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	SURFACE CLOSER	4040XP EDA MC	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS401/402CVX	626	IVE
3	EA	SILENCER	SR64	GRY	IVE
1	EA	POWER SUPPLY	BY DIV 28		B/O
1	EA	CREDENTIAL READER	BY DIV 28		B/O
1	EA	DOOR POSITION SWITCH	MS2049F		DET

DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO READER WILL MOMENTARILY UNLOCK LOCKSET, ALLOWING ACCESS. DOOR REMAINS LOCKED UPON LOSS OF POWER. FREE EGRESS AT ALL TIMES.

HARDWARE GROUP NO. 34

FOR USE ON DOOR #(S):

C1030B

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC LOCKSET (W/ RX)	L9092TEU 06A RX CON 12/24 VDC	626	SCH
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	SURFACE CLOSER (W/ SPRING STOP)	4040XP SCUSH MC	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WEATHERSTRIPPING	429AA-S	AA	ZER
1	EA	RAIN DRIP	142AA	AA	ZER
1	EA	DOOR SWEEP, BRUSH W/ DRIP	8198AA	AA	ZER
1	EA	THRESHOLD, 1/2"	655A	A	ZER
1	EA	CREDENTIAL READER	BY DIV 28		B/O
1	EA	POWER SUPPLY	BY DIV 28		B/O
1	EA	DOOR POSITION SWITCH	MS2049F		DET

DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO READER WILL MOMENTARILY UNLOCK LOCKSET, ALLOWING ACCESS. DOOR REMAINS LOCKED UPON LOSS OF POWER. FREE EGRESS AT ALL TIMES.

HARDWARE GROUP NO. 34A

FOR USE ON DOOR #(S):

B2000B

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	STOREROOM LOCK	L9080T 06A	626	SCH
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	SURFACE CLOSER (W/ SPRING STOP)	4040XP SCUSH MC	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	RAIN DRIP	142AA	AA	ZER
1	EA	WEATHERSTRIPPING	429AA-S	AA	ZER
1	EA	DOOR SWEEP, BRUSH W/ DRIP	8198AA	AA	ZER
1	EA	THRESHOLD, 1/2"	655A	A	ZER
1	EA	DOOR POSITION SWITCH	MS2049F		DET

HARDWARE GROUP NO. 35

FOR USE ON DOOR #(S):

C1036B

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC LOCKSET (W/ RX)	L9092TEU 06A RX CON 12/24 VDC	626	SCH
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	SURFACE CLOSER (W/ SPRING STOP)	4040XP SCUSH MC	689	LCN
1	EA	SURFACE CLOSER	4040XP EDA MC	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	RAIN DRIP	142AA	AA	ZER
1	EA	WEATHERSTRIPPING	429AA-S	AA	ZER
1	EA	DOOR SWEEP, BRUSH W/ DRIP	8198AA	AA	ZER
1	EA	THRESHOLD, 1/2"	655A	A	ZER
1	EA	POWER SUPPLY	BY DIV 28		B/O
1	EA	CREDENTIAL READER	BY DIV 28		B/O
1	EA	DOOR POSITION SWITCH	MS2049F		DET

DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO READER WILL MOMENTARILY UNLOCK LOCKSET, ALLOWING ACCESS. DOOR REMAINS LOCKED UPON LOSS OF POWER. FREE EGRESS AT ALL TIMES.

HARDWARE GROUP NO. 36 - NOT USED

HARDWARE GROUP NO. 37

FOR USE ON DOOR #(S):

B1085 B1108 C1064 C1083

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	STOREROOM LOCK	L9080T 06A	626	SCH
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	SURFACE CLOSER (W/ SPRING STOP)	4040XP SCUSH MC	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 38 - NOT USED

HARDWARE GROUP NO. 39

FOR USE ON DOOR #(S):

B1007 B1084 B1094

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	STOREROOM LOCK	L9080T 06A	626	SCH
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	SURFACE CLOSER	4040XP REG MC	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS401/402CVX	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 40

FOR USE ON DOOR #(S):

C1054B

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	FIRE EXIT HARDWARE	99-NL-F	626	VON
1	EA	RIM CYL HOUSING (FSIC)	20-079 ICX	626	SCH
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	SURFACE CLOSER (W/ DEAD STOP)	4040XP CUSH MC	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	GASKETING	488SBR PSA	BR	ZER

HARDWARE GROUP NO. 41

FOR USE ON DOOR #(S):

B1028 B2002

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	STOREROOM LOCK	L9080T 06A	626	SCH
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	SURFACE CLOSER (W/ SPRING STOP)	4040XP SCUSH MC	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 42

FOR USE ON DOOR #(S):

B2001

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	STOREROOM LOCK	L9080T 06A	626	SCH
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	SURFACE CLOSER	4040XP EDA MC	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS401/402CVX	626	IVE
1	EA	GASKETING	488SBR PSA	BR	ZER
1	EA	DOOR POSITION SWITCH	MS2049F		DET

HARDWARE GROUP NO. 43

FOR USE ON DOOR #(S):

C1076 C1080 D1004 E1011

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	STOREROOM LOCK	L9080T 06A	626	SCH
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	SURFACE CLOSER	4040XP REG MC	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS401/402CVX	626	IVE
1	EA	GASKETING	488SBR PSA	BR	ZER

HARDWARE GROUP NO. 43A

FOR USE ON DOOR #(S):

B1030

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	STOREROOM LOCK	L9080T 06A	626	SCH
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	SURFACE CLOSER	4040XP REG MC	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS401/402CVX	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 44

FOR USE ON DOOR #(S):

C1079

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	STOREROOM LOCK	L9080T 06A	626	SCH
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	SURFACE CLOSER	4040XP REG MC	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS401/402CVX	626	IVE
1	EA	GASKETING	488SBR PSA	BR	ZER
1	EA	DOOR POSITION SWITCH	MS2049F		DET

HARDWARE GROUP NO. 45

FOR USE ON DOOR #(S):

B1024 C1065B

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	STOREROOM LOCK	L9080T 06A	626	SCH
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	SURFACE CLOSER	4040XP REG MC	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS401/402CVX	626	IVE
1	EA	GASKETING	488SBR PSA	BR	ZER

HARDWARE GROUP NO. 46

FOR USE ON DOOR #(S):

C1054A

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	FIRE EXIT HARDWARE	99-NL-F	626	VON
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	RIM CYL HOUSING (FSIC)	20-079 ICX	626	SCH
1	EA	SURFACE CLOSER	4040XP EDA MC	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS401/402CVX	626	IVE
1	EA	GASKETING	488SBR PSA	BR	ZER

HARDWARE GROUP NO. 47

FOR USE ON DOOR #(S):

A1001

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	STOREROOM LOCK	L9080T 06A	626	SCH
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	WALL STOP	WS401/402CVX	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 48

FOR USE ON DOOR #(S):

C1011

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	CONST LATCHING BOLT (HM)	FB51T	630	IVE
1	EA	STOREROOM LOCK	L9080T 06A	626	SCH
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
2	EA	WALL STOP	WS401/402CVX	626	IVE
2	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 49

FOR USE ON DOOR #(S):

C1057

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1HW 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	AUTO FLUSH BOLT (HM)	FB31T	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	ELEC LOCKSET (W/ RX)	L9092TEU 06A RX CON 12/24 VDC	626	SCH
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
2	EA	SURFACE CLOSER	4040XP EDA MC	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
2	EA	WALL STOP	WS401/402CVX	626	IVE
2	EA	SILENCER	SR64	GRY	IVE
1	EA	CREDENTIAL READER	BY DIV 28		B/O
1	EA	POWER SUPPLY	BY DIV 28		B/O
2	EA	DOOR POSITION SWITCH	MS2049F		DET

DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO READER WILL MOMENTARILY UNLOCK LOCKSET, ALLOWING ACCESS. DOOR REMAINS LOCKED UPON LOSS OF POWER. FREE EGRESS AT ALL TIMES.

HARDWARE GROUP NO. 50

FOR USE ON DOOR #(S):

C1053B

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	SET	AUTO FLUSH BOLT (HM)	FB31P	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	L9080T 06A	626	SCH
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	COORDINATOR	COR X FL (MB AS REQ'D)	628	IVE
2	EA	SURFACE TRACK CLOSER (W/ STOP)	4040XPT BUMP MC	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
2	EA	SILENCER	SR64	GRY	IVE
2	EA	DOOR POSITION SWITCH	MS2049F		DET

HARDWARE GROUP NO. 51

FOR USE ON DOOR #(S):

C1053A

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	SET	AUTO FLUSH BOLT (HM)	FB31P	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	L9080T 06A	626	SCH
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	COORDINATOR	COR X FL (MB AS REQ'D)	628	IVE
2	EA	SURFACE CLOSER (W/ SPRING STOP)	4040XP SCUSH MC	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
1	EA	RAIN DRIP	142AA	AA	ZER
1	EA	WEATHERSTRIPPING	429AA-S	AA	ZER
2	EA	DOOR SWEEP, BRUSH W/ DRIP	8198AA	AA	ZER
1	EA	ASTRAGAL, OVERLAP	383AA	AA	ZER
1	EA	THRESHOLD, 1/2"	655A	A	ZER
2	EA	DOOR POSITION SWITCH	MS2049F		DET

HARDWARE GROUP NO. 52

FOR USE ON DOOR #(S):

B2000A

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	SET	AUTO FLUSH BOLT (HM)	FB31P	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	FIRE EXIT HARDWARE	9927-NL-F-LBR-499F	626	VON
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	COORDINATOR	COR X FL (MB AS REQ'D)	628	IVE
1	EA	SURFACE CLOSER (W/ SPRING STOP)	4040XP SCUSH MC	689	LCN
1	EA	SURFACE CLOSER	4040XP EDA MC	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
1	EA	WALL STOP	WS401/402CVX	626	IVE
1	EA	GASKETING	488SBR PSA	BR	ZER
1	EA	GASKETING (MEETING STILE)	8042SBK PSA	BK	ZER

HARDWARE GROUP NO. 53

FOR USE ON DOOR #(S):

C1061

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	PRIVACY W/DB & IND	L9496T 06A L583-363	626	SCH
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	SURFACE CLOSER (W/ SPRING STOP)	4040XP SCUSH MC	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 54

FOR USE ON DOOR #(S):

B1125

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	PRIVACY W/DB & IND	L9496T 06A L583-363	626	SCH
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	SURFACE CLOSER	4040XP REG MC	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS401/402CVX	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 54A

FOR USE ON DOOR #(S):

B1031

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	PRIVACY W/DB & IND	L9496T 06A L583-363	626	SCH
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	SURFACE CLOSER	4040XP EDA MC	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS401/402CVX	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 55

FOR USE ON DOOR #(S):

B1003

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY	628	IVE
1	EA	PANIC HARDWARE	LD-99-EO	626	VON
1	EA	SURFACE CLOSER (W/ SPRING STOP)	4040XP SCUSH MC	689	LCN
1	EA	PA MOUNTING PLATE	4040XP-18PA	689	LCN
1	EA	CUSH SHOE SUPPORT	4040XP-30	689	LCN
1	EA	BLADE STOP SPACER	4040XP-61	689	LCN
1	EA	RAIN DRIP	142AA	AA	ZER
1	EA	WEATHERSTRIPPING	BY DOOR/FRAME MANUFACTURER		B/O
1	EA	DOOR SWEEP, BRUSH W/ DRIP	8198AA	AA	ZER
1	EA	THRESHOLD, 1/2"	655A	A	ZER
1	EA	DOOR POSITION SWITCH	MS2049F		DET

HARDWARE GROUP NO. 56

FOR USE ON DOOR #(S):

B1000C

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY EPT	628	IVE
2	EA	POWER TRANSFER	EPT10	689	VON
1	EA	REMOVABLE MULLION	KR4954	689	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-99-DT 24 VDC	626	VON
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	MORTISE CYL HOUSING (FSIC)	26-094 ICX	626	SCH
2	EA	SURFACE CLOSER (W/ SPRING STOP)	4040XP SCUSH MC	689	LCN
2	EA	BLADE STOP SPACER	4040XP-61	689	LCN
2	EA	PA MOUNTING PLATE	4040XP-18PA	689	LCN
1	EA	CREDENTIAL READER	BY DIV 28		B/O
1	EA	POWER SUPPLY	BY DIV 28		B/O
2	EA	DOOR POSITION SWITCH	MS2049F		DET

PANIC DEVICE LATCHES CAPABLE OF BEING ELECTRONICALLY DOGGED DOWN (I.E. PUSH/PULL MODE) AS DESIGNATED BY ACCESS CONTROL SYSTEM SCHEDULE. EXIT DEVICES LATCH AND LOCK WITH ACTIVATION OF SECURITY SYSTEM. FREE EGRESS AT ALL TIMES.

HARDWARE GROUP NO. 57

FOR USE ON DOOR #(S):

B1000D

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY EPT	628	IVE
2	EA	POWER TRANSFER	EPT10	689	VON
1	EA	REMOVABLE MULLION	KR4954	689	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-99-DT 24 VDC	626	VON
1	EA	ELEC PANIC HARDWARE	LX-RX-QEL-99-NL 24 VDC	626	VON
1	EA	RIM CYL HOUSING (FSIC)	20-079 ICX	626	SCH
1	EA	MORTISE CYL HOUSING (FSIC)	26-094 ICX	626	SCH
2	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	OH STOP	90S -> @ AUTO OP LEAF	630	GLY
1	EA	SURFACE CLOSER (W/ SPRING STOP)	4040XP SCUSH MC	689	LCN
1	EA	SURF. AUTO OPERATOR	4642 WMS 120 VAC -> FLUSH CEILING MOUNT	689	LCN
1	EA	CUSH SHOE SUPPORT	4040XP-30	689	LCN
1	EA	PA MOUNTING PLATE	4040XP-18PA	689	LCN
1	EA	BLADE STOP SPACER	4040XP-61	689	LCN
2	EA	ACTUATOR, WALL MOUNT	8310-853T	630	LCN
2	EA	FLUSH MOUNT BOX	8310-867F	689	LCN
1	EA	POWER SUPPLY	BY DIV 28		B/O
1	EA	CREDENTIAL READER	BY DIV 28		B/O
2	EA	DOOR POSITION SWITCH	MS2049F		DET

DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO READER MOMENTARILY RETRACTS PANIC DEVICE LATCH AND MOMENTARILY ENABLES EXTERIOR ACTUATOR BUTTON. PUSHING ENABLED EXTERIOR ACTUATOR BUTTON SIGNALS AUTOMATIC OPERATOR TO MOMENTARILY OPEN DOOR. INTERIOR ACTUATOR ENABLED AT ALL TIMES. PUSHING THE INTERIOR ACTUATOR BUTTON MOMENTARILY RETRACTS PANIC DEVICE LATCH AND SIGNALS AUTOMATIC OPERATOR TO MOMENTARILY OPEN DOOR. PANIC DEVICE LATCHES ALSO CAPABLE OF BEING ELECTRONICALLY DOGGED DOWN (I.E. PUSH/PULL MODE) AS DESIGNATED BY ACCESS CONTROL SYSTEM SCHEDULE. EXIT DEVICES LATCH AND LOCK WITH ACTIVATION OF SECURITY SYSTEM. FREE EGRESS AT ALL TIMES.

HARDWARE GROUP NO. 58

FOR USE ON DOOR #(S):

C1013A	C1013B	C1013C	C1014A	C1014B

CASED OPEN FRAME/OPENING - NO DOOR OR HARDWARE.

HARDWARE GROUP NO. 59

FOR USE ON ACCESS DOORS AND DOOR #(S):

A1000B	A1000C	A1000D	A1000E	A1000G	A1000H
A1000J	A1000K	A1003B	C1052B	D1008C	E1009D

PROVIDE EACH OPENING WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	PERMANENT CORE (FSIC EVEREST)	23-030 EV29 T	626	SCH
1	EA	MORTISE CYL HOUSING (FSIC)	26-094 ICX	626	SCH

VERIFY EXACT CYLINDER TYPE REQUIRED. BALANCE OF HARDWARE BY DOOR MANUFACTURER.

END OF SECTION

PROJECT MANUAL VOLUME 3 (1)

SPECIFICATIONS TABLE OF CONTENTS

DIVISION 06 – WOOD, PLASTICS AND COMPOSITES

DIVISION 07 – THERMAL AND MOISTURE PROTECTION

DIVISION 08 – OPENINGS

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DIVISION 26 – ELECTRICAL

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PROJECT MANUAL VOLUME 4 (1)

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DIVISION 06 – WOOD, PLASTICS AND COMPOSITES

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DIVISION 26 – ELECTRICAL

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SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

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. 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. Section 271313 "Communications Copper Backbone Cabling" for twisted pair cabling used for data circuits.
2. Section 271513 "Communications Copper Horizontal Cabling" for twisted pair cabling used for data circuits.

1.3 DEFINITIONS

A. VFC: Variable-frequency controller.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.5 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. Thomas & Betts Corporation: A Member of the ABB Group.
2. Cooper Industries, Inc.
3. Belden Inc.
4. Cerro Wire LLC.
5. Encore Wire Corporation.
6. General Cable Technologies Corporation.
7. 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 B3 for bare annealed copper and with ASTM B8 or ASTM B496 for stranded conductors.

E. Conductor Insulation:

1. Type TC-ER: Comply with NEMA WC 70/ICEA S-95-658 and UL 1277.
2. Type THHN and Type THWN-2: Comply with UL 83.
3. Type XHHW-2: Comply with UL 44.

F. Shield:

1. Type TC-ER: Cable designed for use with VFCs, with oversized crosslinked polyethylene insulation, spiral-wrapped foil plus 85 percent coverage braided shields and insulated full-size ground wire, and sunlight- and oil-resistant outer PVC jacket.

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. Belden Inc.
2. Cerro Wire LLC.
3. Encore Wire Corporation.
4. General Cable Technologies Corporation.
5. Southwire Company.
6. Thomas & Betts Corporation: A Member of the ABB Group.

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 B800 and ASTM B801.

E. Conductor Insulation:

1. Type TC-ER: Comply with NEMA WC 70/ICEA S-95-658 and UL 1277.
2. Type THHN and Type THWN-2: Comply with UL 83.
3. Type XHHW-2: Comply with UL 44.

4. Type TFN/THHN/THWN-2: Comply with UL 83.
5. Type XHHW-2: Comply with UL 44.

2.3 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. Hubbell Power Systems, Inc.
4. Ideal Industries, Inc.
5. ILSCO.
6. NSi Industries LLC.
7. O-Z/Gedney; a brand of Emerson Industrial Automation.
8. Thomas & Betts Corporation; A Member of the ABB Group.

C. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Feeders: Copper for feeders smaller than No. 1/0 AWG; copper or aluminum for feeders No. 1/0 AWG and larger. Conductors shall be solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

C. Branch Circuits: Copper. Solid for No. 12 AWG and smaller; stranded for No. 10 AWG and larger.

D. VFC Output Circuits Cable: Extra-flexible stranded for all sizes.

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 Crawlspaces: 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. Feeders Installed below Raised Flooring: Type THHN/THWN-2, single conductors in raceway.

F. Exposed Branch Circuits, Including in Crawlspaces: Type THHN/THWN-2, single conductors in raceway.

G. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway.

H. 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.

I. Branch Circuits Installed below Raised Flooring: Type THHN/THWN-2, single conductors in raceway.

J. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

K. VFC Output Circuits: Type TC-ER cable with braided shield.

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 and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

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 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."

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.
2. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors and conductors feeding the following critical equipment and services for compliance with requirements:

    a. Switchboards.

    b. Panelboards.

    c. Generator.

    d. Automatic Transfer Switches.

3. Perform each of the following visual and electrical tests:

    a. Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.
    b. Test bolted connections for high resistance using one of the following:

        1) A low-resistance ohmmeter.
        2) Calibrated torque wrench.
        3) Thermographic survey.

    c. Inspect compression-applied connectors for correct cable match and indentation.
    d. Inspect for correct identification.
    e. Inspect cable jacket and condition.
    f. Insulation-resistance test on each conductor for ground and adjacent conductors. Apply a potential of 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable for a one-minute duration.
    g. Continuity test on each conductor and cable.

h. Uniform resistance of parallel conductors.

B. Cables will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports to record the following:

1. Procedures used.
2. Results that comply with requirements.
3. Results that do not comply with requirements, and corrective action taken to achieve compliance with requirements.

END OF SECTION 260519

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SECTION 260526 - GROUNDING AND BONDING 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 grounding and bonding systems and equipment, plus the following special applications:

1. Underground distribution grounding.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans showing dimensioned locations of grounding features specified in "Field Quality Control" Article, including the following:

1. Test wells.
2. Ground rods.
3. Ground rings.
4. Grounding arrangements and connections for separately derived systems.

B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

a. Plans showing as-built, dimensioned locations of system described in "Field Quality Control" Article, including the following:

1) Test wells.
2) Ground rods.
3) Ground rings.
4) Grounding arrangements and connections for separately derived systems.

b. Instructions for periodic testing and inspection of grounding features at test wells , ground rings, and grounding connections for separately derived systems based on NFPA 70B.

1) Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
2) Include recommended testing intervals.

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. Burndy; Part of Hubbell Electrical Systems.
2. ERICO; a brand of nVent.
3. Harger Lightning & Grounding.
4. ILSCO.
5. O-Z/Gedney; a brand of Emerson Industrial Automation.
6. Siemens Industry, Inc., Energy Management Division.
7. Thomas & Betts Corporation; A Member of the ABB Group.

2.3 CONDUCTORS

A. Insulated Conductors: Copper or tinned-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 B3.
2. Stranded Conductors: ASTM B8.

3. Tinned Conductors: ASTM B33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches in cross section, with 9/32-inch holes spaced 1-1/8 inches apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

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: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

D. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.

E. Cable-to-Cable Connectors: Compression type, copper or copper alloy.

F. Cable Tray Ground Clamp: Mechanical type, zinc-plated malleable iron.

G. Conduit Hubs: Mechanical type, terminal with threaded hub.

H. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt .

I. Signal Reference Grid Clamp: Mechanical type, stamped-steel terminal with hex head screw.

J. U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.

K. Water Pipe Clamps:

1. Mechanical type, two pieces with zinc-plated bolts.

    a. Material: Die-cast zinc alloy.
    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.

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 copper conductor, No. 1/0 AWG minimum.

1. Bury at least 30 inches below grade.

C. Grounding Conductors: Green-colored insulation with continuous yellow stripe.

D. 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 minimum from wall, 6 inches above finished floor unless otherwise indicated.

E. 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 SEPARATELY DERIVED SYSTEMS

A. Generator: Install grounding electrode(s) at the generator location. The electrode shall be connected to the equipment grounding conductor and to the frame of the generator.

3.4 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

3.5 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

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.

E. Metallic Fences: Comply with requirements of IEEE C2.

1. Grounding Conductor: Bare copper, not less than No. 8 AWG.
2. Gates: Shall be bonded to the grounding conductor with a flexible bonding jumper.
3. Barbed Wire: Strands shall be bonded to the grounding conductor.

3.6 FENCE GROUNDING

A. Fence Grounding: Install at maximum intervals of **500 feet** except as follows:

1. Fences within 100 Feet of Buildings, Structures, Walkways, and Roadways: Ground at maximum intervals of 200 feet.

a. Gates and Other Fence Openings: Ground fence on each side of opening.

1) Bond metal gates to gate posts.
2) Bond across openings, with and without gates, except at openings indicated as intentional fence discontinuities. Use No. 2 AWG wire and bury it at least 18 inches below finished grade.

B. Protection at Crossings of Overhead Electrical Power Lines: Ground fence at location of crossing and at a maximum distance of 150 feet on each side of crossing.

C. Fences Enclosing Electrical Power Distribution Equipment: Ground as required by IEEE C2 unless otherwise indicated.

D. Grounding Method: At each grounding location, drive a grounding rod vertically until the top is 6 inches below finished grade. Connect rod to fence with No. 6 AWG conductor. Connect conductor to each fence component at grounding location.

E. Bonding Method for Gates: Connect bonding jumper between gate post and gate frame.

F. Bonding to Lightning-Protection System: If fence terminates at lightning-protected building or structure, ground the fence and bond the fence grounding conductor to lightning-protection down conductor or lightning-protection grounding conductor, complying with NFPA 780.

3.7 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 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.
2. Use exothermic welds for all below-grade connections.
3. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

C. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Section 260543 "Underground Ducts and Raceways for Electrical Systems," and shall be at least 12 inches deep, with cover.

1. Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.

D. 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.

E. 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.

F. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.

G. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.

H. Ground Ring: Install a grounding conductor, electrically connected to each building structure ground rod and to each steel column, extending around the perimeter of area or item indicated.

1. Install tinned-copper conductor not less than No. 1/0 AWG for ground ring and for taps to building steel.
2. Bury ground ring 30 inches and locate away from building's foundation not less than 24 inches.

I. Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
2. Make connections with clean, bare metal at points of contact.
3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
4. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

3.8 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.

4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

C. Grounding system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 5 ohms.
2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
4. Power Distribution Units or Panelboards Serving Electronic Equipment: 1 ohm(s).

F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS 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. 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.

B. Related Requirements:

1. Section 260548.16 "Seismic Controls for Electrical Systems" for products and installation requirements necessary for compliance with seismic criteria.

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 the following:

a. Slotted support systems, hardware, and accessories.
b. Clamps.
c. Hangers.
d. Sockets.
e. Eye nuts.
f. Fasteners.
g. Anchors.
h. Saddles.
i. Brackets.

2. Include rated capacities and furnished specialties and accessories.

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.
2. Include design calculations for seismic restraints.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) 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. Suspended ceiling components.
2. Ductwork, piping, fittings, and supports.
3. Structural members to which hangers and supports will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Items penetrating finished ceiling, including the following:

a. Luminaires.
b. Air outlets and inlets.
c. Speakers.
d. Sprinklers.
e. Access panels.

B. Seismic Qualification Data: Certificates, for hangers and supports for electrical equipment and systems, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Welding certificates.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M.
2. AWS D1.2/D1.2M.

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. Seismic Performance: Hangers and supports shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the supported equipment and systems will remain in place without separation of any parts when subjected to the seismic forces specified and the supported equipment and systems will be fully operational after the seismic event."
2. Component Importance Factor: [**1.5**] [**1.0**].

C. Surface-Burning Characteristics: Comply with ASTM E84; 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 D635.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch-diameter holes at a maximum of 8 inches o.c. in at least one surface.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ERICO International Corporation.
b. Allied Tube & Conduit; a part of Atkore International.
c. B-line, an Eaton business.
d. GS Metals Corp.
e. Thomas & Betts Corporation; A Member of the ABB Group.
f. Unistrut; Part of Atkore International.
g. Wesanco, Inc.

2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.

3. Material for Channel, Fittings, and Accessories: Galvanized steel unless otherwise indicated on Electrical Drawings. Stainless steel, Type 304 as indicated on Electrical Drawings.
4. Channel Width: Selected for applicable load criteria.

5. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
6. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Conduit and Cable Support Devices: Match Material for 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 A36/A36M 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.
4) Simpson Strong-Tie Co., Inc.

2. Mechanical-Expansion Anchors: Insert-wedge-type, stainless 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.
5) MKT Fastening, LLC.

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 F3125/F3125M, Grade A325.
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 scheduled in NECA 1, where its Table 1 lists maximum spacings that are less than those stated in NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

E. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other 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.

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 may NOT be supported by openings through structure members, according to NFPA 70.

C. 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.

D. 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 thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.
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.

E. 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.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi, 28-day compressive-strength concrete unless otherwise specified or indicated on Structural Drawings and Specifications. Concrete materials, reinforcement, and placement requirements are specified in Section 033000 "Cast-in-Place Concrete."

C. Anchor equipment to concrete base as follows:

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

A. Touchup: Comply with requirements in Section 099113 "Exterior Painting" or Section 099123 "Interior Painting" for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780.

END OF SECTION 260529

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SECTION 260533 - RACEWAYS AND BOXES 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. 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.

1.3 DEFINITIONS

A. GRC: Galvanized rigid steel conduit.

B. IMC: Intermediate metal conduit.

1.4 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

1.5 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.
3. Cable Tray.

B. Qualification Data: For professional engineer.

C. Seismic Qualification Data: Certificates, for enclosures, cabinets, and conduit racks and their mounting provisions, including those for internal components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
4. Detailed description of conduit support devices and interconnections on which the certification is based and their installation requirements.

D. Source quality-control reports.

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:

a. AFC Cable Systems; a part of Atkore International.
b. Allied Tube & Conduit; a part of Atkore International.
c. Anamet Electrical, Inc.
d. Electri-Flex Company.
e. O-Z/Gedney; a brand of Emerson Industrial Automation.
f. Picoma Industries, Inc.
g. Republic Conduit.
h. Southwire Company.
i. Thomas & Betts Corporation; A Member of the ABB Group.
j. Western Tube and Conduit Corporation.
k. Wheatland Tube Company.

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. GRC: Comply with ANSI C80.1 and UL 6.
4. IMC: Comply with ANSI C80.6 and UL 1242.
5. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.

a. Comply with NEMA RN 1.
b. Coating Thickness: 0.040 inch, minimum.

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:

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. Electri-Flex Company.
e. O-Z/Gedney; a brand of Emerson Industrial Automation.
f. Picoma Industries, Inc.
g. Republic Conduit.
h. Southwire Company.
i. Thomas & Betts Corporation; A Member of the ABB Group.
j. Western Tube and Conduit Corporation.
k. Wheatland Tube Company.

2. Comply with NEMA FB 1 and UL 514B.

3. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
4. Fittings, General: Listed and labeled for type of conduit, location, and use.
5. Fittings for EMT:

a. Material: Steel.
b. Type: Compression.

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.
7. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.

C. Joint Compound for IMC, GRC: 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. Electri-Flex Company.
    g. Kraloy.
    h. Lamson & Sessions.
    i. Niedax Inc.
    j. RACO; Hubbell.
    k. Thomas & Betts Corporation; A Member of the ABB Group.

2. Listing and Labeling: Nonmetallic conduit shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
4. LFNC: Comply with UL 1660.

B. 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. CANTEX INC.
    e. CertainTeed Corporation.
    f. Electri-Flex Company.
    g. Kraloy.
    h. Lamson & Sessions.
    i. Niedax Inc.
    j. RACO; Hubbell.
    k. Thomas & Betts Corporation; A Member of the ABB Group.

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.

    a. Fittings for LFNC: Comply with UL 514B.

4. 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 nVent.
3. MonoSystems, Inc.
4. Square D.

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.

D. Wireway Covers: Hinged type unless otherwise indicated.

E. Finish: Manufacturer's standard enamel finish.

2.4 SURFACE RACEWAYS

A. Listing and Labeling: Surface raceways and tele-power poles shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5. Prime coated, ready for field painting.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Hubbell Incorporated; Wiring Device-Kellems.
b. MonoSystems, Inc.
c. Panduit Corp.
d. Wiremold / Legrand.

2.5 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 nVent.
7. Hubbell Incorporated.
8. Kraloy.
9. Milbank Manufacturing Co.
10. MonoSystems, Inc.
11. Oldcastle Enclosure Solutions.
12. O-Z/Gedney; a brand of Emerson Industrial Automation.
13. RACO; Hubbell.
14. Spring City Electrical Manufacturing Company.
15. Thomas & Betts Corporation; A Member of the ABB Group.
16. Wiremold / Legrand.

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. Metal Floor Boxes:

1. Material: Cast metal or sheet metal.
2. Type: Fully 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.

F. Nonmetallic Floor Boxes: Nonadjustable, round.

1. Listing and Labeling: Nonmetallic 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. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.

H. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

I. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

J. Device Box Dimensions: 4 inches square by 2-1/8 inches deep (double gang); 4 inches by 2-1/8 inches by 2-1/8 inches deep (single gang).

K. Gangable boxes are prohibited.

L. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

M. Cabinets:

1. NEMA 250, Type 1 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.

2.6 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. Oldcastle Enclosure Solutions.
b. Oldcastle Precast, Inc.
c. Quazite: Hubbell Power Systems, Inc.

2. Standard: Comply with SCTE 77.
3. Configuration: Designed for flush burial with closed 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.

2.7 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.

1. Tests of materials shall be performed by an independent testing agency.
2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012 and traceable to NIST standards.

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.
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 or IMC.
3. Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:

    a. Mechanical rooms.
    b. Inmate occupied rooms.

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, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

C. Minimum Raceway Size: 3/4-inch 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 compression, 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.

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 fasten conduits onto the bottom side of a pre-cast concrete ceiling.

D. Do not fasten conduits onto the bottom side of a metal deck roof.

E. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

F. Complete raceway installation before starting conductor installation.

G. Arrange stub-ups so curved portions of bends are not visible above finished slab.

H. Install no more than the equivalent of four (4) 90-degree bends in any conduit run except for control wiring conduits (for which fewer bends, not to exceed two (2) 90-degree bends) are allowed. Support within 12 inches of changes in direction.

I. 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.

J. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

K. Support conduit within 12 inches of enclosures to which attached.

L. Raceways Embedded in Slabs:

1. Run conduit larger than 1-inch 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 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 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 GRC before rising above floor.

M. Stub-Ups to Above Recessed Ceilings:

1. Use EMT, IMC, or RMC for raceways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

N. 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.

O. 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 trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

P. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

Q. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

R. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

S. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

T. Surface Raceways:

1. Install surface raceway with a minimum 2-inch radius control at bend points.
2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches 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.

U. 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. Install raceway sealing fittings according to NFPA 70.

V. 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.

W. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

X. Expansion-Joint Fittings:

1. Install expansion fittings at all locations where conduits cross building or structure expansion joints.

2. 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.

Y. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semi-recessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

Z. 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 center of box unless otherwise indicated.

AA. 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 box and cover plate or supported equipment and box.

BB. Horizontally separate boxes mounted on opposite sides of walls, so they are not in the same vertical channel.

CC. Locate boxes so that cover or plate will not span different building finishes.

DD. 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.

EE. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

FF. Set metal floor boxes level and flush with finished floor surface.

GG. 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 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 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 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 of concrete for a minimum of 12 inches 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 from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
5. 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 sieve to No. 4 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 above finished grade.

D. Install handholes with bottom below frost line, below grade.

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 0sleeves 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

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SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

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. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.

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.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A53/A53M, 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 minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. PVC-Pipe Sleeves: ASTM D1785, Schedule 40.

D. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

E. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

F. Sleeves for Rectangular Openings:

1. Material: Galvanized sheet steel.
2. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.
b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

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.
e. Proco Products, 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: Carbon steel.
4. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, 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 one of the following:

a. Presealed System.

b. HOLDRITE.

2.4 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

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 annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
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.
5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.

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 or cast-iron pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch 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 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 260548.16 - SEISMIC CONTROLS 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. Restraint channel bracings.
2. Restraint cables.
3. Seismic-restraint accessories.
4. Mechanical anchor bolts.
5. Adhesive anchor bolts.

B. Related Requirements:

1. Section 260529 "Hangers and Supports for Electrical Systems" for commonly used electrical supports and installation requirements.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.

    a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an agency acceptable to authorities having jurisdiction.
    b. Annotate to indicate application of each product submitted and compliance with requirements.

B. Delegated-Design Submittal: For each seismic-restraint device.

1. Include design calculations and details for selecting seismic restraints complying with performance requirements, design criteria, and analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
2. Design Calculations: Calculate static and dynamic loading caused by equipment weight, operation, and seismic forces required to select seismic restraints and for designing vibration isolation bases.

a. Coordinate design calculations with wind load calculations required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.

3. Seismic Restraint Details:

a. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.
b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
c. Coordinate seismic-restraint and vibration isolation details with wind-restraint details required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.
d. Preapproval and Evaluation Documentation: By an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Show coordination of seismic bracing for electrical components with other systems and equipment in the vicinity, including other supports and seismic restraints. Electrical components include:

1. Control and monitoring panels.
2. Generators.
3. Luminaires.
4. Motor control centers.
5. Panelboards.
6. Switchboards.
7. Switchgear.
8. Transformers.

B. Qualification Data: For testing agency.

C. Welding certificates.

D. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated and that is acceptable to authorities having jurisdiction.

B. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis. They shall bear anchorage preapproval from OSHPD in addition to preapproval, showing maximum seismic-restraint ratings, by ICC-ES or another agency acceptable to authorities having jurisdiction. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) that support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

E. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic-Restraint Loading:

1. Site Class as Defined in the IBC: D.
2. Assigned Seismic Use Group or Building Category as Defined in the IBC:III.

a. Component Importance Factor:1.5
b. Component Response Modification Factor: 1.5
c. Component Amplification Factor: 1.0.

2.2 RESTRAINT CHANNEL BRACINGS

A. Description: MFMA-4, shop- or field-fabricated bracing assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end, with other matching components, and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.3 RESTRAINT CABLES

A. Restraint Cables: ASTM A603 galvanized-steel cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; with a minimum of two clamping bolts for cable engagement.

2.4 SEISMIC-RESTRAINT ACCESSORIES

A. Hanger-Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.

B. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to rigid channel bracings.

C. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings and matched to type and size of anchor bolts and studs.

D. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings and matched to type and size of attachment devices used.

E. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.5 MECHANICAL ANCHOR BOLTS

A. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E488.

2.6 ADHESIVE ANCHOR BOLTS

A. Adhesive Anchor Bolts: Drilled-in and capsule anchor system containing PVC or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E488.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive [**vibration isolation and**]seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.

B. Hanger-Rod Stiffeners: Install hanger-rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods caused by seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.3 SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete."

B. Equipment and Hanger Restraints:

1. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch (3.2 mm).
2. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.

C. Install cables so they do not bend across edges of adjacent equipment or building structure.

D. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

E. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

F. Drilled-in Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.

4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where connection is terminated to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.
3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
5. Test to 90 percent of rated proof load of device.

C. Seismic controls will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.6 ADJUSTING

A. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION 260548.16

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.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for electrical identification products.

B. Identification Schedule: For each piece of electrical equipment and electrical system components to be an index of nomenclature for electrical equipment and system components used in identification signs and labels. Use same designations indicated on Drawings.

C. Delegated-Design Submittal: For arc-flash hazard study.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with ASME A13.1.

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 and Section 260573.19 "Arc-Flash Hazard Analysis" 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, ambient; 180 deg F, 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- 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. Colors for 240-V Circuits:

a. Phase A: Black.
b. Phase B: Red.

4. Colors for 480/277-V Circuits:

a. Phase A: Brown.
b. Phase B: Orange.
c. Phase C: Yellow.

5. Color for Neutral: White.
6. Color for Equipment Grounds: Bare copper, Green, or Green with a yellow stripe.
7. Colors for Isolated Grounds: Green with two or more yellow stripes.

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."

E. Equipment Identification Labels:

1. Black letters on a white field.

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.
i. Seton Identification Products.

B. Snap-around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameters 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.
e. Seton Identification Products.

C. Self-Adhesive Wraparound Labels: Preprinted, 3-mil-thick, 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.
    j. Seton Identification Products.

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: Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.

D. Self-Adhesive Labels: Vinyl, thermal, transfer-printed, 3-mil-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.
    k. Seton Identification Products.

2. Minimum Nominal Size:

    a. 1-1/2 by 6 inches for raceway and conductors.
    b. 3-1/2 by 5 inches 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 long, with diameters sized to suit diameters 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.

B. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tubes with machine-printed identification labels, sized to suit diameter and shrunk to fit firmly. Full shrink recovery occurs at a maximum of 200 deg F. Comply with UL 224.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Brady Corporation.
    b. Panduit Corp.

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.
    f. Panduit Corp.

B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils thick by 1 to 2 inches 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.
    d. Marking Services, Inc.

C. Tape and Stencil: 4-inch-wide black stripes on 10-inch centers placed diagonally over orange background and are 12 inches 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. Seton Identification Products.

D. Floor Marking Tape: 2-inch-wide, 5-mil pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Carlton Industries, LP.
    b. Seton Identification Products.

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.
    f. Seton Identification Products.

2. Tape:

    a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications 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".
    c. Inscriptions for Orange-Colored Tapes: "TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE".

4. Tag: Type ID:

a. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core; bright colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
b. Width: 3 inches.
c. Overall Thickness: 5 mils.
d. Foil Core Thickness: 0.35 mil.
e. Weight: 28 lb/1000 sq. ft..
f. Tensile according to ASTM D882: 70 lbf and 4600 psi.

F. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch.

2.6 TAGS

A. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Brady Corporation.
b. Carlton Industries, LP.
c. emedco.
d. Marking Services, Inc.
e. Seton Identification Products.

B. 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.
c. Seton Identification Products.

2. Polyester Tags: 0.010 inch thick, with corrosion-resistant grommet and cable tie for attachment.
3. 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.
d. Marking Services, Inc.

2. Preprinted aluminum signs,punched or drilled for fasteners, with colors, legend, and size required for application.

3. 1/4-inch grommets in corners for mounting.
4. Nominal Size: 7 by 10 inches.

B. Metal-Backed Butyrate Signs:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Brady Corporation.
b. Champion America.
c. emedco.
d. Marking Services, Inc.

2. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs, with 0.0396-inch galvanized-steel backing, punched and drilled for fasteners, and with colors, legend, and size required for application.

3. 1/4-inch grommets in corners for mounting.
4. Nominal Size: 10 by 14 inches.

C. 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.
d. Marking Services, Inc.

2. Engraved legend.

3. Thickness:

a. For signs up to 20 sq. in., minimum 1/16 inch thick.
b. For signs larger than 20 sq. in., 1/8 inch thick.
c. Engraved legend with black letters on white face.
d. Punched or drilled for mechanical fasteners with 1/4-inch 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.
4. Panduit Corp.

B. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 Deg F according to ASTM D638: 7000 psi.
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F.
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 PREPARATION

A. 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.

3.2 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. 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.

H. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

I. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch-high letters for emergency instructions at equipment used for power transfer.

J. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.

K. 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. "EMERGENCY POWER."
2. "POWER."
3. "UPS."

L. Vinyl Wraparound Labels:

1. Secure tight to surface of raceway or cable 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.

M. Snap-around Labels: Secure tight to surface at a location with high visibility and accessibility.

N. Self-Adhesive Wraparound Labels: Secure tight to surface at a location with high visibility and accessibility.

O. Self-Adhesive Labels:

1. On each item, 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-high letters on 1-1/2-inch-high label; where two lines of text are required, use labels 2 inches high.

P. Snap-around Color-Coding Bands: Secure tight to surface at a location with high visibility and accessibility.

Q. Heat-Shrink, Preprinted Tubes: Secure tight to surface at a location with high visibility and accessibility.

R. Marker Tapes: Secure tight to surface at a location with high visibility and accessibility.

S. 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 where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.

T. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.

U. Floor Marking Tape: Apply stripes to finished surfaces following manufacturer's written instructions.

V. 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 below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches 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.

W. Metal Tags:

1. Place in a location with high visibility and accessibility.
2. Secure using general-purpose cable ties.

X. Nonmetallic Preprinted Tags:

1. Place in a location with high visibility and accessibility.
2. Secure using general-purpose cable ties.

Y. Write-on Tags:

1. Place in a location with high visibility and accessibility.
2. Secure using general-purpose cable ties.

Z. 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-high letters on minimum 1-1/2-inch-high sign; where two lines of text are required, use signs minimum 2 inches high.

AA. 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-high letters on 1-1/2-inch-high sign; where two lines of text are required, use labels 2 inches 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.

3.3 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 vinyl tape applied in bands.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot 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. "EMERGENCY POWER."
2. "POWER."
3. "UPS."

E. Power-Circuit Conductor Identification, 600 V or Less: For conductors in pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot 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 labels with the conductor or cable designation, origin, and destination.

G. Control-Circuit Conductor Termination Identification: For identification at terminations, provide self-adhesive labels with the conductor designation.

H. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source.

I. Auxiliary Electrical Systems Conductor Identification: 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 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 labels.

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: Laminated acrylic or melamine plastic signs.

P. Emergency Operating Instruction Signs: Laminated acrylic or melamine plastic signs with white legend on a red background with minimum 3/8-inch-high letters for emergency instructions at equipment used for power transfer.

Q. Equipment Identification Labels:

1. Indoor Equipment: Engraved, Laminated acrylic or melamine plastic sign.
2. Outdoor Equipment: Laminated acrylic or melamine sign.
3. Equipment to Be Labeled:

a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be in the form of a engraved, laminated acrylic or melamine label.
b. Enclosures and electrical cabinets.
c. Access doors and panels for concealed electrical items.
d. Switchgear.
e. Switchboards.
f. Transformers: Label that includes tag designation indicated on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
g. Substations.
h. Emergency system boxes and enclosures.
i. Motor-control centers.
j. Enclosed switches.
k. Enclosed circuit breakers.
l. Enclosed controllers.
m. Variable-speed controllers.
n. Push-button stations.
o. Power-transfer equipment.
p. Contactors.
q. Remote-controlled switches, dimmer modules, and control devices.
r. Battery-inverter units.
s. Battery racks.
t. Power-generating units.
u. Monitoring and control equipment.
v. UPS equipment.

END OF SECTION 260553

SECTION 260573.13 - SHORT-CIRCUIT STUDIES

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 a computer-based, fault-current study to determine the minimum interrupting capacity of circuit protective devices.

1.3 DEFINITIONS

A. Field Adjusting Agency: An independent electrical testing agency with full-time employees and the capability to adjust devices and conduct testing indicated and that is a member company of NETA.

B. One-Line Diagram: A diagram that shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

C. Power System Analysis Software Developer: An entity that commercially develops, maintains, and distributes computer software used for power system studies.

D. Power Systems Analysis Specialist: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located.

E. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion of the circuit from the system.

F. SCCR: Short-circuit current rating.

G. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

H. Single-Line Diagram: See "One-Line Diagram."

1.4 ACTION SUBMITTALS

A. Product Data:

1. For computer software program to be used for studies.
2. Submit the following after the approval of system protective devices submittals. Submittals shall be in digital form.

    a. Short-circuit study input data, including completed computer program input data sheets.
    b. Short-circuit study and equipment evaluation report; signed, dated, and sealed by a qualified professional engineer.

        1) Submit study report for action prior to receiving final approval of distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary submittal of sufficient study data to ensure that selection of devices and associated characteristics is satisfactory.
        2) Revised one-line diagram, reflecting field investigation results and results of short-circuit study.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data:

1. For Power Systems Analysis Software Developer.
2. For Power System Analysis Specialist.
3. For Field Adjusting Agency.

B. Product Certificates: For short-circuit study software, certifying compliance with IEEE 399.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data:

1. For overcurrent protective devices to include in emergency, operation, and maintenance manuals.
2. The following are from the Short-Circuit Study Report:

    a. Final one-line diagram.
    b. Final Short-Circuit Study Report.
    c. Short-circuit study data files.
    d. Power system data.

1.7 QUALITY ASSURANCE

A. Study shall be performed using commercially developed and distributed software designed specifically for power system analysis.

B. Software algorithms shall comply with requirements of standards and guides specified in this Section.

C. Manual calculations are unacceptable.

1. Power System Analysis Software Qualifications: Computer program shall be designed to perform short-circuit studies or have a function, component, or add-on module designed to perform short-circuit studies.
2. Computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

D. Power Systems Analysis Specialist Qualifications: Professional engineer licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

E. Short-Circuit Study Certification: Short-Circuit Study Report shall be signed and sealed by Power Systems Analysis Specialist.

F. Field Adjusting Agency Qualifications:

1. Employer of a NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification responsible for all field adjusting of the Work.
2. A member company of NETA.
3. Acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 POWER SYSTEM ANALYSIS SOFTWARE DEVELOPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CGI CYME.
2. EDSA Micro Corporation.
3. ESA Inc.
4. Operation Technology, Inc.
5. Power Analytics, Corporation.
6. SKM Systems Analysis, Inc.

B. Comply with IEEE 399 and IEEE 551.

1. Analytical features of power systems analysis software program shall have capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

C. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output.

2.2 SHORT-CIRCUIT STUDY REPORT CONTENTS

A. Executive summary of study findings.

B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.

C. One-line diagram of modeled power system, showing the following:

1. Protective device designations and ampere ratings.
2. Conductor types, sizes, and lengths.
3. Transformer kilovolt ampere (kVA) and voltage ratings.
4. Motor and generator designations and kVA ratings.
5. Switchgear, switchboard, motor-control center, and panelboard designations and ratings.
6. Derating factors and environmental conditions.
7. Any revisions to electrical equipment required by the study.

D. Comments and recommendations for system improvements or revisions in a written document, separate from one-line diagram.

E. Protective Device Evaluation:

1. Evaluate equipment and protective devices and compare to available short-circuit currents. Verify that equipment withstand ratings exceed available short-circuit current at equipment installation locations.
2. Tabulations of circuit breaker, fuse, and other protective device ratings versus calculated short-circuit duties.
3. For 600-V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
4. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in standards to 1/2-cycle symmetrical fault current.
5. Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that short-circuit withstand ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.

F. Short-Circuit Study Input Data:

1. One-line diagram of system being studied.
2. Power sources available.
3. Manufacturer, model, and interrupting rating of protective devices.
4. Conductors.
5. Transformer data.

G. Short-Circuit Study Output Reports:

1. Low-Voltage Fault Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

a. Voltage.
b. Calculated fault-current magnitude and angle.
c. Fault-point X/R ratio.
d. Equivalent impedance.

2. Momentary Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

a. Voltage.
b. Calculated symmetrical fault-current magnitude and angle.
c. Fault-point X/R ratio.
d. Calculated asymmetrical fault currents:

1) Based on fault-point X/R ratio.
2) Based on calculated symmetrical value multiplied by 1.6.
3) Based on calculated symmetrical value multiplied by 2.7.

3. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

a. Voltage.
b. Calculated symmetrical fault-current magnitude and angle.
c. Fault-point X/R ratio.
d. No AC Decrement (NACD) ratio.
e. Equivalent impedance.
f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

PART 3 - EXECUTION

3.1 POWER SYSTEM DATA

A. Obtain all data necessary for conduct of the study.

1. Verify completeness of data supplied on one-line diagram. Call any discrepancies to Architect's attention.
2. For equipment included as Work of this Project, use characteristics submitted under provisions of action submittals and information submittals for this Project.

B. Gather and tabulate the required input data to support the short-circuit study. Comply with requirements in Section 017839 "Project Record Documents" for recording circuit protective device characteristics. Record data on a Record Document copy of one-line diagram. Comply with recommendations in IEEE 551 as to the amount of detail that is required to be acquired in the field. Field data gathering shall be under direct supervision and control of the engineer in charge of performing the study and shall be by the engineer or its representative who holds

NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification. Data include, but are not limited to, the following:

1. Product Data for Project's overcurrent protective devices involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Obtain electrical power utility impedance at the service.
3. Power sources and ties.
4. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
5. For reactors, provide manufacturer and model designation, voltage rating, and impedance.
6. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip, SCCR, current rating, and breaker settings.
7. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
8. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
9. Motor horsepower and NEMA MG 1 code letter designation.
10. Conductor sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).
11. Derating factors.

3.2 SHORT-CIRCUIT STUDY

A. Perform study following the general study procedures contained in IEEE 399.

B. Calculate short-circuit currents according to IEEE 551.

C. Base study on device characteristics supplied by device manufacturer.

D. Extent of electrical power system to be studied is indicated on Drawings.

E. Begin short-circuit current analysis at the service, extending down to system overcurrent protective devices as follows:

1. To normal system low-voltage load buses where fault current is 10 kA or less.
2. Exclude equipment rated 240 V ac or less when supplied by a single transformer rated less than 125 kVA.

F. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.

G. Include the ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and apply to low- and medium-voltage, three-phase ac systems. Also

account for the fault-current dc decrement to address asymmetrical requirements of interrupting equipment.

H. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault and a single line-to-ground fault at each equipment indicated on one-line diagram.

1. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.

I. Include in the report identification of any protective device applied outside its capacity.

3.3 ADJUSTING

Make minor modifications to equipment as required to accomplish compliance with short-circuit study.

END OF SECTION 260573.13

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SECTION 260573.16 - COORDINATION STUDIES

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 computer-based, overcurrent protective device coordination studies to determine overcurrent protective devices and to determine overcurrent protective device settings for selective tripping.

1. Study results shall be used to determine coordination of series-rated devices.

1.3 DEFINITIONS

A. Field Adjusting Agency: An independent electrical testing agency with full-time employees and the capability to adjust devices and conduct testing indicated and that is a member company of NETA.

B. One-Line Diagram: A diagram that shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

C. Power System Analysis Software Developer: An entity that commercially develops, maintains, and distributes computer software used for power system studies.

D. Power System Analysis Specialist: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located.

E. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion of the circuit from the system.

F. SCCR: Short-circuit current rating.

G. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

H. Single-Line Diagram: See "One-Line Diagram."

1.4 ACTION SUBMITTALS

A. Product Data:

1. For computer software program to be used for studies.
2. Submit the following after the approval of system protective devices submittals. Submittals shall be in digital form.

a. Coordination-study input data, including completed computer program input data sheets.
b. Study and equipment evaluation reports.

3. Overcurrent protective device coordination study report; signed, dated, and sealed by a qualified professional engineer.

a. Submit study report for action prior to receiving final approval of distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary submittal of sufficient study data to ensure that selection of devices and associated characteristics is satisfactory.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data:

1. For Power System Analysis Software Developer.
2. For Power Systems Analysis Specialist.
3. For Field Adjusting Agency.

B. Product Certificates: For overcurrent protective device coordination study software, certifying compliance with IEEE 399.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For overcurrent protective devices to include in emergency, operation, and maintenance manuals.

1. The following are from the Coordination Study Report:

a. Final one-line diagram.
b. Final protective device coordination study.
c. Coordination study data files.
d. List of all protective device settings.
e. Time-current coordination curves.
f. Power system data.

1.7 QUALITY ASSURANCE

A. Studies shall be performed using commercially developed and distributed software designed specifically for power system analysis.

B. Software algorithms shall comply with requirements of standards and guides specified in this Section.

C. Manual calculations are unacceptable.

D. Power System Analysis Software Qualifications:

1. Computer program shall be designed to perform coordination studies or have a function, component, or add-on module designed to perform coordination studies.
2. Computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

E. Power Systems Analysis Specialist Qualifications: Professional engineer licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

F. Field Adjusting Agency Qualifications:

1. Employer of a NETA ETT-Certified Technician Level III responsible for all field adjusting of the Work.
2. A member company of NETA.
3. Acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 POWER SYSTEM ANALYSIS SOFTWARE DEVELOPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CGI CYME.
2. EDSA Micro Corporation.
3. ESA Inc.
4. Operation Technology, Inc.
5. Power Analytics, Corporation.
6. SKM Systems Analysis, Inc.

B. Comply with IEEE 242 and IEEE 399.

C. Analytical features of device coordination study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

D. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output. Computer software program shall report device settings and ratings of all overcurrent protective devices and shall demonstrate selective coordination by computer-generated, time-current coordination plots.

2.2 COORDINATION STUDY REPORT CONTENTS

A. Executive summary of study findings.

B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.

C. One-line diagram of modeled power system, showing the following:

1. Protective device designations and ampere ratings.
2. Conductor types, sizes, and lengths.
3. Transformer kilovolt ampere (kVA) and voltage ratings.
4. Motor and generator designations and kVA ratings.
5. Switchgear, switchboard, motor-control center, and panelboard designations.
6. Any revisions to electrical equipment required by the study.

D. Protective Device Coordination Study:

1. Report recommended settings of protective devices, ready to be applied in the field. Use manufacturer's data sheets for recording the recommended setting of overcurrent protective devices when available.

a. Phase and Ground Relays:

1) Device tag.
2) Relay current transformer ratio and tap, time dial, and instantaneous pickup value.
3) Recommendations on improved relaying systems, if applicable.

b. Circuit Breakers:

1) Adjustable pickups and time delays (long time, short time, and ground).
2) Adjustable time-current characteristic.
3) Adjustable instantaneous pickup.
4) Recommendations on improved trip systems, if applicable.

c. Fuses: Show current rating, voltage, and class.

E. Time-Current Coordination Curves: Determine settings of overcurrent protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exists between devices installed in series, including power utility company's upstream devices. Prepare separate sets of curves for the switching schemes and for emergency periods where the power source is local generation. Show the following information:

1. Device tag and title, one-line diagram with legend identifying the portion of the system covered.
2. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device is exposed.
3. Identify the device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.
4. Plot the following listed characteristic curves, as applicable:

    a. Power utility's overcurrent protective device.
    b. Medium-voltage equipment overcurrent relays.
    c. Medium- and low-voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands.
    d. Low-voltage equipment circuit-breaker trip devices, including manufacturer's tolerance bands.
    e. Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves.
    f. Cables and conductors damage curves.
    g. Ground-fault protective devices.
    h. Motor-starting characteristics and motor damage points.
    i. Generator short-circuit decrement curve and generator damage point.
    j. The largest feeder circuit breaker in each motor-control center and panelboard.

5. Provide adequate time margins between device characteristics such that selective operation is achieved.
6. Comments and recommendations for system improvements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Project overcurrent protective device submittals for compliance with electrical distribution system coordination requirements and other conditions affecting performance of the Work. Devices to be coordinated are indicated on Drawings.

1. Proceed with coordination study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to coordination study may not be used in study.

3.2 POWER SYSTEM DATA

A. Obtain all data necessary for conduct of the overcurrent protective device study.

1. Verify completeness of data supplied in one-line diagram on Drawings. Call any discrepancies to Architect's attention.
2. For equipment included as Work of this Project, use characteristics submitted under provisions of action submittals and information submittals for this Project.

B. Gather and tabulate all required input data to support the coordination study. List below is a guide. Comply with recommendations in IEEE 551 for the amount of detail required to be acquired in the field. Field data gathering shall be under direct supervision and control of the engineer in charge of performing the study, and shall be by the engineer or its representative who holds NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification. Data include, but are not limited to, the following:

1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Electrical power utility impedance at the service.
3. Power sources and ties.
4. Short-circuit current at each system bus (three phase and line to ground).
5. Full-load current of all loads.
6. Voltage level at each bus.
7. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
8. For reactors, provide manufacturer and model designation, voltage rating, and impedance.
9. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
10. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
11. For relays, provide manufacturer and model designation, current transformer ratios, potential transformer ratios, and relay settings.
12. Maximum demands from service meters.
13. Busway manufacturer and model designation, current rating, impedance, lengths, size, and conductor material.
14. Motor horsepower and NEMA MG 1 code letter designation.
15. Low-voltage cable sizes, lengths, number, conductor material, and conduit material (magnetic or nonmagnetic).
16. Medium-voltage cable sizes, lengths, conductor material, cable construction, metallic shield performance parameters, and conduit material (magnetic or nonmagnetic).
17. Data sheets to supplement electrical distribution system one-line diagram, cross-referenced with tag numbers on diagram, showing the following:

a. Special load considerations, including starting inrush currents and frequent starting and stopping.
b. Transformer characteristics, including primary protective device, magnetic inrush current, and overload capability.
c. Motor full-load current, locked rotor current, service factor, starting time, type of start, and thermal-damage curve.
d. Generator thermal-damage curve.
e. Ratings, types, and settings of utility company's overcurrent protective devices.
f. Special overcurrent protective device settings or types stipulated by utility company.
g. Time-current-characteristic curves of devices indicated to be coordinated.
h. Manufacturer, frame size, interrupting rating in amperes root mean square (rms) symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers.
i. Manufacturer and type, ampere-tap adjustment range, time-delay adjustment range, instantaneous attachment adjustment range, and current transformer ratio for overcurrent relays.
j. Switchgear, switchboards, motor-control centers, and panelboards ampacity, and SCCR in amperes rms symmetrical.
k. Identify series-rated interrupting devices for a condition where the available fault current is greater than the interrupting rating of downstream equipment. Obtain device data details to allow verification that series application of these devices complies with NFPA 70 and UL 489 requirements.

3.3 COORDINATION STUDY

A. Comply with IEEE 242 for calculating short-circuit currents and determining coordination time intervals.

B. Comply with IEEE 399 for general study procedures.

C. Base study on device characteristics supplied by device manufacturer.

D. Extent of electrical power system to be studied is indicated on Drawings.

E. Begin analysis at the service, extending down to system overcurrent protective devices as follows:

1. To normal system low-voltage load buses where fault current is 10 kA or less.
2. Exclude equipment rated 240 V ac or less when supplied by a single transformer rated less than 125 kVA.

F. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.

G. Transformer Primary Overcurrent Protective Devices:

1. Device shall not operate in response to the following:

    a. Inrush current when first energized.

2. Device settings shall protect transformers according to IEEE C57.12.00, for fault currents.

H. Motor Protection:

1. Select protection for low-voltage motors according to IEEE 242 and NFPA 70.

I. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and protection recommendations in IEEE 242. Demonstrate that equipment withstands the maximum short-circuit current for a time equivalent to the tripping time of the primary relay protection or total clearing time of the fuse. To determine temperatures that damage insulation, use curves from cable manufacturers or from listed standards indicating conductor size and short-circuit current.

J. Generator Protection: Select protection according to manufacturer's written instructions and to IEEE 242.

K. Include the ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and apply to low- and medium-voltage, three-phase ac systems. Also account for fault-current dc decrement, to address asymmetrical requirements of interrupting equipment.

L. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault and a single line-to-ground fault at each equipment indicated on one-line diagram.

1. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.

M. Protective Device Evaluation:

1. Evaluate equipment and protective devices and compare to short-circuit ratings.
2. Adequacy of switchgear, motor-control centers, and panelboard bus bars to withstand short-circuit stresses.
3. Include in the report identification of any protective device applied outside its capacity.

3.4 FIELD ADJUSTING

A. Adjust relay and protective device settings according to recommended settings provided by the coordination study. Field adjustments shall be completed by the engineering service division of equipment manufacturer under the "Startup and Acceptance Testing" contract portion.

B. Make minor modifications to equipment as required to accomplish compliance with short-circuit and protective device coordination studies.

C. Testing and adjusting shall be by a full-time employee of the Field Adjusting Agency, who holds NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification.

1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS. Certify compliance with test parameters. Perform NETA tests and inspections for all adjustable overcurrent protective devices.

3.5 DEMONSTRATION

A. Engage Power Systems Analysis Specialist to train Owner's maintenance personnel in the following:

1. Acquaint personnel in fundamentals of operating the power system in normal and emergency modes.
2. Hand-out and explain the coordination study objectives, study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpreting time-current coordination curves.
3. For Owner's maintenance staff certified as NETA ETT-Certified Technicians Level III or NICET Electrical Power Testing Level III Technicians, teach how to adjust, operate, and maintain overcurrent protective device settings.

END OF SECTION 260573.16

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SECTION 260573.19 - ARC-FLASH HAZARD ANALYSIS

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 a computer-based, arc-flash study to determine the arc-flash hazard distance and the incident energy to which personnel could be exposed during work on or near electrical equipment.

1.3 DEFINITIONS

A. Field Adjusting Agency: An independent electrical testing agency with full-time employees and the capability to adjust devices and conduct testing indicated and that is a member company of NETA.

B. One-Line Diagram: A diagram that shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

C. Power System Analysis Software Developer: An entity that commercially develops, maintains, and distributes computer software used for power system studies.

D. Power Systems Analysis Specialist: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located.

E. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.

F. SCCR: Short-circuit current rating.

G. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

H. Single-Line Diagram: See "One-Line Diagram."

1.4 ACTION SUBMITTALS

A. Product Data: For computer software program to be used for studies.

B. Study Submittals: Submit the following submittals after the approval of system protective devices submittals. Submittals shall be in digital form:

1. Arc-flash study input data, including completed computer program input data sheets.
2. Arc-flash study report; signed, dated, and sealed by Power Systems Analysis Specialist.
3. Submit study report for action prior to receiving final approval of distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary submittal of sufficient study data to ensure that selection of devices and associated characteristics is satisfactory.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data:

1. For Power Systems Analysis Software Developer.
2. For Power System Analysis Specialist.
3. For Field Adjusting Agency.

B. Product Certificates: For arc-flash hazard analysis software, certifying compliance with IEEE 1584 and NFPA 70E.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data:

1. Provide maintenance procedures in equipment manuals according to requirements in NFPA 70E.
2. Operation and Maintenance Procedures: In addition to items specified in Section 017823 "Operation and Maintenance Data," provide maintenance procedures for use by Owner's personnel that comply with requirements in NFPA 70E.

1.7 QUALITY ASSURANCE

A. Study shall be performed using commercially developed and distributed software designed specifically for power system analysis.

B. Software algorithms shall comply with requirements of standards and guides specified in this Section.

C. Manual calculations are unacceptable.

D. Power System Analysis Software Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.

1. Computer program shall be designed to perform arc-flash analysis or have a function, component, or add-on module designed to perform arc-flash analysis.
2. Computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

E. Power Systems Analysis Specialist Qualifications: Professional engineer in charge of performing the arc-flash study, analyzing the arc flash, and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

F. Arc-Flash Study Certification: Arc-Flash Study Report shall be signed and sealed by Power Systems Analysis Specialist.

G. Field Adjusting Agency Qualifications:

1. Employer of a NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification responsible for all field adjusting of the Work.
2. A member company of NETA.
3. Acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CGI CYME.
2. EDSA Micro Corporation.
3. ESA Inc.
4. Operation Technology, Inc.
5. Power Analytics, Corporation.
6. SKM Systems Analysis, Inc.

B. Comply with IEEE 1584 and NFPA 70E.

C. Analytical features of device coordination study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

2.2 ARC-FLASH STUDY REPORT CONTENT

A. Executive summary of study findings.

B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.

C. One-line diagram, showing the following:

1. Protective device designations and ampere ratings.
2. Conductor types, sizes, and lengths.
3. Transformer kilovolt ampere (kVA) and voltage ratings, including derating factors and environmental conditions.
4. Motor and generator designations and kVA ratings.
5. Switchgear, switchboard, motor-control center, panelboard designations, and ratings.

D. Study Input Data: As described in "Power System Data" Article.

E. Short-Circuit Study Output Data: As specified in "Short-Circuit Study Output Reports" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260573.13 "Short-Circuit Studies."

F. Protective Device Coordination Study Report Contents: As specified in "Coordination Study Report Contents" Article in Section 260573.16 "Coordination Studies."

G. Arc-Flash Study Output Reports:

1. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each equipment location included in the report:

a. Voltage.
b. Calculated symmetrical fault-current magnitude and angle.
c. Fault-point X/R ratio.
d. No AC Decrement (NACD) ratio.
e. Equivalent impedance.
f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

H. Incident Energy and Flash Protection Boundary Calculations:

1. Arcing fault magnitude.
2. Protective device clearing time.
3. Duration of arc.
4. Arc-flash boundary.
5. Working distance.
6. Incident energy.
7. Hazard risk category.
8. Recommendations for arc-flash energy reduction.

I. Fault study input data, case descriptions, and fault-current calculations including a definition of terms and guide for interpretation of computer printout.

2.3 ARC-FLASH WARNING LABELS

A. Comply with requirements in Section 260553 "Identification for Electrical Systems" for self-adhesive equipment labels. Produce a 3.5-by-5-inch self-adhesive equipment label for each work location included in the analysis.

B. 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. Protection boundaries.

a. Arc-flash boundary.
b. Restricted approach boundary.
c. Limited approach boundary.

4. Arc flash PPE category.
5. Required minimum arc rating of PPE in Cal/cm squared.
6. Available incident energy.
7. Working distance.
8. Engineering report number, revision number, and issue date.

C. Labels shall be machine printed, with no field-applied markings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Project overcurrent protective device submittals. Proceed with arc-flash study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to arc-flash study may not be used in study.

3.2 ARC-FLASH HAZARD ANALYSIS

A. Comply with NFPA 70E and its Annex D for hazard analysis study.

B. Preparatory Studies: Perform the Short-Circuit and Protective Device Coordination studies prior to starting the Arc-Flash Hazard Analysis.

1. Short-Circuit Study Output: As specified in "Short-Circuit Study Output Reports" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260573.13 "Short-Circuit Studies."
2. Coordination Study Report Contents: As specified in "Coordination Study Report Contents" Article in Section 260573.16 "Coordination Studies."

C. Calculate maximum and minimum contributions of fault-current size.

1. Maximum calculation shall assume a maximum contribution from the utility and shall assume motors to be operating under full-load conditions.
2. Calculate arc-flash energy at 85 percent of maximum short-circuit current according to IEEE 1584 recommendations.
3. Calculate arc-flash energy at 38 percent of maximum short-circuit current according to NFPA 70E recommendations.

D. Calculate the arc-flash protection boundary and incident energy at locations in electrical distribution system where personnel could perform work on energized parts.

E. Include medium- and low-voltage equipment locations, except equipment rated 240 V ac or less fed from transformers less than 125 kVA.

F. Calculate the limited, restricted, and prohibited approach boundaries for each location.

G. Incident energy calculations shall consider the accumulation of energy over time when performing arc-flash calculations on buses with multiple sources. Iterative calculations shall take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors and generators shall be decremented as follows:

1. Fault contribution from induction motors shall not be considered beyond three to five cycles.
2. Fault contribution from synchronous motors and generators shall be decayed to match the actual decrement of each as closely as possible (for example, contributions from permanent magnet generators will typically decay from 10 per unit to three per unit after 10 cycles).

H. Arc-flash energy shall generally be reported for the maximum of line or load side of a circuit breaker. However, arc-flash computation shall be performed and reported for both line and load side of a circuit breaker as follows:

1. When the circuit breaker is in a separate enclosure.
2. When the line terminals of the circuit breaker are separate from the work location.

I. Base arc-flash calculations on actual overcurrent protective device clearing time. Cap maximum clearing time at two seconds based on IEEE 1584, Section B.1.2.

3.3 POWER SYSTEM DATA

A. Obtain all data necessary for conduct of the arc-flash hazard analysis.

1. Verify completeness of data supplied on one-line diagram on Drawings. Call discrepancies to Architect's attention.
2. For new equipment, use characteristics from approved submittals under provisions of action submittals and information submittals for this Project.

3. For existing equipment, whether or not relocated, obtain required electrical distribution system data by field investigation and surveys conducted by qualified technicians and engineers.

B. Electrical Survey Data: Gather and tabulate the following input data to support study. Comply with recommendations in IEEE 1584 and NFPA 70E as to the amount of detail that is required to be acquired in the field. Field data gathering shall be under the direct supervision and control of the engineer in charge of performing the study, and shall be by the engineer or its representative who holds NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification. Data include, but are not limited to, the following:

1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Obtain electrical power utility impedance or available short circuit current at the service.
3. Power sources and ties.
4. Short-circuit current at each system bus (three phase and line to ground).
5. Full-load current of all loads.
6. Voltage level at each bus.
7. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
8. For reactors, provide manufacturer and model designation, voltage rating and impedance.
9. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
10. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
11. For relays, provide manufacturer and model designation, current transformer ratios, potential transformer ratios, and relay settings.
12. Motor horsepower and NEMA MG 1 code letter designation.
13. Low-voltage conductor sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).

3.4 LABELING

A. Apply one arc-flash label on the front cover of each section of the equipment for each equipment included in the study. Base arc-flash label data on highest values calculated at each location.

B. Each piece of equipment listed below shall have an arc-flash label applied to it:

1. Motor-control center.
2. Low-voltage switchboard.
3. Switchgear.
4. Low voltage transformers.

5. Panelboard and safety switch over 250 V.
6. Applicable panelboard and safety switch under 250 V.
7. Control panels.

C. Note on record Drawings the location of equipment where the personnel could be exposed to arc-flash hazard during their work.

1. Indicate arc-flash energy.
2. Indicate protection level required.

3.5 APPLICATION OF WARNING LABELS

A. Install arc-flash warning labels under the direct supervision and control of Power System Analysis Specialist.

3.6 DEMONSTRATION

A. Engage Power Systems Analysis Specialist to train Owner's maintenance personnel in potential arc-flash hazards associated with working on energized equipment and the significance of arc-flash warning labels.

END OF SECTION 260573.19

SECTION 260923 - LIGHTING CONTROL DEVICES

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. Photoelectric switches.
2. Standalone daylight-harvesting switching and dimming controls.
3. Indoor occupancy and vacancy sensors.
4. Switchbox-mounted occupancy sensors.
5. High-bay occupancy sensors.
6. Outdoor motion sensors.
7. Lighting contactors.
8. Emergency shunt relays.

B. Related Requirements:

1. Section 262726 "Wiring Devices" for wall-box dimmers, non-networkable wall-switch occupancy sensors, and manual light switches.

1.3 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.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of lighting control device to include in operation and maintenance manuals.

1.6 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 year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 OUTDOOR PHOTOELECTRIC SWITCHES, SOLID STATE, FLEXIBLE MOUNTING

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 DPST dry contacts rated for 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 agency NRTL, and marked for intended location and application.
2. Light-Level Monitoring Range: 1.5 to 10 fc, 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 ANSI 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.

2.2 DAYLIGHT-HARVESTING DIMMING CONTROLS, DIGITAL

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper Industries, Inc.
2. Hubbell Building Automation, Inc.
3. Leviton Manufacturing Co., Inc.
4. Lithonia Lighting; Acuity Brands Lighting, Inc.
5. Lutron Electronics Co., Inc.
6. WattStopper; a Legrand® Group brand.

B. Description: Sensing daylight and electrical lighting levels, the system adjusts the indoor electrical lighting levels. As daylight increases, lights are dimmed.

1. Lighting control set point is based on the following two lighting conditions:

a. When no daylight is present (target level).
b. When significant daylight is present.

2. System programming is done with two hand-held, remote-control tools.

a. Initial setup tool.
b. Tool for occupants to adjust the target levels by increasing the set point up to 25 percent, or by minimizing the electric lighting level.

C. Ceiling-Mounted Dimming Controls: Solid-state, light-level sensor unit, with integrated or separate power pack, to detect changes in indoor lighting levels that are perceived by the eye.

D. Electrical Components, Devices, and Accessories:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Sensor Output: 0- to 10-V dc to operate luminaires. Sensor is powered by controller unit.
3. Light-Level Sensor Set-Point Adjustment Range: 20 to 60 fc.

E. Power Pack: Digital controller capable of accepting three RJ45 inputs with two output(s) rated for 20-A incandescent or LED load at 120- and 277-V ac, for 16-A LED at 120- and 277-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc Class 2 power source, as defined by NFPA 70.

1. With integral current monitoring.
2. Compatible with digital addressable lighting interface.
3. Plenum rated.

2.3 INDOOR OCCUPANCY AND VACANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper Industries, Inc.
2. Hubbell Building Automation, Inc.
3. Leviton Manufacturing Co., Inc.

4. Lithonia Lighting; Acuity Brands Lighting, Inc.
5. Lutron Electronics Co., Inc.
6. NSi Industries LLC.
7. Sensor Switch, Inc.
8. WattStopper; a Legrand® Group brand.

B. General Requirements for Sensors:

1. Wall or Ceiling-mounted, solid-state indoor occupancy sensors.
2. Dual technology.
3. 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.

7. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A Sensor is powered from the power pack.
8. Power: Line voltage.
9. Power Pack: Dry contacts rated for 20-A LED load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
10. Mounting:

    a. Sensor: Suitable for mounting in any position on a standard outlet box.
    b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
    c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.

11. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
12. Bypass Switch: Override the "on" function in case of sensor failure.
13. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; turn lights off when selected lighting level is present.

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-minimum movement of any portion of a human body that presents a target of not less than 36 sq. in.
2. Detection Coverage (Room, Ceiling Mounted): Detect occupancy anywhere in a circular area of 1000 sq. ft. when mounted on a 96-inch-high ceiling.

3. Detection Coverage (Corridor, Ceiling Mounted): Detect occupancy within 90 feet when mounted on a 10-foot-high ceiling.
4. Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of 2000 square feet when mounted 48 inches above finished floor.

D. Ultrasonic Type: Wall or Ceiling mounted; detect occupants in coverage area through pattern changes of reflected ultrasonic energy.

1. Detector Sensitivity: Detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
2. Detection Coverage (Small Room): Detect occupancy anywhere within a circular area of 600 sq. ft. when mounted on a 96-inch-high ceiling.
3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch-high ceiling.
4. Detection Coverage (Large Room): Detect occupancy anywhere within a circular area of 2000 sq. ft. when mounted on a 96-inch-high ceiling.
5. Detection Coverage (Corridor): Detect occupancy anywhere within 90 feet when mounted on a 10-foot-high ceiling in a corridor not wider than 14 feet.
6. Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of 1000 square feet when mounted 84 inches above finished floor.

E. 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-minimum movement of any portion of a human body that presents a target of not less than 36 sq. in., and detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch-high ceiling.
4. Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of 2000 square feet when mounted48 inches above finished floor.

2.4 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper Industries, Inc.
2. Hubbell Building Automation, Inc.
3. Leviton Manufacturing Co., Inc.

4. Lithonia Lighting; Acuity Brands Lighting, Inc.
5. Lutron Electronics Co., Inc.
6. NSi Industries LLC.
7. Sensor Switch, Inc.
8. WattStopper; a Legrand® Group brand.

B. General Requirements for Sensors: Automatic-wall-switch occupancy sensor with manual on-off switch, suitable for mounting in a single gang switchbox.

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.
4. Switch Rating: Not less than 800-VA LED load at 120 V, 1200-VA LED load at 277 V, and 800-W incandescent.

C. Wall-Switch Sensor Tag WS1:

1. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of 2100 sq. ft.
2. Sensing Technology: Dual technology - PIR and ultrasonic.
3. Switch Type: SP, field-selectable automatic "on," or manual "on," automatic "off."
4. Capable of controlling load in three-way application.
5. Voltage: Dual voltage - 120 and 277 V.
6. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc. The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
7. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
8. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.
9. Color: As selected by the Architect.
10. Faceplate: Color matched to switch.

D. Wall-Switch Sensor Tag WS2:

1. Standard Range: 210-degree field of view, with a minimum coverage area of 900 sq. ft..
2. Sensing Technology: PIR.
3. Switch Type: SP, field-selectable automatic "on," or manual "on," automatic "off."
4. Capable of controlling load in three-way application.
5. Voltage: Dual voltage, 120 and 277 V.
6. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc. The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
7. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
8. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.

9. Color: As selected by the Architect.
10. Faceplate: Color matched to switch.

2.5 HIGH-BAY OCCUPANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Hubbell Building Automation, Inc.

B. Description: Solid-state unit. The unit is designed to operate with the lamp and ballasts indicated.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Operation: Turn lights on when coverage area is occupied, and to half-power when unoccupied; with a time delay for turning lights to half-power that is adjustable over a minimum range of 1 to 16 minutes.
3. Continuous Lamp Monitoring: When lamps are dimmed continuously for 24 hours, automatically turn lamps on to full power for 15 minutes for every 24 hours of continuous dimming.
4. Power: Line voltage.
5. Operating Ambient Conditions: 32 to 149 deg F.
6. Mounting: Threaded pipe.
7. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
8. Detector Technology: PIR.

C. Detector Coverage: User selectable by interchangeable PIR lenses, suitable for mounting heights from 12 to 50 feet.

D. Accessories: Obtain manufacturer's installation and maintenance kit with laser alignment tool for sensor positioning and power port connectors.

2.6 OUTDOOR MOTION SENSORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper Industries, Inc.
2. Hubbell Building Automation, Inc.
3. Leviton Manufacturing Co., Inc.
4. Lithonia Lighting; Acuity Brands Lighting, Inc.
5. NSi Industries LLC.
6. Sensor Switch, Inc.
7. WattStopper; a Legrand® Group brand.

B. Description: Solid-state outdoor motion sensors.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Dual-technology type, weatherproof. Detect occurrences of 6-inch-minimum movement of any portion of a human body that presents a target of not less than 36 sq. in.. Comply with UL 773A.
3. Switch Rating:

    a. Luminaire-Mounted Sensor: 1000-W incandescent, 500-VA fluorescent/LED.
    b. Separately Mounted Sensor: Dry contacts rated for 20-A LED load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.

4. Switch Type: SP, field-selectable automatic "on," or manual "on," automatic "off." With bypass switch to override the "on" function in case of sensor failure.
5. Voltage: Dual voltage, 120- and 277-V type.
6. Detector Coverage:

    a. Standard Range: 210-degree field of view, with a minimum coverage area of 900 sq. ft.
    b. Long Range: 180-degree field of view and 110-foot detection range.

7. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc. The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
8. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
9. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and help eliminate false "off" switching.
10. Operating Ambient Conditions: Suitable for operation in ambient temperatures ranging from minus 40 to plus 130 deg F, rated as "raintight" according to UL 773A.

2.7 LIGHTING CONTACTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Allen-Bradley/Rockwell Automation.
2. ASCO: a brand of Vertiv.
3. Eaton.
4. General Electric Company.
5. Square D.
6. Siemens

B. Description: Electrically operated and mechanically held, combination-type lighting contactors with nonfused disconnect, complying with NEMA ICS 2 and UL 508.

1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less THD of normal load current).

2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
3. Enclosure: Comply with NEMA 250.
4. Provide with control and pilot devices as indicated on Drawings, matching the NEMA type specified for the enclosure.

2.8 EMERGENCY SHUNT RELAY

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Lighting Control and Design.
2. WattStopper; a Legrand® Group brand.

B. Description: NC, electrically held relay, arranged for wiring in parallel with manual or automatic switching contacts; complying with UL 924.

1. Coil Rating: 277 V.

2.9 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. 14 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 EXAMINATION

A. Examine lighting control devices before installation. Reject lighting control devices that are wet, moisture damaged, or mold damaged.

B. Examine walls and ceilings for suitable conditions where lighting control devices will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SENSOR INSTALLATION

A. Comply with NECA 1.

B. 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.

C. 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.

3.3 CONTACTOR INSTALLATION

A. Comply with NECA 1.

3.4 WIRING INSTALLATION

A. Comply with NECA 1.

B. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 3/4 inch.

C. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

D. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.

E. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.5 IDENTIFICATION

A. Identify components and power and control wiring according to Section 260553 "Identification for Electrical Systems."

1. Identify controlled circuits in lighting contactors.
2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.

B. Label time switches and contactors with a unique designation.

3.6 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

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.

3.7 ADJUSTING

A. Occupancy Adjustments: When requested within 2 months from date of Substantial Completion, provide on-site assistance in adjusting lighting control devices to suit actual occupied conditions. Provide up to one 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.

3.8 DEMONSTRATION

A. Coordinate demonstration of products specified in this Section with demonstration requirements.

B. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

END OF SECTION 260923

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SECTION 262213 - LOW-VOLTAGE DISTRIBUTION TRANSFORMERS

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 distribution, dry-type transformers with a nominal primary and secondary rating of 600 V and less, with capacities up to 1500 kVA.

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 each type and size of transformer.
2. Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, and performance for each type and size of transformer.

B. Shop Drawings:

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment.
3. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For transformers to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Inspection: On receipt, inspect for and note any shipping damage to packaging and transformer.

1. If manufacturer packaging is removed for inspection, and transformer will be stored after inspection, re-package transformer using original or new packaging materials that provide protection equivalent to manufacturer's packaging.

B. Storage: Store in a warm, dry, and temperature-stable location in original shipping packaging.

C. Temporary Heating: Apply temporary heat according to manufacturer's written instructions within the enclosure of each ventilated-type unit, throughout periods during which equipment is not energized and when transformer is not in a space that is continuously under normal control of temperature and humidity.

D. Handling: Follow manufacturer's instructions for lifting and transporting transformers.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Acme Electric Corporation.
2. Controlled Power Company; an Emerson company.
3. Eaton.
4. Federal Pacific.
5. General Electric Company.
6. Siemens Industry, Inc., Energy Management Division.
7. Sola/Hevi-Duty; a brand of Emerson Electric Co.
8. Square D; by Schneider Electric.

B. Source Limitations: Obtain each transformer type from single source from single manufacturer.

2.2 GENERAL TRANSFORMER REQUIREMENTS

A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.

B. Comply with NFPA 70.

1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

C. Transformers Rated 15 kVA and Larger:

1. Comply with 10 CFR 431 (DOE 2016) efficiency levels.
2. Marked as compliant with DOE 2016 efficiency levels by an NRTL.

D. Shipping Restraints: Paint or otherwise color-code bolts, wedges, blocks, and other restraints that are to be removed after installation and before energizing. Use fluorescent colors that are easily identifiable inside the transformer enclosure.

2.3 DISTRIBUTION TRANSFORMERS

A. Comply with NFPA 70, and list and label as complying with UL 1561.

B. Provide transformers that are constructed to withstand seismic forces specified in Section 260548.16 "Seismic Controls for Electrical Systems."

C. Cores: Electrical grade, non-aging silicon steel with high permeability and low hysteresis losses.

1. One leg per phase.
2. Core volume shall allow efficient transformer operation at 10 percent above the nominal tap voltage.
3. Grounded to enclosure.

D. Coils: Continuous windings except for taps.

1. Coil Material: Copper.
2. Internal Coil Connections: Brazed or pressure type.

E. Encapsulation: Transformers smaller than 30 kVA shall have core and coils completely resin encapsulated.

F. Enclosure: Totally enclosed, nonventilated.

1. NEMA 250, Type 3R: Core and coil shall be encapsulated within resin compound, sealing out moisture and air.
2. Wiring Compartment: Sized for conduit entry and wiring installation.
3. Finish: Comply with NEMA 250.

G. Taps for Transformers 3 kVA and Smaller: None.

H. Taps for Transformers 7.5 to 24 kVA: One 5 percent tap above and one 5 percent tap below normal full capacity.

I. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and four 2.5 percent taps below normal full capacity.

J. Insulation Class, Smaller Than 30 kVA: 180 deg C, UL-component-recognized insulation system with a maximum of 115 deg C rise above 40 deg C ambient temperature.

K. Insulation Class, 30 kVA and Larger: 220 deg C, UL-component-recognized insulation system with a maximum of 115 deg C rise above 40 deg C ambient temperature.

L. Grounding: Provide ground-bar kit or a ground bar installed on the inside of the transformer enclosure.

M. K-Factor Rating: Transformers indicated to be K-factor rated shall comply with UL 1561 requirements for nonsinusoidal load current-handling capability to the degree defined by designated K-factor.

1. Unit shall not overheat when carrying full-load current with harmonic distortion corresponding to designated K-factor, without exceeding the indicated insulation class in a 40 deg C maximum ambient and a 24-hour average ambient of 30 deg C.
2. Indicate value of K-factor on transformer nameplate.
3. Unit shall comply with requirements of DOE 2016 efficiency levels when tested according to NEMA TP 2 with a K-factor equal to one.

N. Electrostatic Shielding: Each winding shall have an independent, single, full-width copper electrostatic shield arranged to minimize interwinding capacitance.

1. Arrange coil leads and terminal strips to minimize capacitive coupling between input and output terminals.
2. Include special terminal for grounding the shield.

O. Neutral: Rated 200 percent of full load current for K-factor-rated transformers.

P. Wall Brackets: Manufacturer's standard brackets.

Q. Low-Sound-Level Requirements: Maximum sound levels when factory tested according to IEEE C57.12.91, as follows:

1. 30.01 to 50.00 kVA: 45 dBA.
2. 50.01 to 150.00 kVA: 55 dBA.

2.4 IDENTIFICATION

A. Nameplates: Engraved, laminated-acrylic or melamine plastic signs for each distribution transformer, mounted with corrosion-resistant screws. Nameplates and label products are specified in Section 260553 "Identification for Electrical Systems."

2.5 SOURCE QUALITY CONTROL

A. Test and inspect transformers according to IEEE C57.12.01 and IEEE C57.12.91.

1. Resistance measurements of all windings at rated voltage connections and at all tap connections.
2. Ratio tests at rated voltage connections and at all tap connections.
3. Phase relation and polarity tests at rated voltage connections.
4. No load losses, and excitation current and rated voltage at rated voltage connections.
5. Impedance and load losses at rated current and rated frequency at rated voltage connections.
6. Applied and induced tensile tests.
7. Regulation and efficiency at rated load and voltage.
8. Insulation-Resistance Tests:

    a. High-voltage to ground.
    b. Low-voltage to ground.
    c. High-voltage to low-voltage.

9. Temperature tests.

B. Factory Sound-Level Tests: Conduct prototype sound-level tests on production-line products.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for each transformer.

B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's written instructions.

C. Examine walls, floors, roofs, and concrete bases for suitable mounting conditions where transformers will be installed.

D. Verify that ground connections are in place and requirements in Section 260526 "Grounding and Bonding for Electrical Systems" have been met. Maximum ground resistance shall be 5 ohms at location of transformer.

E. Environment: Enclosures shall be rated for the environment in which they are located. Covers for NEMA 250, Type 4X enclosures shall not cause accessibility problems.

F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install wall-mounted transformers level and plumb with wall brackets fabricated by transformer manufacturer.

1. Coordinate installation of wall-mounted and structure-hanging supports with actual transformer provided.

B. Install transformers level and plumb on a concrete base with vibration-dampening supports. Locate transformers away from corners and not parallel to adjacent wall surface.

C. Construct concrete bases according to Section 033000 "Cast-in-Place Concrete" and anchor floor-mounted transformers according to manufacturer's written instructions, seismic codes applicable to Project, and requirements in Section 260529 "Hangers and Supports for Electrical Systems."

1. Coordinate size and location of concrete bases with actual transformer provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

D. Secure transformer to concrete base according to manufacturer's written instructions.

E. Secure covers to enclosure and tighten all bolts to manufacturer-recommended torques to reduce noise generation.

F. Remove shipping bolts, blocking, and wedges.

3.3 CONNECTIONS

A. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

B. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. 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.

D. Provide flexible connections at all conduit and conductor terminations and supports to eliminate sound and vibration transmission to the building structure.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Small (Up to 167-kVA Single-Phase or 500-kVA Three-Phase) Dry-Type Transformer Field Tests:

1. Visual and Mechanical Inspection.

    a. Inspect physical and mechanical condition.
    b. Inspect anchorage, alignment, and grounding.
    c. Verify that resilient mounts are free and that any shipping brackets have been removed.
    d. Verify the unit is clean.
    e. Perform specific inspections and mechanical tests recommended by manufacturer.
    f. Verify that as-left tap connections are as specified.
    g. Verify the presence of surge arresters and that their ratings are as specified.

2. Electrical Tests:

    a. Measure resistance at each winding, tap, and bolted connection.
    b. Perform insulation-resistance tests winding-to-winding and each winding-to-ground. Apply voltage according to manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.5. Calculate polarization index: the value of the index shall not be less than 1.0.
    c. Perform turns-ratio tests at all tap positions. Test results shall not deviate by more than one-half percent from either the adjacent coils or the calculated ratio. If test fails, replace the transformer.
    d. Verify correct secondary voltage, phase-to-phase and phase-to-neutral, after energization and prior to loading.

C. Remove and replace units that do not pass tests or inspections and retest as specified above.

D. Test Labeling: On completion of satisfactory testing of each unit, attach a dated and signed "Satisfactory Test" label to tested component.

3.5 ADJUSTING

A. Record transformer secondary voltage at each unit for at least 48 hours of typical occupancy period. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 5 percent and not being lower than nameplate voltage minus 3 percent at maximum load conditions. Submit recording and tap settings as test results.

B. Output Settings Report: Prepare a written report recording output voltages and tap settings.

3.6 CLEANING

A. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

END OF SECTION 262213

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SECTION 262313
PARALLELING & DISTRIBUTION SWITCHBOARD

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Generator Paralleling Sections.
B. Distribution Switchboard.

1.2 RELATED SECTIONS AND WORK

A. Refer to the One-Line Diagram for size, rating, and configuration.
B. Section 26 24 13 - Switchboards
C. Section 26 36 00 - Transfer Switches
D. Section 26 32 13 - Packaged Engine Generator System

1.3 QUALITY CONTROL AND SYSTEM COORDINATION

A. The generator manufacturer shall supply the paralleling distribution equipment to provide a single source of responsibility for the entire system. Thus, the generator manufacturer shall provide a fully operational and tested turnkey system. The system shall include the generators, parallel distribution equipment, automatic transfer switches, and related control equipment.

B. Provide factory trained technicians to oversee the final installation, programming, testing, witness testing, and commissioning of the complete system. The complete system shall include the paralleling distribution equipment, generators, and automatic transfer switches.

C. Functional (Witness) Testing: Provide functional testing per this specification section.

D. Commissioning: Provide factory trained technicians for commissioning the installed system. The system commissioning shall include at least one full day to test the system. Additional commissioning days may be required if the system fails to pass the commissioning test. A commissioning report that defines the criteria for a satisfactory test will be provided by the Architect/Engineer prior to the commissioning date. The date of the commissioning testing shall be coordinated between the Owner, Architect/Engineer, and manufacturer.

1.4 REFERENCES

A. FS W-C-375 - Circuit Breakers, Molded Case, Branch Circuit and Service
B. NEMA AB 1 - Molded Case Circuit Breakers
C. NEMA PB 2 - Dead Front Distribution Switchboards
D. NEMA PB 2.1 - Instructions for Safe Handling, Installation, Operation and Maintenance of Dead Front Switchboards Rated 600 volts or less
E. ANSI/IEC C12 - Code for Electricity Metering
F. ANSI/IEC C39.1 - Requirements for Electrical Analog Indicating Instruments
G. ANSI/IEC C57.13 - Requirements for Instrument Transformers
H. ANSI/IEC 1000.4.4 - Fast Transients Immunity
I. ANSI/IEC 1000.4.2 - Electrostatic Discharge Immunity
J. ANSI/IEC 1000.4.3 - Radiated Field Immunity
K. ANSI/IEC 1000.4.6 - Conducted Field Immunity
L. ANSI/IEC 1000.4.11 - Voltage Dip Immunity

M. NFPA 70 - National Electrical Code; latest 2008 edition
N. NFPA 99 – Standard for Health Care Facilities
O. NFPA 110 - Emergency and Standby Power Systems
P. IEEE 446 - Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
Q. UL891 - Switchboards and Controls Equipment
R. UL489 - Low Voltage Circuit Breakers
S. ANSI/IEC C37.20.1 - Metal Enclosed Low Voltage Power Circuit Breaker Switchgear
T. ANSI/IEC C37.51 - Testing of Metal-Enclosed Low Voltage AC Power Circuit Breaker Switchgear
U. NEMA SG-5 - Power Switchgear Assemblies
V. UL 1558 - Switchgear Assemblies
W. UL1066 - Power Circuit Breakers

1.5 SUBMITTALS

A. Submit product data under provisions of Division 1.

B. Include front and side views of enclosures with overall dimensions shown; conduit entrance locations and requirements; nameplate legends; size and number of bus bars per phase, neutral, and ground; switchboard instrument details; instructions for handling and installation of switchboard; and electrical characteristics including voltage, frame size and trip ratings, withstand ratings, and time-current curves of all equipment and components; diagram; completed nameplate schedule.

C. Submit AC One-Line or Three-line schematic diagram with individual components referenced or identified.

D. Submit DC schematic diagrams with all components referenced or identified.

E. Include equipment access information. Clearly indicate which locations require access during installation and which locations require access for maintenance, testing, and repair.

F. Certification Letter: The manufacturer shall provide a letter certifying compliance with all the requirements of this specification. Any exceptions to the specification shall be listed.

G. Submit complete control and operation sequence which outlines system operation.

H. Submit manufacturer's installation instructions under provisions of Section 26 05 00.

I. Include documentation of conformance with the qualifications section of this section.

1.6 SPARE PARTS

A. Keys: Furnish four (4) each to the Owner.

B. Control Fuses: Furnish three (3) spare fuses of each type and rating installed to the Owner.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Section 26 05 00.

B. Store and protect products under provisions of Section 26 05 00.

C. Deliver in 48” maximum width shipping splits, unless approved otherwise by both the Contractor and Architect/Engineer, individually wrapped for protection, and mounted on shipping skids.

D. Store in a clean, dry space. Maintain factory wrapping or provide an additional waterproof cover to protect units from dirt, water, and debris.

E. Handle in accordance with NEMA PB 2.1 and manufacturer's written instructions. Lift only with lifting lugs. Handle carefully to avoid damage.

1.8 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Section 26 05 00.

B. Include instructions for operating equipment based on the control sequences.

C. Include instructions for operating equipment under emergency conditions when engine generator is running.

D. Include spare parts data listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

E. List special tools, maintenance materials, and replacement parts.

1.9 QUALIFICATIONS

A. Manufacturer: Company specializing in paralleling equipment with minimum five (5) years documented experience.

B. Supplier: Authorized distributor of paralleling equipment with service facilities within 50 miles of the project site.

1.10 WARRANTY AND SERVICE

A. The manufacturer shall warrant the equipment to be free from defects in material and workmanship for 24 months from the date of shipment.

B. Manufacturer shall have an established network of service centers capable of servicing the specified equipment.

C. Service center and manufacturer's personnel shall be on call 24 hours a day, 365 days a year. Personnel shall be factory trained and certified in the maintenance and repair of the specified equipment.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - PARALLELING AND DISTRIBUTION SWITCHBOARD

A. ASCO
B. Russlectric

2.2 RATINGS

A. Definitions:

1. The paralleling and distribution switchboards for this project shall be fully rated unless otherwise specifically noted in the Drawings or Specifications.

2.3 PARALLELING AND DISTRIBUTION CIRCUIT BREAKER SWITCHBOARD

A. The freestanding paralleling and distribution switchboard shall be configured as shown on the contract drawings, and rated for operation at voltage and current levels as shown on drawings. It shall contain devices and equipment as shown on the drawings, in addition to the requirements of this section.

B. Low-Voltage Insulated Case Circuit Breaker Switchgear: NEMA PB2; UL-1558 metal-enclosed switchboard assembly including compartmentalized draw-out circuit breakers in free-standing cubicles, securely bolted together to form an integrated structure.

C. Provide silver plated copper bus with bolted joints for all phases, fully rated neutral, and ground bus that extends through each section. All vertical and horizontal distribution bussing shall be fully rated.

D. Meet requirements for service conditions as follows:

1. Maximum Ambient Temperature: 120°F.

2. Altitude: 1000 feet.

E. Meet requirements for use as service disconnecting means.

F. Nominal Voltage: 480-volt, 3 phase, 4 wire, 60 Hertz.

G. Short-Circuit Rating: 100 as indicated on plan KA rms, at rated maximum voltage.

H. Voltage and Insulation Levels: To ANSI/IEEE C37.20.

I. Momentary Current Rating: To ANSI/IEEE C37.20.

J. Install fuses in safety fuse blocks with visible fuse blown indicators.

K. Install fuses in safety fuse blocks with visible fuse blown indicators.

L. Provide insulated barriers between all circuit breakers and the bus structure.

M. Provide insulated barriers between the busing and cable compartments.

N. Provide insulated compartments and barriers for instrumentation and control equipment. Circuit breakers shall be installed in separate compartments with insulating barriers between the control equipment compartments and the circuit breaker compartments.

O. Each section shall contain one or more individual circuit breaker compartments or instrumentation compartments with a rear compartment for the buses and outgoing cable terminations. An insulated barrier instrumentation compartment shall be provided when additional instruments or controls are provided in the switchboard section of a circuit breaker compartment. Provide dedicated conduit entry for control cabling separate from power cabling entry locations.

P. Locks: Front doors shall be supplied with a lockable handle. All door locks shall be keyed alike to operate from a single key and one key shall be supplied for each lock. Full height doors shall latch at three (3) points to secure the door firmly.

Q. Provide adequate wire bending space for circuit breakers. Refer to the plans for wire size; allow for 750 KCM minimum.

R. Sheet Metal Finish: Prime painted with a rust-inhibiting primer and finished with two coats of satin finish ANSI 61 gray enamel.

S. Switchgear wiring shall be composed of UL listed, 105 degree C rated material, with all wiring labeled at each end and terminal block.

T. Use solderless compression type connectors for terminating all wires to devices requiring lugs. Devices designed for lug-less connections will not use lugs at those connection points. Other circuits shall be locking spade type applied with the proper tool.

U. All interconnections between shipping sections shall use locking pull-apart terminal blocks.

2.4 ACCEPTABLE MANUFACTURER - POWER CIRCUIT BREAKERS

A. Square D
B. Siemens

2.5 LOW VOLTAGE INSULATED-CASE CIRCUIT BREAKERS

A. Circuit Breaker: Insulated case with programmable trip functions; NEMA A81 and UL-1066.

B. Circuit Breaker Operator: Spring-charged stored energy. With electric operator to ANSI/IEEE C37.17 and electric trip with auxiliary contacts. Provide for manual charging of the mechanism and interlocks to prevent withdraw of the circuit breaker unless it is open. Circuit breaker shall be 120 volt AC for charging and closing purposes with 24VDC shunt trip system. When required provide an individual control power transformer for each generator paralleling and generator main tie circuit breaker from the main tie main bus, generator paralleling bus, generator side of the circuit breaker, utility side of the circuit breaker.

C. Rated Maximum Voltage: 600 volt.

D. Fully rated regardless of mounting location within the switchgear. Rated for 5,000 operation without maintenance for 4,000 amp or larger; rated for 10,000 operations without maintenance for a 4,000 amp or less rating.

E. Rated Frequency: 60 Hertz.

F. Rated Permissible Tripping Delay: 2 seconds.

G. Main Section Devices: Individually mounted and compartmented.

H. Distribution Section Devices: Individually mounted

I. Operation Endurance Capability: ANSI/IEEE C37.16.

J. Circuit Breaker Control Voltage: 120VAC for Charging and Closing operation and 24-volt DC for Tripping operation.

K. Solid-State Insulated Case Circuit Breakers: Provide insulated case breaker with two-step stored energy closing. Provide manual charging handle, and electric charging motor where indicated as electrically operated. Provide with rating plug as required on drawings and electronic circuits for true rms current sensing, timing, and tripping for fully adjustable time current characteristics including; instantaneous trip; long time trip; short time trip and ground fault indication only. Trip settings shall be field programmable with a sealable clear cover. Provide draw-out construction. Provide breaker interrupted ratings as indicated on the plans.

L. Provide power trip units with all power metering including amperage, voltage, kW, pF, as well as breaker communications via TCP/IP all wired to a common monitoring point.

M. Provide Modbus communications TCP/IP for all breakers.

N. Arc Energy Reduction:

1. Provide an arc energy reduction system to reduce the clearing time of an arc flash event. The arc energy reduction system shall be provided for overcurrent protection devices rated **800** amps or larger.

O. Arc Energy Reduction with Selective Coordination:

1. Provide an arc energy reduction system to reduce the clearing time of an arc flash event. The arc energy reduction system shall be provided for overcurrent protection devices rated 800 amps or larger.

2. The following arc energy reduction system options are acceptable:

a. Zone-selective interlocking with permanent arc energy reduction
b. Differential relaying with permanent arc energy reduction
c. Listed energy-reducing active arch flash mitigating system

P. All circuit breakers shall be UL 1066 rated for compliance with ANSI/IEC C37.20.

Q. Provide circuit breakers with padlock hasp.

2.6 MASTER CONTROLLER

A. Provide a system master control to monitor and control the operation of the entire paralleling system, including the generator set controls. The master control panel shall contain the components and functions described in this section.

1. Electronic isochronous kW load sharing control to operate the engine governors during synchronizing and to provide isochronous load sharing when paralleled. The control system shall allow sharing of real kW load between all generator sets in the system to within 1% of equal levels, without introduction of frequency droop into the system. The control system shall include all equipment required for kW load sharing with an infinite bus. The infinite bus governing controls shall allow the generator set to synchronize to an infinite bus, parallel, and ramp up to a preset load level on the generator set. Additional controls shall be provided to cause the generator set to ramp up to a kW load level signaled by the system master control PLC. The isochronous load sharing module and engine governor shall be a coordinated system of a single manufacturer.

2. Electronic kVAR load sharing control to operate the alternator excitation system while the generator set is paralleled. The control system shall allow sharing of reactive load between all generator sets in the system to within 1% of equal levels, without introduction of voltage droop into the system. The control system shall include all equipment required for VAR load sharing with an infinite bus in either a constant VAR or constant power factor mode for future application flexibility. Mode and adjustments selectable by the operator.

3. Load demand governing controls shall be provided to cause the generator set to ramp down to zero load when signaled to shut down in a load demand mode. On a signal to re-start, the load demand governing controls shall cause the generator

set to synchronize to the system bus, close, and ramp up to its proportional share of the total bus load. The ramp rate of the generator set shall be operator-adjustable.

4. Equipment shall be provided to monitor the generator set as it is starting, and verify that it has reached at least 90% of nominal voltage and frequency before closing to the bus. The equipment provided shall positively prevent out-of-phase paralleling if two or more engine generator sets reach operating conditions simultaneously by providing a lockout signal to disable breaker closure for generator set(s) in the system which have not been selected to be the first units to close to the bus. Controls to recognize the failure of the first breaker signaled to close, and allow system operation to proceed despite this failure shall also be provided (breaker failure alarm). Systems using dead bus relay schemes without a disable signal to positively prevent out-of-phase paralleling shall not be acceptable under this specification. System shall include an independent backup to automatically operate if the primary system fails.

5. Synchronizer to electronically adjust the engine governor to match the voltage, frequency and phase angle of the bus. Synchronizer shall maintain the engine-generator voltage within 1% of bus voltage and phase angle within 20 electrical degrees of the bus for 0.5 seconds before circuit breaker closing. Each unit shall have its own synchronizer; systems using a switching scheme to use a single system synchronizer will not be approved. Synchronizers and systems which utilize a motor driven pot for control of AC voltage during the synchronizing process will not be accepted. The system shall be provided with a fail to synchronize time delay that is adjustable from 10-120 seconds. Control logic for fail to synchronize function shall allow field adjustment of function for either alarm or shutdown of the generator set on failure condition. Synchronizer shall be a product of the generator set governor manufacturer for guaranteed compatibility and performance.

6. Controls shall include a permissive relay function to assure that the generator set does not attempt to close out of phase with the bus, due to errant operation of the synchronizer.

7. Controls shall include a permissive (sync check) function, to be used with “generator synchronized” indicator during manual paralleling, to prevent accidental closure of the breaker with the generator set out of phase with the bus. Provisions to allow manual closure of the first generator set to a de-energized bus shall be included.

8. Control equipment shall contain a system of diagnostic LED’s to assist in analyzing proper system function.

9. Controls shall include three phase sensing reverse power equipment, to prevent sustained reverse power flow into the generator set. When the reverse power condition exceeds 10% of the generator set kW for 3 seconds, the paralleling circuit breaker shall be tripped open and the generator shut down.

10. Controls shall be provided to verify generator set and bus phase rotation match prior to closing the paralleling breaker.

11. Microprocessor-based alternator overcurrent alarm and shutdown protection. This protection is required in addition to the overcurrent trip on the paralleling breaker, and shall sense current flow at the generator set output terminals. The overcurrent alarm shall be indicated when the load current on the generator set is more than

110% of rated current for more than 60 seconds. The overcurrent shutdown shall be matched to the thermal damage curve of the generator set, and shall not have an instantaneous function.

12. Microprocessor-based alternator short circuit protection. This protection is in addition to the overcurrent trip on the paralleling breaker. The short circuit shall occur when the load current on the generator set is more than 175% of rated current and an aggregate time/current calculation indicates that the system is approaching the thermal damage point of the alternator. The equipment used shall not have an instantaneous function.

13. Provide overcurrent and short circuit protection for the feeder connecting the generator set to the paralleling switchgear. This protection may be integrated with alternator protection but must be positively coordinated to prevent tripping of the paralleling breaker prior to the operation of the alternator protective equipment.

14. Controls shall be provided to sense loss of excitation of the alternator while paralleled to the system bus.

15. Generator set start contacts rated 10 amps at 32 VDC. A redundant network-based starting system shall also be provided.

16. The control system shall monitor the paralleling breaker auxiliary contacts, and initiate a fault signal if the breaker fails to close within an adjustable time delay period after the control has signaled it to close (0.5-15 seconds). Breaker failure alarm shall cause the paralleling breaker to trip open, and lock out until manually reset.

17. Controls shall be provided to initiate an alarm condition when generator set is at 90% of rated frequency for more than 10 seconds.

18. Controls shall be provided to shut down generator set and initiate alarm when the generator set is at less than 85% of nominal voltage for more than 10 seconds, more than 110% of nominal voltage for more than 10 seconds, or more than 130% of nominal.

B. Provide a hot swappable redundant master controller. The redundant controller will automatically take over all functions if the primary controller fails. The hot swappable capability will allow a maintenance technician to replace a defective control without de-energizing any primary control functions.

C. Provide Modbus-TCP/IP network card for interface with third party equipment.

D. Provide a complete NFPA compliance Joint Commission / HVAP reporting server platform which monitors and provides NFPA compliant Emergency System test reports. Other features shall include:

1. Real-time equipment metering, monitoring, and remote access.
2. Information sharing with power and building management via Modbus.
3. Notifications and reports about power events and alarms via email, text, and SNMP.
4. A single intuitive interface for controlling engine-generators, transfer switches, load banks (if applicable)
5. Monitoring and historical data from all transfer switches fed by the emergency system.
6. One line diagram representing the entire emergency power system.

7. Reference electronic library storing all manual for generators, transfer switches, and circuit breakers associated with emergency power system.
8. Optional Dynamic/Active line diagram with power event playback functions.

2.7 PROTECTIVE RELAYS, SYNCHRONIZING RELAYS, INSTRUMENTS, AND CONTROLLERS

A. Repetitive Accuracies:

1. Repetitive accuracies for solid state protective relays, devices, controls and monitors shall not exceed stated values for AC powered devices over a voltage range of 70-110% of nominal, and for DC powered devices, over a voltage range of 20 to 40-volt DC.

a. Voltage: ± 2% of setpoint over a frequency range of 40-70 Hz.
b. Current: ± 3% of setpoint over a frequency range of 40-70 Hz.
c. Frequency: ± 0.2 Hz.
d. Power: ± 3% of setpoint over a frequency range of 40-70 Hz., across a power factor range of 0.2 to unity, leading or lagging.
e. Voltage Difference: ± 1.0 volt over a frequency range of 40-70 Hz.
f. Frequency Difference: ± 0.05 Hz.
g. Relative Phase Angle: ± 1.0° at 50 60 Hz.

2. Environmental Conditions: Solid state circuitry, controls, relays, timers, monitors etc. shall meet the following environmental conditions:

a. Temperature range: 0°C to +65°C.

B. Protective Relays: Provide industrial grade relaying instruments for each circuit breaker and system level controls. Protective relay package (Generator Protection Package) shall be industrial grade multiple integrated circuit protective relays combined into a single protection package device. Package shall include the following protective relay functions.

1. Directional Power Relay: Provide directional power protection to open the circuit breaker in the event of a power reversal in the generator supply circuit.

2. Voltage/Frequency Stabilization Relay: Provide voltage/frequency stabilization protection to prevent synchronizing operation of the circuit breaker unless voltage and frequency of the generator are within settable limits for a selected period of time.

3. Overcurrent Ground Relay: Provide overcurrent ground protection to provide audible and visual display by means of a local and remote annunciator in the event of a ground fault.

4. Locking-Out Relay: Provide locking-out relays to prevent circuit breaker closing in the event of other protection device operations.

5. Synchronizing Relay: Provide synchronizing relays to allow the closing of the circuit breaker upon either manual or logic commands. Provide with dead bus option.

6. Synchronizing Control: Provide engine governor control to control engine speed for a paralleling sequence and for load pick-up. Control furnished to match the engine-generator supplier’s requirements. Synchronizing controller to provide breaker close signal output.

7. Bus Underfrequency Relay: Provide under frequency relay for input to control PLC to indicate system overload.

8. Synchroscope: ANSI C39.1; rotary synchroscope with 4.5-inch square recessed case and divided scale indicating SLOW/FAST, white dial with black figures and pointer, 2-degree accuracy.

9. Synchronizing Light: One LED lighted pushbutton, light turns off when generator is synchronized.

10. Frequency Meter: 4.5-inch square recessed case, pointer type, frequency span - 55/65 Hertz.

11. Current Transformers: ANSI C57.13; Five ampere secondary, bar or window type, with single secondary winding and secondary shorting device, primary/secondary ratio as required, burden and accuracy consistent with connected metering and relay devices, 60 Hertz.

12. Potential Transformers: ANSI C57.13; 120-volt single secondary, disconnecting type with integral primary and secondary fuses, primary/secondary ratio as required, burden and accuracy consistent with connected metering and relay devices, 60 Hertz.

13. AC control circuit shall be protected with line and load side fused which are installed in safety type fuse blocks. Provide visible blown indication for each fuse.

14. Synchronizing Selector Switch: Rotary multi-stage snap-action type with 600-volt AC/DC silver plated contacts, engraved escutcheon plate, oval type handle, and three positions including OFF-MANUAL-AUTOMATIC.

15. Governor Speed Setting, Momentary contact type with 600-volt AC/DC silver plated contacts, engraved escutcheon plate, three position RAISE-OFF-LOWER control.

16. Engine Mode Control Switch: Rotary, oval handle, maintained contact type with 600-volt AC/DC silver plated contacts, engraved escutcheon plate, five- position engine control.

17. System PLC: Programmable logic controller with interface keypad and LCD screen, complete with com port for software changes. Provide programming for all necessary inputs and outputs for system operation.

C. Digital Power Metering:

1. Provide a multifunction digital meter at each generator circuit breaker and control section for generator metering. Each meter shall include a communication module to permit information to be sent to a central monitoring computer for display, analysis, and logging.

2. System programming and setup shall be stored in non-volatile memory and retained in the event of a power interruption.

3. Digital meters shall be equipped with the following I/O: eight (8) solid state status inputs, four (4) relay output contacts.

4. Include LCD back-light display, installed semi-flush in the front of the paralleling distribution equipment. Values shall be displayed through the use of menu scroll buttons. The following metered readings shall be displayed and communicated.

   a. Current, per phase RMS and neutral.

   b. Current unbalance %.

   c. Voltage, phase to phase and phase to neutral.

   d. Voltage unbalance %.

   e. Real power (KW), per phase and 3-phase total.

   f. Apparent power (KVA), per phase and 3-phase total.

   g. Reactive power (KVAR), per phase and 3-phase total.

   h. Power factor, 3-phase total & per phase.

   i. Frequency.

   j. Accumulated energy (MWH, MVAH and MVARH) – Reset of accumulated energy parameters shall be allowed from the front of the Data Monitor.

   k. 24 months of peak Demand kW historical data shall be stored within Power Meter non-volatile memory

2.8 SYSTEM CONTROL POWER

A. Control power for the paralleling and distribution equipment shall be derived from the generator starting batteries; 24 Volt DC.

B. The control logic shall be powered through a suitable means which shall permit continuity of power until the last battery is no longer available. The controls shall be powered from any battery or combination of batteries and prevent feedback to a failing battery. The transition of control logic power from any battery combination to any other battery combination shall be accomplished without disruption in the power flow.

C. Provide a solid state, no break “best battery” selector system. The system shall automatically select the alternative battery string for control voltage if the primary battery string has failed. The battery banks of each individual generator shall be isolated to prevent the failure of any one battery from disabling the entire system.

D. DC Control Power Station Battery System: In addition to the engine start batteries that are used as a source of control power, a separate 24VDC station battery system shall be provided and wired into the Master Control section (wiring by contractor). The station battery system shall include front access batteries, battery charger powered from an emergency 120VAC-240VAC power source, and an integrated DC distribution system capable of accommodating up to twelve (2) pole circuit breakers. The complete DC Control Power Station Battery System shall be housed in a single free standing enclosure, and shall be factory assembled, wired, and tested via 24hr burn in at full load. Voltage readings shall be taken and documented during burn in testing. 24VDC output from the station battery system shall be connected into the Best Battery selector system (wiring by contractor) described below such that 24VDC control power will be available to the critical

system control components, even while the diesel engine-generators are starting up.

2.9 INDICATION

A. Operating and safety indications, protective devices, basic system controls, engine gauges, and transfer switch statuses shall be grouped in a common control and monitoring panel mounted on front face of the paralleling distribution equipment. The indications components shall be displayed from the master control system display.

B. Provide a lamp test push button. The test button shall cause all indication lamps on the paralleling and switchboard equipment to be simultaneously tested.

C. Provide a master audible alarm. The alarm horn shall be the DC vibration type. Provide with an alarm horn silence button.

D. Provide indication in compliance of ANSI/NFPA 99 and NFPA 110 for a Level 1 2 system. Include the listed pre-alarm and alarm points, audible alarm, alarm silencing means, repetitive alarm circuitry, and lamp test switch in main control section of the paralleling distribution equipment. Provide all interconnecting wiring in conduit per manufacturer's requirements by the Electrical Contractor. The remotely reported alarms shall include the following generator and paralleling equipment indications.

FUNCTION	LAMP COLOR	ALARM HORN
1. Overcrank	Red	Yes
2. Low water (engine) temperature	Red	Yes
3. High engine temperature pre-alarm	Amber	
4. High engine temperature	Red	Yes
5. Low lube oil pressure pre-alarm	Amber	
6. Low lube oil pressure	Red	Yes
7. Overspeed	Red	Yes
8. Under frequency	Red	Yes
9. Under voltage	Red	Yes
10. Over voltage	Red	Yes
11. High battery voltage	Amber	Yes
12. Low battery voltage	Amber	Yes
13. Battery charger failure (includes AC failure)	Amber	Yes
14. Loss of excitation	Red	Yes
15. Low fuel main tank	Amber	Yes
16. Low fuel daytank	Amber	Yes
17. Rupture basin alarm	Red	Yes
18. Reverse Power	Red	Yes
19. Phase rotation	Red	Yes
20. Failure to sync generators	Amber	Yes
21. Ground fault	Amber	Yes
22. Over current alarm	Red	Yes
23. Generator breaker failure	Red	Yes
24. Generator breaker trip	Red	Yes
25. Breaker open (generator)	Green	
26. Breaker closed (generator)	Red	
27. Timer for generator start and transfer	Green	
28. Timer for generator shutdown.	Green	
29. Generator running	Green	
30. Normal utility power	Green	
31. Emergency Power Supply (EPS) supplying load	Green	

FUNCTION	LAMP COLOR	ALARM HORN
32. Not in auto	Red	Yes
33. Emergency stop	Red	Yes
34. Emergency Power Off Switch activated (EPO)	Red	Yes
35. Manual Paralleling available	Green	
36. Load Shed Circuit Activated (one for each priority)	Amber	Yes
37. Load Shed Bypass (one for each priority)	Amber	
38. Generator Locked out (one for each generator)	Red	Yes
39. System PLC Stopped	Red	Yes
40. PLC Power Source Failure	Red	Yes
41. Emergency Bus Optimization Active	Amber	
42. Load Demand Active	Amber	
43. Bus loaded to Capacity	Red	Yes
44. Bus Optimization Stopped Adding	Red	Yes

45. Indicator lamps: High intensity LED type or liquid crystal display LCD type.
46. Door mounted control components shall be industrial oil-tight type devices.
47. Alarm Horn: Provide an alarm horn silence button labeled alarm silence in the front face of the paralleling distribution equipment.

E. Five Position Engine Control Switch Operation:

1. Provide a five-position engine control switch for each generator.

2. Provide labels with 1/4” letters for each switch position.

3. Stop/Reset: In this position, the engine shall not be capable of starting and/or running. If the engine was shut down due to the operation of a protective device, the shutdown malfunction shall be reset when the switch is moved to this position. If the engine is running when the switch is moved to this position, it shall be immediately shutdown.

4. Off/Cool down: In this position, the engine shall shutdown after a cooldown period.

5. Automatic: In this position, the engine control shall be in readiness for fully automatic operation upon receipt of a start signal.

6. Test Off-Line: When placed in this position, the engine shall start and run as if a start signal were received except it shall not be connected to the bus unless a start signal is received. When returned to the automatic position, the engine will shut down.

7. Test On-Line: When placed in this position, the engine shall start, run and connect to the bus as if a start signal were received. When returned to the "Automatic" position, the circuit breaker will open and the engine will run for its cool down period before shutting down.

F. Operator Panel: Provide an operator panel for each generator set. The generator operator panel shall provide the following information.

1. Provide the following instrumentation information for each generator: Amps, voltage L-L and L-N, frequency, watts, volt-amps, KWH, power factor, with a digital display.

2. Generator set mode indicating: manual operation, emergency, cool down, stop, lockout, or auto.

3. Other generator information: warnings, alarms, demand as a percentage of unit capacity.

4. Screen to display control, data, performance, present run time, total run time, and all indications/alarm reported at the generator control panel.

5. Engine cool down time: Adjustable 0-600 seconds. The control panel shall indicate the time remaining in the time delay period for each generator when the generator is timing for shutdown.

6. Generator start time delay: Adjustable 0-60 seconds. The control panel shall indicate the time remaining in the time delay period when the generator is timing to start.

G. Provide a visual indication of the status and position of each transfer switch at the main control panel of the paralleling distribution equipment.

1. Provide red LED for normal and emergency position.

2. Provide SCADA diagram indicating switch position on LCD monitor.

2.10 MASTER CONTROL STATION DISPLAY

A. Provide a system master control to monitor and control the operation of the entire paralleling distribution system and generator set controls.

B. The master control station interface shall be displayed through a liquid crystal display LCD screen. LCD display shall be full color, high resolution, human machine interface (HMI). The screen shall be sized appropriately for the amount of system information, minimum 14-inch screen.

C. Provide a redundant master control station display. The redundant screen will display all the same information as the primary screen.

D. Components displayed on the HMI display shall be designated as indicated on the plans. The display shall include the following screens/functions.

1. Main Menu Screen: Provide a main menu for ease of navigation through the various screens. The display shall turn return to the main screen and the display shall turn off after 10 minutes without human input.

2. One Line Diagram Screen: Provide a one-line diagram screen showing the system status of the following components by a combination of animation, changing color indicators, text messages, and pop up indicators.

a. Generators: (/), (/).
b. Paralleling distribution equipment: (/).
c. Automatic transfer switches including position: (/).
d. Generator circuit breaker with status indications.
e. Paralleling circuit breaker with status indication.
f. Other:

3. Generator Set Screen: Provide a generator set screen for each unit. Screen to display control, data, performance, present run time, total run time, and all indications/alarm reported at the generator control panel.

    a. Provide the following instrumentation information for each generator: engine rpm, oil pressure, coolant temperature, DC voltage, engine hours, genset KW hours, number of starts, generator and bus line to line voltage on all phases, generator and busline to neutral voltage on all phases, generator and bus frequency, generator and load current, power factor, kVAR and kw, and power factor.

4. Load Control Screen: Provide a load control screen to display the following information and allow the following operations.

    a. Display the paralleling bus capacity in KW, KVA, and amps.

    b. Display the total load in KW, KVA, and amps.

    c. Display loads served by priority level. Refer to drawings and operations systems operation portion of this section for complete list of priorities. In general, the priorities will be categorized as follows (priority 1 being most important.

        1) Priority 1: Life Safety Transfer Switches.
        2) Priority 2: Critical Power Transfer Switches.
        3) Priority 3: Equipment Power Transfer Switches.
        4) Priority 4: Equipment Power Transfer Switches.

    d. Operation: Allow user to manually shed or restore loads from the display screen.

5. History and alarms screen: Provide a history and alarm screen which provides a history of all historical operations and alarms with time stamp. Provide capability of storing 100 events. New events shall override the oldest stored information after the log is full. The historical events screen shall not be allowed to be cleared or erased. Each event shall be logged by date, time, alarm description, and time of alarm acknowledgement.

6. The following functions may be provided on separate screens or included on the above screens.

    a. Allow the operator to enable or disable load demand operation.

    b. Initiate test (with or without load).

    c. Control the shutdown sequence for the generator sets in the load demand mode.

    d. Set the load demand time delays.

    e. Set the load demand operation setpoints.

    f. Display and modify the automatic load add and shed sequence.

    g. Manually start and stop each generator.

h. Generator set mode indicating: manual operation, emergency, cool down, stop, lockout, or auto.

i. Other generator information: warnings, alarms, demand as a percentage of unit capacity.

j. Trending information: Display KW, KVA, and frequency for each generator and the total load for the system.

k. Engine cool down time: Adjustable 0-600 seconds. The control panel shall indicate the time remaining in the time delay period for each generator when the generator is timing for shutdown.

l. Generator start time delay: Adjustable 0-60 seconds. The control panel shall indicate the time remaining in the time delay period when the generator is timing to start.

7. Security Log-in: Provide provisions for a security log-in function to prevent unauthorized use of the system. Provide three levels of access.

a. Security Levels:

1) Monitor only: Access to all status screens, history, and alarm logs. No access to set points, engine controls, circuit breaker controls, or system status functions.

2) Monitor and Control: Access to system controls, functions, and basic system adjustable setpoints.

3) Administrative Technician: Access to all set points including factory established set points and calibration.

2.11 MANUAL SYNCHRONIZING CONTROLS

A. Provide manual synchronizing controls for each generator. The manual synch controls shall be provided separately from the LCD human machine interface.

B. Provide a synch scope for each generator. The synch scope shall be a digital display, mechanical display in the face of the switchboard.

C. Provide protective provisions so that the manual synch provisions will not allow a user to manually synch the generators in a dangerous situation which may damage the generators or paralleling equipment.

D. Provide a separate LED indication in the switchboard for each generator to indicate successful synchronization.

2.12 SYSTEM OPERATION

A. Normal Condition:

1. Operate as a paralleling standby system for hospital essential systems.

2. Under normal conditions, all generator breakers will be open, and the packaged engine generators will not be running.

3. The utility source will be supplying the entire load through the normal distribution system.

4. The automatic paralleling engine starting controls are placed in their automatic position and the engine generators are in a state of standby.

B. Automatic Mode:

1. Start signal from any transfer switch shall automatically start all engine generators which have not been locked out.

2. The first generator to reach 90% of rated voltage and frequency is connected to the emergency bus through its associated paralleling circuit breaker.

3. Electronic interlocks permit the connection of only one generator.

4. The transfer switches sense available emergency power.

5. Priority 1 and Priority 2 loads shall close to the emergency bus.

6. Priority 1 and Priority 2 loads shall be fully operational within 10 seconds or less after losing utility power.

7. The paralleling equipment shall maintain “transfer inhibit” output contact to inhibit other priority loads from transferring to the emergency bus until all generators are paralleled on the emergency bus.

8. The synchronizers shall automatically adjust the frequency of the other generators to achieve synchronism with the emergency bus. When within acceptable limits of synchronizing the on-coming generator shall close to the emergency bus through its associated paralleling circuit breaker.

9. When the generators are paralleled their governors shall be connected for load sharing operation.

10. Generators which have been locked out for maintenance or other reasons shall not inhibit the system from continuing past this step of the sequence.

11. The paralleling equipment shall release the “transfer inhibit” control of the remaining transfer switches in order of priority level. The in sequence the remaining transfer switches sense available emergency power and transfer to the emergency bus. Transfer Delays are listed in seconds from transfer delay of priority 1.

    a. Priority 1 Legal Transfer Switch:

        1) Transfer to emergency delay (0 seconds).
        2) Transfer to utility normal delay (10 minutes).
        3) Load Shed allowed: No.
        4) Includes: Legal ATS

    b. Priority 2: - Critical Power ODPA and ODPB:

        1) Transfer to emergency delay (0 seconds).
        2) Transfer to utility normal delay (10 minutes).
        3) Load Shed allowed: No.
        4) Includes: Breakers in Paralleling Gear

c. Priority 3 Chiller #1

1) Transfer to emergency delay (2 seconds).
2) Transfer to utility normal delay (8 minutes).
3) Load Shed allowed: Yes.

d. Priority 4: - Chiller #2

1) Transfer to emergency delay (4 seconds).
2) Transfer to utility normal delay (6 minutes).
3) Load Shed allowed: Yes.

12. Utility (Normal) Power Returns:

a. The transfer switch shall automatically transfer to the normal utility power source after utility power returns. Refer to the transfer to normal time delay settings listed in this section.

b. When all loads have been transferred to the normal utility and all start signals have been removed from the generator sets, the circuit breakers in the paralleling equipment for each generator set shall open. The generators shall operate at no load for a cool down period of 15 minutes. The cool down period shall be adjustable from 10-30 minutes.

c. The generators shall shut down after the cool down period.

d. If a system start signal is received during the cool down period the automatic operation sequence shall be initiated again.

13. Special Conditions:

a. Bus under frequency relay shall initiate for bus frequency below 58 Hz. System PLC shall initiate “Load Shed” contact when bus under frequency condition is maintained for continuous 5 seconds. “Load Shed” contact shall initiate disconnecting from emergency source. Load shed operation shall require manual reset to restore shed transfer switches to emergency source.

b. Should an engine generator set fail to start, fail to automatically parallel or develop a critical running monitored fault, the control system shall cause the engine to automatically shut down with its circuit breaker automatically tripped open. The paralleling system would then load shed the lowest priority load in order of importance.

c. If the facility experiences a partial normal power outage, only those automatic transfer switches that are affected shall detect a power failure. This action shall prompt the system to automatically add the highest priority blocks of load, to the bus, that are experiencing a power failure. If subsequent normal power failures occur at other transfer switches the system shall automatically adjust the load add/shed schedule accordingly to keep as many higher priority loads connected as the generator capacity permits.

d. If the engine fails to start after 4 adjustable cranking attempts (factory set at 10 seconds on, 10 seconds off, adjustable from 5 to 30 seconds) or if any protective device should operate while the engine is running, the

engine shall be disconnected from service and immediately stopped. The engine control logic shall lock the failed set out of service and requires a manual reset. The engine control logic shall include a provision for conversion to single cycle cranking, adjustable from 35 to 210 seconds.

C. Manual Operation:

1. System in manual shall require manual initiating of engine/generators. Initiation from system PLC shall start and synchronize both generators. Initiation from each engine generator shall require manual synchronizing and paralleling.

2. Relay interlocks shall inhibit the manual paralleling of generators in an unsafe condition.

3. Relay interlocks shall inhibit the manual switching of automatic transfer switches in an unsafe condition.

4. System in manual shall disable system “Transfer Inhibit” and “Load Shed” functions.

5. Generator start signal from a transfer switch while system is in manual shall override system to automatic operation.

D. Test Mode:

1. The system shall allow the generators to be tested by transfer of the system loads to the generator sets from the transfer switches. Loads shall be transferred to the emergency power supply system similar to the automatic operation control sequence.

E. Generator Set Exercise (Test Without Load Mode):

1. The system shall allow testing of the generator sets at no load. In this operation mode the generator sets will start, build up to rated speed and voltage, synchronize and close to the generator bus, but system loads shall not automatically transfer to the generator system. If a power failure occurs during a test period, loads shall immediately close into the system on a priority basis.

F. Load Demand:

1. After all generator sets have been paralleled to the bus and all loads connected, a stabilization time delay (0-15 minutes) factory set at 15 minutes will be initiated. At the expiration of the time delay period, the system will operate in a load demand mode. The load demand control logic and its associated controls will control the number of generating sets on the bus, such that the on-line reserve capacity of the bus is not less than 10%, nor more than 120%, of the capacity of a single generator set.

2. Upon sensing that the connected load has decreased the reserve capacity to 10% or less, a 10-second time delay is initiated. this time delay will be field adjustable from 0-300 seconds. If the reserve capacity stays below 10% for the duration of the time delay, the controls will initiate the starting and paralleling of the next set in sequence. If, during the time delay period, the reserve capacity decreases to 0 or less (signifying bus overload), the time delay will be bypassed and the next set in sequence will be immediately started and paralleled. At the same time signals will be given to shed loads such that the connected priority blocks of load are

reduced to equal the number of engine generator sets on line. When the next set is paralleled to the bus, the shed load will be reconnected and all controls automatically reset.

3. Should the next set in sequence have its engine control switch in the "off" position or fail to synchronize within the preset time delay of the "fail-to-synchronize" timer, the controls will automatically pass the starting signal to the next set in sequence.

4. Upon sensing that the on-line reserve capacity has increased to 120% or more, a 180 second (adjustable 0-300 seconds) time delay will be initiated. if the reserve capacity stays above 120% for the duration of the time delay, the circuit breaker of the last set that went on line will be opened. The engine will run for its cool down period, then shutdown.

5. The paralleling equipment shall “transfer inhibit” any set of priority loads and the associated transfer switches from connecting to the emergency bus if the respective priority load has been shed twice during the same power outage. The transfer inhibit signal will remain in effect unless reset manually or reset automatically after all transfer switches have returned to the utility (normal) power source.

2.13 ACCESSORIES

A. DC Control Power: Diode power supply for best battery arrangement connection to both engine battery systems.

B. Auxiliary Contacts:

1. Provide 2 N.O., 2 N.C. spare independent auxiliary contacts, 120 volt, 10 amp, which change state when each diesel generator is to start. Reverse state when units are to stop. Provide separate contacts in paralleling equipment for each unit.

C. Emergency Power Off Switch (EPO): The emergency stop switch shall be red, mushroom head switch, with protective Lexan cover, mounted in the face of the main control panel of the paralleling distribution equipment.

D. Paralleling Switchgear Remote Annunciator Panel:

1. Remote annunciator to duplicate all points as specified in generator control section. Remote annunciator shall be powered from the paralleling distribution equipment.

a. Located as shown on drawings.

E. Portable Generator / Load Bank Operation – A control station shall be provided on the master section that allows for control of single breaker being provided for load banking / portable generator operation.

1. Control shall be via a key operated three position control selector switch allowing for one of three positions: Off, Load Bank and Portable Gen
2. Off – Load Bank / Portable Operation is turned off and the breaker is open
3. Load Bank – Breaker closes and allows power to exported from the parallel generators to the load bank located elsewhere. Control wiring

shall be provided to turn load bank off if an emergency start signal is received from any transfer switch.

4. Portable Gen – Breaker closes and allows power to be imported from the portable generator to power the emergency loads. The permanent generator breakers shall open and programming shall the prevent the starting and paralleling of the permanent generators as well as closing of the permanent generator breakers even if a start signal is received. Portable generator controls shall be provided for start/stop controls.
5. A control terminal block shall be provided for all controls to land on.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install distribution paralleling equipment in accordance with manufacturer's written guidelines and instructions.

B. Installation of equipment shall include all interconnecting wiring between equipment provided for the emergency power supply system. The contractor shall also provide interconnecting wiring between equipment sections when required, under the supervision of the equipment supplier.

C. Verify adequate clearance to paralleling and distribution switchboard equipment prior to installation.

D. Install paralleling and distribution switchboard on concrete housekeeping pads. Inspect concrete pads for level prior to installation.

E. Tighten accessible bus connections and mechanical fasteners after placing switchboard.

F. Install fuses.

3.2 INSTALLATION OF CONTROLS FURNISHED BY ENGINE-GENERATOR SUPPLIER

A. Switchgear manufacturer shall mount and wire all electronic and electric controls associated with the engine-generator set governor and voltage regulator as described in the engine-generator set specifications. Controls may include, but not be limited to:

1. Electronic control portion of governor.
2. Frequency adjust potentiometer.
3. Cross current compensation transformer.

3.3 FIELD QUALITY CONTROL

A. Inspect completed installation for physical damage, proper alignment, anchorage and grounding.

B. Measure insulation resistance of each bus section phase to phase and phase to ground for one minute each. Test voltage shall be 1000 volts, and a minimum acceptable value for insulation resistance is 2 megohms.

C. Check tightness of accessible bolted bus joints using a calibrated torque wrench. Tightness shall be in accordance with manufacturer's recommended values.

D. The Factory Technician shall perform the following series onsite:

1. Verify contractor connections, control power availability, visually inspect relay settings, verify megger test of the generator cables and the main bus.

2. With the engine generator supplier's technical representative controlling the engine, verify that the switchgear and control equipment are fully operational and perform per the sequence of operation specified. Equipment or services required for load or performance testing of the engines shall be provided by the engine generator set supplier.

3. With the engine generator supplier's technical representative controlling the engine, demonstrate all functions of the control system, both automatic and manual.

4. Provide documentation in the form of function checklists and recorded data for each section to the approving Architect/Engineer.

3.4 ADJUSTING AND CLEANING

A. Provide field services as required in conjunction with manufacturer for system start-up and testing as described in Section 23 32 13.

B. Verify proper phase rotation between the individual generators of the emergency power system and the utility source.

C. Adjust all operating mechanisms for free mechanical movement.

D. Touch up scratched or marred surfaces to match original finish.

E. Adjust trip and time delay settings to values as scheduled, or as instructed by the Architect/Engineer.

F. Make necessary adjustment and debugging at terminal locations to obtain correct data and access for revising set points for operation.

3.5 RELAY COORDINATION

A. The switchboard supplier and contractor shall be responsible for relay coordination of generator protection package as required for reliable system operation and equipment protection. All documentation and settings shall be submitted to the Architect/Engineer for review prior to start-up.

3.6 SYSTEM COMMISSIONING (ON-SITE ACCEPTANCE TESTING)

A. The complete installation shall be tested for compliance with the specification following competition of all the complete emergency power supply system.

B. The date and times for the system commissioning shall be coordinated to allow representatives from the following groups to attend: Owner representatives, Architect/Engineer, appropriate contractors, factory representatives. The contractor and factory representatives shall actually conduct the tests as outlined in the commissioning report.

C. The requirements associated with the emergency power supply system commissioning report shall be provided by the Architect/Engineer prior to the test. The detailed

requirements of the test have not been included in this section. In general, the requirements will include the following items:

1. Explanation of emergency power supply system for owner's representatives.
2. Cold start test of the generators.
3. Simulated utility power outage.
4. Two-hour full load test of each generator; generator supplier shall provide load banks
5. One step rated load pickup test in accordance with NFPA 110.
6. Simulate power outage at each transfer switch.
7. Verify successful automatic restart of all mechanical, electrical, and other systems which are connected to the emergency power system after a simulated power outage. Example: Motors shall be tested for proper phase rotation, VFDs programming shall be tested for automatic restart.
8. Onsite commissioning shall include all load banks, cables, cable ramps, and any other associated equipment required to functional test all paralleling controls and load sharing functions at various kW load levels (as recommended by equipment manufacturer). All equipment shall remain onsite at the expense of the generator supplier until functional testing is successfully completed. Typical onsite time will be two weeks.

3.7 FUNCTIONAL TESTING (WITNESS TESTING AT FACTORY)

A. Paralleling gear manufacturer shall coordinate with generator manufacturer for conducting a fully functioning test of the gear and the generator sets at the factory.

B. The equipment shall be factory tested to simulate a complete and integrated system. The circuit breakers supplied shall be installed in their actual positions and electrically and mechanically tested. A narrative of the system operation shall be provided and shall be used when testing the equipment. Copies of the test reports shall be submitted to the Architect/Engineer.

C. Electrical Contractor shall notify Owner, Architect, and Engineer a minimum of 2 weeks prior to functional testing in order to be available to witness testing. Travel expenses for the Owner, Architect, and Engineer, including meals and lodging, shall be the responsibility of the Electrical Contractor.

D. Functional test shall simulate field installed conditions including transfer switch controls, load shedding, load sense demand and fault conditions. Testing shall include, not limited to, the following:

1. Connect genset to fuel source in testing area.

2. Witness of test shall be at engine dealer discretion; however; any transportation, lodging, or meals for these personnel shall be the responsibility of the requesting personnel.

3. Disconnect after test.

4. Touch up paint and prepare for shipment.

E. The following tests shall be documented prior to the witness test:

1. Dielectric Test (Per ANSI C37.20.2, 5.3.1).
2. Mechanical Test (Per ANSI C37.20.2, 5.3.2).
3. Grounding of Instrument Transformer Case Test (Per ANSI C37.20.2, 5.3.3).
4. Electrical Operation and Control Wiring Test (Per ANSI C37.20.2, 5.3.4.1).
5. Polarity Test (Per ANSI C37.20.2, 5.3.4.3).
6. Sequence Test (Per ANSI C37.20.2, 5.3.4.4).

F. Manufacturer shall include all airfare, travel, & lodging expenses for up to 4 owner representatives.

END OF SECTION

SECTION 262413 - SWITCHBOARDS

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. Service and distribution switchboards rated 600 V and less.
2. Disconnecting and overcurrent protective devices.
3. Accessory components and features.
4. Identification.

B. Related Requirements

1. Section 260573.19 "Arc-Flash Hazard Analysis" for arc-flash analysis and arc-flash label requirements.

1.3 ACTION SUBMITTALS

A. Product Data: For each switchboard, overcurrent protective device, surge protection device, ground-fault protector, accessory, and component.

1. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

B. Shop Drawings: For each switchboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Detail short-circuit current rating of switchboards and overcurrent protective devices.
5. Include descriptive documentation of optional barriers specified for electrical insulation and isolation.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

7. Include time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.
8. Include schematic and wiring diagrams for power, signal, and control wiring.

C. Delegated Design Submittal:

1. For arc-flash hazard analysis.
2. For arc-flash labels.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Seismic Qualification Data: Certificates, for switchboards, overcurrent protective devices, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Field Quality-Control Reports:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For switchboards and components to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

   a. Routine maintenance requirements for switchboards and all installed components.
   b. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
   c. Time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Potential Transformer Fuses: Equal to 10 percent of quantity installed for each size and type but no fewer than two of each size and type.
2. Control-Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.
3. Indicating Lights: Equal to 10 percent of quantity installed for each size and type but no less than one of each size and type.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers qualified as defined in NEMA PB 2.1 and trained in electrical safety as required by NFPA 70E.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver switchboards in sections or lengths that can be moved past obstructions in delivery path.

B. Remove loose packing and flammable materials from inside switchboards and install temporary electric heating (250 W per section) to prevent condensation.

C. Handle and prepare switchboards for installation according to NECA 400.

1.9 FIELD CONDITIONS

A. Installation Pathway: Remove and replace access fencing, doors, lift-out panels, and structures to provide pathway for moving switchboards into place.

B. Environmental Limitations:

1. Do not deliver or install switchboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above switchboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

a. Ambient Temperature: Not exceeding 104 deg F.

b. Altitude: Not exceeding 6600 feet.

1.10 COORDINATION

A. Coordinate layout and installation of switchboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

1.11 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace switchboard enclosures, buswork, overcurrent protective devices, accessories, and factory installed interconnection wiring that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Switchboards shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation. Shake-table testing shall comply with ICC-ES AC156.
2. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2.2 SWITCHBOARDS

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.
4. Square D; by Schneider Electric.

B. Source Limitations: Obtain switchboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

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.

D. Comply with NEMA PB 2.

E. Comply with NFPA 70.

F. Comply with UL 891.

G. Front-Connected, Front-Accessible Switchboards:

1. Main Devices: Fixed, individually mounted.
2. Branch Devices: Panel mounted.
3. Sections front and rear aligned.

H. Nominal System Voltage: 480Y/277 V.

I. Main-Bus Continuous: **4000** A.

J. Seismic Requirements: Fabricate and test switchboards according to IEEE 344 to withstand seismic forces defined in Section 260548.16 "Seismic Controls for Electrical Systems."

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation. Shake-table testing shall comply with ICC-ES AC156.

a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

K. Indoor Enclosures: Steel, NEMA 250, Type 1.

L. Enclosure Finish for Indoor Units: Factory-applied finish in manufacturer's standard gray finish over a rust-inhibiting primer on treated metal surface.

M. Barriers: Between adjacent switchboard sections.

N. Insulation and isolation for main bus of main section and main and vertical buses of feeder sections.

O. Service Entrance Rating: Switchboards intended for use as service entrance equipment shall contain from one to six service disconnecting means with overcurrent protection, a neutral bus with disconnecting link, a grounding electrode conductor terminal, and a main bonding jumper.

P. Bus Transition and Incoming Pull Sections: Matched and aligned with basic switchboard.

Q. Hinged Front Panels: Allow access to circuit breaker, metering, accessory, and blank compartments.

R. Pull Box on Top of Switchboard (IF NEEDED)

1. Adequate ventilation to maintain temperature in pull box within same limits as switchboard.
2. Set back from front to clear circuit-breaker removal mechanism.
3. Removable covers shall form top, front, and sides. Top covers at rear shall be easily removable for drilling and cutting.
4. Bottom shall be insulating, fire-resistive material with separate holes for cable drops into switchboard.
5. Cable supports shall be arranged to facilitate cabling and adequate to support cables indicated, including those for future installation.

S. Buses and Connections: Three phase, four wire unless otherwise indicated.

1. Provide phase bus arrangement A, B, C from front to back, top to bottom, and left to right when viewed from the front of the switchboard.
2. Phase- and Neutral-Bus Material: Hard-drawn copper of 98 percent conductivity, silver-plated.
3. Copper feeder circuit-breaker line connections.
4. Ground Bus: 1/4-by-2-inch- hard-drawn copper of 98 percent conductivity, equipped with compression connectors for feeder and branch-circuit ground conductors.
5. Main-Phase Buses and Equipment-Ground Buses: Uniform capacity for entire length of switchboard's main and distribution sections. Provide for future extensions from both ends.
6. Disconnect Links:

    a. Isolate neutral bus from incoming neutral conductors.
    b. Bond neutral bus to equipment-ground bus for switchboards utilized as service equipment or separately derived systems.

7. Neutral Buses: 100 percent of the ampacity of phase buses unless otherwise indicated, equipped with compression connectors for outgoing circuit neutral cables. Brace bus extensions for busway feeder neutral bus.
8. Isolation Barrier Access Provisions: Permit checking of bus-bolt tightness.

T. Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of circuit-breaker compartment.

U. Bus-Bar Insulation: Factory-applied, flame-retardant, tape wrapping of individual bus bars or flame-retardant, spray-applied insulation. Minimum insulation temperature rating of 105 deg C.

2.3 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. 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 with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:

    a. Instantaneous trip.
    b. Long- and short-time pickup levels.
    c. Long and short time adjustments.
    d. Ground-fault pickup level, time delay, and I squared t response.
4. MCCB Features and Accessories:

    a. Standard frame sizes, trip ratings, and number of poles.
    b. Lugs: Compression style, suitable for number, size, trip ratings, and conductor material.

2.4 ACCESSORY COMPONENTS AND FEATURES

A. Portable Test Set: For testing functions of solid-state trip devices without removing from switchboard.

2.5 IDENTIFICATION

A. Service Equipment Label: NRTL labeled for use as service equipment for switchboards with one or more service disconnecting and overcurrent protective devices.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store switchboards according to NECA 400.

1. Lift or move panelboards with spreader bars and manufacturer-supplied lifting straps following manufacturer's instructions.
2. Use rollers, slings, or other manufacturer-approved methods if lifting straps are not furnished.
3. Protect from moisture, dust, dirt, and debris during storage and installation.
4. Install temporary heating during storage per manufacturer's instructions.

B. Examine switchboards before installation. Reject switchboards that are moisture damaged or physically damaged.

C. Examine elements and surfaces to receive switchboards for compliance with installation tolerances and other conditions affecting performance of the Work or that affect the performance of the equipment.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install switchboards and accessories according to NECA 400.

B. Equipment Mounting: Install switchboards on concrete base, 4-inch nominal thickness. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete."

1. Install conduits entering underneath the switchboard, entering under the vertical section where the conductors will terminate. Install with couplings flush with the concrete base. Extend 2 inches above concrete base after switchboard is anchored in place.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
3. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to switchboards.
6. Anchor switchboard to building structure at the top of the switchboard if required or recommended by the manufacturer.

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, straps and brackets, and temporary blocking of moving parts from switchboard units and components.

D. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."

E. Operating Instructions: Frame and mount the printed basic operating instructions for switchboards, including control and key interlocking sequences and emergency procedures. Fabricate frame of finished wood or metal and cover instructions with clear acrylic plastic. Mount on front of switchboards.

F. Install filler plates in unused spaces of panel-mounted sections.

G. Install overcurrent protective devices, surge protection devices, and instrumentation.

1. Set field-adjustable switches and circuit-breaker trip ranges.

H. Comply with NECA 1.

3.3 CONNECTIONS

A. Bond conduits entering underneath the switchboard to the equipment ground bus with a bonding conductor sized per NFPA 70.

B. Support and secure conductors within the switchboard according to NFPA 70.

C. Extend insulated equipment grounding cable to busway ground connection and support cable at intervals in vertical run.

3.4 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

B. Switchboard Nameplates: Label each switchboard compartment with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

C. Device Nameplates: Label each disconnecting and overcurrent protective device and each meter and control device mounted in compartment doors with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.5 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 tests and inspections.

1. Acceptance Testing:

   a. Test insulation resistance for each switchboard bus, component, connecting supply, feeder, and control circuit. Open control and metering circuits within the switchboard, and remove neutral connection to surge protection and other electronic devices prior to insulation test. Reconnect after test.
   b. Test continuity of each circuit.

2. Test ground-fault protection of equipment for service equipment per NFPA 70.
3. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
4. Correct malfunctioning units on-site where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
5. Perform the following infrared scan tests and inspections, and prepare reports:

   a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each switchboard. Remove front panels so joints and connections are accessible to portable scanner.
   b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switchboard 11 months after date of Substantial Completion.
   c. Instruments and Equipment:

      1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

6. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

C. Switchboard will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports, including a certified report that identifies switchboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Section 260573.16 "Coordination Studies."

3.7 PROTECTION

A. Temporary Heating: Apply temporary heat, to maintain temperature according to manufacturer's written instructions, until switchboard is ready to be energized and placed into service.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain switchboards, overcurrent protective devices, instrumentation, and accessories.

END OF SECTION 262413

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SECTION 262416 - PANELBOARDS

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. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.

1.3 DEFINITIONS

A. ATS: Acceptance testing specification.

B. GFCI: Ground-fault circuit interrupter.

C. GFEP: Ground-fault equipment protection.

D. MCCB: Molded-case circuit breaker.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of panelboard.

1. Include materials, switching and overcurrent protective devices, SPDs, accessories, and components indicated.
2. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details.
2. Show tabulations of installed devices with nameplates, conductor termination sizes, equipment features, and ratings.
3. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
4. Detail bus configuration, current, and voltage ratings.
5. Short-circuit current rating of panelboards and overcurrent protective 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. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device. Include an Internet link for electronic access to downloadable PDF of the coordination curves.

1.5 INFORMATIONAL SUBMITTALS

A. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Keys: Two spares for each type of panelboard cabinet lock.
2. Circuit Breakers Including GFCI and GFEP Types: Two spares for each panelboard.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: ISO 9001 or ISO 9002 certified.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.

B. Handle and prepare panelboards for installation according to NECA 407.

1.10 FIELD CONDITIONS

A. Environmental Limitations:

1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

a. Ambient Temperature: Not exceeding 23 deg F to plus 104 deg F.
b. Altitude: Not exceeding 6600 feet.

1.11 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 AND LOAD CENTERS COMMON REQUIREMENTS

A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Section 260548.16 "Seismic Controls for Electrical Systems."

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 PB 1.

D. Comply with NFPA 70.

E. 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. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
d. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

2. Height: 84 inches maximum.

3. 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.
4. Finishes:

    a. Panels and Trim: galvanized steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
    b. Back Boxes: Same finish as panels and trim.

F. Incoming Mains:

1. Location: Top or Bottom.
2. Main Breaker: Main lug interiors up to 400 amperes shall be field convertible to main breaker.

G. Phase, Neutral, and Ground Buses:

1. Material: Tin-plated aluminum or Hard-drawn copper, 98 percent conductivity.

    a. Plating shall run entire length of bus.
    b. Bus shall be fully rated the entire length.

2. Interiors shall be factory assembled into a unit. Replacing switching and protective devices shall not disturb adjacent units or require removing the main bus connectors.
3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
4. Full-Sized Neutral: Equipped with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure. Do not mount neutral bus in gutter.
5. Extra-Capacity Neutral Bus: Neutral bus rated 200 percent of phase bus and listed and labeled by an NRTL acceptable to authority having jurisdiction, as suitable for nonlinear loads in electronic-grade panelboards and others designated on Drawings. Connectors shall be sized for double-sized or parallel conductors as indicated on Drawings. Do not mount neutral bus in gutter.

H. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Tin-plated aluminum or Hard-drawn copper, 98 percent conductivity.
2. Terminations shall allow use of 75 deg C rated conductors without derating.
3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.
4. Main and Neutral Lugs: Compression type, with a lug on the neutral bar for each pole in the panelboard.
5. Ground Lugs and Bus-Configured Terminators: Compression type, with a lug on the bar for each pole in the panelboard.
6. Feed-Through Lugs: Compression type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
7. Subfeed (Double) Lugs: Compression type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.

8. Extra-Capacity Neutral Lugs: Rated 200 percent of phase lugs mounted on extra-capacity neutral bus.

I. NRTL Label: Panelboards or load centers 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 or load centers shall have meter enclosures, wiring, connections, and other provisions for utility metering. Coordinate with utility company for exact requirements.

J. Future Devices: Panelboards or load centers shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

K. 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.

1. Panelboards and overcurrent protective devices rated 240 V or less shall have short-circuit ratings as shown on Drawings, but not less than 10,000 A rms symmetrical.
2. Panelboards and overcurrent protective devices rated above 240 V and less than 600 V shall have short-circuit ratings as shown on Drawings, but not less than 14,000 A rms symmetrical.

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

2.3 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. Siemens Industry, Inc., Energy Management Division.
4. Square D; by Schneider Electric.

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 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.

2.4 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. Siemens Industry, Inc., Energy Management Division.
4. Square D; by Schneider Electric.

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Mains: Circuit breaker or lugs only (Refer to Electrical Drawings – One-Line Diagram, Panelboard Schedules).

D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

E. Doors: Door-in-door construction with concealed hinges; secured with multipoint latch with tumbler lock; keyed alike. Outer door shall permit full access to the panel interior. Inner door shall permit access to breaker operating handles and labeling, but current carrying terminals and bus shall remain concealed.

2.5 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. Siemens Industry, Inc., Energy Management Division.
4. Square D; by Schneider Electric.

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. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
4. GFEP Circuit Breakers: Class B ground-fault protection (30-mA trip).
5. Subfeed Circuit Breakers: Vertically mounted.
6. 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: Compression style, suitable for number, size, trip ratings, and conductor materials.
    e. Application Listing: Appropriate for application.
    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 75 percent of rated voltage.
    h. Multipole units enclosed in a single housing with a single handle.
    i. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.
    j. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

2.6 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: Computer-generated circuit directory mounted inside panelboard door with transparent plastic protective cover.

1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify actual conditions with field measurements prior to ordering panelboards to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in NFPA 70.

B. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.

C. Examine panelboards before installation. Reject panelboards that are damaged, rusted, or have been subjected to water saturation.

D. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Comply with NECA 1.

C. Install panelboards and accessories according to NECA 407.

D. Equipment Mounting:

1. Attach panelboard to the vertical finished or structural surface behind the panelboard.
2. Comply with requirements for seismic control devices specified in Section 260548.16 "Seismic Controls for Electrical Systems."

E. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

F. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."

G. Mount top of trim 90 inches above finished floor unless otherwise indicated.

H. Mount panelboard cabinet plumb and rigid without distortion of box.

I. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

J. Mount surface-mounted panelboards to steel slotted supports 1-1/4 inch in depth. Orient steel slotted supports vertically.

K. Install overcurrent protective devices and controllers not already factory installed.

1. Set field-adjustable, circuit-breaker trip ranges.

2. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written instructions.

L. 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.

M. Install filler plates in unused spaces.

N. Stub three (3) 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future.

O. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.

3.3 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 after balancing panelboard 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.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

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. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
2. Perform the following infrared scan tests and inspections and prepare reports:

a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 11 months after date of Substantial Completion.
c. Instruments and Equipment:

1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

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.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Section 260573.16 "Coordination Studies."

C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes. Prior to making circuit changes to achieve load balancing, inform Architect of effect on phase color coding.

1. Measure loads during period of normal facility operations.
2. Perform circuit changes to achieve load balancing outside normal facility operation schedule or at times directed by the Architect. Avoid disrupting services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
3. After changing circuits to achieve load balancing, recheck loads during normal facility operations. Record load readings before and after changing circuits to achieve load balancing.
4. Tolerance: Maximum difference between phase loads, within a panelboard, shall not exceed 20 percent.

3.6 PROTECTION

A. Temporary Heating: Prior to energizing panelboards, apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION 262416

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SECTION 262500 - ENCLOSED BUS ASSEMBLIES

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. Feeder-bus assemblies.
2. Plug-in bus assemblies.
3. Bus plug-in devices.

1.3 DEFINITIONS

A. kAIC: kiloampere interrupting capacity.

B. SPD: Surge protective device.

1.4 ACTION SUBMITTALS

A. Shop Drawings: For each type of product.

1. Show fabrication and installation details for enclosed bus assemblies. Include plans, elevations, and sections of components. Designate components and accessories, including clamps, brackets, hanger rods, connectors, straight lengths, and fittings.
2. Show fittings, materials, fabrication, and installation methods for listed firestop barriers.
3. Indicate required clearances, method of field assembly, and location and size of each field connection.
4. Detail connections to switchgear, switchboards, transformers, and panelboards.
5. Cable and conductor terminal sizes for bus and plug-in device terminations.
6. Wiring Diagrams: Power wiring.

B. Delegated-Design Submittal: For seismic-restraint details, signed and sealed by a qualified professional engineer.

1. Include design calculations for selecting seismic restraints.
2. Detail fabrication, including anchorages and attachments to structure and to supported equipment.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Floor plans and sections, drawn to scale. Include scaled bus-assembly layouts and relationships between components and adjacent structural, mechanical, and electrical elements. Show the following:

1. Vertical and horizontal enclosed bus-assembly runs, offsets, and transitions.
2. Clearances for access above and to the side of enclosed bus assemblies.
3. Vertical elevation of enclosed bus assemblies above the floor or bottom of structure.
4. Support locations, type of support, and weight on each support.
5. Location of adjacent construction elements including luminaires, HVAC and plumbing equipment, fire sprinklers and piping, signal and control devices, and other equipment.

B. Qualification Data: For testing agency.

C. Seismic Qualification Certificates: For enclosed bus assemblies, plug-in devices, accessories, and components.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For enclosed bus assemblies to include in emergency, operation, and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Plug-in Units: 10 percent of amount installed for each size indicated, but no fewer than one unit.

1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA.

1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle enclosed bus assemblies according to NEMA BU 1.1, "General Instructions for Handling, Installation, Operation, and Maintenance of Busway Rated 600 Volts or Less."

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTIONS

A. Source Limitations: Obtain enclosed bus assemblies and plug-in devices from single source from single manufacturer.

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 UL 857.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design enclosed bus assemblies, plug-in devices, and components.

B. Seismic Performance: Enclosed bus assemblies, plug-in devices, and components shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
2. Component Importance Factor: 1.5.

C. Derate enclosed bus assemblies for continuous operation at indicated ampere ratings for ambient temperature not exceeding 122 deg F.

2.3 ENCLOSED BUS ASSEMBLIES

A. Feeder-Bus Assemblies: Low-impedance bus assemblies in totally enclosed, nonventilated housing; single-bolt joints; ratings as indicated.
1. Seismic Fabrication Requirements: Fabricate mounting provisions and attachments for feeder-bus assemblies with reinforcement strong enough to withstand seismic forces defined in Section 260548.16 "Seismic Controls for Electrical Systems" when mounting provisions and attachments are anchored to building structure
2. Electrical Characteristics:

a. Voltage:277/480 V.

b. Phase: Three/ 4 wire.
c. Percent of Neutral Capacity: 100.

3. Short-Circuit Interrupting Rating:

a. For Bus Amperage of 800: 85 symmetrical kAIC.
b. For Bus Amperage of 1200: 100 symmetrical kAIC.
c. For Bus Amperage of 1600: 125 symmetrical kAIC.
d. For Bus Amperage of 2500: 150 symmetrical kAIC.
e. For Bus Amperage of 5000: 200 symmetrical kAIC.

4. Temperature Rise: 55 deg C above 40 deg C ambient maximum for continuous rated current.
5. Bus Materials: Current-carrying aluminum conductors, fully insulated with Class 130C insulation except at joints; plated surface at joints.
6. Voltage Drop:

a. Measure voltage drop at 30 deg C ambient with bus thermally stabilized at full rated load.
b. Three-phase, line-to-line voltage drop less than 3.1 V per 100 feet at 40 percent power factor.

7. Ground: 50 percent capacity, integral with housing.
8. Ground: 50 percent capacity, internal bus bar of material matching bus material.
9. Ground: 50 percent capacity, isolated, internal bus bar of material matching bus material.
10. Enclosure: Steel, with manufacturer's standard finish.
11. Fittings and Accessories: Manufacturer's standard.
12. Firestop: Comply with UL 1479 firestop system, listed and labeled by an NRTL acceptable to authorities having jurisdiction for penetrations of fire-rated walls, ceilings, and floors.
13. Mounting: Arranged flat, edgewise, or vertically without derating. Rated for hanger spacing of up to 10 feet for horizontally mounted runs and up to 16 feet for vertically mounted runs.
14. Expansion Section: Manufacturer's standard expansion fitting for the provided busway with expansion capability to accommodate thermal expansion of bus and enclosure, and to accommodate movement across building expansion joints.

B. Plug-in Bus Assemblies: Low-impedance bus assemblies in totally enclosed, nonventilated housing; single-bolt joints; ratings as indicated.
1. Electrical Characteristics:

a. Voltage: 277/480 V.
b. Phase: Three; 4 wire.
c. Percent of Neutral Capacity: 100.

2. Short-Circuit Interrupting Rating:

a. For Bus Amperage of 800: 85 symmetrical kAIC.
b. For Bus Amperage of 1200: 100 symmetrical kAIC.

c. For Bus Amperage of 1600: 125 symmetrical kAIC.
d. For Bus Amperage of 2500: 150 symmetrical kAIC.
e. For Bus Amperage of 5000: 200 symmetrical kAIC.

3. Temperature Rise: 55 deg C above 40 deg C ambient maximum for continuous rated current.
4. Bus Materials: Current-carrying copper or aluminum conductors, fully insulated with Class 130C insulation except at stabs and joints; plated surface at stabs and joints.
5. Ground: 50 percent capacity, integral with housing.
6. Ground: 50 percent capacity, internal bus bar of material matching bus material.
7. Ground: 50 percent capacity, isolated, internal bus bar of material matching bus material.
8. Enclosure: Steel, with manufacturer's standard finish.
9. Plug-in Openings: 24 inches o.c. on each side of bus, and hinged covers over unused openings. Plug-in openings shall be finger-safe with covers open or closed.
10. Fittings and Accessories: Manufacturer's standard.
11. Firestop: Comply with UL 1479 firestop system, listed and labeled by an NRTL acceptable to authorities having jurisdiction for penetrations of fire-rated walls, ceilings, and floors.
12. Mounting: Arranged flat, edgewise, or vertically without derating. Rated for hanger spacing of up to 10 feet for horizontally mounted runs and up to 16 feet for vertically mounted runs.
13. Expansion Section: Manufacturer's standard expansion fitting for the provided busway with expansion capability to accommodate thermal expansion of bus and enclosure, and to accommodate movement across building expansion joints.

C. Joints:

1. Busway joints shall use one high-strength steel bolt with Belleville washers.
2. Bolts shall be torque indicating type and at ground potential.
3. Bolts shall be two-headed design to indicate when proper torque has been applied and require only a standard long handle wrench to be properly activated.
4. Access shall be required to only one side of the busway for tightening joint bolts.
5. Joint connection assemblies shall be removable without disturbing adjacent busway lengths.
6. Joint connection assemblies that rely on the joint cover to provide ground continuity are unacceptable.

2.4 PLUG-IN DEVICES

A. Fusible Switches: NEMA KS 1, heavy duty; with [**R-type rejection**] [**J-type**] [**L-type**] fuse clips to accommodate specified fuses; hookstick-operated handle, lockable with two padlocks, and interlocked with cover in closed position. Interlocked to prevent plug-in device insertion into or removal from bus with switch in closed position. See Section 262813 "Fuses" for fuses and fuse installation requirements.

B. Molded-Case Circuit Breakers: UL 489; hookstick-operated handle, lockable with two padlocks, and interlocked with cover in closed position. Interlocked to prevent plug-in device insertion into or removal from bus with switch in closed position.

C. SPD: NEMA 250, Type 1 enclosure with NEMA KS 1, fusible, disconnect switch and external handle to isolate SPD from busway. SPD product and installation requirements are specified in Section 264313 "Surge Protection for Low-Voltage Electrical Power Circuits."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Coordinate layout and installation of enclosed bus assemblies and suspension system with other construction that penetrates ceilings or floors or is supported by them, including luminaires, HVAC equipment, fire-suppression system, and partition assemblies.

B. Equipment Mounting:

1. Install enclosed bus assemblies on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
2. Coordinate size and location of concrete curbs around openings for vertical bus. Concrete, reinforcement, and formwork requirements are specified with concrete.

C. Support bus assemblies independent of supports for other elements such as equipment enclosures at connections to panelboards and switchboards, pipes, conduits, ceilings, and ducts.

1. Design each fastener and support to carry load indicated by seismic requirements and to comply with seismic-restraint details according to Section 260548.16 "Seismic Controls for Electrical Systems."
2. Design each fastener and support to carry 200 lb or 4 times the weight of bus assembly, whichever is greater.
3. Support bus assembly to prevent twisting from eccentric loading.
4. Support bus assembly with not less than 3/8-inch steel rods. Install side bracing to prevent swaying or movement of bus assembly. Modify supports after completion to eliminate strains and stresses on bus bars and housings.
5. Fasten supports securely to building structure according to Section 260529 "Hangers and Supports for Electrical Systems."
6. Bolts and nuts that are loosened for any reason after tightening to manufacturer's recommended torque setting shall be discarded and replaced with new bolts and nuts.

D. Install expansion fittings at locations where bus assemblies cross building expansion joints. Install at other locations so distance between expansion fittings does not exceed manufacturer's recommended distance between fittings.

E. Construct rated firestop assemblies where bus assemblies penetrate fire-rated elements such as walls, floors, and ceilings. Seal around penetrations according to Section 078413 "Penetration Firestopping."

F. Install weatherseal fittings and flanges where bus assemblies penetrate exterior elements such as walls or roofs. Seal around openings to make weathertight. See Section 079200 "Joint Sealants" for materials and application.

G. Coordinate bus-assembly terminations to equipment enclosures to ensure proper phasing, connection, and closure.

H. Tighten bus-assembly joints with torque wrench or similar tool recommended by bus-assembly manufacturer. Tighten joints again after bus assemblies have been energized for 30 days.

I. Install bus-assembly, plug-in units. Support connecting conduit independent of plug-in unit.

J. Comply with NECA 1.

3.2 CONNECTIONS

A. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

B. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. Terminate to transformer enclosures with matching bus assemblies according to Section 262200 "Low-Voltage Transformers."

D. Terminate to switchgear enclosures with matching bus assemblies according to Section 262300 "Low-Voltage Switchgear."

E. Terminate to switchboard enclosures with matching bus assemblies according to Section 262413 "Switchboards."

F. Terminate to panelboard enclosures with matching bus assemblies according to Section 262416 "Panelboards."

G. Terminate to motor-control centers enclosures with matching bus assemblies according to Section 262419 "Motor-Control Centers."

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. After installing equipment test, for compliance with requirements according to NETA ATS.

2. Visual and Mechanical Inspection:

    a. Compare equipment nameplate data with Drawings and Specifications.
    b. Inspect physical and mechanical condition.
    c. Inspect anchorage, alignment, and grounding.
    d. Verify correct connection according to single-line diagram.
    e. Inspect bolted electrical connections for high resistance using one or more of the following methods:

        1) Use of low-resistance ohmmeter.
        2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method according to manufacturer's published data.
        3) Perform thermographic survey.

3. Electrical Tests:

    a. Perform insulation resistance measurements through bolted connections and bus joints with low-resistance ohmmeter.
    b. Perform insulation resistance tests of each busway, phase to phase, and phase to ground.
    c. Perform a dielectric withstand voltage test on each busway, phase to ground with phases not under test grounded for one minute.
    d. Measure resistance of assembled busway sections on insulated busway and compare values with adjacent phases.
    e. Perform phasing test on each busway tie section energized by separate sources.
    f. Verify operation of busway space heaters.

B. Test Labeling: On completion of satisfactory testing of each unit, attach a dated and signed "Satisfactory Test" label to tested component.

C. Enclosed bus assemblies will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.4 ADJUSTING

A. Set field-adjustable, circuit-breaker trip ranges and overload relay trip settings as indicated.

3.5 CLEANING

A. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

3.6 PROTECTION

A. Provide final protection to ensure that moisture does not enter bus assembly.

END OF SECTION 262500

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SECTION 262726 - WIRING DEVICES

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-grade receptacles, 125 V, 20 A.
2. USB receptacles.
3. GFCI receptacles, 125 V, 20 A.
4. Toggle switches, 120/277 V, 20 A.
5. Wall-box dimmers.
6. Wall plates.
7. Floor service fittings.

1.3 DEFINITIONS

A. BAS: Building automation system.

B. GFCI: Ground-fault circuit interrupter.

C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

1.4 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.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Floor Service-Outlet Assemblies: One for every 10, but no fewer than one.

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. RoHS compliant.

C. Comply with NFPA 70.

D. Comply with NEMA WD 1.

E. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:

1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
2. Devices shall comply with requirements in this Section.

F. Devices for Owner-Furnished Equipment:

1. Receptacles: Match plug configurations.
2. Cord and Plug Sets: Match equipment requirements.

G. Device Color:

1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
2. Wiring Devices Connected to Uninterruptible Power System ‘UPS’: Red.

H. Wall Plate Color: For plastic covers, match device color.

I. 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) #5351 (single), CR5362 (duplex).
b. Hubbell Incorporated; Wiring Device-Kellems #HBL5351 (single), #HBL5352 (duplex).
c. Leviton Manufacturing Co., Inc #5891 (single), #5352 (duplex).
d. Pass & Seymour/Legrand (Pass & Seymour) #5361 (single), #5362 (duplex).

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. Tamper-Resistant 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. Pass & Seymour/Legrand (Pass & Seymour).

2. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle.

3. Configuration: NEMA WD 6, Configuration 5-20R.
4. Standards: Comply with UL 498 and FS W-C-596.
5. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" Article.

2.3 USB RECEPTACLES

A. USB Charging Receptacles:

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. Pass & Seymour/Legrand (Pass & Seymour).

2. Description: Single-piece, rivetless, nickel-plated, all-brass grounding system. Nickel-plated, brass mounting strap.

3. USB Receptacles: Dual, USB Type A, 5 V dc, and 2.1 A per receptacle (minimum).
4. Standards: Comply with UL 1310 and USB 3.0 devices.

B. Tamper-Resistant Duplex and USB Charging Receptacles:

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. Pass & Seymour/Legrand (Pass & Seymour).

2. Description: Single-piece, rivetless, nickel-plated, all-brass grounding system. Nickel-plated, brass mounting strap. Integral shutters that operate only when a plug is inserted in the line voltage receptacle.

3. Line Voltage Receptacles: Two pole, three wire, and self-grounding; NEMA WD 6, Configuration 5-20R.
4. USB Receptacles: Dual USB Type A, 5 V dc, and 2.1 A per receptacle (minimum).
5. Standards: Comply with UL 498, UL 1310, USB 3.0 devices, and FS W-C-596.
6. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" Article.

2.4 GFCI RECEPTACLES, 125 V, 20 A

A. Duplex GFCI Receptacles, 125 V, 20 A
1. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding.
2. Configuration: NEMA WD 6, Configuration 5-20R.
3. Type: Non-feed through.
4. Standards: Comply with UL 498, UL 943 Class A, and FS W-C-596.

B. Tamper-Resistant Duplex GFCI Receptacles, 125 V, 20 A
1. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle.
2. Configuration: NEMA WD 6, Configuration 5-20R.
3. Type: Non-feed through.
4. Standards: Comply with UL 498, UL 943 Class A, and FS W-C-596.
5. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" Article.

C. Tamper- and Weather-Resistant, GFCI Duplex Receptacles, 125 V, 20 A

1. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
2. Configuration: NEMA WD 6, Configuration 5-15R.
3. Type: Non-feed through.
4. Standards: Comply with UL 498 and UL 943 Class A.
5. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" and "Receptacles in Damp or Wet Locations" articles.

2.5 TOGGLE SWITCHES, 120/277 V, 20 A

A. Single-Pole Switches, 120/277 V, 20 A
   1. Standards: Comply with UL 20 and FS W-S-896.

B. Two-Pole Switches, 120/277 V, 20 A
   1. Comply with UL 20 and FS W-S-896.

C. Three-Way Switches, 120/277 V, 20 A
   1. Comply with UL 20 and FS W-S-896.

D. Four-Way Switches, 120/277 V, 20 A
   1. Standards: Comply with UL 20 and FS W-S-896.
   2. Standards: Comply with UL 20 and FS W-S-896.

E. Lighted Single-Pole Switches, 120/277 V, 20 A:
   1. Description: Handle illuminated when switch is on.
   2. Standards: Comply with NEMA WD 1, UL 20, and FS W-S-896.

2.6 DIMMERS

A. Wall-Box Dimmers:
   1. Description: Modular, full-wave, solid-state dimmer switch with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.
   2. Control: Continuously adjustable slider; with single-pole or three-way switching.
   3. Standards: Comply with UL 1472.
   4. LED Lamp Dimmer Switches: Modular; compatible with LED lamps; trim potentiometer to adjust low-end dimming; capable of consistent dimming with low end not greater than 20 percent of full brightness.

2.7 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: Cast aluminum with spring-loaded lift cover and listed and labeled for use in wet and damp locations.

5. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

6. Detention areas heavy gauge steel security grade fasteners.

2.8 FLOOR SERVICE FITTINGS

A. Flush-Type Floor Service Fittings:
   1. Description: Type: Modular, flush-type, dual-service units suitable for wiring method used, with cover flush with finished floor.
   2. Compartments: Barrier separates power from voice and data communication cabling.
   3. Service Plate and Cover: Rectangular with satin finish.
   4. Power Receptacle: NEMA WD 6 Configuration 5-20R, gray finish, unless otherwise indicated.
   5. Data Communication Outlet: Two modular, keyed, color-coded, RJ-45 jacks for twisted pair cable, complying with requirements in Section 271513 "Communications Copper Horizontal Cabling."

2.9 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

   1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes, and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
   2. 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.
   3. 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.
   4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

   1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.

2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall comply with NFPA 70, Article 300, without pigtails.
4. Existing Conductors:

    a. Cut back and pigtail or replace all damaged conductors.
    b. Straighten conductors that remain and remove corrosion and foreign matter.
    c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

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. Dimmers:

1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan-speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device, listing conditions in the written instructions.

G. 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.

H. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

2.10 GFCI RECEPTACLES

A. Install non-feed-through GFCI receptacles where protection of downstream receptacles is not required.

2.11 IDENTIFICATION

A. Comply with Section 260553 "Identification for Electrical Systems."

B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

C. Essential Electrical System: Mark receptacles supplied from the essential electrical system to allow easy identification using a self-adhesive label.

2.12 FIELD QUALITY CONTROL

A. Test Instruments: Use instruments that comply with UL 1436.

B. Test Instrument for Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

C. Perform the following tests and inspections:
1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

D. 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.
6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault-current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

E. Test straight-blade for the retention force of the grounding blade according to NFPA 99. Retention force shall be not less than 4 oz.

F. Wiring device will be considered defective if it does not pass tests and inspections.

G. Prepare test and inspection reports.

END OF SECTION 262726

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SECTION 262813 - FUSES

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. Cartridge fuses rated 600 V ac and less for use in the following:

    a. Control circuits.
    b. Motor-control centers.
    c. Panelboards.
    d. Switchboards.
    e. Enclosed controllers.
    f. Enclosed switches.

2. Spare-fuse cabinets.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:

1. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
2. Current-limitation curves for fuses with current-limiting characteristics.
3. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse. Submit in electronic format suitable for use in coordination software and in PDF format.
4. Coordination charts and tables and related data.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Ambient temperature adjustment information.
2. Current-limitation curves for fuses with current-limiting characteristics.
3. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse used on the Project.
4. Coordination charts and tables and related data.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.

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. Ferras Shawmut, Inc.
4. Littelfuse, Inc.

B. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.

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: 600-V, zero- to 600-A rating, 200k AIC, time delay.
2. Type CC: 600-V, zero- to 30-A rating, 200k AIC, 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.

2.3 SPARE-FUSE CABINET

A. Characteristics: Wall-mounted steel unit with full-length, recessed piano-hinged door and key-coded cam lock and pull.

1. Size: Adequate for storage of spare fuses specified with 15 percent spare capacity minimum.
2. Finish: Gray, baked enamel.
3. Identification: "SPARE FUSES" in 1-1/2-inch-high letters on exterior of door.
4. Fuse Pullers: For each size of fuse, where applicable and available, from fuse manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.

B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.

C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

A. Cartridge Fuses:

1. Feeders: Class RK1, time delay.
2. Motor Branch Circuits: Class RK1, time delay.
3. Other Branch Circuits: Class RK1, time delay.
4. Control Transformer Circuits: Class CC, time delay, control transformer duty.

3.3 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 Construction Manager.

3.4 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 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Nonfusible switches.
3. Molded-case circuit breakers (MCCBs).
4. Enclosures.

1.3 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. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current ratings (interrupting and withstand, as appropriate).
4. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
5. 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 wiring diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Data: Certificates, for enclosed switches and circuit breakers, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

a. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
b. 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.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
2. Fuse Pullers: Two for each size and type.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
2. Altitude: Not exceeding 6600 feet.

1.8 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(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2.2 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. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

C. Comply with NFPA 70.

2.3 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.
5. Square D; by Schneider Electric.

B. Type HD, Heavy Duty:

1. Single throw.
2. Three pole.
3. 600-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. Hookstick Handle: Allows use of a hookstick to operate the handle.
5. Lugs: Compression type, suitable for number, size, and conductor material.

2.4 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.
4. Square D; by Schneider Electric.

B. Type HD, Heavy Duty, Three Pole, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, 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. Hookstick Handle: Allows use of a hookstick to operate the handle.
4. Lugs: Compression type, suitable for number, size, and conductor material.

2.5 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. Siemens Industry, Inc., Energy Management Division.
4. Square D; by Schneider Electric.

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 140 deg F rated wire on 125-A circuit breakers and below.

G. Standard: Comply with UL 489 with interrupting capacity to comply with available fault currents.

H. Thermal-Magnetic Circuit Breakers: Inverse time-current thermal element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

I. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

J. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:

1. Instantaneous trip.
2. Long- and short-time pickup levels.
3. Long- and short-time time adjustments.
4. Ground-fault pickup level, time delay, and I-squared t response.

K. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.

L. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker and trip activation on fuse opening or on opening of fuse compartment door.

M. Ground-Fault Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).

N. Ground-Fault Equipment-Protection (GFEP) Circuit Breakers: With Class B ground-fault protection (30-mA trip).

O. Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Compression type, suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Appropriate for application;
4. Ground-Fault Protection: Comply with UL 1053; integrally mounted, self-powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
5. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
6. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
7. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
8. Electrical Operator: Provide remote control for on, off, and reset operations.
9. Accessory Control Power Voltage: Integrally mounted, self-powered.

2.6 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) gray baked enamel paint, electrodeposited on cleaned, phosphatized galvannealed steel (NEMA 250 Types 3R, 12) a brush finish on Type 304 stainless steel (NEMA 250 Type 4-4X stainless steel) copper-free cast aluminum alloy (NEMA 250 Types 7, 9).

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 externally operable with the operating mechanism being an integral part of the box, not the cover. 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 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Commencement of work shall indicate Installer's acceptance of the areas and conditions as satisfactory.

3.2 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. Kitchen Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.

3.3 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. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."

D. Temporary Lifting Provisions: Remove temporary lifting of eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

E. Install fuses in fusible devices.

F. Comply with NFPA 70 and NECA 1.

3.4 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.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. 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. Verify that operation and sequencing of interlocking systems is as described in the Specifications and shown on the Drawings.
h. Verify correct phase barrier installation.
i. Verify lubrication of moving current-carrying parts and moving and sliding surfaces.

C. 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 operating mechanism, contacts, and chutes in unsealed units.
g. Perform adjustments for final protective device settings in accordance with the coordination study.

2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:

a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and

circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.

b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each enclosed switch and circuit breaker 11 months after date of Substantial Completion.

c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

E. 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.

3.6 ADJUSTING

A. Adjust moving parts and operable components to function smoothly and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Section 260573.16 "Coordination Studies."

END OF SECTION 262816

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SECTION 262913.03 - MANUAL AND MAGNETIC MOTOR CONTROLLERS

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. Manual motor controllers.
2. Enclosed full-voltage magnetic motor controllers.
3. Enclosures.
4. Accessories.
5. Identification.

1.3 DEFINITIONS

A. CPT: Control power transformer.

B. MCCB: Molded-case circuit breaker.

C. MCP: Motor circuit protector.

D. NC: Normally closed.

E. OCPD: Overcurrent protective device.

F. SCCR: Short-circuit current rating.

G. SCPD: Short-circuit protective device.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For each type of magnetic controller.

1. Include plans, elevations, sections, and mounting details.
2. Indicate dimensions, weights, required clearances, and location and size of each field connection.
3. Wire Termination Diagrams and Schedules: Include diagrams for 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 features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

C. Product Schedule: List the following for each enclosed controller:

1. Each installed magnetic controller type.
2. NRTL listing.
3. Factory-installed accessories.
4. Nameplate legends.
5. SCCR of integrated unit.

1.5 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Data: Certificates, for magnetic controllers, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For magnetic controllers to include in operation and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

a. Routine maintenance requirements for magnetic controllers and installed components.
b. Manufacturer's written instructions for testing and adjusting circuit breaker and MCP trip settings.
c. Manufacturer's written instructions for setting field-adjustable overload relays.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
2. Control Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.
3. Indicating Lights: Two of each type and color installed.
4. Auxiliary Contacts: Furnish one spare(s) for each size and type of magnetic controller installed.
5. Power Contacts: Furnish three spares for each size and type of magnetic contactor installed.

1.8 QUALITY ASSURANCE

1.9 DELIVERY, STORAGE, AND HANDLING

A. Store controllers indoors in clean, dry space with uniform temperature to prevent condensation. Protect controllers from exposure to dirt, fumes, water, corrosive substances, and physical damage.

B. If stored in areas subject to weather, cover controllers to protect them from weather, dirt, dust, corrosive substances, and physical damage. Remove loose packing and flammable materials from inside controllers; install temporary electric heating, with at least 250 W per controller.

1.10 FIELD CONDITIONS

A. Ambient Environment Ratings: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than23 deg F and not exceeding 104 deg F.
2. Altitude: Not exceeding 6600 feet for electromagnetic and manual devices.

PART 2 - PRODUCTS

2.1 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 use.

B. UL Compliance: Fabricate and label magnetic motor controllers to comply with UL 508 and UL 60947-4-1.

C. NEMA Compliance: Fabricate motor controllers to comply with ICS 2.

D. Seismic Performance: Magnetic controllers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the controller will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
2. Component Importance Factor: **1.5**

2.2 MANUAL MOTOR CONTROLLERS

A. Motor-Starting Switches (MSS): "Quick-make, quick-break" toggle or push-button action; marked to show whether unit is off or on.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Eaton.
b. General Electric Company.
c. Rockwell Automation, Inc.
d. Siemens Industry, Inc., Energy Management Division.
e. Square D; by Schneider Electric.

2. Standard: Comply with NEMA ICS 2, general purpose, Class A.

3. Configuration: Nonreversing.
4. Surface mounting.
5. Red (ENERGIZED) LED pilot light.

B. Fractional Horsepower Manual Controllers (FHPMC): "Quick-make, quick-break" toggle or push-button action; marked to show whether unit is off, on, or tripped.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Eaton.
b. General Electric Company.
c. Rockwell Automation, Inc.
d. Siemens Industry, Inc., Energy Management Division.
e. Square D; by Schneider Electric.

2. Configuration: Nonreversing.

3. Overload Relays: Inverse-time-current characteristics; NEMA ICS 2, Class 10 tripping characteristics; heaters matched to nameplate full-load current of actual protected motor; external reset push button; bimetallic type.
4. Pilot Light: Red (RUN); Amber (OVERLOAD TRIPPED) LED.

2.3 ENCLOSED FULL-VOLTAGE MAGNETIC MOTOR CONTROLLERS

A. Description: Across-the-line start, electrically held, for nominal system voltage of 600-V ac and less.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton.
2. General Electric Company.
3. Rockwell Automation, Inc.
4. Siemens Industry, Inc., Energy Management Division.
5. Square D; by Schneider Electric.

C. Standard: Comply with NEMA ICS 2, general purpose, Class A.

D. Configuration: Nonreversing.

E. Contactor Coils: Pressure-encapsulated type with coil transient suppressors.

1. Operating Voltage: Manufacturer's standard, unless indicated.

F. Control Power:

1. For on-board control power, obtain from line circuit or from integral CPT. The CPT shall have capacity to operate integral devices and remotely located pilot, indicating, and control devices.

a. Spare CPT Capacity as Indicated on Drawings: 200 VA.

G. Overload Relays:

1. Solid-State Overload Relay:

a. Switch or dial selectable for motor-running overload protection.
b. Sensors in each phase.
c. Class 10/20 selectable tripping characteristic selected to protect motor against voltage and current unbalance and single phasing.
d. Class II ground-fault protection shall comply with UL 1053 to interrupt low-level ground faults. The ground-fault detection system shall include circuitry that will prevent the motor controller from tripping when the fault current exceeds the interrupting capacity of the controller. Equip with start and run delays to prevent nuisance trip on starting, and a trip indicator.

2.4 ENCLOSURES

A. Comply with NEMA 250, type designations as indicated on Drawings, complying with environmental conditions at installed location.

B. The construction of the enclosures shall comply with NEMA ICS 6.

C. Controllers in hazardous (classified) locations shall comply with UL 1203.

2.5 ACCESSORIES

A. General Requirements for Control Circuit and Pilot Devices: NEMA ICS 5; factory installed in controller enclosure cover unless otherwise indicated.

1. Push Buttons, Pilot Lights, and Selector Switches: Standard-duty, except as needed to match enclosure type. Heavy-duty or oil-tight where indicated in the controller schedule.

a. Push Buttons: As indicated in the controller schedule.
b. Pilot Lights: As indicated in the controller schedule.

2. Elapsed Time Meters: Heavy duty with digital readout in hours; resettable.

B. Reversible N.C. / N.O. auxiliary contact(s).

C. Control Relays: Auxiliary and adjustable solid-state time-delay relays.

D. Breather assemblies, to maintain interior pressure and release condensation in Type 4X enclosures installed outdoors or in unconditioned interior spaces subject to humidity and temperature swings.

E. Spare control wiring terminal blocks, quantity as indicated; wired.

2.6 IDENTIFICATION

A. Controller Nameplates: Laminated acrylic or melamine plastic signs, as described in Section 260553 "Identification for Electrical Systems," for each compartment, mounted with corrosion-resistant screws.

B. Arc-Flash Warning Labels:

1. Comply with requirements in Section 260573.19 "Arc-Flash Hazard Analysis." Produce a 3.5-by-5-inch self-adhesive equipment label for each work location included in the analysis.
2. Comply with requirements in Section 260553 "Identification for Electrical Systems." Produce a 3.5-by-5-inch self-adhesive equipment 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.

b. Labels shall be machine printed, with no field-applied markings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and space conditions for compliance with requirements for motor controllers, their relationship with the motors, and other conditions affecting performance of the Work.

3.2 INSTALLATION

A. Comply with NECA 1.

B. Wall-Mounted Controllers: Install magnetic controllers on walls with tops at uniform height indicated, and by bolting units to wall or mounting on lightweight structural-steel channels bolted to wall. For controllers not at walls, provide freestanding racks complying with Section 260529 "Hangers and Supports for Electrical Systems" unless otherwise indicated.

C. Comply with requirements for seismic control devices specified in Section 260548.16 "Seismic Controls for Electrical Systems."

D. Maintain minimum clearances and workspace at equipment according to manufacturer's written instructions and NFPA 70.

E. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

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. Perform tests and inspections.

B. Tests and Inspections:

1. Comply with the provisions of NFPA 70B, "Testing and Test Methods" Chapter.
2. Visual and Mechanical Inspection:

a. Compare equipment nameplate data with drawings and specifications.
b. Inspect physical and mechanical condition.
c. Inspect anchorage, alignment, and grounding.
d. Verify the unit is clean.
e. Inspect contactors:

1) Verify mechanical operation.
2) Verify contact gap, wipe, alignment, and pressure are according to manufacturer's published data.

f. Motor-Running Protection:

1) Verify overload element rating is correct for its application.
2) If motor-running protection is provided by fuses, verify correct fuse rating.

g. Inspect bolted electrical connections for high resistance using one of the two following methods:

1) Use a low-resistance ohmmeter. Compare bolted connection resistance values with 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 according to manufacturer's published data or NETA ATS Table 100.12. Bolt-torque levels shall be according to manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.

h. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.

3. Infrared Inspection: Perform the survey during periods of maximum possible loading. Remove all necessary covers prior to the inspection.

a. Comply with the recommendations of NFPA 70B, "Testing and Test Methods" Chapter, "Infrared Inspection" Article.
b. After Substantial Completion, but not more than 60 days after Final Acceptance, perform infrared inspection of the electrical power connections of each motor controller.

c. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each motor controller 11 months after date of Substantial Completion.
d. Report of Infrared Inspection: Prepare a certified report that identifies the testing technician and equipment used, and lists the following results:

1) Description of equipment to be tested.
2) Discrepancies.
3) Temperature difference between the area of concern and the reference area.
4) Probable cause of temperature difference.
5) Areas inspected. Identify inaccessible and unobservable areas and equipment.
6) Load conditions at time of inspection.
7) Photographs and thermograms of the deficient area.
8) Recommended action.

e. Equipment: Inspect distribution systems with imaging equipment capable of detecting a minimum temperature difference of 1 deg C at 30 deg C. The equipment shall detect emitted radiation and convert detected radiation to a visual signal.
f. Act on inspection results and recommended action, and considering the recommendations of NETA ATS, Table 100.18. Correct possible and probable deficiencies as soon as Owner's operations permit. Retest until deficiencies are corrected.

C. Motor controller will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.5 SYSTEM FUNCTION TESTS

A. System function tests shall prove the correct interaction of sensing, processing, and action devices. Perform system function tests after field quality control tests have been completed and all components have passed specified tests.

1. Develop test parameters and perform tests for the purpose of evaluating performance of integral components and their functioning as a complete unit within design requirements and manufacturer's published data.
2. Verify the correct operation of interlock safety devices for fail-safe functions in addition to design function.
3. Verify the correct operation of sensing devices, alarms, and indicating devices.

B. Motor controller will be considered defective if it does not pass the system function tests and inspections.

C. Prepare test and inspection reports.

3.6 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain switchgear.

END OF SECTION 262913.03

SECTION 262923 - VARIABLE-FREQUENCY MOTOR CONTROLLERS

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 separately enclosed, preassembled, combination VFCs, rated 600 V and less, for speed control of three-phase, squirrel-cage induction motors.

1.3 DEFINITIONS

A. BAS: Building Automation System

B. CE: Conformite Europeene (European Compliance).

C. CPT: Control power transformer.

D. DDC: Direct digital control.

E. EMI: Electromagnetic interference.

F. LED: Light-emitting diode.

G. NC: Normally closed.

H. NO: Normally open.

I. OCPD: Overcurrent protective device.

J. PID: Control action, proportional plus integral plus derivative.

K. RFI: Radio-frequency interference.

L. VFC: Variable-frequency motor controller.

1.4 ACTION SUBMITTALS

A. Product Data: For each type and rating of VFC indicated.

1. Include dimensions and finishes for VFCs.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For each VFC indicated.

1. Include mounting 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. Include diagrams for power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Floor plans, drawn to scale, showing dimensioned layout on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Required working clearances and required area above and around VFCs.
2. Show VFC layout and relationships between electrical components and adjacent structural and mechanical elements.
3. Show support locations, type of support, and weight on each support.
4. Indicate field measurements.

B. Seismic Qualification Certificates: For each VFC, accessories, and components, from manufacturer.

1. Certificate of compliance.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based, and their installation requirements.

C. Product Certificates: For each VFC from manufacturer.

D. Harmonic Analysis Report: Provide Project-specific calculations and manufacturer's statement of compliance with IEEE 519.

E. Source quality-control reports.

F. Field quality-control reports.

G. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For VFCs to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

a. Manufacturer's written instructions for testing and adjusting thermal-magnetic circuit breaker and motor-circuit protector trip settings.
b. Manufacturer's written instructions for setting field-adjustable overload relays.
c. Manufacturer's written instructions for testing, adjusting, and reprogramming microprocessor control modules.
d. Manufacturer's written instructions for setting field-adjustable timers, controls, and status and alarm points.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
2. Control Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.
3. Indicating Lights: Two of each type and color installed.
4. Auxiliary Contacts: Furnish one spare(s) for each size and type of magnetic controller installed.
5. Power Contacts: Furnish three spares for each size and type of magnetic contactor installed.

1.8 DELIVERY, STORAGE, AND HANDLING

A. If stored in space that is not permanently enclosed and air conditioned, remove loose packing and flammable materials from inside controllers and install temporary electric heating, with at least 250 W per controller.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace VFCs that fail 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ABB.
2. Cerus Industrial, Inc.
3. Danfoss Inc.
4. Eaton.
5. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
6. Rockwell Automation, Inc.
7. Schneider Electric USA, Inc.
8. Siemens Industry, Inc.
9. Toshiba International Corporation.

2.2 SYSTEM DESCRIPTION

A. General Requirements for VFCs:

1. VFCs and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with NEMA ICS 7, NEMA ICS 61800-2, and UL 508C.

B. Application: Variable torque.

C. VFC Description: Variable-frequency motor controller, consisting of power converter that employs pulse-width-modulated inverter, factory built and tested in an enclosure, with integral disconnecting means and overcurrent and overload protection; listed and labeled by an NRTL as a complete unit; arranged to provide self-protection, protection, and variable-speed control of one or more three-phase induction motors by adjusting output voltage and frequency.

1. Units suitable for operation of NEMA MG 1, Design A and Design B motors, as defined by NEMA MG 1, Section IV, Part 30, "Application Considerations for Constant Speed Motors Used on a Sinusoidal Bus with Harmonic Content and General Purpose Motors Used with Adjustable-Voltage or Adjustable-Frequency Controls or Both."
2. Units suitable for operation of inverter-duty motors as defined by NEMA MG 1, Section IV, Part 31, "Definite-Purpose Inverter-Fed Polyphase Motors."
3. Listed and labeled for integrated short-circuit current (withstand) rating by an NRTL acceptable to authorities having jurisdiction.

D. Design and Rating: Match load type, such as fans, blowers, and pumps; and type of connection used between motor and load such as direct or through a power-transmission connection.

E. Output Rating: Three phase; 10 to 60 Hz, with voltage proportional to frequency throughout voltage range; maximum voltage equals input voltage.

F. Unit Operating Requirements:

1. Input AC Voltage Tolerance: Plus 10 and minus 10 percent of VFC input voltage rating.
2. Input AC Voltage Unbalance: Not exceeding 3 percent.
3. Input Frequency Tolerance: Plus or minus 3 percent of VFC frequency rating.
4. Minimum Efficiency: 96 percent at 60 Hz, full load.
5. Minimum Displacement Primary-Side Power Factor: 96 percent under any load or speed condition.
6. Minimum Short-Circuit Current (Withstand) Rating: 10 kA.
7. Ambient Temperature Rating: Not less than 32 deg F and not exceeding 104 deg F.
8. Humidity Rating: Less than 95 percent (noncondensing).
9. Altitude Rating: Not exceeding 3300 feet.
10. Vibration Withstand: Comply with NEMA ICS 61800-2.
11. Overload Capability: 1.1 times the base load current for 60 seconds; minimum of 1.8 times the base load current for three seconds.
12. Starting Torque: Minimum 100 percent of rated torque from 3 to 60 Hz.
13. Speed Regulation: Plus or minus 5 percent.
14. Output Carrier Frequency: Selectable; 0.5 to 15 kHz.
15. Stop Modes: Programmable; includes fast, free-wheel, and dc injection braking.

G. Inverter Logic: Microprocessor based, 32 bit, isolated from all power circuits.

H. Isolated Control Interface: Allows VFCs to follow remote-control signal over a minimum 40:1 speed range.

1. Signal: Electrical.

I. Internal Adjustability Capabilities:

1. Minimum Speed: 5 to 25 percent of maximum rpm.
2. Maximum Speed: 80 to 100 percent of maximum rpm.
3. Acceleration: 0.1 to 999.9 seconds.
4. Deceleration: 0.1 to 999.9 seconds.
5. Current Limit: 30 to minimum of 150 percent of maximum rating.

J. Self-Protection and Reliability Features:

1. Surge Suppression: Factory installed as an integral part of the VFC, complying with UL 1449 SPD, Type 1 or Type 2.
2. Loss of Input Signal Protection: Selectable response strategy, including speed default to a percent of the most recent speed, a preset speed, or stop; with alarm.
3. Under- and overvoltage trips.
4. Inverter overcurrent trips.
5. VFC and Motor-Overload/Overtemperature Protection: Microprocessor-based thermal protection system for monitoring VFCs and motor thermal characteristics, and for

providing VFC overtemperature and motor-overload alarm and trip; settings selectable via the keypad.
6. Critical frequency rejection, with three selectable, adjustable deadbands.
7. Instantaneous line-to-line and line-to-ground overcurrent trips.
8. Loss-of-phase protection.
9. Reverse-phase protection.
10. Short-circuit protection.
11. Motor-overtemperature fault.

K. Automatic Reset/Restart: Attempt three restarts after drive fault or on return of power after an interruption and before shutting down for manual reset or fault correction; adjustable delay time between restart attempts.

L. Power-Interruption Protection: To prevent motor from re-energizing after a power interruption until motor has stopped, unless "Bidirectional Autospeed Search" feature is available and engaged.

M. Bidirectional Autospeed Search: Capable of starting VFC into rotating loads spinning in either direction and returning motor to set speed in proper direction, without causing damage to drive, motor, or load.

N. Torque Boost: Automatically varies starting and continuous torque to at least 1.5 times the minimum torque to ensure high-starting torque and increased torque at slow speeds.

O. Motor Temperature Compensation at Slow Speeds: Adjustable current fall-back based on output frequency for temperature protection of self-cooled, fan-ventilated motors at slow speeds.

P. Integral Input Disconnecting Means and OCPD: NEMA KS 1, fusible switch with pad-lockable, door-mounted handle mechanism.

1. Disconnect Rating: Not less than 115 percent of NFPA 70 motor full-load current rating or VFC input current rating, whichever is larger.
2. Auxiliary Contacts: NO or NC, arranged to activate before switch blades open.

2.3 PERFORMANCE REQUIREMENTS

A. Seismic Performance: VFCs shall withstand the effects of earthquake motions determined according to ASCE/SEI 7. The designated VFCs shall be tested and certified by an NRTL as meeting the ICC-ES AC 156 test procedure requirements.

1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2.4 CONTROLS AND INDICATION

A. Status Lights: Door-mounted LED indicators displaying the following conditions:

1. Power on.
2. Run.
3. Overvoltage.
4. Line fault.
5. Overcurrent.
6. External fault.

B. Panel-Mounted Operator Station: Manufacturer's standard front-accessible, sealed keypad and plain-English-language digital display; allows complete programming, program copying, operating, monitoring, and diagnostic capability.

1. Keypad: In addition to required programming and control keys, include keys for HAND, OFF, and AUTO modes.
2. Security Access: Provide electronic security access to controls through identification and password with at least three levels of access: View only; view and operate; and view, operate, and service.

a. Control Authority: Supports at least four conditions: Off, local manual control at VFC, local automatic control at VFC, and automatic control through a remote source.

C. Historical Logging Information and Displays:

1. Real-time clock with current time and date.
2. Running log of total power versus time.
3. Total run time.
4. Fault log, maintaining last four faults with time and date stamp for each.

D. Indicating Devices: Digital display mounted flush in VFC door and connected to display VFC parameters including, but not limited to:

1. Output frequency (Hz).
2. Motor speed (rpm).
3. Motor status (running, stop, fault).
4. Motor current (amperes).
5. Motor torque (percent).
6. Fault or alarming status (code).
7. PID feedback signal (percent).
8. DC-link voltage (V dc).
9. Set point frequency (Hz).
10. Motor output voltage (V ac).

E. Control Signal Interfaces:

1. Electric Input Signal Interface:

a. A minimum of two programmable analog inputs: 4- to 20-mA dc.
b. A minimum of six multifunction programmable digital inputs.

2. Remote Signal Inputs: Capability to accept any of the following speed-setting input signals from the BAS system or other control systems:

a. 0- to 10-V dc.
b. 4- to 20-mA dc.
c. Potentiometer using up/down digital inputs.
d. Fixed frequencies using digital inputs.

3. Output Signal Interface: A minimum of one programmable analog output signal(s) (4- to 20-mA dc), which can be configured for any of the following:

a. Output frequency (Hz).
b. Output current (load).
c. DC-link voltage (V dc).
d. Motor torque (percent).
e. Motor speed (rpm).
f. Set point frequency (Hz).

4. Remote Indication Interface: A minimum of two programmable dry-circuit relay outputs (120-V ac, 1 A) for remote indication of the following:

a. Motor running.
b. Set point speed reached.
c. Fault and warning indication (overtemperature or overcurrent).
d. PID high- or low-speed limits reached.

F. BAS Interface: Factory-installed hardware and software shall interface with BAS to monitor, control, display, and record data for use in processing reports. VFC settings shall be retained within VFC's nonvolatile memory.

1. Network Communications Ports: Ethernets and RS-422/485.

2. Embedded BAS Protocols for Network Communications: ASHRAE 135 BACnet or Echelon Lon Works; protocols accessible via the communications ports.

2.5 LINE CONDITIONING AND FILTERING

A. Input Line Conditioning: Based on the manufacturer's harmonic analysis study and report, provide input filtering, as required, to limit total demand (harmonic current) distortion and total harmonic voltage demand at the defined point of common coupling to meet IEEE 519 recommendations.

2.6 BYPASS SYSTEMS

A. Bypass Operation: Safely transfers motor between power converter output and bypass circuit, manually, automatically, or both. Selector switches set modes and indicator lights indicate mode selected. Unit is capable of stable operation (starting, stopping, and running) with motor completely disconnected from power converter.

2.7 ENCLOSURES

A. VFC Enclosures: NEMA 250, to comply with environmental conditions at installed location.

1. Dry and Clean Indoor Locations: Type 1.
2. Outdoor Locations: Type 4X.
3. Other Wet or Damp Indoor Locations: Type 4.

2.8 ACCESSORIES

A. General Requirements for Control-Circuit and Pilot Devices: NEMA ICS 5; factory installed in VFC enclosure cover unless otherwise indicated.

1. Push Buttons: Unguarded.
2. Pilot Lights: Push to test.
3. Selector Switches: Rotary type.
4. Stop and Lockout Push-Button Station: Momentary-break, push-button station with a factory-applied hasp arranged so padlock can be used to lock push button in depressed position with control circuit open.

B. Reversible NC/NO bypass contactor auxiliary contact(s).

C. Control Relays: Auxiliary and adjustable solid-state time-delay relays.

D. Phase-Failure, Phase-Reversal, and Undervoltage and Overvoltage Relays: Solid-state sensing circuit with isolated output contacts for hard-wired connections. Provide adjustable undervoltage, overvoltage, and time-delay settings.

1. Current Transformers: Continuous current rating, basic impulse insulating level (BIL) rating, burden, and accuracy class suitable for connected circuitry. Comply with IEEE C57.13.

E. Breather and drain assemblies, to maintain interior pressure and release condensation in NEMA 250, Type 4X enclosures installed outdoors or in unconditioned interior spaces subject to humidity and temperature swings.

F. Space heaters, with NC auxiliary contacts, to mitigate condensation in NEMA 250, Type 4X enclosures installed outdoors or in unconditioned interior spaces subject to humidity and temperature swings.

G. Cooling Fan and Exhaust System: For NEMA 250, Type 1; UL 508 component recognized: Supply fan, with composite intake and exhaust grills and filters; 120-V ac; obtained from integral CPT.

H. Sun shields installed on fronts, sides, and tops of enclosures installed outdoors and subject to direct and extended sun exposure.

2.9 SOURCE QUALITY CONTROL

A. Testing: Test and inspect VFCs according to requirements in NEMA ICS 61800-2.

1. Test each VFC while connected to a motor that is comparable to that for which the VFC is rated.
2. Verification of Performance: Rate VFCs according to operation of functions and features specified.

B. VFCs will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, surfaces, and substrates to receive VFCs, with Installer present, for compliance with requirements for installation tolerances, and other conditions affecting performance of the Work.

B. Examine VFC before installation. Reject VFCs that are wet, moisture damaged, or mold damaged.

C. Examine roughing-in for conduit systems to verify actual locations of conduit connections before VFC installation.

D. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Wall-Mounting Controllers: Install with tops at uniform height and with disconnect operating handles not higher than 79 inches above finished floor, unless otherwise indicated, and by bolting units to wall or mounting on lightweight structural-steel channels bolted to wall. For controllers not on walls, provide freestanding racks complying with Section 260529 "Hangers and Supports for Electrical Systems."

B. Floor-Mounting Controllers: Install VFCs on 4-inch nominal thickness concrete base. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete."

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to supported equipment.

C. Roof-Mounting Controllers: Install VFC on roofs with tops at uniform height and with disconnect operating handles not higher than 79 inches above finished roof surface unless otherwise indicated, and by bolting units to curbs or mounting on freestanding, lightweight, structural-steel channels bolted to curbs. Seal roof penetrations after raceways are installed.

1. Curbs and roof penetrations are specified in Section 077200 "Roof Accessories."
2. Structural-steel channels are specified in Section 260529 "Hangers and Supports for Electrical Systems."

D. Seismic Bracing: Comply with requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."

E. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

F. Install fuses in each fusible-switch VFC.

G. Install fuses in control circuits if not factory installed. Comply with requirements in Section 262813 "Fuses."

H. Install heaters in thermal-overload relays. Select heaters based on actual nameplate full-load amperes after motors are installed.

I. Install, connect, and fuse thermal-protector monitoring relays furnished with motor-driven equipment.

J. Comply with NECA 1.

3.3 IDENTIFICATION

A. Identify VFCs, components, and control wiring. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.

2. Label each VFC with engraved nameplate.
3. Label each enclosure-mounted control and pilot device.

B. Operating Instructions: Frame printed operating instructions for VFCs, including control sequences and emergency procedures. Fabricate frame of finished metal, and cover instructions with clear acrylic plastic. Mount on front of VFC units.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each VFC element, bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Inspect VFC, wiring, components, connections, and equipment installation. Test and adjust controllers, components, and equipment.
2. Test insulation resistance for each VFC element, component, connecting motor supply, feeder, and control circuits.
3. Test continuity of each circuit.
4. Verify that voltages at VFC locations are within 10 percent of motor nameplate rated voltages. If outside this range for any motor, notify Construction Manager before starting the motor(s).
5. Test each motor for proper phase rotation.
6. Perform tests according to the Inspection and Test Procedures for Adjustable Speed Drives stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
7. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

8. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. VFCs will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies the VFC and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations made after remedial action.

3.5 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

3.6 ADJUSTING

A. Program microprocessors for required operational sequences, status indications, alarms, event recording, and display features. Clear events memory after final acceptance testing and prior to Substantial Completion.

B. Set field-adjustable switches, auxiliary relays, time-delay relays, timers, and overload-relay pickup and trip ranges.

C. Adjust the trip settings of instantaneous-only circuit breakers and thermal-magnetic circuit breakers with adjustable, instantaneous trip elements. Initially adjust to 6 times the motor nameplate full-load amperes and attempt to start motors several times, allowing for motor cool-down between starts. If tripping occurs on motor inrush, adjust settings in increments until motors start without tripping. Do not exceed 8 times the motor full-load amperes (or 11 times for NEMA Premium Efficient motors if required). Where these maximum settings do not allow starting of a motor, notify Owner before increasing settings.

D. Set the taps on reduced-voltage autotransformer controllers.

E. Set field-adjustable pressure switches.

3.7 PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions until controllers are ready to be energized and placed into service.

B. Replace VFCs whose interiors have been exposed to water or other liquids prior to Substantial Completion.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, reprogram, and maintain VFCs.

END OF SECTION 262923

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SECTION 263213 - ENGINE GENERATORS

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 packaged engine-generator sets for standby power supply with the following features:

1. Diesel engine.
2. Unit-mounted cooling system.
3. Unit-mounted control and monitoring.
4. Performance requirements for sensitive loads.
5. Fuel system.
6. Outdoor enclosure.

B. Related Requirements:

1. Section 263600 "Transfer Switches" for transfer switches including sensors and relays to initiate automatic-starting and -stopping signals for engine-generator sets.

2. Section 262313 Paralleling Low voltage switchgear

1.3 DEFINITIONS

A. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.

B. EPS: Emergency power supply.

C. EPSS: Emergency power supply system.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

2. Include thermal damage curve for generator.
3. Include time-current characteristic curves for generator protective device.
4. Include fuel consumption in gallons per hour at 0.8 power factor at 0.5, 0.75 and 1.0 times generator capacity.
5. Include generator efficiency at 0.8 power factor at 0.5, 0.75 and 1.0 times generator capacity.
6. Include air flow requirements for cooling and combustion air in cfm at 0.8 power factor, with air supply temperature of 95, 80, 70, and 50 deg F. Provide drawings showing requirements and limitations for location of air intake and exhausts.
7. Include generator characteristics, including, but not limited to kw rating, efficiency, reactances, and short-circuit current capability.

B. Shop Drawings:

1. Include plans and elevations for engine-generator set and other components specified. Indicate access requirements affected by height of subbase fuel tank.
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. Identify fluid drain ports and clearance requirements for proper fluid drain.
4. Design calculations for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
5. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include base weights.
6. Include diagrams for power, signal, and control wiring. Complete schematic, wiring, and interconnection diagrams showing terminal markings for EPS equipment and functional relationship between all electrical components.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and testing agency.

B. Seismic Qualification Certificates: For engine-generator set, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: With engine and generator mounted on rails identify center of gravity and total weight including full fuel tank, supplied enclosure, subbase-mounted fuel tank, and each piece of equipment not integral to the engine-generator set, and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Source quality-control reports, including, but not limited to the following:

1. Certified summary of prototype-unit test report.

2. Certified Test Reports: For components and accessories that are equivalent, but not identical, to those tested on prototype unit.
3. Certified Summary of Performance Tests: Certify compliance with specified requirement to meet performance criteria for sensitive loads.
4. Report of factory test on units to be shipped for this Project, showing evidence of compliance with specified requirements.
5. Report of sound generation.
6. Report of exhaust emissions showing compliance with applicable regulations.
7. Certified Torsional Vibration Compatibility: Comply with NFPA 110.

D. Field quality-control reports.

E. Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For packaged engine generators to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

a. List of tools and replacement items recommended to be stored at Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.
b. Operating instructions laminated and mounted adjacent to generator location.
c. Training plan.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: One for every 10 of each type and rating but no fewer than one of each.
2. Indicator Lamps: Two for every six of each type used, but no fewer than two of each.
3. Filters: One set each of lubricating oil, fuel, and combustion-air filters.
4. Tools: Each tool listed by part number in operations and maintenance manual.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved by manufacturer.

B. Testing Agency Qualifications: Member company of an NRTL.

1.9 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 5 years from date of Substantial Completion. Warranty shall include labor, parts, mileage and travel time.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. 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:

1. Caterpillar, Inc.; Electric Power Division.
2. Cummins Power Generation.
3. Generac Power Systems, Inc.
4. IAC - Taylor Power Systems.
5. Kohler Power Systems.
6. MTU Onsite Energy Corporation.

B. Source Limitations: Obtain packaged generator sets and auxiliary components through one source from a single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Engine-generator set housing, subbase fuel tank, engine-generator set, batteries, battery racks, silencers, and sound attenuating equipment, accessories, and components as required for the 911 Center System shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
2. Shake-table testing shall comply with ICC-ES AC156. Testing shall be performed with all fluids at worst case normal levels.
3. Component Importance Factor: 1.5.

B. ASME Compliance: Comply with ASME B15.1.

C. NFPA Compliance:

1. Comply with NFPA 37.
2. Comply with NFPA 70.

3. Comply with NFPA 110 requirements for Level 1 emergency power supply system

D. UL Compliance: Comply with UL 2200.

E. Engine Exhaust Emissions: Comply with current EPA requirements and applicable state and local government requirements.

F. Noise Emission: Comply with applicable state and local government requirements for maximum noise level at adjacent property boundaries due to sound emitted by generator set including engine, engine exhaust, engine cooling-air intake and discharge, and other components of installation.

G. Environmental Conditions: Engine-generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:

1. Altitude: Sea level to 1000 feet.

2.3 ASSEMBLY DESCRIPTION

A. Factory-assembled and -tested, water-cooled engine, with brushless generator and accessories.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.

C. EPSS Class: Engine-generator set shall be classified as a Class 48 in accordance with NFPA 110.

D. Induction Method: Turbocharged.

E. Governor: Adjustable isochronous, with speed sensing.

F. Emissions: Comply with current EPA requirements and applicable state and local government requirements.

G. Mounting Frame: Structural steel framework to maintain alignment of mounted components without depending on concrete foundation. Provide lifting attachments sized and spaced to prevent deflection of base during lifting and moving.

H. Capacities and Characteristics:

1. Power Output Ratings: Nominal ratings as indicated at 0.8 power factor excluding power required for the continued and repeated operation of the unit and auxiliaries.
2. Output Connections: Three-phase, four wire.
3. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of component.

I. Generator-Set Performance:

1. Steady-State Voltage Operational Bandwidth: 3 percent of rated output voltage from no load to full load.
2. Transient Voltage Performance: Not more than 20 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within three seconds.
3. Steady-State Frequency Operational Bandwidth: 0.5 percent of rated frequency from no load to full load.
4. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
5. Transient Frequency Performance: Less than 5 percent variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within five seconds.
6. Output Waveform: At no load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3 percent for single harmonics. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.
7. Sustained Short-Circuit Current: For a three-phase, bolted short circuit at system output terminals, system shall supply a minimum of 250 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to generator system components.
8. Start Time: Comply with NFPA 110, Type 10, system requirements.

2.4 ENGINE

A. Fuel: Fuel oil, Grade DF-2.

B. Rated Engine Speed: 1800 rpm.

C. Maximum Piston Speed for Four-Cycle Engines: 2250 fpm.

D. Lubrication System: The following items are mounted on engine or skid:

1. Filter and Strainer: Rated to remove 90 percent of particles 5 micrometers and smaller while passing full flow.
2. Thermostatic Control Valve: Control flow in system to maintain optimum oil temperature. Unit shall be capable of full flow and is designed to be fail-safe.
3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.

E. Jacket Coolant Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with NFPA 110 requirements for Level 1 equipment for heater capacity.

F. Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine-generator-set mounting frame and integral engine-driven coolant pump.

1. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.

G. Muffler/Silencer: Semicritical type, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.

1. Minimum sound attenuation of 18 dB at 500 Hz.
2. Sound level measured at a distance of 25 feet from exhaust discharge after installation is complete shall be 85 dBA or less.

H. Air-Intake Filter: Heavy-duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.

I. Starting System: 24-V electric, with negative ground.

1. Components: Sized so they are not damaged during a full engine-cranking cycle with ambient temperature at maximum specified in "Performance Requirements" Article.
2. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.
3. Cranking Cycle: As required by NFPA 110 for system level specified.
4. Battery: Lead acid or Nicad, with capacity within ambient temperature range specified in "Performance Requirements" Article to provide specified cranking cycle at least twice without recharging.
5. Battery Cable: Size as recommended by engine manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.
6. Battery Compartment: Factory fabricated of metal with acid-resistant finish and thermal insulation. Thermostatically controlled heater shall be arranged to maintain battery above 10 deg C regardless of external ambient temperature within range specified in "Performance Requirements" Article. Include accessories required to support and fasten batteries in place. Provide ventilation to exhaust battery gases.
7. Battery Stand: Factory-fabricated, two-tier metal with acid-resistant finish designed to hold the quantity of battery cells required and to maintain the arrangement to minimize lengths of battery interconnections.
8. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35 A minimum continuous rating.
9. Battery Charger: Current-limiting, automatic-equalizing and float-charging type designed for lead-acid or Nicad batteries. Unit shall comply with UL 1236 and include the following features:

a. Operation: Equalizing-charging rate of 10 A shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 40 deg F to 140 deg F to prevent overcharging at high temperatures and undercharging at low temperatures.

c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.
d. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates.
e. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
f. Enclosure and Mounting: NEMA 250, Type 1, wall-mounted cabinet.

2.5 DIESEL FUEL-OIL SYSTEM

A. Comply with NFPA 30.

B. Piping: Fuel-oil piping shall be Schedule 40 black steel, complying with requirements in Section 231113 "Facility Fuel-Oil Piping." Cast iron, aluminum, copper, and galvanizing shall not be used in the fuel-oil system.

C. Main Fuel Pump: Mounted on engine to provide primary fuel flow under starting and load conditions.

D. Fuel Filtering: Remove water and contaminants larger than 1 micron.

E. Relief-Bypass Valve: Automatically regulates pressure in fuel line and returns excess fuel to source.

F. Subbase-Mounted, Double-Wall, Fuel-Oil Tank: Factory installed and piped, complying with UL 142 fuel-oil tank. Features include the following:

1. Tank level indicator.
2. Fuel-Tank Capacity: Provide fuel required for a minimum of 48 hours of run time at full load, this includes periodic maintenance operations between refills and fuel for continuous operation at EPSS class 48.
3. Leak detection in interstitial space.
4. Vandal-resistant fill cap.
5. Containment Provisions: Comply with requirements of authorities having jurisdiction.

2.6 CONTROL AND MONITORING

A. Automatic Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of generator set. When mode-selector switch is switched to the on position, generator set starts. The off position of same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. **Comply with section 262313 Paralleling low voltage switchgear**.

B. Provide minimum run time control set for 30 minutes with override only by operation of a remote emergency-stop switch.

C. Comply with UL 508A.

D. Configuration: Operating and safety indications, protective devices, basic system controls, and engine gages shall be grouped in a common control and monitoring panel mounted on the generator set. Mounting method shall isolate the control panel from generator-set vibration. Panel shall be powered from the engine-generator set battery.

E. Indicating Devices : As required by NFPA 110 for Level 1 system, including the following:

1. AC voltmeter.
2. AC ammeter.
3. AC frequency meter.
4. EPS supplying load indicator.
5. Ammeter and voltmeter phase-selector switches.
6. DC voltmeter (alternator battery charging).
7. Engine-coolant temperature gage.
8. Engine lubricating-oil pressure gage.
9. Running-time meter.
10. Current and Potential Transformers: Instrument accuracy class.

F. Protective Devices and Controls in Local Control Panel: Shutdown devices and common visual alarm indication as required by NFPA 110 for Level 1 system, including the following:

1. Start-stop switch.
2. Overcrank shutdown device.
3. Overspeed shutdown device.
4. Coolant high-temperature shutdown device.
5. Coolant low-level shutdown device.
6. Low lube oil pressure shutdown device.
7. Air shutdown damper shutdown device when used.
8. Overcrank alarm.
9. Overspeed alarm.
10. Coolant high-temperature alarm.
11. Coolant low-temperature alarm.
12. Coolant low-level alarm.
13. Low lube oil pressure alarm.
14. Air shutdown damper alarm when used.
15. Lamp test.
16. Contacts for local and remote common alarm.
17. Coolant high-temperature prealarm.
18. Generator-voltage adjusting rheostat.
19. Main fuel tank low-level alarm.

a. Low fuel level alarm shall be initiated when the level falls below that required for operation for the duration required in "Fuel Tank Capacity" Paragraph in "Diesel Fuel-Oil System" Article.

20. Run-Off-Auto switch.
21. Control switch not in automatic position alarm.
22. Low-starting air pressure alarm.
23. Low-starting hydraulic pressure alarm.
24. Low cranking voltage alarm.
25. Battery-charger malfunction alarm.
26. Battery low-voltage alarm.
27. Battery high-voltage alarm.
28. Generator overcurrent protective device not closed alarm.

G. Supporting Items: Include sensors, transducers, terminals, relays, and other devices and include wiring required to support specified items. Locate sensors and other supporting items on engine or generator, unless otherwise indicated.

H. Connection to Datalink: A separate terminal block, factory wired to Form C dry contacts, for each alarm and status indication. Provide connections for datalink transmission of indications to remote data terminals via BACnet. Data system connections to terminals are covered in Section 260913 "Electrical Power Monitoring and Control."

I. Common Remote Panel with Common Audible Alarm: Comply with NFPA 110 requirements for Level 1 systems. Include necessary contacts and terminals in control and monitoring panel. Remote panel shall be powered from the engine-generator set battery.

J. Remote Alarm Annunciator: Comply with NFPA 99. An LED labeled with proper alarm conditions shall identify each alarm event, and a common audible signal shall sound for each alarm condition. Silencing switch in face of panel shall silence signal without altering visual indication. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset. Cabinet and faceplate are surface- or flush-mounting type to suit mounting conditions indicated.

1. Overcrank alarm.
2. Coolant low-temperature alarm.
3. High engine temperature prealarm.
4. High engine temperature alarm.
5. Low lube oil pressure alarm.
6. Overspeed alarm.
7. Low fuel main tank alarm.
8. Low coolant level alarm.
9. Low cranking voltage alarm.
10. Contacts for local and remote common alarm.
11. Audible-alarm silencing switch.
12. Air shutdown damper when used.
13. Run-Off-Auto switch.
14. Control switch not in automatic position alarm.

15. Fuel tank derangement alarm.
16. Fuel tank high-level shutdown of fuel supply alarm.
17. Low cranking voltage alarm.

K. Supporting Items: Include sensors, transducers, terminals, relays, and other devices and include wiring required to support specified items. Locate sensors and other supporting items on engine or generator, unless otherwise indicated.

L. Remote Emergency-Stop Switch: Flush; wall mounted, unless otherwise indicated; and labeled. Push button shall be protected from accidental operation.

2.7 GENERATOR OVERCURRENT AND FAULT PROTECTION

A. Overcurrent protective devices for the entire EPSS shall be coordinated to optimize selective tripping when a short circuit occurs. Coordination of protective devices shall consider both utility and EPSS as the voltage source.

1. Overcurrent protective devices for the EPSS shall be accessible only to authorized personnel.

B. Generator Circuit Breaker: Molded-case, electronic-trip type; 100 percent rated; complying with UL 489.

1. Tripping Characteristics: Adjustable long-time and short-time delay and instantaneous.
2. Trip Settings: Selected to coordinate with generator thermal damage curve.
3. Shunt Trip: Connected to trip breaker when generator set is shut down by other protective devices.
4. Mounting: Adjacent to or integrated with control and monitoring panel.

C. Generator Disconnect Switch: Molded-case type, 100 percent rated.

1. Trip Rating: Matched to generator output rating.
2. Shunt Trip: Connected to trip switch when signaled by generator protector or by other protective devices.

D. Generator Protector: Microprocessor-based unit shall continuously monitor current level in each phase of generator output, integrate generator heating effect over time, and predict when thermal damage of alternator will occur. When signaled by generator protector or other generator-set protective devices, a shunt-trip device in the generator disconnect switch shall open the switch to disconnect the generator from load circuits. Protector performs the following functions:

1. Initiates a generator overload alarm when generator has operated at an overload equivalent to 110 percent of full-rated load for 60 seconds. Indication for this alarm is integrated with other generator-set malfunction alarms. Contacts shall be available for load shed functions.
2. Under single or three-phase fault conditions, regulates generator to 300 percent of rated full-load current for up to 10 seconds.

3. As overcurrent heating effect on the generator approaches the thermal damage point of the unit, protector switches the excitation system off, opens the generator disconnect device, and shuts down the generator set.
4. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot.

E. Ground-Fault Indication: Comply with NFPA 70, "Emergency System" signals for ground fault.

1. Indicate ground fault with other generator-set alarm indications.
2. Trip generator protective device on ground fault.

2.8 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

A. Comply with NEMA MG 1.

B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.

C. Electrical Insulation: Class H or Class F.

D. Stator-Winding Leads: Brought out to terminal box to permit future reconnection for other voltages if required.

E. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.

F. Enclosure: Dripproof.

G. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified and as required by NFPA 110.

1. Adjusting Rheostat on Control and Monitoring Panel: Provide plus or minus 5 percent adjustment of output-voltage operating band.

H. Strip Heater: Thermostatically controlled unit arranged to maintain stator windings above dew point.

2.9 OUTDOOR GENERATOR-SET ENCLOSURE

A. Description: Vandal-resistant, sound-attenuating, weatherproof steel housing, wind resistant up to 100 mph. Multiple panels shall be lockable and provide adequate access to components requiring maintenance. Panels shall be removable by one person without tools. Instruments and control shall be mounted within enclosure.

1. Structural Design and Anchorage: Comply with ASCE 7 for wind loads up to 100 mph.

2. Seismic Design: Comply with seismic requirements in Section 260548.16 "Seismic Controls for Electrical Systems."
3. Louvers: Equipped with bird screen and filter arranged to permit air circulation when engine is not running while excluding dust, birds and rodents.
4. Hinged Doors: With padlocking provisions.
5. Space Heater: Thermostatically controlled and sized to prevent condensation.
6. Thermal Insulation: Manufacturer's standard materials and thickness selected in coordination with space heater to maintain winter interior temperature within operating limits required by engine-generator-set components.
7. Muffler Location: Within enclosure.

B. Engine Cooling Airflow through Enclosure: Maintain temperature rise of system components within required limits when unit operates at 110 percent of rated load for 2 hours with ambient temperature at top of range specified in system service conditions.

1. Louvers: Fixed-engine, cooling-air inlet and discharge. Storm-proof and drainable louvers prevent entry of rain and snow.
2. Automatic Dampers: At engine cooling-air inlet and discharge. Dampers shall be closed to reduce enclosure heat loss in cold weather when unit is not operating.

C. Pre-wired AC distribution panel: 100A main circuit breaker, connected to 120VAC line-neutral and 240VAC line-line, spare breaker provisions and capacity for future upgrades. Components wired by the manufacturer shall include:

1. Battery Charger.
2. Battery Box Heater.
3. Block Heater.
4. Control Panel Heater.
5. Convenience Outlet.

D. Convenience Outlets: Factory wired, GFCI. Arrange for external electrical connection.

2.10 FINISHES

A. Indoor and Outdoor Enclosures and Components: Manufacturer's standard finish over corrosion-resistant pretreatment and compatible primer.

2.11 SOURCE QUALITY CONTROL

A. Prototype Testing: Factory test engine-generator set using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.

1. Tests: Comply with NFPA 110, Level 1 Energy Converters and with IEEE 115.

B. Project-Specific Equipment Tests: Before shipment, factory test engine-generator set and other system components and accessories manufactured specifically for this Project. Perform tests at rated load and power factor. Include the following tests:

1. Test components and accessories furnished with installed unit that are not identical to those on tested prototype to demonstrate compatibility and reliability.
2. Test generator, exciter, and voltage regulator as a unit.
3. Full load run.
4. Maximum power.
5. Voltage regulation.
6. Transient and steady-state governing.
7. Single-step load pickup.
8. Safety shutdown.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine-generator performance.

B. Examine roughing-in for piping systems and electrical connections. Verify actual locations of connections before packaged engine-generator installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with packaged engine-generator manufacturers' written installation and alignment instructions and with NFPA 110.

B. Equipment Mounting:

1. Install packaged engine generators on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
2. Coordinate size and location of concrete bases for packaged engine generators. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

C. Install packaged engine-generator to provide access, without removing connections or accessories, for periodic maintenance.

D. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping and specialties.

B. Connect fuel, cooling-system, and exhaust-system piping adjacent to packaged engine-generator to allow service and maintenance.

C. Connect fuel piping to engines with a gate valve and union and flexible connector.

D. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

E. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Provide a minimum of one 90 degree bend in flexible conduit routed to the generator set from a stationary element.

F. Balance single-phase loads to obtain a maximum of 10 percent unbalance between any two phases.

3.4 IDENTIFICATION

A. Identify system components according to Section 230553 "Identification for HVAC Piping and Equipment" and Section 260553 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections.

C. Tests and Inspections:

1. Perform tests recommended by manufacturer and each visual and mechanical inspection and electrical and mechanical test listed in the first two subparagraphs. Certify compliance with test parameters.

a. Visual and Mechanical Inspection

1) Compare equipment nameplate data with drawings and specifications.
2) Inspect physical and mechanical condition.
3) Inspect anchorage, alignment, and grounding.
4) Verify the unit is clean.

b. Electrical and Mechanical Tests

1) Perform insulation-resistance tests in accordance with IEEE 43.

a) Machines larger than 200 horsepower. Test duration shall be 10 minutes. Calculate polarization index.
b) Machines 200 horsepower or less. Test duration shall be one minute. Calculate the dielectric-absorption ratio.

2) Test protective relay devices.
3) Verify phase rotation, phasing, and synchronized operation as required by the application.
4) Functionally test engine shutdown for low oil pressure, over-temperature, overspeed, and other protection features as applicable.
5) Conduct performance test in accordance with NFPA 110.
6) Verify correct functioning of the governor and regulator.

2. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here including, but not limited to, single-step full-load pickup test.
3. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions. Record individual cell voltages.

a. Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions. Check electrolyte level and specific gravity under both conditions.
b. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery.
c. Verify acceptance of charge for each element of the battery after discharge.
d. Verify that measurements are within manufacturer's specifications.

4. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.
5. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine-generator system before and during system operation. Check for air, exhaust, and fluid leaks.
6. Voltage and Frequency Transient Stability Tests: Use recording oscilloscope to measure voltage and frequency transients for 50 and 100 percent step-load increases and decreases, and verify that performance is as specified.
7. Harmonic-Content Tests: Measure harmonic content of output voltage at 25 percent and 100 percent of rated linear load. Verify that harmonic content is within specified limits.

D. Coordinate tests with tests for transfer switches and run them concurrently.

E. Test instruments shall have been calibrated within the last 12 months, traceable to NIST Calibration Services, and adequate for making positive observation of test results. Make calibration records available for examination on request.

F. Leak Test: After installation, charge exhaust, coolant, and fuel systems and test for leaks. Repair leaks and retest until no leaks exist.

G. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation for generator and associated equipment.

H. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

I. Remove and replace malfunctioning units and retest as specified above.

J. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.

K. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generators.

B. Offer a complete maintenance and repair agreement for the owner’s review.

END OF SECTION 263213

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SECTION 263214 STATIONARY LOAD BANK WITH AUTOMATIC LOAD LEVELING CONTROL

PART 1 - GENERAL

1.1 SCOPE

A. This specification contains the minimum requirements for the design, manufacture and testing of a UL listed, air-cooled, outdoor weatherproof resistive load bank.
B. The load bank is required for periodic exercising and testing of the (standby) emergency power source. The load bank shall be permanently mounted in a weatherproof enclosure, forced air cooled with remotely mounted control panel.
C. This specification shall apply if the load bank is supplied to the purchaser, or as a part of other equipment.
D. Should the vendor take exception to any part of this specification, it shall be stated in the bid, and referenced to the specification line number.

1.2 SUBMITTALS

A. The manufacturer shall submit for review technical data including features, performance, electrical characteristics, physical characteristics, ratings, accessories, and finishes.
B. Shop drawings shall include dimensional plans, front and side elevations and mounting details sufficient to properly install the load bank. Load bus configuration and load connections termination area shall be clearly identified.
C. Electrical schematic drawings shall be provided to detail the operation of the load bank and the provided safety circuits. Over-current protection and control devices shall be identified and their ratings marked. A system interconnection drawing shall be included for control wiring related to the load bank.

1.3 STANDARDS

A. The equipment covered by this specification shall be designed with the latest applicable NPFA-70 NEMA, NEC, IEEE, and ANSI standards.
B. The load bank certified to a NRTL such as UL or CSA.

PART 2.0 PRODUCTS

2.1 RATINGS

A. The total capacity of the load bank shall be rated **1100kW** at 480 Volts, 3-Phase, 3-Wire, 60 Hertz, at unity Power Factor and 50 kW minimum load step resolution.

2.2 MATERIAL AND CONSTRUCTION

A. Provide a UL Listed, Free-Standing, Outdoor Resistive Load Bank. The load bank shall be suitable for installation in the following ambient conditions:

Wind Loading:	75 MPH
Seismic Rating:	Zone 4
Ambient Temperature:	-20^{o}F to +120^{o}F

Altitude: 5,000 feet above sea level

B. The load bank will be rated for a continuous duty cycle at 1100kw KW at 480 Volts AC, 3-phase, 60 Hertz. The Load Step Resolution shall be approximately 10 percent of the total load bank capacity.

C. The load bank shall be a completely self-contained, freestanding unit which includes all resistive load elements, load control devices, load element branch circuit fuse protection, main load bus, control terminals, system protection devices and NEMA type enclosure.

D. The load bank is designed for installation and operation in an outdoor environment with sufficient fresh intake air available, while secured to a flat surface such as a roof, finished floor or concrete pad. Cooling air is drawn in from the screened air-intake sides, with hot air vertically exhausted from the top of the unit away from personnel. The load bank enclosure shall be constructed of galvanized steel with powder coat paint finish with exterior stainless steel fastners. Dead front access to all electrical and mechanical connections shall be provided.

E. All power connections including main-input load bus, external bower power, operator remote control, instrumentation and customer interface connections are made within the enclosed relay/connection compartment. Bottom access through a removable gland plate provides a “safe and sealed” ease of installation of all conduit entry cable. Load connections are made directly to the main input load bus bars. A standard NEMA 4-hole pattern shall be provided for customer load cables connections. All copper bus bars are plated for superior oxidation resistance. Relay/connection compartment is heated and thermostatically controlled to limit any harmful effects of condensation.

F. The load bank shall have a sound level of 80 dB(A) or less at a distance of 23 feet.

G. The load bank will cooled by an integrally mounted blower system. The system will include a TEFC motor with high-performance, direct-driven fan blade. The Blower can be powered from an external 3-phase supply source, or internally from the main input load bus (source under test).

H. The load bank control circuits will be operated at 120 VAC AC, 1-phase. The control power will be derived from a control transformer connected to the bower circuit. The Control Transformer will be primary and secondary fuse protected.

I. Resistor load element provide the necessary KW load rating for each load step. Resistors are fully supported across their entire length within the air stream by stainless steel support rods which are insulated with heavy-duty, high temperature ceramic insulators. The change in resistance is minimized by maintaining conservative resistor designs.

J. Branch circuit fuse protection provides short-circuit protection of all load steps. Fuses are fast-acting, current-limiting type with an interrupting rating of 200K A.I.C.

K. The load bank will include safety circuits which will disable the load bank if an over-temperature or loss of air flow condition occur. The Blower Motor is short circuit protected by current limiting fuses and thermally protected by overload relay. Load cannot be reapplied until the fault condition is corrected.

L. Load Bank Control Panel will be installed in a NEMA wall mountable enclosure. The control panel will include; Main Power On/Off switch, Blower Start/Stop push buttons, Master Load On/Off switch, and Individual Load Step switches KW On/Off). Illuminated indicators provide Power On, Blower On, Motor Overload, Air-Flow Failure, Over-Temperature and Load Dump. An Emergency-Stop (E-STOP) push button is provided to disable control power voltage to all operator control circuits, including blower and load application circuits.

M. Automatic Load Leveling Control will add/subtract load bank load in response to dynamic power fluctuations of the connected building load. It utilizes the load bank as a supplemental load for maintaining a minimum load on the power source. A customer supplied “transfer of control” contact closure initiates the load bank and time delay load application circuit. A separately supplied current transformer provides the necessary feedback signal for sensing the building load.

N. Automatic Load Dump circuit provides user interface provisions to the generator controls, automatic transfer switch or building management system, to disconnect and disable all load steps from a normally closed (NC) set of auxiliary contacts. In the event of an actual power failure, all load bank load is removed from the source under test.

O. Remote Indication and Alarm contact closure [form-c-type, normally open and normally closed] provides user interface to building management system for indication, detection and alarm of Air-Flow Failure, Over-Temperature and Load Dump.

P. The load bank will be manufactured by Load Banks Direct or approved equal.

PART 3.0 EXECUTION

3.1 QUALITY CONTROL

A. The load bank shall be fully tested using a test specification written by the supplier. Tests shall include electrical functional testing, verifying conformance to assembly drawings and specifications. Each load step shall be cold resistance checked to verify proper calibration of resistive load steps and proper ohmic value.

B. The manufacturer shall maintain this data on file for inspection purposes by the purchaser. Tests using high potential equipment shall be performed to ensure isolation of the load circuits from the control circuits and to determine isolation of the load circuits from the load bank frame. Tests of all safety circuits shall be performed to verify conformance to the specification.
C. All electrical circuits shall have a high potential insulation resistance test performed at twice rated voltage plus 1000 VAC to assure insulation integrity.
D. All quality control test equipment shall be regularly maintained and calibrated to traceable national standards.
E. The Company's Quality System shall be at least ISO9001:2015 Certified.

3.2 QUALIFICATIONS OF MANUFACTURER

A. The load bank shall be manufactured by a firm regularly engaged in the manufacture of load banks and who can demonstrate at least twenty five (25) years of experience with at least twenty five (25) installations of load banks similar or equal to the ones specified herein.
B. The manufacturer shall have a written Quality Control procedure available for review by the purchaser, which shall document all phases of operations, engineering, and manufacturing.

END OF SECTION 263214

SECTION 263353 - STATIC UNINTERRUPTIBLE POWER SUPPLY

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. Modular N+1 UPS#1 (40KVA/36KW) capable of being upgradeable to 50KVA by addition of UPS modules within the same cabinet. Each UPS module shall be rated 10KVA.

2. Modular N+1 UPS#2 (30KVA/27KW) capable of being upgradeable to 40KVA by addition of UPS modules within the same cabinet

3. Provide with the following features with each UPS:

a. Surge suppression.
b. Input harmonics reduction.
c. Rectifier-charger.
d. Inverter.
e. Static bypass transfer switch.
f. Battery and battery disconnect device.
g. Remote UPS monitoring provisions via network communication card.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. LCD: Liquid-crystal display.

C. LED: Light-emitting diode.

D. THD: Total harmonic distortion.

E. UPS: Uninterruptible power supply.

1.4 ACTION SUBMITTALS

A. Seismic Performance: UPS shall withstand the effects of earthquake motions determined according to ASCE.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

B. Product Data: For each type of product indicated. Include data on features, components, ratings, and performance.

C. Shop Drawings: For UPS. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, components, and location and identification of each field connection. Show access, workspace, and clearance requirements; details of control panels; and battery arrangement.

1.5 INFORMATIONAL SUBMITTALS

A. Manufacturer Certificates: For each product, from manufacturer.

B. Factory Test Reports: Comply with specified requirements.

C. Field quality-control reports.

D. Performance Test Reports: Indicate test results compared with specified performance requirements and provide justification and resolution of differences if values do not agree.

E. Warranties: Sample of special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For UPS units to include in emergency, operation, and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: One for every 10 of each type and rating, but no fewer than one of each for each UPS set.
2. Cabinet Ventilation Filters: One complete set(s) for each UPS set.

1.8 QUALITY ASSURANCE

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. UL Compliance: Listed and labeled under UL 1778 by an NRTL.

C. Reliability: The UPS equipment reliability shall be represented in terms of theoretical Mean-Time-Between-Failures (MTBF). The UPS manufacturer shall, as a minimum provide the following capability:

1. Total single module UPS system output (includes reliability of bypass circuit) is 1,8000,000 MTBF hours.
2. Single module UPS operation (represents UPS module operation only): 233,000 MTBF hours.
3. Maintainability: Mean Time to Repair (MTTR) of the UPS shall not exceed one (1) hour including time to replace components.

1.9 WARRANTY

A. Special UPS Warranties: Specified form in which manufacturer and Installer agree to repair or replace components that fail in materials or workmanship within special warranty period.

1. Special Warranty Period: One year from date of Factory Startup for UPS and one year from date of Factory Startup for batteries.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The Basis of Design is:

1. Mitsubishi.

B. Substitutions shall be submitted 10 days prior to bid date to the Engineer with a list of any deviations or exceptions to this specification.

2.2 OPERATIONAL REQUIREMENTS

A. Automatic operation includes the following:

1. Normal Conditions: Load is supplied with power flowing from the normal power input terminals, through the rectifier-charger and inverter, with the battery connected in parallel with the rectifier-charger output.

2. Abnormal Supply Conditions: If normal supply deviates from specified and adjustable voltage, voltage waveform, or frequency limits, the battery supplies energy to maintain constant, regulated inverter power output to the load without switching or disturbance.
3. If normal power fails, energy supplied by the battery through the inverter continues supply-regulated power to the load without switching or disturbance.
4. When power is restored at the normal supply terminals of the system, controls automatically synchronize the inverter with the external source before transferring the load. The rectifier-charger then supplies power to the load through the inverter and simultaneously recharges the battery.
5. If the battery becomes discharged and normal supply is available, the rectifier-charger charges the battery. On reaching full charge, the rectifier-charger automatically shifts to float-charge mode.
6. If any element of the UPS system fails and power is available at the normal supply terminals of the system, the static bypass transfer switch switches the load to the normal ac supply circuit without disturbance or interruption.
7. If a fault occurs in the system supplied by the UPS, and current flows in excess of the overload rating of the UPS system, the static bypass transfer switch operates to bypass the fault current to the normal ac supply circuit for fault clearing.
8. When the fault has cleared, the static bypass transfer switch returns the load to the UPS system.
9. If the battery is disconnected, the UPS continues to supply power to the load with no degradation of its regulation of voltage and frequency of the output bus.

B. Manual operation includes the following:

1. Turning the inverter off causes the static bypass transfer switch to transfer the load directly to the normal ac supply circuit without disturbance or interruption.
2. Turning the inverter on causes the static bypass transfer switch to transfer the load to the inverter.

C. Three-breaker wrap around Maintenance Bypass/Isolation Switch with electrical interlocks – SKRU.

D. Environmental Conditions: The UPS shall be capable of operating continuously in the following environmental conditions without mechanical or electrical damage or degradation of operating capability, except battery performance.

1. Ambient Temperature for Electronic Components: 32 to 104 degrees F.
2. Ambient Temperature for Battery: 41 to 95 degrees F.
3. Relative Humidity: 5 to 95 percent, noncondensing.
4. Altitude: Sea level to 5000 feet.

2.3 PERFORMANCE REQUIREMENTS

A. The UPS shall perform as specified in this article while supplying rated full-load current, composed of any combination of linear and nonlinear load, up to 100 percent nonlinear load

with a load crest factor of 2.5, under the following conditions or combinations of the following conditions:

1. Inverter is switched to battery source.
2. Steady-state ac input voltage deviates up to plus or minus 10 percent from nominal voltage.
3. Steady-state input frequency deviates up to plus or minus 5 percent from nominal frequency.
4. THD of input voltage is 15 percent or more with a minimum crest factor of 2.5, and the largest single harmonic component is a minimum of 5 percent of the fundamental value.
5. Load is 30 percent unbalanced continuously.
6. Supply a single input connection.

B. Minimum Duration of Supply: If battery is sole energy source supplying rated full UPS load current at 90 percent power factor, duration of supply is 10 minutes.

C. Input Voltage Tolerance: System steady-state and transient output performance remains within specified tolerances when steady-state ac input voltage varies plus 15, minus 30 percent from nominal voltage.

D. Overall UPS Efficiency: Equal to or greater than 93.0 percent at 100 percent load and 93.0 percent at 50 percent load.

E. Maximum AC Output-Voltage Regulation for Loads up to 100 Percent Unbalanced: Plus or minus 2 percent over the full range of battery voltage.

F. Output Frequency: 60 Hz, plus or minus 0.01 percent over the full range of input voltage, load, and battery voltage.

G. Limitation of harmonic distortion of input current to the UPS shall be as follows:

1. Description: Either a tuned harmonic filter or an arrangement of rectifier-charger circuits shall limit THD to less than 4 percent, at rated full UPS load current, for power sources with X/R ratio between 2 and 30.

H. Maximum Harmonic Content of Output-Voltage Waveform: 2 percent maximum at 100 percent linear load, 5 percent maximum at 100 percent non-linear load.

I. Minimum Overload Capacity of UPS at Rated Voltage: 125 percent of rated full load for 60 seconds, and 150 percent for 30 seconds in all operating modes.

J. Maximum Output-Voltage Transient Excursions from Rated Value: For the following instantaneous load changes, stated as percentages of rated full UPS load, voltage shall remain within stated percentages of rated value and recover to, and remain within, plus or minus 3 percent of that value within 100 ms:

1. 50 Percent: Plus or minus 3 percent, recovery in less than 1 cycle.
2. 100 Percent: Plus or minus 3 percent, recovery in less than 1 cycle.
3. Loss of AC Input Power: Plus or minus 1 percent.

4. Restoration of AC Input Power: Plus or minus 1 percent.

K. Input Power Factor: A minimum of 0.98 lagging when supply voltage and current are at nominal rated values and the UPS is supplying rated at 50 percent and 100 percent load.

L. EMI Emissions: Comply with FCC Rules and Regulations and with 47 CFR 15 for Class A equipment.

2.4 UPS SYSTEMS

A. Electronic Equipment: Solid-state devices using hermetically sealed, semiconductor elements. Devices include rectifier-charger, inverter, static bypass transfer switch, and system controls.

B. Enclosures: Comply with NEMA 250, Type 1, unless otherwise indicated.

C. Control Assemblies: Mount on modular plug-ins, readily accessible for maintenance.

D. Surge Suppression: Components shall be protected from surges at the panel level, refer to specification 264313 “Surge Protection for Low-Voltage Electrical Power Circuits.”

2.5 RECTIFIER-CHARGER

A. Capacity: Adequate to supply the inverter during rated full output load conditions and simultaneously recharge the battery from fully discharged condition to 95 percent of full charge within 10 times the rated discharge time for duration of supply under battery power at full load.

B. Output Ripple: Limited by output filtration to less than 0.5 percent of rated current, peak to peak.

C. Control Circuits: Immune to frequency variations within rated frequency ranges of normal and emergency power sources.

1. Response Time: Field adjustable for maximum compatibility with local generator-set power source.

D. Battery Float-Charging Conditions: Comply with battery manufacturer's written instructions for battery terminal voltage and charging current required for maximum battery life.

2.6 INVERTER

A. Description: Utilize fully Insulated Gate Bipolar Transistor (IGBT) inverter and Pulse Width Modulation (PWM) controls.

2.7 STATIC BYPASS TRANSFER SWITCH

A. Description: Solid-state switching device providing uninterrupted transfer. A contactor or electrically operated circuit breaker automatically provides electrical isolation for the switch.

B. Switch Rating: Continuous duty at the rated full UPS load current, minimum.

2.8 BATTERY

A. Description: Valve-regulated, premium, heavy-duty, recombinant, lead-calcium units; factory assembled in a separate matching cabinet, complete with battery disconnect switch. The battery disconnect switch shall be sized to handle the maximum rating of the UPS.

2.9 HOT SWAPPABLE

A. The Power Converter modules and battery modules shall be designed draw out hot swappable modules.

2.10 CONTROLS AND INDICATIONS

A. Description: Group displays, indications, and basic system controls on a common control panel on front of UPS enclosure.

B. Operation/Display Panel: The control panel shall employ the use of a 3.4” touch screen interface which allows lockout of all UPS control functions for security. (The Emergency Power Off function shall not be locked out.

1. The operator interface shall provide the following:

a. UPS start-up procedure.
b. UPS shutdown procedure.
c. Emergency Power Off (EPO).
d. Audible alarm silence.
e. System status levels.

2. The UPS shall be provided with a control/indicator panel. The panel shall be on the front of the UPS module. Controls, Meters, alarms and indicators for operation of the UPS shall be on this panel.

C. Graphic Operator Terminal 3.4” Liquid Crystal Display (LCD)

D. The LCD touch screen interfaces with the UPS system control and main processor board to provide menu-driven operator instructions and UPS system operation detail. The LCD indicates system operation, operational guidance, measurement data, set-up data, alarm messages and logs. All metering shall be digitally displayed on the LCD having and accuracy of 1% or better.

E. The touch screen area is composed of one MAIN sheet and eight MENU sheets: MAIN, METER, OPERATION, STATUS LOG, BATTERY LOG, SETUP, the power converter module STATUS, CURRENT and FAULT LOG.

F. MAIN Sheet: The MAIN sheet indicates power flow and measured values. The LCD panel allows the user to verify the status and operation of the UPS components by the mimic display. The following information is available on the MAIN sheet:

1. Converter operation.
2. Battery operation.
3. Load on inverter.
4. Load on bypass.
5. Typical measurement values on Input, Bypass, Battery and Output.
6. Alarm/Fault messages.

G. Meter Sheet: The METER sheet indicates measured values. The following information is available on the METER sheet.

1. Display information:
    a. Input Voltage and Frequency.
    b. Battery Voltage and Charging/Dis-charging Current.
    c. Output Voltage, Frequency and Current.
    d. Output active power.
    e. Output power factor.

H. OPERATION Sheet: The OPERATION sheet prompts the user to select specific performance.

1. The Power Converter Module Start.
2. The Power Converter Module Stop.
3. Load transfer to Bypass.
4. Load transfer to Inverter.

I. STATUS MENU Sheet: The STATUS MENU Sheet indicates event and alarm/fault information. A minimum of 100 events can be displayed. The following alarm/status information shall be available as a minimum:

1. Load on Inverter
2. Load on Bypass
3. System Startup
4. System Stop

J. Emergency Power Off Switch: Capable of local operation and operation by means of activation by external dry contacts.

2.11 MAINTENANCE BYPASS/ISOLATION SWITCH

A. Description: Manually operated switch or arrangement of switching devices with mechanically actuated contact mechanism arranged to route the flow of power to the load around the rectifier-charger, inverter, and static bypass transfer switch.

1. Switch shall be electrically and mechanically interlocked to prevent interrupting power to the load when switching to bypass mode.
2. Switch shall electrically isolate other UPS components to permit safe servicing.

B. Mounting Provisions: Internal to system cabinet.

2.12 MECHANICAL DESIGN

A. Cabinet Structure (Enclosure)

1. The enclosure shall be primed and painted with the Munsell N1.5 (black) color. The enclosure shall be free standing floor mount design. The enclosure panels shall consist of non-flammable plastic. The inside cover and frame shall consist of minimum 16-gage (1.5mm) steel for maximum strength and durability.
2. The UPS shall be installed in cabinets of heavy-duty structure meeting with NEMA standard for floor mounting. Caster with locking point and leveling feet shall be included as a standard feature. Operating controls shall be located on the front panel of the UPS module. Input, output, and external battery cables shall be installed through the bottom of the cabinet.

B. Serviceability

1. The UPS shall have front access for all servicing adjustments and connections only for maintenance or service. Side access or rear access shall not be accepted. The UPS shall be designed such that it’s sides can be pressed against side and rear walls.
2. Cabinets shall be matching for front and rear alignment.

C. Ventilation

1. Forced air cooling shall be provided to allow all components to operate within their rated temperature window. Forced air shall be provide with redundant high-quality fans. All air inlets use air filters that shall be removable from the front of the UPS without exposure to any electrical hazard. Air filters shall be front cover mounted to prevent floor dust from being sucked into the unit.

2.13 MONITORING BY REMOTE COMPUTER

A. Description: Communication module in unit control panel provides capability for remote monitoring of status, parameters, and alarms specified in "Controls and Indications" Article. The remote computer and the connecting signal wiring are not included in this Section. Include the following features:

1. Connectors and network interface units for data transmission.
2. The UPS shall be supplied with a Network Communication Card to enable the UPS to be monitored remotely via a TCP/IP network. This will provide real time monitoring of the UPS condition, status of voltages and currents, review error logs, and receive email notifications (SNMP traps) of errors as they occur. In addition, it will provide the ability to perform remote server shut-downs.
3. Software designed for control and monitoring of UPS functions and to provide on-screen explanations, interpretations, diagnosis, action guidance, and instructions for use of monitoring indications and development of meaningful reports. Permit storage and analysis of power-line transient records. Designs for Windows applications, software, and computer are not included in this Section.

2.14 SOURCE QUALITY CONTROL

A. Factory test complete UPS system before shipment. Use simulated battery testing. Include the following:

1. Test and demonstration of all functions, controls, indicators, sensors, and protective devices.
2. Full-load test.
3. Transient-load response test.
4. Overload test.
5. Power failure test.

B. Report test results. Include the following data:

1. Description of input source and output loads used. Describe actions required to simulate source load variation and various operating conditions and malfunctions.
2. List of indications, parameter values, and system responses considered satisfactory for each test action. Include tabulation of actual observations during test.
3. List of instruments and equipment used in factory tests.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for conditions affecting performance of the UPS.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Equipment Mounting: Install UPS on concrete base. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete".

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to supported equipment.

B. Maintain minimum clearances and workspace at equipment according to manufacturer's written instructions and NFPA 70.

C. Connections: Interconnect system components. Make connections to supply and load circuits according to manufacturer's wiring diagrams unless otherwise indicated.

3.3 GROUNDING

A. Separately Derived Systems: If not part of a listed power supply for a data-processing room, comply with NFPA 70 requirements for connecting to grounding electrodes and for bonding to metallic piping near isolation transformer.

3.4 IDENTIFICATION

A. Identify components and wiring according to Section 260553 "Identification for Electrical Systems."

3.5 BATTERY EQUALIZATION

A. Equalize charging of battery cells according to manufacturer's written instructions. Record individual-cell voltages.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Comply with manufacturer's written instructions.
2. Inspect interiors of enclosures, including the following:

a. Integrity of mechanical and electrical connections.
b. Component type and labeling verification.
c. Ratings of installed components.

3. Test manual and automatic operational features and system protective and alarm functions.
4. Test communication of status and alarms to remote monitoring equipment.

a. Test battery-monitoring system functions.

C. The UPS system will be considered defective if it does not pass tests and inspections.

D. Record of Tests and Inspections: Maintain and submit documentation of tests and inspections, including references to manufacturers' written instructions and other test and inspection criteria. Include results of tests, inspections, and retests.

E. Prepare test and inspection reports.

3.7 DEMONSTRATION AND TRAINING

A. Demonstrate to Owner the operation of the UPS under fully loaded conditions.

B. Train Owner's maintenance personnel to adjust, operate, and maintain the UPS. At the time of startup. Notice is to be given to the Owner ten (10) working days ahead of startup to allow for scheduling of the training. Include training materials with Operation and Maintenance Manual.

END OF SECTION 263353

SECTION 263600 - TRANSFER SWITCHES

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. Specification 263213 – “Engine Generators.” , section 262313 “Generator Paralleling low voltage switchgear”

1.2 SUMMARY

A. Section includes transfer switches rated 600 V and less, including the following:

1. Automatic transfer switches.
2. Bypass/isolation switches.
3. Remote annunciation and control systems.

1.3 GENERAL REQUIREMENTS

A. The minimum interrupt ampere rating (RMS symmetrical) of transfer switch equipment shall be as indicated by Electrical Drawings (One-Line Diagram). The minimum interrupt rating shall also meet or exceed the recommendations of the Short Circuit Study (Specification Section 260573.13 - “Short-Circuit Study.”)

1. The Short Circuit Study shall be completed and approved by Engineer prior to approval of transfer switch equipment shop drawings. The equipment interrupt rating may be reduced with Engineer approval pending completion of, and recommendations from, the Short Circuit Study.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, weights, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: Dimensioned plans, elevations, sections, and details showing minimum clearances, conductor entry provisions, gutter space, installed features and devices, and material lists for each switch specified.

1. Single-Line Diagram: Show connections between transfer switch, bypass/isolation switch, power sources, and load; and show interlocking provisions for each combined transfer switch and bypass/isolation switch.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

B. Field quality-control reports.

C. Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017820 "Operation and Maintenance Data," include the following:

1. Features and operating sequences, both automatic and manual.
2. List of all factory settings of relays; provide relay-setting and calibration instructions, including software, where applicable.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Maintain a service center capable of providing training, parts, and emergency maintenance repairs within a response period of less than eight hours from time of notification.

B. Source Limitations: Obtain automatic transfer switches bypass/isolation switches and remote annunciators and control panels through one source from a single manufacturer.

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.

D. Comply with NEMA ICS 1.

E. Comply with NFPA 70.

F. Comply with NFPA 110.

G. Comply with UL 1008 unless requirements of these Specifications are stricter.

1.8 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 5 years from date of Substantial Completion. Warranty shall include labor, parts, mileage and travel time.

1.9 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Section 033000 "Cast-in-Place Concrete."

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ASCO Power Technologies 7000 Series Front Access.
b. Russelectric, Inc – Front Access.

B. Automatic open transition transfer switches & bypass-isolation switches basis of design shall be ASCO 7000 Series. Any alternate not listed above shall be submitted for approval to the consulting engineer at least 10 days prior to bid; and shall be submitted with a list of any deviations or exceptions from this specification.

2.2 GENERAL TRANSFER-SWITCH PRODUCT REQUIREMENTS

A. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including tungsten filament lamp loads not exceeding 30 percent of switch ampere rating, unless otherwise indicated.

B. Tested Fault-Current Closing and Withstand Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.

1. The interrupt rating of the transfer switch shall not be based upon a series/combination rating with a specific breaker. The interrupt rating shall be fully rated with any breaker.

2. The automatic transfer switch shall be provided with a time-based fault rating of 0.025 seconds for switches 230 amps and less and 0.05 seconds for switches 260 amps and larger. The amperage of this rating shall be larger than the amount of the fault current available to the transfer switch and shall be verified by the coordination study.

3. Automatic transfer switches rated 800 amps and larger shall be provided with a minimum short time rating of 36kA for a period of no less than 0.3 seconds.

4. Any automatic transfer switch that is fed by a breaker that has a short time rating shall also have a short time rating to meet the criteria of UL1008 7th edition. No exceptions shall be taken from this requirement.

C. Microprocessor Controller: The controller's sensing and logic shall be provided by a single built-in microprocessor for maximum reliability, minimum maintenance, and the ability to communicate serially through an optional serial communication module.

1. A single controller shall provide twelve selectable nominal voltages for maximum application flexibility and minimal spare part requirements. Voltage sensing shall be true RMS type and shall be accurate to +/- 1% of nominal voltage. Frequency sensing shall be accurate to +/- 0.2%. The panel shall be capable of operating over a temperature range of -20 to +60 degrees C and storage from -55 to +85 degrees C.

2. The controller shall be connected to the transfer switch by an interconnecting wiring harness. The harness shall include a keyed disconnect plug to enable the controller to be disconnected from the transfer switch for routine maintenance. Sensing and control logic shall be provided on multi-layer printed circuit boards. Interfacing relays shall be industrial grade plug-in type with dust covers. The panel shall be enclosed with a protective cover and be mounted separately from the transfer switch unit for safety and ease of maintenance. The protective cover shall include a built-in pocket for storage of the operator's manuals.

3. All customer connections that interface with the control shall be wired to a common terminal block to simplify field-wiring connections.

4. Data Logging – The controller shall have the ability to log data and to maintain the last 99 events, even in the event of total power loss. The following events shall be time and date stamped and maintained in a non-volatile memory:

    a. Event Logging
        1) Data and time and reason for transfer normal to emergency.
        2) Data and time and reason for transfer emergency to normal.
        3) Data and time and reason for engine start.
        4) Data and time engine stopped.
        5) Data and time emergency source available.
        6) Data and time emergency source not available.

    b. Statistical Data
        1) Total number of transfers.
        2) Total number of transfers due to source failure.
        3) Total number of days controller is energized.
        4) Total number of hours both normal and emergency sources are available.

5. Self-Diagnostics - The controller shall contain a diagnostic screen for the purpose of detecting system errors. This screen shall provide information on the status input signals to the controller which may be preventing load transfer commands from being completed.

6. The controller shall meet or exceed the requirements for Electromagnetic Compatibility (EMC) as follows:

a.	EN 55011:1991	Emission standard – Group 1, Class A
b.	EN 50082:-2:1995	Generic immunity standard, from which:
c.	EN 61000-4-2:1995	Electrostatic Discharge (ESD) immunity
d.	ENV 50140:1993	Radiated Electro-Magnetic field immunity
e.	EN 61000-4-4:1995	Electrical Fast Transient (EFT) immunity
f.	EM 61000-4-5:1995	Surge Transient immunity

D. Electrical Operation: Accomplish by a non-fused, momentarily energized dual solenoid or dual electric-motor-operated mechanism, mechanically and electrically interlocked in both directions.

E. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.

1. Limitation: Switches using molded-case switches or circuit breakers or insulated-case circuit-breaker components shall not be acceptable.
2. Switch Action: Double throw; mechanically held in both directions.
3. Contacts: Silver composition or silver alloy for load-current switching. Conventional automatic transfer-switch units, rated 225 A and higher, shall have separate arcing contacts. Transfer switches using tin plated contacts are not acceptable.

F. Neutral Switching. Where four-pole switches are indicated on Electrical Drawings (One-Line Diagram), provide neutral pole switched simultaneously with phase poles.

G. Annunciation, Control, and Programming Interface Components: Devices at transfer switches for communicating with remote programming devices, annunciators, or annunciator and control panels shall have communication capability matched with remote device.

H. Factory Wiring: Train and bundle factory wiring and label, consistent with Shop Drawings, either by color-code or by numbered or lettered wire and cable tape markers at terminations. Color-coding and wire and cable tape markers are specified in Section 260553 "Identification for Electrical Systems."

1. Designated Terminals: Pressure type, suitable for types and sizes of field wiring indicated.
2. Power-Terminal Arrangement and Field-Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated.
3. Control Wiring: Equipped with lugs suitable for connection to terminal strips.

I. Enclosures: General-purpose NEMA 250, Type 1, complying with NEMA ICS 6 and UL 508, unless otherwise indicated.

2.3 AUTOMATIC TRANSFER SWITCHES

A. Comply with Level 1 equipment according to NFPA 110.

B. Switching Arrangement: Double-throw type, incapable of pauses or intermediate position stops during normal functioning, unless otherwise indicated.

C. Controller Display and Keypad: A four-line, 20-character LCD display and keypad shall be an integral part of the controller for viewing all available data and setting desired operational parameters. Operation parameters shall also be available for viewing and limited control through the serial communications input port. The following parameters shall only be adjustable via DIP switches on the controller:

1. Nominal line voltage and frequency
2. Single or Three phase sensing.
3. Operating parameter protection.

D. Manual Switch Operation: Under load, with door closed and with either or both sources energized. Transfer time is same as for electrical operation. Control circuit automatically disconnects from electrical operator during manual operation.

E. Digital Communication Interface: Matched to capability of remote annunciator or annunciator and control panel.

F. In-Phase Monitor: Factory-wired, internal relay controls transfer so it occurs only when the two sources are synchronized in phase. Relay compares phase relationship and frequency difference between normal and emergency sources and initiates transfer when both sources are within 15 electrical degrees, and only if transfer can be completed within 60 electrical degrees. Transfer is initiated only if both sources are within 2 Hz of nominal frequency and 70 percent or more of nominal voltage.

G. Automatic Transfer-Switch Features:

1. Voltage and frequency on both the normal and emergency sources (as noted below) shall be continuously monitored, with the following pickup, dropout and trip setting capabilities (values shown as % of nominal unless otherwise specified):

Parameter	Sources	Dropout / Trip	Pickup / Reset
Undervoltage	N&E,3 Phase	70 to 98%	85 to 100%
Overvoltage	N&E,3 Phase	102 to 115%	2% below trip
Underfrequency	N&E	85 to 98%	90 to 100%
Overfrequency	N&E	102 to 110%	2% below trip
Voltage unbalance	N&E	5 to 20%	1% below dropout

a. Repetitive accuracy of all settings shall be within ± 0.5% over an operating temperature range of -20 degrees C to 60 degrees C.

b. Voltage and frequency settings shall be field adjustable in 1% increments either locally with the display and keypad or remotely via serial communications port access.
c. The controller shall be capable (when activated by the keypad or through the serial port) of sensing the phase rotation of both the normal and emergency sources. The source shall be considered unacceptable if the phase rotation is not the preferred rotation selected (ABC or CBA).
d. Source status screens shall be provided for both normal & emergency to pro-vide digital readout of voltage on all 3 phases, frequency, and phase rotation.
e. The controller shall include a user selectable algorithm to prevent repeated transfer cycling to a source on an installation which experiences primary side, single phase failures on a Grounded Wye – Grounded Wye transformer which regenerates voltage when unloaded. The algorithm shall also inhibit retransfer to the normal (utility) source upon detection of a single phasing condition until a dedicated timer expires, the alternate source fails, or the normal source fails completely and is restored during this time delay period. The time delays associated with this feature shall be adjustable by the user through the controller keypad and LCD.

2. Adjustable Time Delays: One for override of normal-source voltage sensing to delay engine start signals and one separate time delay to delay transfer to generator. Adjustable from zero to six seconds, and factory set for one second for generator starting, and adjustable from 0 to 60 minutes for transfer, factory set at zero seconds.

3. Time Delays for Retransfer to Normal Source: Two (2) time delay modes (which are independently adjustable) shall be provided on re-transfer to normal. One (1) time delay shall be for actual normal power failures and the other for the normal monthly test mode function. The time delays shall be adjustable from 0 to 60 minutes. Time delay shall be automatically bypassed if the emergency source fails and the normal source is acceptable.

4. All time delays shall be adjustable by using the LCD display and keypad or with a remote device connected to the serial communications port. Adjusting time delays shall not require a factory technician to change.

5. Test Switch: A three position momentary-type test switch shall be provided for the test / automatic / reset modes. The test position will simulate a normal source failure. The reset position shall bypass the time delays on either transfer to emergency or retransfer to normal.

6. Switch-Position Pilot Lights: Indicate source to which load is connected.

7. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.

    a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
    b. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."

8. All standard and optional door-mounted switches and pilot lights shall be 16-mm industrial grade type 12 or equivalent for easy viewing & replacement. Door controls shall be provided on a separate removable plate.

9. Unassigned Auxiliary Contacts: Two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.

10. Transfer Override Switch: Overrides automatic retransfer control so automatic transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.

11. The controller shall be capable of accepting a normally open contact that will allow the transfer switch to function in a non-automatic mode using an external control device.

12. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 5 A at 30-V dc minimum.

13. Engine Shutdown Contacts: Time delay adjustable from zero to five minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.

14. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods are adjustable from 10 to 30 minutes. Factory settings are for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:

    a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
    b. Push-button programming control with digital display of settings.
    c. Integral battery operation of time switch when normal control power is not available.
    d. For this project, one (1) of two (2) transfer switches shall be equipped with the Engine-Generator Exerciser.

15. Communications Module – Provide a remote interface module to support remote monitoring of the transfer switch, and controller. The communications module shall provide status, analog parameters, event logs, equipment settings & configurations over embedded webpage and open protocol. Features shall include:

    a. Email notifications and SNMP traps of selectable events and alarms may be sent to a mobile device or PC.
    b. Modbus TCP/IP, SNMP, HTTP, SMTP open protocols shall be simultaneously supported.
    c. Web app interface requiring user credentials to monitor and control the transfer switch supporting modern smart phones, tablets and PC browsers. User will be able to view the dynamic one-line; ATS controls status, alarms, metering, event logging as well as settings.
    d. Secure access shall be provided by requiring credentials for a minimum of 3 user privilege levels to the web app, monitor (view only), control (view and control) and administrator (view, control and change settings). 128-Bit AES encryption standard shall be supported for all means of connectivity. Digital communications modules that are not encrypted are not acceptable.
    e. Shall allow for the initiating of transfers, retransfers, bypassing of active timers and the activating/deactivating of engine start signal shall be available over the embedded webpage and to the transfer switch vendor's monitoring equipment.
    f. An event log displaying a minimum of ninety-nine (99) events shall be viewable and printable from the embedded web pages and accessible from supported open protocols.
    g. Four (4) 100 Mbps Ethernet copper RJ-45 ports, five (5) serial ports, Termination dip-switches and LEDs for diagnostics.
    h. DIN rail mountable inside the switch enclosure.

2.4 BYPASS/ISOLATION SWITCHES

A. Comply with requirements for Level 1 equipment according to NFPA 110.

B. Description: Manual type, arranged to select and connect either source of power directly to load, isolating the transfer switch from load and from both power sources. Include the following features for each combined automatic transfer switch and bypass/isolation switch:

1. Means to lock bypass/isolation switch in the position that isolates transfer switch with an arrangement that permits complete electrical testing of transfer switch while isolated. While isolated, interlocks prevent transfer-switch operation, except for testing or maintenance.
2. Draw-out Arrangement for Transfer Switch: Provide physical separation from live parts and accessibility for testing and maintenance operations.
3. Bypass/Isolation Switch Current, Voltage, Closing, and Short-Circuit Withstand Ratings: Equal to or greater than those of associated automatic transfer switch, and with same phase arrangement and number of poles.

4. Contact temperatures of bypass/isolation switches shall not exceed those of automatic transfer-switch contacts when they are carrying rated load.
5. Operability: Constructed so load bypass and transfer-switch isolation can be performed by 1 person in no more than 2 operations in 15 seconds or less. Separate bypass and isolation handles shall be permanently affixed and operable without opening the enclosure door. Designs requiring insertion of loose operating handles or opening of the enclosure door to operator are not acceptable.
6. Bypass operation to the load-carrying source shall be accomplished with no interruption of power to the load (make before break contacts). Designs which disconnect the load when bypassing are not acceptable and will not be allowed.
7. When the isolation switch is in the “Test” or “Open” mode, the bypass switch shall function as a manual transfer switch.
8. Designs requiring operation of key interlocks for bypass isolation of ATS’s which cannot by completely withdrawn when isolated are not acceptable.
9. Legend: Manufacturer's standard legend for control labels and instruction signs shall describe operating instructions.
10. Maintainability: Fabricate to allow convenient removal of major components from front without removing other parts or main power conductors.

C. Interconnection of Bypass/Isolation Switches with Automatic Transfer Switches: Factory-installed silver-plated copper bus bars; plated at connection points and braced for the indicated available short-circuit current. The only field installed power connections shall be at the service and load terminals of the bypass-isolation switch. All control inter-wiring between the removable automatic contactor and bypass isolation switch shall be provided with automatic disconnect plugs that when isolating the switch become disconnect without operator intervention. Designs that use standard type plugs that require an operator to manually separate disconnect plugs when removing the automatic contactor are not acceptable.

2.5 REMOTE ANNUNCIATOR SYSTEM

A. Functional Description: Remote annunciator panel shall annunciate conditions for each transfer switch. Annunciation shall include the following:

1. Sources available, as defined by actual pickup and dropout settings of transfer-switch controls.
2. Switch position.
3. Switch in test mode.
4. Failure of communication link.

B. Annunciator Panel: LED-lamp type with audible signal and silencing switch.

1. Indicating Lights: Grouped for each transfer switch monitored.
2. Label each group, indicating transfer switch it monitors, location of switch, and identity of load it serves.
3. Mounting: Flush or surface mounted, modular, cabinet, unless otherwise indicated.
4. Lamp Test: Push-to-test or lamp-test switch on front panel.

2.6 SOURCE QUALITY CONTROL

A. Factory test and inspect components, assembled switches, and associated equipment. Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.

2.7 WITHSTAND AND CLOSE ON RATINGS

A. The transfer switch shall be rated to close on and withstand the available RMS symmetrical short circuit current at the transfer terminals with the type of overcurrent protection as shown as calculated.

B. Transfer switch shall be listed to UL 1008 7th Edition and shall have been tested for a minimum of .050 seconds (3 cycles) with the WCR on ratings as required on the project.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Floor-Mounting Switch: Anchor to floor by bolting.

1. Concrete Bases: 4 inches high, reinforced, with chamfered edges. Extend base no more than 4 inches in all directions beyond the maximum dimensions of switch, unless otherwise indicated. Construct concrete bases according to Section 033000 “Cast-in-Place Concrete.”

B. Annunciator and Control Panel Mounting: Flush in wall, unless otherwise indicated.

C. Set field-adjustable intervals and delays, relays, and engine exerciser clock.

3.2 CONNECTIONS

A. Wiring to Remote Components: Match type and number of cables and conductors to control and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner if necessary, to accommodate required wiring.

B. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

C. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 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. After installing equipment and after electrical circuitry has been energized, test for compliance with requirements.
2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
3. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.

    a. Check for electrical continuity of circuits and for short circuits.
    b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
    c. Verify that manual transfer warnings are properly placed.
    d. Perform manual transfer operation.

4. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times.

    a. Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.
    b. Simulate loss of phase-to-ground voltage for each phase of normal source.
    c. Verify time-delay settings.
    d. Verify pickup and dropout voltages by data readout or inspection of control settings.
    e. Test bypass/isolation unit functional modes and related automatic transfer-switch operations.
    f. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.

5. Ground-Fault Tests: Coordinate with testing of ground-fault protective devices for power delivery from both sources.

    a. Verify grounding connections and locations and ratings of sensors.

C. Coordinate tests with tests of generator and run them concurrently.

D. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.

E. Remove and replace malfunctioning units and retest as specified above.

F. Prepare test and inspection reports.

3.4 DEMONSTRATION AND TRAINING

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain transfer switches and related equipment as specified below.

B. Coordinate this training with that for generator equipment.

END OF SECTION 263600

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SECTION 264313 - SURGE PROTECTION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

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 field-mounted SPDs for low-voltage (120 to 600 V) power distribution and control equipment.

1. Main Paralleling Gear ‘MDPA’ – 480/277V, 3-phase, 4-wire.
2. Emergency Distribution Panel ‘DP-L’ - 480/277V, 3-phase, 4-wire.
3. Emergency Distribution Switchboard ‘ODPA’ - 480/277V, 3-phase, 4-wire.
4. Emergency Distribution Switchboard ‘ODPB’ - 480/277V, 3-phase, 4-wire.
5. Lighting Panel ‘L1P’ – 208/120V, 3-phase, 4-wire.
6. Lighting Panel ‘L2P’ - 208/120V, 3-phase, 4-wire.
7. Lighting Panel ‘E1PA’ - 208/120V, 3-phase, 4-wire.
8. Lighting Panel ‘E1PB’ - 208/120V, 3-phase, 4-wire.
9. Lighting Panel ‘E1PC’ - 208/120V, 3-phase, 4-wire.
10. Lighting Panel ‘E1PD’ - 208/120V, 3-phase, 4-wire.
11. Lighting Panel ‘E2PA’ - 208/120V, 3-phase, 4-wire.
12. Lighting Panel ‘E2PB’ - 208/120V, 3-phase, 4-wire.
13. Lighting Panel ‘E2PC’ - 208/120V, 3-phase, 4-wire.
14. Lighting Panel ‘E2PD’ - 208/120V, 3-phase, 4-wire.
15. Lighting Panel ‘E2PE’ - 208/120V, 3-phase, 4-wire.
16. Lighting Panel ‘E3PA’ - 208/120V, 3-phase, 4-wire.
17. Lighting Panel ‘E4PA’ - 208/120V, 3-phase, 4-wire.
18. Lighting Panel ‘E4PB’ - 208/120V, 3-phase, 4-wire.
19. Lighting Panel ‘E5PA’ - 208/120V, 3-phase, 4-wire.
20. Lighting Panel ‘E5PB’ - 208/120V, 3-phase, 4-wire.
21. Lighting Panel ‘U1R’ - 208/120V, 3-phase, 4-wire.
22. Lighting Panel ‘U2R’ - 208/120V, 3-phase, 4-wire.

1.3 REFERENCED STANDARDS

A. IEEE C62.41: IEEE Guide for Surge Voltages in Low Voltage AC Power Circuits (ANSI).

B. IEEE C62.45: IEEE Guide for Surge Suppressor Testing (ANSI).

C. NETA ATS: Acceptance Testing Specifications; Section 7.19, "Low-Voltage Surge Protection Devices".

D. NEMA 250: Enclosures for Electrical Equipment (1000 Volts Maximum).

E. NEMA WD 6: Wiring Device--Dimensional Requirements.

F. NFPA 70: National Electrical Code.

G. UL 486A: Wire Connectors and Soldering Lugs for Use with Copper Conductors.

H. UL 1283: Electromagnetic Interference Filters.

I. UL 1449 (3rd Edition Effective 9/29/2009): UL1149 4th Edition Effective 3/26/2016 Surge Protection Devices.

1.4 DEFINITIONS

A. Inominal: Nominal discharge current.

B. MCOV: Maximum continuous operating voltage.

C. Mode(s), also Modes of Protection: The pair of electrical connections where the VPR applies.

D. SCCR: Short-circuit current rating.

E. SPD: Surge protective device.

F. VPR: Voltage protection rating.

1.5 SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
2. Copy of UL Category Code VZCA certification, as a minimum, listing the tested values for VPRs, Inominal ratings, MCOVs, type designations, OCPD requirements, model numbers, system voltages, and modes of protection.
3. Shipping, installed, and operating weights; furnished specialties; and accessories.

B. Product Certificates: Signed by manufacturers of surge protection devices, certifying that products furnished comply with the following testing and labeling requirements:

1. UL 1283 certification by an OSHA approved NRTL.
2. UL 1449 (3rd Edition Effective 9/29/2009) 4th Edition Effective 3/26/2016 listing and classification by an OSHA approved NRTL.
3. NEMA LS-1 Single Pulse

C. Field Test Reports: Written reports of tests specified in Part 3 of this Section. Include the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Failed test results and corrective action taken to achieve requirements.

D. Maintenance Data: For surge protection devices to include in maintenance manuals specified in Division 1.

E. Warranties: Special warranties specified in this Section.

1.6 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Sample Warranty: For manufacturer's special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For SPDs to include in maintenance manuals.

1.8 WARRANTY

A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of surge suppressors that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Fifteen (15) years from date of Substantial Completion for TG and CGP series.

1.9 SERVICE CONDITIONS

A. Rate surge protective devices for continuous operation under the following conditions, unless otherwise indicated:

1. Maximum Continuous Operating Voltage: Not less than 115 percent of nominal system operating voltage.
2. Operating Temperature: minus 20 degrees F to plus 120 degrees F.
3. Humidity: 0 to 85 percent, non-condensing.

4. Altitude: Less than 20,000 feet above sea level.

PART 2 - PRODUCTS

2.1 GENERAL SPD REQUIREMENTS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Current Technology Inc.

2. Substitutions need to be submitted to Engineer for review a minimum of 10-days prior to bid date with a list of any deviations or exceptions from this specification.

B. SPD with Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NFPA 70.

D. Comply with UL 1449. 4th Edition Effective 3/26/2016.

E. MCOV of the SPD shall be the nominal system voltage.

2.2 PANEL SUPPRESSORS

A. Comply with UL 1449 (4th Edition) Type 1, tested at Inominal Rating: 20 kA.

B. Per ANSI/IEEE C62.41.1-2002, C62.41.2-2002 and C62.45-2002, the SPD system shall be repetitive surge current capacity tested in every mode using a 1.2 x 50 µsec, 20KV open circuit voltage, 8 x 20 µsec, 200KA short circuit current ANSI/IEEE C62.41 Category C3 waveform at one minute interval. Minimum repetitive strikes with less than 10% degradation of clamping voltage shall be 3500 repetitive C3 strikes per mode.

C. Single Pulse Surge Testing: The maximum single-pulse surge current capacity per mode shall be verified through testing at an independent third party testing facility. Testing shall be conducted in each mode of the device and all tested modes shall be from the same test sample. This test shall include all components of the SPD system, including disconnects (if applicable) and fusing as a completed assembly. Individual component testing, module testing only, or subsystem testing of the SPD for compliance with this section will not be acceptable. Ratings based on the arithmetic sum of the ratings of the individual MOVs in a given mode are not acceptable. Testing that causes damage to the device, fuse operation, or voltage clamping performance degradation by more than 10% is not acceptable. The Single Pulse Surge Current Capacity shall be as below:

1. 150kA per mode (Main Switchboard).
2. 80kA per mode (Emergency Distribution Switchboards and Panels).
3. 60kA per mode (Lighting Panels)

D. Filtering: The SPD shall provide a noise filtering system capable of attenuating noise levels produced by electromagnetic interference and radio frequency interference (EMI/RFI). The system's filtering characteristics shall be expressed in decibels (dB) of attenuation at no less than 8 points over a frequency spectrum between 50kHz and 100MHz. The noise filtering system shall also be listed to UL 1283 by an approved NRTC, as an electromagnetic interference filter.

E. Fusing: Each MOV shall be individually fused and designed to operate only in the event of an MOV failure within the SPD. In the event of an MOV failure, the fuse will operate to remove the failed MOV from the circuit. The remaining MOV's and fuses will stay intact to handle subsequent surges. The fusing included with the SPD system shall be required to meet the above requirement and shall be included with the above testing guidelines. Overcurrent fusing that limits the rated single pulse surge current of the SPD is not acceptable. Replaceable cartridge type per phase or per mode overcurrent fusing is not acceptable where there is more than one MOV per mode.

F. Fault Current Capability: The unit shall be capable of interrupting up to a 200kA symmetrical fault current with 600VAC applied without the need of an upstream overcurrent protection device (fuse or circuit breaker).

G. UL 1449 Voltage Protection Rating: The unit shall be UL 1449 3rd Edition 4th Edition Effective 3/26/2016Listed by a Nationally Recognized Testing Laboratory and shall be as follows for L-N, L-G, N-G, and L-L, modes: Note: the below values are for a 120/240 or 120/208 volt systems, for 277/480 volts the VPR's are 1200V L-N, 1200V L-G, 1000V N-G, 2000V L-L

1. Main Distribution Panel: 150kA rated products (Current Technology TG3-150-480-3Y-PNB-M3-F-2):

    a. Line to Neutral: 700 V.
    b. Line to Ground: 700 V.
    c. Neutral to Ground: 700 V.
    d. Line to Line: 1200 V.

2. Emergency Distribution Panel: 80kA rated products (Current Technology CGP-080-277/480-3GY):

    a. Line to Neutral: 700 V.
    b. Line to Ground: 700 V.
    c. Neutral to Ground: 700 V.
    d. Line to Line: 1200 V.

3. Lighting Panels: 60kA rated products (Current Technology CGP-060-120/208-3GY):

    a. Line to Neutral: 700 V.
    b. Line to Ground: 700 V.
    c. Neutral to Ground: 700 V.
    d. Line to Line: 1200 V.

SPD units shall provide protection status indication via a tri-colored LED per phase. The tri-colored LED shall report when the SPD has reached 75% of remaining useful life, and 40% of remaining useful life.

H. Monitoring Contacts: The unit shall come standard with Form C dry relay contacts (N.O. and N.C.) for remote monitoring capability, and internal audible alarm with silence button.

I. Event Counter: The unit shall come standard with a transient event counter with LCD panel display and reset button on the front cover.

J. Enclosure: The unit shall be supplied in a NEMA type 1 enclosure rated for indoor applications.

PART 3 - EXECUTION

3.1 COORDINATION

A. Coordinate location of field-mounted surge suppressors to allow adequate clearances for maintenance.

3.2 INSTALLATION

A. Placing into Service: Do not energize or connect service entrance equipment, or power or lighting panelboards to their sources until the surge protective devices are installed and connected. Verify system voltage prior to energizing surge protective device. When the cable connection length, between the SPD and the switchboard or panelboard, exceeds more than 6 lineal feet, the Contractor shall furnish and install a low impedance connection system from Current Technology, Model HPI, to maximize the performance of the SPD in mitigating the effects of transient voltage surges to the client’s protected systems

B. Comply with NECA 1.

C. Install an OCPD or disconnect as required to comply with the UL listing of the SPD.

D. Install SPDs with conductors between suppressor and points of attachment as short and straight as possible; adjust circuit-breaker positions to achieve shortest and straightest leads. Do not splice and extend SPD leads unless specifically permitted by manufacturer and Engineer. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.

E. Use crimped connectors and splices only. Wire nuts are unacceptable.

F. Wiring:

1. Power Wiring: Comply with wiring methods in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 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.

3.4 FIELD QUALITY CONTROL AND START-UP

A. Perform the following the following field quality-control tests and inspections with the assistance of a factory-authorized service representative.

1. Compare equipment nameplate data for compliance with Drawings and Specifications.
2. Inspect anchorage, alignment, grounding, and clearances.
3. Verify that electrical wiring installation complies with manufacturer's written installation requirements.
4. After installing surge protective devices, but before electrical circuitry has been energized, test for compliance with requirements, using a diagnostic portable test kit.
5. Complete startup checks according to manufacturer's written instructions.
6. Do not perform insulation-resistance tests of the distribution wiring equipment with SPDs installed. Disconnect SPDs before conducting insulation-resistance tests and reconnect them immediately after the testing is over.
7. Energize SPDs after power system has been energized, stabilized, and tested.

B. Manufacturer's Field Service: Upon completion of installation and prior to energization, a factory-authorized local service representative shall provide product start-up testing services. The tests shall include:

1. On-Line Testing: Verification that all suppression and filtering paths are operating with 100% protection as well as verification of proper facility neutral-to-ground bond by measuring neutral-to-ground current and voltage.
2. Off-line testing: Impulse injection to verify the system tolerances as well as verification of proper facility neutral-to-ground bond. To be compared to factory benchmark test parameters supplied with each individual unit.

C. The SPD manufacturer’s technician shall perform a system checkout and start-up in the field to assure proper installation, operation and to initiate the warranty of the system. The technician will be required to do the following:

1. Verify voltage clamping levels utilizing a diagnostic test kit, comparing factory readings to installed readings.
2. Verify N-G connection.
3. Record information to a product signature card; to be located in each SPD for future evaluation.

D. Documentation and Reporting:

1. Prepare test and inspection reports.

a. A copy of the start-up test results and the factory benchmark testing results shall be provided to the Engineer and the Owner for confirmation of proper system function.
b. This letter shall also confirm that all neutral-to-ground bonds were verified through testing and visual inspection, and that all grounding bonds were observed to be in place.
c. Include Operation and Maintenance Manual.

E. An SPD will be considered defective if it does not pass tests and inspections. Repair or replace malfunctioning units. Retest after repairs or replacements are made.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to operate and maintain surge protective devices.

1. Train Owner's maintenance personnel on procedures and schedules for maintaining suppressors.
2. Review data to be included in operation and maintenance manuals. Refer to Division 017823 “Operation and Maintenance Data.”
3. Schedule training with Owner, through Construction Manager, with a seven (7) day advanced notice.

END OF SECTION 264313

SECTION 265119 - LED INTERIOR LIGHTING

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 the following types of LED luminaires:

1. Cylinder.
2. Downlight.
3. Highbay, linear.
4. Highbay, nonlinear.
5. Linear industrial.
6. Recessed, linear.
7. Strip light.
8. Surface mount, linear.
9. Surface mount, nonlinear.
10. Suspended, linear.
11. Suspended, nonlinear.

B. Related Requirements:

1. Section 262726 “Wiring Devices” for manual lighting control switches and dimmer switches.

2. Section 260923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. LED: Light-emitting diode.

F. Lumen: Measured output of lamp and luminaire, or both.

G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Arrange in order of luminaire designation.
2. Include data on features, accessories, and finishes.
3. Include physical description and dimensions of luminaires.
4. Include emergency lighting units, including batteries and chargers.
5. Include life, output (lumens, CCT, and CRI), and energy-efficiency data.
6. Photometric data and adjustment factors based on laboratory tests, complying with IES "Lighting Measurements Testing and Calculation Guides" for each luminaire type. The adjustment factors shall be for lamps and accessories identical to those indicated for the luminaire as applied in this Project.

    a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

1.5 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Data: For luminaires, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Product Certificates: For each type of luminaire.

C. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.

1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
2. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

1.8 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

B. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.10 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 year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified and the luminaire will be fully operational during and after the seismic event."

B. Ambient Temperature: 5 to 104 deg F.

C. Altitude: Sea level to 1000 feet.

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. Standards:

1. ENERGY STAR certified.
2. UL Listing: Listed for damp location.
3. Recessed luminaires shall comply with NEMA LE 4.

D. CRI of minimum 80. CCT of 4100 K.

E. Nominal Operating Voltage: 277 V ac.

F. Rated lamp life of 50,000 hours to L70.

G. Internal driver.

H. Dimmable from 100 percent to 0 percent of maximum light output. Dimmable drivers shall be compatible with dimmable switches.

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. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

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 steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.

C. Wires: ASTM A641/A641M, Class 3, soft temper, zinc-coated steel, 12 gage.

D. Rod Hangers: 3/16-inch 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 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 luminaire to verify actual locations of luminaire and electrical connections before luminaire installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 TEMPORARY LIGHTING

A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is sufficiently complete, clean luminaires used for temporary lighting and install new lamps.

3.3 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. Flush-Mounted Luminaires:

1. Secured to outlet box.
2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
3. Trim ring flush with finished surface.

F. Wall-Mounted Luminaires:

1. Attached using through bolts and backing plates on either side of wall.
2. Do not attach luminaires directly to gypsum board.

G. Suspended Luminaires:

1. Ceiling Mount:

a. Two 5/32-inch- diameter aircraft cable supports.
b. Four-point pendant mount with 5/32-inch- diameter aircraft cable supports.
c. Hook mount.

2. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
3. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
4. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and wire support for suspension for each unit length of luminaire chassis, including one at each end.
5. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

H. Ceiling-Grid-Mounted Luminaires:

1. Secure to any required outlet box.
2. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

I. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. For inmate occupied areas, provide security sealant between luminaires and ceilings/walls; seal all crevices to avoid concealment of small contraband (i.e. razor blades, etc.). Refer to specification 079200 “Joint Sealants” for security sealant requirements.

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. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

C. Luminaire will be considered defective if it does not pass operation tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION 265119

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SECTION 265613 - LIGHTING POLES AND STANDARDS

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. Poles and accessories for support of luminaires.

1.3 DEFINITIONS

A. EPA: Equivalent projected area.

B. Luminaire: Complete luminaire.

C. Pole: Luminaire-supporting structure, including tower used for large-area illumination.

D. Standard: See "Pole."

1.4 ACTION SUBMITTALS

A. Product Data: For each pole, accessory, and luminaire-supporting and -lowering device, arranged as indicated.

1. Include data on construction details, profiles, EPA, cable entrances, materials, dimensions, weight, rated design load, and ultimate strength of individual components.
2. Include finishes for lighting poles and luminaire-supporting devices.
3. Anchor bolts.

B. Shop Drawings:

1. Include plans, elevations, sections, and mounting 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 poles and pole accessories.

4. Foundation construction details, including material descriptions, dimensions, anchor bolts, support devices, and calculations, signed and sealed by a professional engineer licensed in the state of installation.
5. Anchor bolt templates keyed to specific poles and certified by manufacturer.
6. Method and procedure of pole installation. Include manufacturer's written installations.

1.5 INFORMATIONAL SUBMITTALS

A. Pole and Support Component Certificates: Signed by manufacturers of poles, certifying that products are designed for indicated load requirements according to AASHTO LTS-6-M and that load imposed by luminaire and attachments has been included in design. The certification shall be based on design calculations signed and sealed by a professional engineer.

B. Seismic Qualification Data: For poles, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Field quality-control reports.

D. Sample Warranty: Manufacturer's standard warranty.

E. Soil test reports

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For poles to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include pole inspection and repair procedures.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Pole repair materials.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Package aluminum poles for shipping according to ASTM B660.

B. Store poles on decay-resistant skids at least 12 inches above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.

C. Retain factory-applied pole wrappings on metal poles until right before pole installation. Handle poles with web fabric straps.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of pole(s) that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within a specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs from special warranty period.

1. Warranty Period: Five years from date of Substantial Completion.
2. Warranty Period for Corrosion Resistance: Five years from date of Substantial Completion.
3. Warranty Period for Color Retention: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Foundation and pole shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the system will remain in place without separation of any parts when subjected to the seismic forces specified and the system will be fully operational after the seismic event."
2. Component Importance Factor: 1.5.

B. Wind-Load Strength of Poles: Adequate at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of speed indicated in Part 1 ‘Structural Analysis Criteria for Pole Selection” Article, with a gust factor of 1.3.

C. Strength Analysis: For each pole, multiply the actual EPA of luminaires and brackets by a factor of 1.3 Insert number to obtain the EPA to be used in pole selection strength analysis.

D. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts unless otherwise indicated.

2.2 ALUMINUM POLES

A. In Lighting Fixture Schedule where titles below are column or row headings that introduce lists, the following requirements apply to product selection:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

B. Poles: Seamless, extruded structural tube complying with ASTM B221, Alloy 6061-T6, with access handhole in in pole wall.

1. Shape: Square, straight.
2. Mounting Provisions: Butt flange for bolted mounting on foundation or breakaway support.

C. Grounding and Bonding Lugs: Bolted 1/2-inch threaded lug, complying with requirements in Section 260526 "Grounding and Bonding for Electrical Systems," listed for attaching grounding and bonding conductors of type and size listed in that Section, and accessible through handhole.

D. Fasteners: Stainless steel, size and type as determined by manufacturer. Corrosion-resistant items compatible with support components.

1. Materials: Compatible with poles and standards as well as to substrates to which poles and standards are fastened and shall not cause galvanic action at contact points.
2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication unless otherwise indicated.

E. Handhole: Oval shaped, with minimum clear opening of 2-1/2 by 5 inches, with cover secured by stainless-steel captive screws.

2.3 POLE ACCESSORIES

A. Duplex Receptacle: Ground-fault circuit interrupter type, 120 V ac, 20 A in a weatherproof assembly where indicated on plans. Comply with requirements in Section 262726 "Wiring Devices."

1. Recessed 12 inches above finished grade.

a. NEMA 250, Type 3R, nonmetallic polycarbonate plastic or reinforced fiberglass, enclosure with cover; color to match pole.
b. Lockable hasp and latch complying with OSHA lockout and tag-out requirements.

2.4 MOUNTING HARDWARE

A. Anchor Bolts: Manufactured to ASTM F1554, Grade 55, with a minimum yield strength of 55,000 psi.

1. Galvanizing: Hot dip galvanized according to ASTM A153, Class C.

B. Nuts: ASTM A563, Grade A, Heavy-Hex.

1. Galvanizing: Hot dip galvanized according to ASTM A153, Class C.
2. Two nuts provided per anchor bolt, shipped with nuts pre-assembled to the anchor bolts.

C. Washers: ASTM F436, Type 1.

1. Galvanizing: Hot dip galvanized according to ASTM A153, Class C.
2. Two washer(s) provided per anchor bolt.

2.5 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: 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.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine poles, luminaire-mounting devices, lowering devices, and pole accessories before installation. Components that are scratched, dented, marred, wet, moisture damaged, or visibly damaged are considered defective.

C. Examine roughing-in for foundation and conduit to verify actual locations of installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 POLE INSTALLATION

A. Alignment: Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on pole.

B. Clearances: Maintain the following minimum horizontal distances of poles from surface and underground features unless otherwise indicated on drawing.

1. Fire Hydrants and Water Piping: 60 inches.
2. Water, Gas, Electric, Communications, and Sewer Lines: 10 feet.
3. Trees: 15 feet from tree trunk.

C. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer. Concrete materials, installation, and finishing requirements are specified in Section 033000 "Cast-in-Place Concrete."

D. Foundation-Mounted Poles: Mount pole with leveling nuts and tighten top nuts to torque level according to pole manufacturer's written instructions.

1. Use anchor bolts and nuts selected to resist seismic forces defined for the application and approved by manufacturer.
2. Grout void between pole base and foundation. Use nonshrink or expanding concrete grout firmly packed to fill space.
3. Install base covers unless otherwise indicated.
4. Use a short piece of 1/2 -inch diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.

E. Poles and Pole Foundations Set in Concrete-Paved Areas: Install poles with a minimum 6-inch-wide, unpaved gap between the pole or pole foundation and the edge of the adjacent concrete slab. Fill unpaved ring with pea gravel. Insert material to a level 1 inch below top of concrete slab.

F. Raise and set pole using web fabric slings (not chain or cable) at locations indicated by manufacturer.

3.3 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum using insulating fittings or treatment.

3.4 GROUNDING

A. Ground Metal Poles and Support Structures: Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

1. Install grounding electrode for each pole unless otherwise indicated.
2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.

B. Ground Nonmetallic Poles and Support Structures: Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

1. Install grounding electrode for each pole.
2. Install grounding conductor and conductor protector.
3. Ground metallic components of pole accessories and foundation.

3.5 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.6 FIELD QUALITY CONTROL

A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:

1. Inspect poles for nicks, mars, dents, scratches, and other damage.
2. System function tests.

END OF SECTION 265613

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SECTION 265619 – LED EXTERIOR LIGHTING

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. Exterior solid-state luminaires that are designed for and exclusively use LED lamp technology.
2. Luminaire supports.

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.
2. Section 265613 "Lighting Poles and Standards" for poles and standards used to support exterior lighting equipment.

1.3 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.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of luminaire.

1. Arrange in order of luminaire designation.

2. Include data on features, accessories, and finishes.
3. Include physical description and dimensions of luminaire.
4. Lamps, include life, output (lumens, CCT, and CRI), and energy-efficiency data.
5. Photometric data and adjustment factors based on laboratory tests, complying with IES Lighting Measurements Testing and Calculation Guides, of each luminaire type. The adjustment factors shall be for lamps and accessories identical to those indicated for the luminaire as applied in this Project.

    a. Manufacturer's Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the NVLAP for Energy Efficient Lighting Products.

6. Wiring diagrams for power, control, and signal wiring.
7. Means of attaching luminaires to supports and indication that the attachment is suitable for components involved.

B. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

C. Delegated-Design Submittal: For luminaire supports.

1. Include design calculations for luminaire supports and seismic restraints.

1.5 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Data: For luminaires, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires to include in operation and maintenance manuals.

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.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Glass, Acrylic, and Plastic Lenses, Covers, and Other Optical Parts: One for every 100 of each type and rating installed. Furnish at least one of each type.
2. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
3. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

1.8 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturers' laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

B. Provide luminaires from a single manufacturer for each luminaire type.

C. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering prior to shipping.

1.10 FIELD CONDITIONS

A. Verify existing and proposed utility structures prior to the start of work associated with luminaire installation.

B. Mark locations of exterior luminaires for approval by Architect prior to the start of luminaire installation.

1.11 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. Failures include, but are not limited to, the following:

a. Structural failures, including luminaire support components.
b. Faulty operation of luminaires and accessories.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Period: 2 year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified and the luminaire will be fully operational during and after the seismic event."

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. NRTL Compliance: Luminaires shall be listed and labeled for indicated class and division of hazard by an NRTL.

C. UL Compliance: Comply with UL 1598 and listed for wet location.

D. Lamp base complying with ANSI C81.61 or IEC 60061-1.

E. Bulb shape complying with ANSI C79.1.

F. CRI of minimum 80. CCT of 3000 K.

G. L70 lamp life of 50,000 hours.

H. Lamps dimmable from 100 percent to 0 percent of maximum light output.

I. Internal driver.

J. Nominal Operating Voltage: 277 V ac.

K. In-line Fusing: Separate in-line fuse for each luminaire.

L. Lamp Rating: Lamp marked for outdoor use and in enclosed locations.

M. 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.

2.3 LUMINAIRE TYPES

A. Area and Site:

1. In Lighting Fixture Schedule where titles below are column or row headings that introduce lists, the following requirements apply to product selection:
   a. Manufacturers: Subject to compliance with requirements, provide products by one the manufacturers specified.
2. Luminaire Shape: As noted on Lighting Fixture Schedule.
3. Mounting: As noted on Lighting Fixture Schedule.
4. Luminaire-Mounting Height: As noted on Lighting Fixture Schedule.
5. Distribution: As noted on Lighting Fixture Schedule.
6. Diffusers and Globes: As noted on Lighting Fixture Schedule.
7. Housings:

   a. Finish as noted on Lighting Fixture Schedule.

B. Bollard:

1. In Lighting Fixture Schedule where titles below are column or row headings that introduce lists, the following requirements apply to product selection:
   a. Manufacturers: Subject to compliance with requirements, provide products by one the manufacturers specified.
2. Shape: As noted on Lighting Fixture Schedule.
3. Height Above Finished Grade: As noted on Lighting Fixture Schedule.
4. Overall Height: As noted on Lighting Fixture Schedule.
5. Diameter: As noted on Lighting Fixture Schedule.
6. Mounting: As noted on Lighting Fixture Schedule.
7. Distribution: As noted on Lighting Fixture Schedule.
8. Diffusers and Globes: As noted on Lighting Fixture Schedule.
9. Housings:

   a. Finish as noted on Lighting Fixture Schedule.

C. Canopy:

1. In Lighting Fixture Schedule where titles below are column or row headings that introduce lists, the following requirements apply to product selection:
   a. Manufacturers: Subject to compliance with requirements, provide products by one the manufacturers specified
2. Shape: As noted on Lighting Fixture Schedule.
3. Dimensions: As noted on Lighting Fixture Schedule.
4. Diffusers and Globes: As noted on Lighting Fixture Schedule.
5. Housings:

   a. Finish as noted on Lighting Fixture Schedule.

2.4 MATERIALS

A. Metal Parts: Free of burrs and sharp corners and edges.

B. Sheet Metal Components: Finish as noted on Lighting Fixture Schedule. Form and support to prevent warping and sagging.

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. Lens and Refractor Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

E. 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.

F. 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.

G. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Labels shall be located 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 for all luminaires.

2.5 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.

2.6 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 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 luminaire electrical conduit to verify actual locations of conduit connections before luminaire installation.

C. Examine walls, roofs, canopy ceilings and overhang ceilings for suitable conditions where luminaires will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 TEMPORARY LIGHTING

A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is substantially complete, clean luminaires used for temporary lighting and install new lamps.

3.3 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. Fasten luminaire to structural support.

D. Wall-Mounted Luminaire Support:

1. Attached to structural members in walls.

E. Wiring Method: Install cables in raceways. Conceal raceways and cables.

F. Install luminaires level, plumb, and square with finished grade unless otherwise indicated. Install luminaires at height and aiming angle as indicated on Drawings.

G. Coordinate layout and installation of luminaires with other construction.

H. Adjust luminaires that require field adjustment or aiming.

I. 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.

3.4 BOLLARD LUMINAIRE INSTALLATION:

A. Align units for optimum directional alignment of light distribution.

3.5 INSTALLATION OF INDIVIDUAL GROUND-MOUNTED LUMINAIRES

A. Aim as indicated on Drawings.

B. Install on concrete base with top 4 inches above finished grade or surface at luminaire location. Cast conduit into base, and finish by troweling and rubbing smooth. Concrete materials, installation, and finishing are specified in Section 033000 "Cast-in-Place Concrete."

3.6 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-thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.7 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.8 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. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IES testing guide(s):

a. IES LM-5.
b. IES LM-50.
c. IES LM-52.
d. IES LM-64.
e. IES LM-72.

2. 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.

3.9 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain luminaires.

3.10 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to one visit to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.

1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
3. Adjust the aim of luminaires in the presence of the Architect.

END OF SECTION 265619

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SECTION 270526 - GROUNDING AND BONDING FOR COMMUNICATIONS 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. Grounding conductors.
2. Grounding connectors.
3. Grounding busbars.
4. Grounding rods.
5. Grounding labeling.

1.3 DEFINITIONS

A. BCT: Bonding conductor for telecommunications.

B. TGB: Telecommunications grounding busbar.

C. TMGB: Telecommunications main grounding busbar.

D. Service Provider: The operator of a service that provides telecommunications transmission delivered over access provider facilities.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For communications equipment room signal reference grid. Include plans, elevations, sections, details, and attachments to other work.

1.5 INFORMATIONAL SUBMITTALS

A. As-Built Data: Plans showing as-built locations of grounding and bonding infrastructure, including the following:

1. Ground rods.
2. Ground and roof rings.
3. BCT, TMGB, TGBs, and routing of their bonding conductors.

B. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

a. Result of the ground-resistance test, measured at the point of BCT connection.
b. Result of the bonding-resistance test at each TGB and its nearest grounding electrode.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Installation Supervision: Installation shall be under the direct supervision of ITS Level 2 Installer, who shall be present at all times when Work of this Section is performed at Project site.
2. Field Inspector: Currently registered by BICSI as a designer RCDD to perform the on-site inspection.

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.

C. Comply with TIA-607-B.

2.2 CONDUCTORS

A. Comply with UL 486A-486B.

B. Insulated Conductors: Stranded copper wire, green or green with yellow stripe insulation, insulated for 600 V, and complying with UL 83.

1. Ground wire for custom-length equipment ground jumpers shall be No. 6 AWG, 19-strand, UL-listed, Type THHN wire.
2. Cable Tray Equipment Grounding Wire: No. 6 AWG.

C. Cable Tray Grounding Jumper:

1. Not smaller than No. 6 AWG and not longer than 12 inches (300 mm). If jumper is a wire, it shall have a crimped grounding lug with two holes and long barrel for two crimps. If jumper is a flexible braid, it shall have a one-hole ferrule. Attach with grounding screw or connector provided by cable tray manufacturer.

D. Bare Copper Conductors:

1. Solid Conductors: ASTM B3.
2. Stranded Conductors: ASTM B8.
3. Tinned Conductors: ASTM B33.
4. Bonding Cable: 28 kcmils (14.2 sq. mm), 14 strands of No. 17 AWG conductor, and 1/4 inch (6.3 mm) in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Tinned-copper tape, braided conductors terminated with two-hole copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

2.3 CONNECTORS

A. Irreversible connectors listed for the purpose. Listed by an NRTL as complying with NFPA 70 for specific types, sizes, and combinations of conductors and other items connected. Comply with UL 486A-486B.

B. Compression Wire Connectors: Crimp-and-compress connectors that bond to the conductor when the connector is compressed around the conductor. Comply with UL 467.

1. Electroplated tinned copper, C and H shaped.

C. Signal Reference Grid Connectors: Combination of compression wire connectors, access floor grounding clamps, bronze U-bolt grounding clamps, and copper split-bolt connectors, designed for the purpose.

D. Busbar Connectors: Cast silicon bronze, solderless [**compression**] [**or**] [**exothermic**]-type, mechanical connector; with a long barrel and two holes spaced on 5/8- or 1-inch (15.8- or 25.4-mm) centers for a two-bolt connection to the busbar.

E. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.4 GROUNDING BUSBARS

A. TMGB: Predrilled, wall-mounted, rectangular bars of hard-drawn solid copper, **1/4 by 4 inches (6.3 by 100 mm)** in cross section, length as indicated on Drawings. The busbar shall be NRTL listed for use as TMGB and shall comply with TIA-607-B.

1. Predrilling shall be with holes for use with lugs specified in this Section.
2. Mounting Hardware: Stand-off brackets that provide a **4-inch (100-mm)** clearance to access the rear of the busbar. Brackets and bolts shall be stainless steel.
3. Stand-off insulators for mounting shall be Lexan or PVC. Comply with UL 891 for use in 600-V switchboards, impulse tested at 5000 V.

B. TGB: Predrilled rectangular bars of hard-drawn solid copper, [**1/4 by 2 inches (6.3 by 50 mm)**] in cross section, length as indicated on Drawings. The busbar shall be for wall mounting, shall be NRTL listed as complying with UL 467, and shall comply with TIA-607-B.

1. Predrilling shall be with holes for use with lugs specified in this Section.
2. Mounting Hardware: Stand-off brackets that provide at least a 2-inch (50-mm) clearance to access the rear of the busbar. Brackets and bolts shall be stainless steel.
3. Stand-off insulators for mounting shall be Lexan or PVC. Comply with UL 891 for use in 600-V switchboards, impulse tested at 5000 V.

C. Rack and Cabinet Grounding Busbars: Rectangular bars of hard-drawn solid copper, accepting conductors ranging from No. 14 to No. 2/0 AWG, NRTL listed as complying with UL 467, and complying with TIA-607-B. Predrilling shall be with holes for use with lugs specified in this Section.

1. Cabinet-Mounted Busbar: Terminal block, with stainless-steel or copper-plated hardware for attachment to the cabinet.
2. Rack-Mounted Horizontal Busbar: Designed for mounting in 19- or 23-inch (483- or 584-mm) equipment racks. Include a copper splice bar for transitioning to an adjoining rack, and stainless-steel or copper-plated hardware for attachment to the rack.
3. Rack-Mounted Vertical Busbar: 72 or 36 inches (1827 or 914 mm) long, with stainless-steel or copper-plated hardware for attachment to the rack.

2.5 GROUND RODS

A. Ground Rods: Copper-clad steel; **3/4 inch by 10 feet (19 mm by 3 m)** in diameter.

2.6 IDENTIFICATION

A. Comply with requirements for identification products in Section 270553 "Identification for Communications Systems."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the ac grounding electrode system and equipment grounding for compliance with requirements for maximum ground-resistance level and other conditions affecting performance of grounding and bonding of the electrical system.

B. Inspect the test results of the ac grounding system measured at the point of BCT connection.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with connection of the BCT only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Bonding shall include the ac utility power service entrance, the communications cable entrance, and the grounding electrode system. The bonding of these elements shall form a loop so that each element is connected to at least two others.

B. Comply with NECA 1.

C. Comply with TIA-607-B.

3.3 APPLICATION

A. Conductors: Install solid conductor for No. 8 AWG and smaller and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

1. The bonding conductors between the TGB and structural steel of steel-frame buildings shall not be smaller than No. 6 AWG.
2. The bonding conductors between the TMGB and structural steel of steel-frame buildings shall not be smaller than No. 6 AWG.

B. Underground Grounding Conductors: Install bare copper conductor, No. 2 AWG minimum.

C. 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.

D. Conductor Support:

1. Secure grounding and bonding conductors at intervals of not less than 36 inches (900 mm).

E. Grounding and Bonding Conductors:

1. Install in the straightest and shortest route between the origination and termination point, and no longer than required. The bend radius shall not be smaller than eight times the diameter of the conductor. No one bend may exceed 90 degrees.
2. Install without splices.
3. Support at not more than 36-inch (900-mm) intervals.
4. Install grounding and bonding conductors in 3/4-inch (21-mm) PVC conduit until conduit enters a telecommunications room. The grounding and bonding conductor pathway through a plenum shall be in EMT. Conductors shall not be installed in EMT unless otherwise indicated.

    a. If a grounding and bonding conductor is installed in ferrous metallic conduit, bond the conductor to the conduit using a grounding bushing that complies with

requirements in Section 270528 "Pathways for Communications Systems," and bond both ends of the conduit to a TGB.

3.4 GROUNDING ELECTRODE SYSTEM

A. The BCT between the TMGB and the ac service equipment ground shall not be smaller than No. 3/0 AWG.

3.5 GROUNDING BUSBARS

A. Indicate locations of grounding busbars on Drawings. Install busbars horizontally, on insulated spacers 2 inches (50 mm) minimum from wall, 12 inches (300 mm) above finished floor unless otherwise indicated.

B. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

3.6 CONNECTIONS

A. Bond metallic equipment in a telecommunications equipment room to the grounding busbar in that room, using equipment grounding conductors not smaller than No. 6 AWG.

B. Stacking of conductors under a single bolt is not permitted when connecting to busbars.

C. Assemble the wire connector to the conductor, complying with manufacturer's written instructions and as follows:

1. Use crimping tool and the die specific to the connector.
2. Pretwist the conductor.
3. Apply an antioxidant compound to all bolted and compression connections.

D. Primary Protector: Bond to the TMGB with insulated bonding conductor.

E. Interconnections: Interconnect all TGBs with the TMGB with the telecommunications backbone conductor. If more than one TMGB is installed, interconnect TMGBs using the grounding equalizer conductor. The telecommunications backbone conductor and grounding equalizer conductor size shall not be less than 2 kcmils/linear foot (1 sq. mm/linear meter) of conductor length, up to a maximum size of No. 3/0 AWG unless otherwise indicated.

F. Telecommunications Enclosures and Equipment Racks: Bond metallic components of enclosures to the telecommunications bonding and grounding system. Install rack grounding busbar unless the enclosure and rack are manufactured with the busbar. Bond the equipment grounding busbar to the TGB No. 2 AWG bonding conductors.

G. Structural Steel: Where the structural steel of a steel frame building is readily accessible within the room or space, bond each TGB and TMGB to the vertical steel of the building frame.

H. Electrical Power Panelboards: Where an electrical panelboard for telecommunications equipment is located in the same room or space, bond each TGB to the ground bar of the panelboard.

I. Shielded Cable: Bond the shield of shielded cable to the TGB in communications rooms and spaces. Comply with TIA-568-C.1 and TIA-568-C.2 when grounding shielded balanced twisted-pair cables.

J. Rack- and Cabinet-Mounted Equipment: Bond powered equipment chassis to the cabinet or rack grounding bar. Power connection shall comply with NFPA 70; the equipment grounding conductor in the power cord of cord- and plug-connected equipment shall be considered as a supplement to bonding requirements in this Section.

K. Access Floors: Bond all metal parts of access floors to the TGB.

L. Equipment Room Signal Reference Grid: Provide a low-impedance path between telecommunications cabinets, equipment racks, and the reference grid, using No. 6 AWG bonding conductors.

1. Install the conductors in grid pattern on 4-foot (1200-mm) centers, allowing bonding of one pedestal from each access floor tile.
2. Bond the TGB of the equipment room to the reference grid at two or more locations.
3. Bond all conduits and piping entering the equipment room to the TGB at the perimeter of the room.

M. Towers and Antennas:

1. Ground Ring: Buried at least 30 inches (760 mm) below grade and at least 24 inches (610 mm) from the base of the tower or mounting.
2. Bond each tower base and metallic frame of a dish to the ground ring, buried at least 18 inches (460 mm) below grade.
3. Bond the ground ring and antenna grounds to the equipment room TMGB or TGB, buried at least 30 inches (760 mm) below grade.
4. Bond metallic fences within 6 feet (1.8 m) of towers and antennas to the ground ring, buried at least 18 inches (460 mm) below grade.
5. Special Requirements for Roof-Mounted Towers:

    a. Roof Ring: Meet requirements for the ground ring except the conductors shall comply with requirements in Section 264113 "Lightning Protection for Structures."
    b. Bond tower base footings steel, the TGB in the equipment room, and antenna support guys to the roof ring.
    c. Connect roof ring to the perimeter conductors of the lightning protection system.

6. Waveguides and Coaxial Cable:

    a. Bond cable shields at the point of entry into the building to the TGB and to the cable entrance plate, using No. 2 AWG bonding conductors.
    b. Bond coaxial cable surge arrester to the ground or roof ring using bonding conductor size recommended by surge-arrester manufacturer.

3.7 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Duct-Bank Grounding Conductor: Bury 12 inches (300 mm) above duct bank when indicated as part of duct-bank installation.

B. Comply with IEEE C2 grounding requirements.

C. 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) extends 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.

D. 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, bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect grounding conductors to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.

3.8 IDENTIFICATION

A. Labels shall be preprinted or computer-printed type.

1. Label TMGB(s) with "fs-TMGB," where "fs" is the telecommunications space identifier for the space containing the TMGB.
2. Label TGB(s) with "fs-TGB," where "fs" is the telecommunications space identifier for the space containing the TGB.
3. Label the BCT and each telecommunications backbone conductor at its attachment point: "WARNING! TELECOMMUNICATIONS BONDING CONDUCTOR. DO NOT REMOVE OR DISCONNECT!"

3.9 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. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
2. Test the bonding connections of the system using an ac earth ground-resistance tester, taking two-point bonding measurements in each telecommunications equipment room containing a TMGB and a TGB and using the process recommended by BICSI TDMM. Conduct tests with the facility in operation.

a. Measure the resistance between the busbar and the nearest available grounding electrode. The maximum acceptable value of this bonding resistance is 100 milliohms.

3. Test for ground loop currents using a digital clamp-on ammeter, with a full-scale of not more than 10 A, displaying current in increments of 0.01 A at an accuracy of plus/minus 2.0 percent.

a. With the grounding infrastructure completed and the communications system electronics operating, measure the current in every conductor connected to the TMGB. Maximum acceptable ac current level is 1 A.

D. Excessive Ground Resistance: If resistance to ground at the BCT exceeds 5 ohms, notify Architect promptly and include recommendations to reduce ground resistance.

E. Grounding system will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

END OF SECTION 270526

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SECTION 270528 - PATHWAYS FOR COMMUNICATIONS 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. Metal conduits and fittings.
2. Nonmetallic conduits and fittings.
3. Optical-fiber-cable pathways and fittings.
4. Boxes, enclosures, and cabinets.
5. Handholes and boxes for exterior underground cabling.

B. Related Requirements:

1. Section 260533 "Raceways and Boxes for Electrical Systems" for conduits, wireways, surface raceways, boxes, enclosures, cabinets, handholes, and faceplate adapters serving electrical systems.

1.3 DEFINITIONS

A. ARC: Aluminum rigid conduit.

B. GRC: Galvanized rigid steel conduit.

C. IMC: Intermediate metal conduit.

1.4 ACTION SUBMITTALS

A. Product Data: For surface pathways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Pathway 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 pathway groups with common supports.
2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

B. Seismic Qualification Certificates: For pathway racks, enclosures, cabinets, equipment racks and their mounting provisions, including those for internal components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which certification is based and their installation requirements.
4. Detailed description of conduit support devices and interconnections on which certification is based and their installation requirements.

C. Source quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems; a part of Atkore International.
2. Allied Tube & Conduit; a part of Atkore International.
3. Anamet Electrical, Inc.
4. Electri-Flex Company.
5. O-Z/Gedney; a brand of Emerson Industrial Automation.
6. Picoma Industries, Inc.
7. Republic Conduit.
8. Robroy Industries.
9. Southwire Company.
10. Thomas & Betts Corporation; A Member of the ABB Group.
11. Western Tube and Conduit Corporation.
12. Wheatland Tube Company.

B. General Requirements for Metal Conduits and Fittings:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with TIA-569-B.

C. GRC: Comply with ANSI C80.1 and UL 6.

D. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.

1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch, minimum.

E. EMT: Comply with ANSI C80.3 and UL 797.

F. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Fittings for EMT:

a. Material: Steel.
b. Type: Compression.

2. Expansion Fittings: PVC or steel to match conduit type, complying with UL-467, rated for environmental conditions where installed, and including flexible external bonding jumper.
3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.

G. 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems; a part of Atkore International.
2. Allied Tube & Conduit; a part of Atkore International.
3. Anamet Electrical, Inc.
4. CANTEX INC.
5. Carlon; a brand of Thomas & Betts Corporation.
6. CertainTeed Corporation.
7. Condux International, Inc.
8. Electri-Flex Company.
9. Kraloy.
10. Niedax Inc.
11. RACO; Hubbell.
12. Thomas & Betts Corporation; A Member of the ABB Group.

B. General Requirements for Nonmetallic Conduits and Fittings:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with TIA-569-B.

C. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

D. RTRC: Comply with UL 1684A and NEMA TC 14.

E. Fittings for RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

2.3 OPTICAL-FIBER-CABLE PATHWAYS AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Alpha Wire.
2. Carlon; a brand of Thomas & Betts Corporation.
3. Dura-Line.
4. Endot Industries Inc.
5. IPEX USA LLC.

B. Description: Comply with UL 2024; flexible-type pathway, approved for general-use installation unless otherwise indicated.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with TIA-569-B.

2.4 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Adalet.
2. Carlon; a brand of Thomas & Betts Corporation.
3. Crouse-Hinds, an Eaton business.
4. EGS/Appleton Electric.
5. Erickson Electrical Equipment Company.
6. FSR Inc.
7. Hoffman; a brand of Pentair Equipment Protection.
8. Milbank Manufacturing Co.
9. MonoSystems, Inc.
10. O-Z/Gedney; a brand of Emerson Industrial Automation.
11. Quazite: Hubbell Power Systems, Inc.
12. RACO; Hubbell.
13. Robroy Industries.
14. Spring City Electrical Manufacturing Company.
15. Stahlin Non-Metallic Enclosures.
16. Thomas & Betts Corporation; A Member of the ABB Group.
17. Wiremold / Legrand.

B. General Requirements for Boxes, Enclosures, and Cabinets:

1. Comply with TIA-569-B.
2. 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. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

F. Metal Floor Boxes:

1. Material: sheet metal.
2. Type: Fully 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. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

H. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum or galvanized, cast iron with gasketed cover.

I. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.

J. Gangable boxes are prohibited.

K. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

L. Cabinets:

1. NEMA 250, Type 1, 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 CABLING

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.
3. Comply with TIA-569-B.

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. Carson Industries LLC.
    c. NewBasis.
    d. Oldcastle Precast, Inc.
    e. Quazite: Hubbell Power Systems, 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, "COMMUNICATIONS.".
7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
8. Handholes 12 Inches Wide by 24 Inches Long and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

C. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with frame and covers of hot-dip galvanized-steel diamond plate.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Armorcast Products Company.
    b. Carson Industries LLC.
    c. NewBasis.
    d. Nordic Fiberglass, Inc.
    e. Oldcastle Precast, Inc.
    f. Quazite: Hubbell Power Systems, Inc.

2. Standard: Comply with SCTE 77.
3. Color of Frame and Cover: Gray.
4. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
5. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
6. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
7. Cover Legend: Molded lettering, "COMMUNICATIONS.".

8. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
9. Handholes 12 Inches Wide by 24 Inches Long and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.6 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.

1. Tests of materials shall be performed by an independent testing agency.
2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

PART 3 - EXECUTION

3.1 PATHWAY APPLICATION

A. Outdoors: Apply pathway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC, RNC, Type EPC-40-PVC.
2. Concealed Conduit, Aboveground: GRC, RNC, Type EPC-40-PVC.
3. Underground Conduit: RNC, Type EPC-40-PVC, concrete encased.
4. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply pathway 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. Pathway locations include the following:

    a. Mechanical rooms.

4. Concealed in Ceilings and Interior Walls and Partitions: EMT RNC, Type EPC-40-PVC.
5. Damp or Wet Locations: GRC.
6. Pathways for Optical-Fiber or Communications Cable in Spaces Used for Environmental Air: Plenum-type, optical-fiber-cable pathway Plenum-type, communications-cable pathway, EMT.
7. Pathways for Optical-Fiber or Communications-Cable Risers in Vertical Shafts: Riser-type, optical-fiber-cable pathway Riser-type, communications-cable pathway, EMT.
8. Pathways for Concealed General-Purpose Distribution of Optical-Fiber or Communications Cable: EMT.

9. Boxes and Enclosures: NEMA 250 Type 1, except use NEMA 250 Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

C. Minimum Pathway Size: 3/4-inch trade size. Minimum size for optical-fiber cables is 1 inch.

D. Pathway Fittings: Compatible with pathways 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. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use compression, steel fittings. Comply with NEMA FB 2.10.

E. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.2 INSTALLATION

A. Comply with NECA 1, NECA 101, and TIA-569-B for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum pathways. Comply with NFPA 70 limitations for types of pathways allowed in specific occupancies and number of floors.

B. Keep pathways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal pathway runs above water and steam piping.

C. Complete pathway installation before starting conductor installation.

D. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

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 pathway run. Support within 12 inches of changes in direction. Utilize long radius ells for all optical-fiber cables.

G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

H. Support conduit within 12 inches of enclosures to which attached.

I. Pathways Embedded in Slabs:

1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure pathways to reinforcement at maximum 10-foot intervals.

2. Arrange pathways to cross building expansion joints at right angles with expansion fittings.
3. Arrange pathways to keep a minimum of 1 inch 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 ENT to GRC before rising above floor.

J. Stub-ups to Above Recessed Ceilings:

1. Use EMT, IMC, or RMC for pathways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

K. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of pathway and fittings before making up joints. Follow compound manufacturer's written instructions.

L. Coat field-cut threads on PVC-coated pathway with a corrosion-preventing conductive compound prior to assembly.

M. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install insulated bushings on conduits terminated with locknuts.

N. Install pathways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

O. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

P. Cut conduit perpendicular to the length. For conduits of 2-inch trade size and larger, use roll cutter or a guide to ensure cut is straight and perpendicular to the length.

Q. Install pull wires in empty pathways. Use polypropylene or monofilament plastic line with not less than 200-lbtensile strength. Leave at least 12 inchesof slack at each end of pull wire. Cap underground pathways designated as spare above grade alongside pathways in use.

R. Pathways for Optical-Fiber and Communications Cable: Install pathways, metal and nonmetallic, rigid and flexible, as follows:

1. 3/4-Inch Trade Size and Smaller: Install pathways in maximum lengths of 50 feet.
2. 1-Inch Trade Size and Larger: Install pathways in maximum lengths of 75 feet.
3. Install with a maximum of two 90-degree bends or equivalent for each length of pathway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

S. Install pathway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed pathways, install each fitting in a flush steel box with a

blank cover plate having a finish similar to that of adjacent plates or surfaces. Install pathway sealing fittings according to NFPA 70.

T. Install devices to seal pathway 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 pathways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service pathway enters a building or structure.
3. Where otherwise required by NFPA 70.

U. Comply with manufacturer's written instructions for solvent welding PVC conduit and fittings.

V. Expansion-Joint Fittings:

1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F, and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.
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 temperature change.
    b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
    c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F 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 deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal 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.

W. 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 center of box unless otherwise indicated.

X. 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 surface to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

Y. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

Z. 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.

AA. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

BB. Set metal floor boxes level and flush with finished floor surface.

CC. 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 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 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-ups 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 of concrete for a minimum of 12 inches 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 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 sieve to No. 4 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 above finished grade.

D. Install handholes 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 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 COMMUNICATIONS PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 270544 "Sleeves and Sleeve Seals for Communications Pathways 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 or 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 270528

SECTION 270529 - HANGERS AND SUPPORTS FOR COMMUNICATIONS 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. Steel slotted support systems for communication raceways.
2. Aluminum slotted support systems for communication raceways.
3. Nonmetallic slotted support systems for communication raceways.
4. Conduit and cable support devices.
5. Support for conductors in vertical conduit.
6. Structural steel for fabricated supports and restraints.
7. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
8. Fabricated metal equipment support assemblies.

B. Related Requirements:

1. Section 270548 "Seismic Controls for Communications Systems" for products and installation requirements necessary for compliance with seismic criteria.

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 the following:

a. Slotted support systems, hardware, and accessories.
b. Clamps.
c. Hangers.
d. Sockets.
e. Eye nuts.
f. Fasteners.
g. Anchors.
h. Saddles.
i. Brackets.

2. Include rated capacities and furnished specialties and accessories.

B. Shop Drawings: For fabrication and installation details for communications hangers and support systems.

1. Trapeze hangers. Include product data for components.
2. Steel slotted-channel systems.
3. Aluminum slotted-channel systems.
4. Nonmetallic slotted-channel systems.
5. Equipment supports.
6. 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 communications systems.

1. Include design calculations and details of trapeze hangers.
2. Include design calculations for seismic restraints.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) 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. Suspended ceiling components.
2. Ductwork, piping, fittings, and supports.
3. Structural members to which hangers and supports will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Items penetrating finished ceiling, including the following:

a. Luminaires.
b. Air outlets and inlets.
c. Speakers.
d. Sprinklers.
e. Access panels.
f. Projectors.

B. Seismic Qualification Data: Certificates, for hangers and supports for communications equipment and systems, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Welding certificates.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M.
2. AWS D1.2/D1.2M.

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. Seismic Performance: Hangers and supports shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the supported equipment and systems will remain in place without separation of any parts when subjected to the seismic forces specified and the system will be fully operational after the seismic event."
2. Component Importance Factor: 1.5.

C. Surface-Burning Characteristics: Comply with ASTM E84; 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 D635.

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. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
2. Material for Channel, Fittings, and Accessories: Galvanized steel.
3. Channel Width: Selected for applicable load criteria
4. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
5. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
6. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
7. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
8. Channel Dimensions: Selected for applicable load criteria.

B. Conduit and Cable Support Devices**:** Steel clamps, hangers, 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 communications 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 A36/A36M 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.

2. Mechanical-Expansion Anchors: Insert-wedge-type [**zinc-coated steel**] [**stainless steel**] for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

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 F3125/F3125M,Grade A325 (Grade A325M).
6. Toggle Bolts: Stainless-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/BICSI 568.
3. TIA-569-D.
4. NECA 101.

5. NECA 102.
6. NECA 105.
7. 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 pathways specified in Section 270528 "Pathways for Communications Systems."

D. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMTs, IMCs, and RMCs as scheduled in NECA 1, where its Table 1 lists maximum spacings that are less than those stated in 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. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, according to NFPA 70.

B. 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).

C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten communications 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: Use approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Use 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: 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 by means that comply with seismic-restraint strength and anchorage requirements.

D. 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 communications materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas, and apply galvanizing-repair paint to comply with ASTM A780.

END OF SECTION 270529

SECTION 270536 - CABLE TRAYS FOR COMMUNICATIONS 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. Wire-basket cable trays.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of cable tray.

1. Include data indicating dimensions and finishes for each type of cable tray indicated.

B. Shop Drawings: For each type of cable tray.

1. Show fabrication and installation details of cable trays, including plans, elevations, and sections of components and attachments to other construction elements. Designate components and accessories, including clamps, brackets, hanger rods, splice-plate connectors, expansion-joint assemblies, straight lengths, and fittings.

1.4 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For cable trays, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Cable trays shall withstand the effects of eqrthquake motions determined according to ASCE 7-10 Chapter 13.

1. Seismic Controls shall be provided as required for the entire Cable Tray system.

2.2 GENERAL REQUIREMENTS FOR CABLE TRAYS

A. Cable Trays and Accessories: Identified as defined in NFPA 70 and marked for intended location, application, and grounding.

1. Source Limitations: Obtain cable trays and components from single manufacturer.

B. Sizes and Configurations: See the Cable Tray Schedule on Drawings for specific requirements for types, materials, sizes, and configurations.

C. Structural Performance: See articles for individual cable tray types for specific values for the following parameters:

1. Uniform Load Distribution: Capable of supporting a uniformly distributed load on the indicated support span when supported as a simple span and tested according to NEMA VE 1.
2. Concentrated Load: A load applied at midpoint of span and centerline of tray.
3. Load and Safety Factors: Applicable to both side rails and rung capacities.

2.3 WIRE-BASKET CABLE TRAYS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. B-line, an Eaton business.
2. Chalfant Manufacturing Company.
3. Cooper Industries; Cooper B-Line; GS Metals Corp.
4. Hubbell Incorporated; Wiring Device-Kellems.
5. Legrand US.
6. MonoSystems, Inc.
7. MP Husky USA Cable Tray & Cable Bus.
8. Niedax Inc.

B. Description:

1. Configuration: Wires are formed into a standard 2-by-4-inch wire mesh pattern with intersecting wires welded together. Mesh sections must have at least one bottom longitudinal wire along entire length of section.

2. Materials: High-strength-steel longitudinal wires with no bends.
3. Safety Provisions: Wire ends along wire-basket sides (flanges) rounded during manufacturing to maintain integrity of cables and installer safety.
4. Sizes:

    a. Straight sections shall be furnished in standard 118-inch lengths.
    b. Wire-Basket Depth: 4-inch usable loading depth by 12 inches, 18 inches or 24 inches wide.

5. Connector Assemblies: Bolt welded to plate shaped to fit around adjoining tray wires and mating plate. Mechanically joins adjacent tray wires to splice sections together or to create horizontal fittings.
6. Connector Assembly Capacity: Splices located within support span shall not diminish rated loading capacity of cable tray.
7. Hardware and Fasteners: ASTM F 593 and ASTM F 594 stainless steel, Type 316.

2.4 MATERIALS AND FINISHES

A. Steel:

1. Straight Section and Fitting Side Rails and Rungs: Steel complies with the minimum mechanical properties of ASTM A 1011/A 1011M, SS, Grade 33 or ASTM A 1008/A 1008M, Grade 33, Type 2.
2. Steel Tray Splice Plates: ASTM A 1011/A 1011M, HSLAS, Grade 50, Class 1.
3. Fasteners: Steel complies with the minimum mechanical properties of ASTM A 510/A 510M, Grade 1008.

4. Finish: Hot-dip galvanized after fabrication.

    a. Standard: Comply with ASTM A 123/A 123M, Class B2.
    b. Hardware: Stainless steel, Type 316, ASTM F 593 and ASTM F 594.

2.5 CABLE TRAY ACCESSORIES

A. Fittings: Tees, crosses, risers, elbows, and other fittings as indicated, of same materials and finishes as cable tray.

B. Cable tray supports and connectors, including bonding jumpers, as recommended by cable tray manufacturer.

2.6 WARNING SIGNS

A. Lettering: 1-1/2-inch- high, black letters on yellow background with legend "Warning! Not To Be Used as Walkway, Ladder, or Support for Ladders or Personnel."

B. Comply with requirements for fasteners in Section 260553 "Identification for Electrical Systems."

2.7 SOURCE QUALITY CONTROL

A. Testing: Test and inspect cable trays according to NEMA VE 1.

PART 3 - EXECUTION

3.1 CABLE TRAY INSTALLATION

A. Install cable trays according to NEMA VE 2.

B. Install cable trays as a complete system, including fasteners, hold-down clips, support systems, barrier strips, adjustable horizontal and vertical splice plates, elbows, reducers, tees, crosses, cable dropouts, adapters, covers, and bonding.

C. Install cable trays so that the tray is accessible for cable installation and all splices are accessible for inspection and adjustment.

D. Remove burrs and sharp edges from cable trays.

E. Fasten cable tray supports to building structure and install seismic restraints.

F. Place supports so that spans do not exceed maximum spans on schedules and provide clearances shown on Drawings. Install intermediate supports when cable weight exceeds the load-carrying capacity of the tray rungs.

G. Construct supports from channel members, threaded rods, and other appurtenances furnished by cable tray manufacturer. Arrange supports in trapeze or wall-bracket form as required by application.

H. Support bus assembly to prevent twisting from eccentric loading.

I. Install center-hung supports for single-rail trays designed for 60 versus 40 percent eccentric loading condition, with a safety factor of 3.

J. Locate and install supports according to NEMA VE 2. Do not install more than one cable tray splice between supports.

K. Support wire-basket cable trays with center support hangers or trapeze hangers.

L. Install expansion connectors where cable trays cross building expansion joints and in cable tray runs that exceed dimensions recommended in NEMA VE 2. Space connectors and set gaps according to applicable standard.

M. Make changes in direction and elevation using manufacturer's recommended fittings.

N. Make cable tray connections using manufacturer's recommended fittings.

O. Seal penetrations through fire and smoke barriers. Comply with requirements in Section 078413 "Penetration Firestopping."

P. Install capped metal sleeves for future cables through firestop-sealed cable tray penetrations of fire and smoke barriers.

Q. Install cable trays with enough workspace to permit access for installing cables.

R. Install barriers to separate cables of different systems, such as power, communications, and data processing; or of different insulation levels, such as 600, 5000, and 15 000 V.

S. Install warning signs in visible locations on or near cable trays after cable tray installation.

3.2 CABLE TRAY GROUNDING

A. Ground cable trays according to NFPA 70 unless additional grounding is specified. Comply with requirements in Section 270526 "Grounding and Bonding for Communications Systems."

B. Cable trays with communications cable shall be bonded together with splice plates listed for grounding purposes or with listed bonding jumpers.

C. Cable trays with control conductors shall be bonded together with splice plates listed for grounding purposes or with listed bonding jumpers.

D. When using epoxy- or powder-coat painted cable trays as a grounding conductor, completely remove coating at all splice contact points or ground connector attachment. After completing splice-to-grounding bolt attachment, repair the coated surfaces with coating materials recommended by cable tray manufacturer.

E. Bond cable trays to power source for cables contained within with bonding conductors sized according to NFPA 70, Article 250.122, "Size of Equipment Grounding Conductors."

3.3 CABLE INSTALLATION

A. Install cables only when each cable tray run has been completed and inspected.

B. Fasten cables on horizontal runs with cable clamps or cable ties according to NEMA VE 2. Tighten clamps only enough to secure the cable, without indenting the cable jacket. Install cable ties with a tool that includes an automatic pressure-limiting device.

C. Fasten cables on vertical runs to cable trays every 18 inches.

D. Fasten and support cables that pass from one cable tray to another or drop from cable trays to equipment enclosures. Fasten cables to the cable tray at the point of exit and support cables independent of the enclosure. The cable length between cable trays or between cable tray and enclosure shall be no more than 72 inches.

E. Tie MI cables down every 36 inches where required to provide a 2-hour fire rating and every 72 inches elsewhere.

3.4 CONNECTIONS

A. Remove paint from all connection points before making connections. Repair paint after the connections are completed.

B. Connect pathways to cable trays according to requirements in NEMA VE 2 and NEMA FG 1.

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. After installing cable trays and after electrical circuitry has been energized, survey for compliance with requirements.
2. Visually inspect cable insulation for damage. Correct sharp corners, protuberances in cable trays, vibrations, and thermal expansion and contraction conditions, which may cause or have caused damage.
3. Verify that the number, size, and voltage of cables in cable trays do not exceed that permitted by NFPA 70. Verify that communications or data-processing circuits are separated from power circuits by barriers or are installed in separate cable trays.
4. Verify that there are no intruding items such as pipes, hangers, or other equipment in the cable tray.
5. Remove dust deposits, industrial process materials, trash of any description, and any blockage of tray ventilation.
6. Visually inspect each cable tray joint and each ground connection for mechanical continuity. Check bolted connections between sections for corrosion. Clean and retorque in suspect areas.
7. Check for improperly sized or installed bonding jumpers.
8. Check for missing, incorrect, or damaged bolts, bolt heads, or nuts. When found, replace with specified hardware.
9. Perform visual and mechanical checks for adequacy of cable tray grounding; verify that all takeoff raceways are bonded to cable trays. Test entire cable tray system for continuity. Maximum allowable resistance is 1 ohm.

B. Prepare test and inspection reports.

3.6 PROTECTION

A. Protect installed cable trays and cables.

1. Install temporary protection for cables in open trays to safeguard exposed cables against falling objects or debris during construction. Temporary protection for cables and cable tray can be constructed of wood or metal materials and shall remain in place until the risk of damage is over.

2. Repair damage to galvanized finishes with zinc-rich paint recommended by cable tray manufacturer.
3. Repair damage to paint finishes with matching touchup coating recommended by cable tray manufacturer.

END OF SECTION 270536

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SECTION 270544 - SLEEVES AND SLEEVE SEALS FOR COMMUNICATIONS PATHWAYS AND CABLING

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. Sleeves for pathway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.

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.

1.3 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 minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

D. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

E. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

F. Sleeves for Rectangular Openings:

1. Material: Galvanized-steel sheet.
2. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter, less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.
b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and pathway 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. HOLDRITE.
d. Metraflex Company (The).
e. Pipeline Seal and Insulator, Inc.
f. Proco Products, 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: Carbon steel.
4. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, 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. HOLDRITE.
b. Presealed Systems.

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, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

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 pathway 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 annular clear space between sleeve and pathway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
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 pathways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using cast-iron pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch 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 annular clear space between pathway 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 pathway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for pathway or cable material and size. Position pathway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pathway 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 270544

SECTION 270548.16 - SEISMIC CONTROLS FOR COMMUNICATIONS 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. Restraint channel bracings.
2. Restraint cables.
3. Seismic-restraint accessories.
4. Mechanical anchor bolts.
5. Adhesive anchor bolts.

B. Related Requirements:

1. Section 270528.29 "Hangers and Supports for Communications Systems" for commonly used supports and installation requirements.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.

    a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an agency acceptable to authorities having jurisdiction.
    b. Annotate to indicate application of each product submitted and compliance with requirements.

B. Delegated-Design Submittal: For each seismic-restraint device.

1. Include design calculations and details for selecting seismic restraints complying with performance requirements, design criteria, and analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
2. Design Calculations: Calculate static and dynamic loading caused by equipment weight, operation, and seismic forces required to select seismic restraints and for designing vibration isolation bases.

a. Coordinate design calculations with wind load calculations required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.

3. Seismic Restraint Details:

a. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.
b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
c. Coordinate seismic-restraint and vibration isolation details with wind-restraint details required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Show coordination of seismic bracing for electrical components with other systems and equipment in the vicinity, including other supports and seismic restraints. Communications components include:

1. Uninterruptible power supplies.
2. Racks.
3. Frames.
4. Cabinets.
5. Cable tray.
6. Conduits.

B. Qualification Data: For professional engineer.

C. Welding certificates.

D. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated and that is acceptable to authorities having jurisdiction.

B. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis. They shall bear anchorage preapproval from OSHPD in addition to preapproval, showing maximum

seismic-restraint ratings, by ICC-ES or another agency acceptable to authorities having jurisdiction. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) that support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

E. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic-Restraint Loading: Seismic-Restraint Loading:

1. Site Class as Defined in the IBC: D.
2. Assigned Seismic Use Group or Building Category as Defined in the IBC:III.

a. Component Importance Factor:1.5
b. Component Response Modification Factor: 1.5
c. Component Amplification Factor: 1.0.

2.2 RESTRAINT CHANNEL BRACINGS

A. Description: MFMA-4, shop- or field-fabricated bracing assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end, with other matching components, and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.3 RESTRAINT CABLES

A. Restraint Cables: [**ASTM A603 galvanized**] [**ASTM A492 stainless**]-steel cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; with a minimum of two clamping bolts for cable engagement.

2.4 SEISMIC-RESTRAINT ACCESSORIES

A. Hanger-Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.

B. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to rigid channel bracings.

C. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings and matched to type and size of anchor bolts and studs.

D. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings and matched to type and size of attachment devices used.

E. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.5 MECHANICAL ANCHOR BOLTS

A. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E488.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive [**vibration isolation and**]seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.

B. Hanger-Rod Stiffeners: Install hanger-rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods caused by seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.3 SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete."

B. Equipment and Hanger Restraints:

1. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch (3.2 mm).
2. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.

C. Install cables so they do not bend across edges of adjacent equipment or building structure.

D. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

E. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

F. Drilled-in Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where connection is terminated to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative.

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.

2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.
3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
5. Test to 90 percent of rated proof load of device.

C. Seismic controls will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.6 ADJUSTING

A. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION 270548.16

SECTION 270553 - IDENTIFICATION FOR COMMUNICATIONS 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 labels and signs.
2. Labels.
3. Bands and tubes.
4. Tapes.
5. Signs.
6. Cable ties.
7. Fasteners for labels and signs.

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 communications identification products.

B. Samples: For each type of label and sign to illustrate composition, size, colors, lettering style, mounting provisions, and graphic features of identification products.

C. Identification Schedule:

1. Outlets: Scaled drawings indicating location and proposed designation.
2. Backbone Cabling: Riser diagram showing each communications room, backbone cable, and proposed backbone cable designation.
3. Racks: Scaled drawings indicating location and proposed designation.
4. Patch Panels: Enlarged scaled drawings showing rack row, number, and proposed designations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with NFPA 70 and TIA 606-B.

B. Comply with ANSI Z535.4 for safety signs and labels.

C. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

2.2 COLOR AND LEGEND REQUIREMENTS

A. Equipment Identification Labels:

1. Black letters on a white field.

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.

B. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameters of raceway or cable they identify, that stay in place by gripping action.

C. Self-Adhesive Wraparound Labels: Preprinted, 3-mil- (0.08-mm-) thick, **vinyl** flexible labels with acrylic pressure-sensitive adhesive.
1. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating protective shields over the legend. Labels sized such that the clear shield overlaps the entire printed legend.
2. Marker for Labels: Permanent, waterproof black ink marker recommended by tag manufacturer.
3. Marker for Labels: Machine-printed, permanent, waterproof black ink recommended by printer manufacturer.

D. Self-Adhesive Labels: 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. 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 diameters of raceway or cable they identify, that stay in place by gripping action.

2.5 UNDERGROUND-LINE WARNING TAPE

A. Tape:

1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground communications utility lines.
2. Printing on tape shall be permanent and shall not be damaged by burial operations.
3. 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.

B. Color and Printing:

1. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, and ANSI Z535.4.
2. Inscriptions for Orange-Colored Tapes: "TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL-FIBER CABLE".
3.).

C. Material:

1. Reinforced, detectable three-layer laminate, consisting of a printed pigmented woven scrim, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core; bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
2. Width: 3 inches (75 mm).
3. Overall Thickness: 8 mils (0.2 mm).
4. Foil Core Thickness: 0.35 mil (0.00889 mm).
5. Weight: 34 lb/1000 sq. ft. (16.6 kg/100 sq. m).
6. Tensile according to ASTM D882: 300 lbf (1334 N) and 12,500 psi (86.1 MPa).

2.6 SIGNS

A. Baked-Enamel Signs:
1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch (6.4-mm) grommets in corners for mounting.
3. Nominal Size: 7 by 10 inches (180 by 250 mm).

B. Laminated-Acrylic or Melamine-Plastic Signs:
1. Engraved legend.
2. 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. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.7 CABLE TIES

A. 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 D638: 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.

B. 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 D638: 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.

C. 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 D638: 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.

2.8 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 PREPARATION

A. Self-Adhesive Identification Products: Before applying communications identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 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 communications systems and connected items.

G. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.

H. Vinyl Wraparound Labels:

1. Secure tight to surface of raceway or cable 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.
3. Provide label 6 inches (150 mm) from cable end.

I. Snap-Around Labels:

1. Secure tight to surface at a location with high visibility and accessibility.
2. Provide label 6 inches (150 mm) from cable end.

J. Self-Adhesive Wraparound Labels:

1. Secure tight to surface at a location with high visibility and accessibility.
2. Provide label 6 inches (150 mm) from cable end.

K. Self-Adhesive Labels:

1. On each item, 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.

L. Snap-Around, Color-Coding Bands: Secure tight to surface at a location with high visibility and accessibility.

M. 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 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.

N. Cable Ties: General purpose, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

3.3 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 with high visibility. Identify by system and circuit designation.

C. Accessible Fittings for Raceways and Cables within Buildings: Identify covers of each junction and pull box with self-adhesive labels containing wiring system legend.

1. System legends shall be as follows:

a. Telecommunications.

D. Faceplates: Label individual faceplates with self-adhesive labels. Place label at top of faceplate. Each faceplate shall be labeled with its individual, sequential designation, composed of the following, in the order listed:

1. Wiring closet designation.
2. Colon.
3. Faceplate number.

E. Equipment Room Labeling:

1. Racks, Frames, and Enclosures: Identify front and rear of each with self-adhesive labels.
2. Patch Panels: Label individual rows and outlets, starting at to left and working down, with self-adhesive labels.
3. Data Outlets: Label each outlet with a self-adhesive label indicating the following, in the order listed:

a. Room number being served.
b. Colon.
c. Faceplate number.

F. Backbone Cables: Label each cable with a vinyl-wraparound label or self-adhesive wraparound label indicating the location of the far or other end of the backbone cable. Patch panel or punch down block where cable is terminated should be labeled identically.

G. Horizontal Cables: Label each cable with a vinyl-wraparound lable or self-adhesive wraparound label indicating the following, in the order listed:

1. Room number.
2. Colon.
3. Faceplate number.

H. Locations of Underground Lines: Underground-line warning tape for copper, coaxial, hybrid copper/fiber, and optical-fiber cable.

I. Instructional Signs: Self-adhesive labels.

J. Warning Labels for Indoor Cabinets, Boxes, and Enclosures: Metal-backed, butyrate warning signs.

1. Apply to exterior of door, cover, or other access.

K. Equipment Identification Labels:

1. Indoor Equipment: Laminated-acrylic or melamine-plastic sign.
2. Outdoor Equipment: Laminated-acrylic or melamine-plastic sign.
3. Equipment to Be Labeled:

a. Communications cabinets.
b. Uninterruptible power supplies.
c. Computer room air conditioners.
d. Fire-alarm and suppression equipment.
e. Egress points.
f. Power distribution components.

END OF SECTION 270553

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SECTION 271100 - COMMUNICATIONS EQUIPMENT ROOM FITTINGS

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. Backboards.
2. Boxes, enclosures, and cabinets.
3. Power strips.

B. Related Requirements:

1. Section 270536 "Cable Trays for Communications Systems" for cable trays and accessories.
2. Section 271313 "Communications Copper Backbone Cabling" for copper data cabling associated with system panels and devices.
3. Section 271323 "Communications Optical Fiber Backbone Cabling" for optical-fiber data cabling associated with system panels and devices.
4. Section 271333 "Communications Coaxial Backbone Cabling" for coaxial data cabling associated with system panels and devices.
5. Section 271513 "Communications Copper Horizontal Cabling" for copper data cabling associated with system panels and devices.
6. Section 271523 "Communications Optical Fiber Horizontal Cabling" for coaxial data cabling associated with system panels and devices.
7. Section 271533 "Communications Coaxial Horizontal Cabling" for coaxial data cabling associated with system panels and devices.

1.3 DEFINITIONS

A. Access Provider: An operator that provides a circuit path or facility between the service provider and user. An access provider can also be a service provider.

B. BICSI: Building Industry Consulting Service International.

C. RCDD: Registered communications distribution designer.

D. Service Provider: The operator of a telecommunications transmission service delivered through access provider facilities.

E. TGB: Telecommunications grounding bus bar.

F. TMGB: Telecommunications main grounding bus bar.

1.4 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 equipment racks and cabinets.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For communications equipment room fittings. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Equipment Racks and Cabinets: Include workspace requirements and access for cable connections.
3. Grounding: Indicate location of grounding bus bar and its mounting detail showing standoff insulators and wall mounting brackets.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, qualified layout technician, installation supervisor, and field inspector.

B. Seismic Qualification Data: Certificates, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions. Base certification on the maximum number of components capable of being mounted in each rack type. Identify components on which certification is based.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Cabling installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings shall be under direct supervision of **RCDD.**

2. Installation Supervision: Installation shall be under direct supervision of **Installer 2, Copper or Fiber**, who shall be present at all times when Work of this Section is performed at Project site.
3. Field Inspector: Currently registered by BICSI as **RCDD** to perform the on-site inspection.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Equipment shall withstand the effects of earthquake motions determined according to **ASCE/SEI 7** .

1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2.2 BACKBOARDS

A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches (19 by 1220 by 2440 mm).

2.3 BOXES, ENCLOSURES, AND CABINETS

A. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets shall be listed and labeled for intended location and use.

B. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

C. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, Type FD, ferrous alloy , with gasketed cover.

D. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

F. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, **galvanized cast iron** with gasketed cover.

G. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

H. Device Box Dimensions: [**4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep)**.

I. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, 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.

J. Cabinets:

1. NEMA 250, Nema type as required, 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.

2.4 POWER STRIPS

A. Comply with requirements in Section 271116 "Communications Racks, Frames, and Enclosures."

B. Power Strips: Comply with UL 1363.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Rack mounting, **with integral** flanges.
3. **Six 20A, 120-V ac, NEMA WD 6, Configuration 5-20R** receptacles.
4. LED indicator lights for power and protection status.
5. LED indicator lights for reverse polarity and open outlet ground.
6. Circuit Breaker and Thermal Fusing: When protection is lost, circuit opens and cannot be reset.
7. Circuit Breaker and Thermal Fusing: Unit continues to supply power if protection is lost.
8. Rocker-type on-off switch, illuminated when in on position.
9. Surge Protection: UL 1449, Type 3.

a. Maximum Surge Current, Line to Neutral: **72 kA.**
b. Protection modes shall be line to neutral, line to ground, and neutral to ground.
c. UL 1449 Voltage Protection Rating for line to neutral and line to ground shall be **600 V** for neutral to ground.

PART 3 - EXECUTION

3.1 ENTRANCE FACILITIES

A. Contact telecommunications service provider and arrange for installation of demarcation point, protected entrance terminals, and a housing when so directed by service provider.

B. Comply with requirements in Section 270528 "Pathways for Communications Systems" for materials and installation requirements for **underground** pathways.

3.2 INSTALLATION

A. Comply with NECA 1.

B. Comply with BICSI's "Telecommunications Distribution Methods Manual" for layout of communications equipment spaces.

C. Comply with BICSI's "Information Technology Systems Installation Methods Manual" for installation of equipment in communications equipment spaces.

D. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

E. Coordinate layout and installation of communications equipment in tracks and in room. Coordinate service entrance configuration with service provider.

1. Meet jointly with systems providers, equipment suppliers, and Owner to exchange information and agree on details of equipment configurations and installation interfaces.
2. Record agreements reached in meetings and distribute them to other participants.
3. Adjust configurations and locations of distribution frames, cross-connects, and patch panels in equipment rooms to accommodate and optimize configurations and space requirements of communications equipment.
4. Adjust configurations and locations of equipment with distribution frames, cross-connects, and patch panels of cabling systems of other communications, electronic safety and security, and related systems that share space in equipment room.

F. Coordinate location of power raceways and receptacles with locations of communications equipment requiring electrical power to operate.

G. Backboards:

1. Install from 6 inches (150 mm) to 8 feet, 6 inches (2588 mm) above finished floor. If plywood is fire rated, ensure that fire-rating stamp is visible after installation.
2. Paint all sides of backboard with two coats of paint, leaving fire rating stamp visible.
3. Comply with requirements for backboard installation in BICSI's "Information Technology Systems Installation Methods Manual" and TIA-569-D.

3.3 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 270544 "Sleeves and Sleeve Seals for Communications Pathways and Cabling."

3.4 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping."

B. Comply with TIA-569-D, Annex A, "Firestopping."

C. Comply with BICSI's "Information Technology Systems Installation Methods Manual," "Firestopping Practices" Chapter.

END OF SECTION 271100

SECTION 271116 - COMMUNICATIONS RACKS, FRAMES, AND ENCLOSURES

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. 19” **wall-mounted** equipment cabinets.
2. 23-inch **freestanding** equipment cabinets.
3. Grounding.
4. Labeling.

B. Related Requirements:

1. Section 271110 "Communications Equipment Room Fittings" for backboards and accessories.
2. Section 270526 "Grounding and Bonding for Telecommunications Equipment" for TMGBs and TGBs.
3. Section 270536 "Cable Trays for Communications Systems" for cable trays and cable tray accessories.
4. Section 271313 "Communications Copper Backbone Cabling" for copper data cabling associated with system panels and devices.
5. Section 271323 "Communications Optical Fiber Backbone Cabling" for optical-fiber data cabling associated with system panels and devices.
6. Section 271333 "Communications Coaxial Backbone Cabling" for coaxial data cabling associated with system panels and devices.
7. Section 271513 "Communications Copper Horizontal Cabling" for copper data cabling associated with system panels and devices.

8. Section 271523 "Communications Optical Fiber Horizontal Cabling" for optical-fiber data cabling associated with system panels and devices.
9. Section 271533 "Communications Coaxial Horizontal Cabling" for coaxial data cabling associated with system panels and devices.

1.3 DEFINITIONS

A. Access Provider: An operator that provides a circuit path or facility between the service provider and user. An access provider can also be a service provider.

B. BICSI: Building Industry Consulting Service International.

C. LAN: Local area network.

D. RCDD: Registered communications distribution designer.

E. Service Provider: The operator of a telecommunications transmission service delivered through access provider facilities.

F. TGB: Telecommunications grounding bus bar.

G. TMGB: Telecommunications main grounding bus bar.

1.4 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 equipment racks and cabinets.
2. Include rated capacities, operating characteristics, electrical characteristics, certifications, standards compliance, and furnished specialties and accessories.

B. Shop Drawings: For communications racks, frames, and enclosures. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

2. Equipment Racks and Cabinets: Include workspace requirements and access for cable connections.

3. Grounding: Indicate location of TGB and its mounting detail showing standoff insulators and wall-mounting brackets.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For **Installer.**

B. Seismic Qualification Data: Certificates, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions. Base certification on the maximum number of components capable of being mounted in each rack type. Identify components on which certification is based.

3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Cabling installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings shall be under direct supervision of **RCDD.**

2. Installation Supervision: Installation shall be under direct supervision of **Installer 2, Copper or Fiber**, who shall be present at all times when Work of this Section is performed at Project site.

3. Field Inspector: Currently registered by BICSI as **RCDD** to perform on-site inspection.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Equipment shall withstand the effects of earthquake motions determined according to **ASCE/SEI 7**.

1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified **and the unit will be fully operational after the seismic event**."

B. UL listed.

C. RoHS compliant.

D. Compliant with requirements of the Payment Card Industry Data Security Standard.

2.2 BACKBOARDS

A. Backboards: Plywood, **fire-retardant treated,** 3/4 by 48 by 96 inches (19 by 1220 by 2440 mm). Comply with requirements for plywood backing panels specified in Section 061000 "Rough Carpentry."

2.3 23-INCH EQUIPMENT CABINETS

A. Description: Manufacturer-assembled four-post frame enclosed by side and top panels and front and rear doors, designed for mounting telecommunications equipment. Width is compatible with 23-inch (584.2-mm) equipment mounting.

B. General Cabinet Requirements:

1. Modular units designed for telecommunications terminal support and coordinated with dimensions of units to be supported.
2. Material:**Sheet steel**.
3. Finish: Manufacturer's standard, baked-polyester powder coat.
4. Color:**Black**.

C. Modular Freestanding Cabinets:

1. Overall Height: **As indicated on Drawings**.
2. Overall Depth: **23 inches (584.2 mm)**.
3. Load Rating: [**3000 lb (1362 kg)**] .
4. Removable and lockable side and top panels.
5. Hinged and lockable front and rear doors.
6. Adjustable feet for leveling.
7. Screened ventilation openings in roof and rear door.
8. Cable access provisions in roof and base.
9. TGB.
10. Power strip.
11. All cabinets keyed alike.

D. Modular Wall Cabinets:

1. Height:**As indicated on Drawings**].
2. Depth: **23 inches (584.2 mm)**.
3. Load Rating:**200 lb (91 kg)**] <**Insert value**>.
4. Number of Rack Units: [**8**] [**12**] [**22**] [**As indicated on Drawings**] <**Insert number**>.
5. Threads: [**10-32**] [**12-24**] [**Universal square**].
6. Lockable front[**and rear**] doors.
7. Louvered side panels.
8. Cable access provisions top and bottom.
9. Grounding lug.
10. Power strip.
11. All cabinets keyed alike.

E. Cable Management:

1. Metal, with integral wire retaining fingers.
2. Baked-polyester powder coat finish.
3. Vertical cable management panels shall have front and rear channels, with covers.

4. Provide horizontal crossover cable manager at top of each relay rack, with a minimum height of two rack units each.

2.4 GROUNDING

A. Comply with requirements in Section 270526 "Grounding and Bonding for Communications Systems" for grounding conductors and connectors.

B. Rack and Cabinet TGBs: Rectangular bars of hard-drawn solid copper, accepting conductors ranging from No. 14 to No. 2/0 AWG, NRTL listed as complying with UL 467, and complying with TIA-606-B. Predrilling shall be with holes for use with lugs specified in this Section.

1. Cabinet-Mounted TGB: Terminal block, with stainless-steel or copper-plated hardware for attachment to cabinet.
2. Rack-Mounted Horizontal TGB: Designed for mounting in 19- or 23-inch (482.6- or 584.2-mm) equipment racks. Include a copper splice bar for transitioning to an adjoining rack, and stainless-steel or copper-plated hardware for attachment to the rack.
3. Rack-Mounted Vertical TGB: 72 or 36 inches (1828.8 or 914.4 mm) long, with stainless-steel or copper-plated hardware for attachment to rack.

2.5 LABELING

A. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Comply with BICSI TDMM for layout of communications equipment spaces.

C. Comply with BICSI ITSIMM for installation of communications equipment spaces.

D. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

E. Coordinate layout and installation of communications equipment in racks and room. Coordinate service entrance configuration with service provider.

1. Meet jointly with system providers, equipment suppliers, and Owner to exchange information and agree on details of equipment configurations and installation interfaces.
2. Record agreements reached in meetings and distribute them to other participants.
3. Adjust configurations and locations of distribution frames, cross-connects, and patch panels in equipment spaces to accommodate and optimize configuration and space requirements of telecommunications equipment.
4. Adjust configurations and locations of equipment with distribution frames, cross-connects, and patch panels of cabling systems of other communications, electronic safety and security, and related systems that share space in equipment room.

F. Coordinate location of power raceways and receptacles with locations of communications equipment requiring electrical power to operate.

3.2 GROUNDING

A. Comply with NECA/BICSI 607.

B. Install grounding according to BICSI ITSIMM, "Bonding, Grounding (Earthing) and Electrical Protection" Ch.

C. Locate TGB to minimize length of bonding conductors. Fasten to wall, allowing at least 2 inches (50 mm) of clearance behind TGB. Connect TGB with a minimum No. 4 AWG grounding electrode conductor from TGB to suitable electrical building ground. Connect rack TGB to near TGB or the TMGB.

1. Bond the shield of shielded cable to patch panel, and bond patch panel to TGB or TMGB.

3.3 IDENTIFICATION

A. Coordinate system components, wiring, and cabling complying with TIA-606-B. Comply with requirements in Section 270553 "Identification for Electrical Systems."

B. Comply with requirements in Section 099123 "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.

C. Paint and label colors for equipment identification shall comply with TIA-606-B administration**, including optional identification requirements of this standard**.

D. Labels shall be machine printed. Type shall be **1/8 inch (3 mm)**] [**3/16 inch (5 mm)**.

END OF SECTION 271116

SECTION 271300 - COMMUNICATIONS BACKBONE CABLING

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. Pathways.
2. UTP cable.
3. 50/125-micrometer, optical fiber cabling.
4. Coaxial cable.
5. Cable connecting hardware, patch panels, and cross-connects.
6. Cabling identification products.

1.3 DEFINITIONS

A. BICSI: Building Industry Consulting Service International.

B. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

C. EMI: Electromagnetic interference.

D. IDC: Insulation displacement connector.

E. LAN: Local area network.

F. RCDD: Registered Communications Distribution Designer.

G. UTP: Unshielded twisted pair.

1.4 BACKBONE CABLING DESCRIPTION

A. Backbone cabling system shall provide interconnections between communications equipment rooms, main terminal space, and entrance facilities in the telecommunications cabling system structure. Cabling system consists of backbone cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for backbone-to-backbone cross-connection.

B. Backbone cabling cross-connects may be located in communications equipment rooms or at entrance facilities. Bridged taps and splitters shall not be used as part of backbone cabling.

1.5 PERFORMANCE REQUIREMENTS

A. General Performance: Backbone cabling system shall comply with transmission standards in TIA/EIA-568-B.1, when tested according to test procedures of this standard.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1. For coaxial cable, include the following installation data for each type used:

a. Nominal OD.
b. Minimum bending radius.
c. Maximum pulling tension.

B. Shop Drawings:

1. System Labeling Schedules: Electronic copy of labeling schedules in Microsoft Excel software.
2. Cabling administration drawings and printouts.
3. Wiring diagrams to show typical wiring schematics including the following:

a. Cross-connects.
b. Patch panels.
c. Patch cords.

4. Cross-connects and patch panels. Detail mounting assemblies, and show elevations and physical relationship between the installed components.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: Forqualified layout technician, installation supervisor, and field inspector.

B. Source quality-control reports.

C. Field quality-control reports.

D. Maintenance Data: For splices and connectors to include in maintenance manuals.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Patch-Panel Units: One of each type.
2. Connecting Blocks: One of each type.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings, Cabling Administration Drawings, and field testing program development by an RCDD.
2. Installation Supervision: Installation shall be under the direct supervision of Level 2 Installer, who shall be present at all times when Work of this Section is performed at Project site.

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. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A.

D. Grounding: Comply with ANSI-J-STD-607-A.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1. Test optical fiber cable to determine the continuity of the strand end to end. Use optical fiber flashlight or optical loss test set.
2. Test optical fiber cable while on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connector, including the loss value of each. Retain test data and include the record in maintenance data.
3. Test each pair of UTP cable for open and short circuits.

1.11 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.12 COORDINATION

A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.

PART 2 - PRODUCTS

2.1 PATHWAYS

A. General Requirements: Comply with TIA/EIA-569-A.

B. Cable Trays: Comply with requirements in Section 270536 Cable Trays for Communications Systems.

C. Conduit and Boxes: Comply with requirements in Section 260533 "Raceway and Boxes for Electrical Systems."

1. Outlet boxes shall be no smaller than 2-1/8 inches wide, 4 inches high, and 2-1/2 inches deep.

2.2 BACKBOARDS

A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches. Comply with requirements in Section 061000 "Rough Carpentry" for plywood backing panels.

2.3 UTP CABLE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hubbell Premise Wiring.
2. 3M.
3. AMP NETCONNECT; a TE Connectivity Ltd. company.
4. Belden CDT Networking Division/NORDX.
5. Berk-Tek Leviton; a Nexans/Leviton alliance.
6. CommScope, Inc.
7. Draka USA.
8. General Cable; General Cable Corporation.
9. Genesis Cable Products; Honeywell International, Inc.
10. Mohawk; a division of Belden Networking, Inc.
11. Superior Essex Inc.
12. SYSTIMAX Solutions; a CommScope Inc. brand.

B. Description: 100-ohm, four-pair UTP, formed into 25-pair, binder groups covered with a blue thermoplastic jacket.

1. Comply with ICEA S-90-661 for mechanical properties.
2. Comply with TIA/EIA-568-B.1 for performance specifications.
3. Comply with TIA/EIA-568-B.2, Category 6.
4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:

a. Communications, General Purpose: Type CM or CMG.
b. Communications, Plenum Rated: Type CMP, complying with NFPA 262.
c. Communications, Riser Rated: Type CMR, complying with UL 1666.
d. Communications, Limited Purpose: Type CMX.
e. Multipurpose: Type MP or MPG.
f. Multipurpose, Plenum Rated: Type MPP, complying with NFPA 262.
g. Multipurpose, Riser Rated: Type MPR, complying with UL 1666.

2.4 UTP CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Leviton Manufacturing Co., Inc.

B. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-B.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.

C. Connecting Blocks: 110-style IDC for Category 6. Provide blocks for the number of cables terminated on the block, plus 25 percent spare. Integral with connector bodies, including plugs and jacks where indicated.

D. Jacks and Jack Assemblies: Modular, color-coded, eight-position modular receptacle units with integral IDC-type terminals.

E. Patch Cords: Factory-made, four-pair cables in 48-inch lengths; terminated with eight-position modular plug at each end.

1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure Category 6 performance. Patch cords shall have latch guards to protect against snagging.

2.5 OPTICAL FIBER CABLE

A. 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:

1. 3M.
2. AMP NETCONNECT; a TE Connectivity Ltd. company.
3. Belden CDT Networking Division/NORDX.
4. Berk-Tek Leviton; a Nexans/Leviton alliance.
5. CommScope, Inc.
6. Corning Cable Systems.
7. CSI Technologies Inc.
8. General Cable; General Cable Corporation.
9. Mohawk; a division of Belden Networking, Inc.
10. Superior Essex Inc.

11. SYSTIMAX Solutions; a CommScope Inc. brand.

B. Description: Multimode, 50/125-micrometer, 24-fiber, nonconductive, tight buffer, optical fiber cable.

1. Comply with ICEA S-83-596 for mechanical properties.
2. Comply with TIA/EIA-568-B.3 for performance specifications.
3. Comply with TIA-492AAAB for detailed specifications.
4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:

a. General Purpose, Nonconductive: Type OFN or OFNG.
b. Plenum Rated, Nonconductive: Type OFNP, complying with NFPA 262.
c. Riser Rated, Nonconductive: Type OFNR, complying with UL 1666.
d. General Purpose, Conductive: Type OFC or OFCG.
e. Plenum Rated, Conductive: Type OFCP, complying with NFPA 262.
f. Riser Rated, Conductive: Type OFCR, complying with UL 1666.

5. Maximum Attenuation: 3.50 dB/km at 850 nm; 1.5 dB/km at 1300 nm.
6. Minimum Modal Bandwidth: 160 MHz-km at 850 nm; 500 MHz-km at 1300 nm.

C. Jacket:

1. Jacket Color: Aqua for 50/125-micrometer cable.
2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA-598-C.
3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches.

2.6 OPTICAL FIBER CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Leviton Manufacturing Co., Inc.

B. Cross-Connects and Patch Panels: Modular panels housing multiple-numbered, duplex cable connectors.

1. Number of Connectors per Field: One for each fiber of cable or cables assigned to field, plus spares and blank positions adequate to suit specified expansion criteria.

C. Patch Cords: Factory-made, dual-fiber cables in 36-inch lengths.

D. Cable Connecting Hardware:

1. Comply with Optical Fiber Connector Intermateability Standards (FOCIS) specifications of TIA-604-2-B, TIA-604-3-B, and TIA/EIA-604-12. Comply with TIA/EIA-568-B.3.
2. Quick-connect, simplex and duplex, Type SC or Type LC connectors. Insertion loss not more than 0.75 dB.

3. Type SFF connectors may be used in termination racks, panels, and equipment packages.

2.7 COAXIAL CABLE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Alpha Wire.
2. Belden CDT Networking Division/NORDX.
3. Coleman Cable, Inc.
4. CommScope, Inc.
5. Draka USA.

B. Cable Characteristics: Broadband type, recommended by cable manufacturer specifically for broadband data transmission applications. Coaxial cable and accessories shall have 75-ohm nominal impedance with a return loss of 20 dB maximum from 7 to 806 MHz.

C. RG-11/U: NFPA 70, Type CATV.

1. No. 14 AWG, solid, copper-covered steel conductor.
2. Gas-injected, foam-PE insulation.
3. Double shielded with 100 percent aluminum polyester tape and 60 percent aluminum braid.
4. Jacketed with sunlight-resistant, black PVC or PE.
5. Suitable for outdoor installations in ambient temperatures ranging from minus 40 to plus 85 deg C.

D. RG59/U: NFPA 70, Type CATVR.

1. No. 20 AWG, solid, silver-plated, copper-covered steel conductor.
2. Gas-injected, foam-PE insulation.
3. Triple shielded with 100 percent aluminum polyester tape and 95 percent aluminum braid; covered by aluminum foil with grounding strip.
4. Color-coded PVC jacket.

E. RG-6/U: NFPA 70, Type CATV or CM.

1. No. 16 AWG, solid, copper-covered steel conductor; gas-injected, foam-PE insulation.
2. Double shielded with 100 percent aluminum-foil shield and 60 percent aluminum braid.
3. Jacketed with black PVC or PE.
4. Suitable for indoor installations.

F. RG59/U: NFPA 70, Type CATV.

1. No. 20 AWG, solid, copper-covered steel conductor; gas-injected, foam-PE insulation.
2. Double shielded with 100 percent aluminum polyester tape and 40 percent aluminum braid.

3. PVC jacket.

G. RG59/U (Plenum Rated): NFPA 70, Type CMP.

1. No. 20 AWG, solid, copper-covered steel conductor; foam fluorinated ethylene propylene insulation.
2. Double shielded with 100 percent aluminum-foil shield and 65 percent aluminum braid.
3. Copolymer jacket.

H. NFPA and UL compliance, listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 1655 and with NFPA 70 "Radio and Television Equipment" and "Community Antenna Television and Radio Distribution" Articles. Types are as follows:

1. CATV Cable: Type CATV.
2. CATV Plenum Rated: Type CATVP, complying with NFPA 262.
3. CATV Riser Rated: Type CATVR, complying with UL 1666.
4. CATV Limited Rating: Type CATVX.

2.8 GROUNDING

A. Comply with requirements in Section 270526 "Grounding and Bonding for Communications Systems" for grounding conductors and connectors.

B. Comply with ANSI-J-STD-607-A.

2.9 IDENTIFICATION PRODUCTS

A. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.10 SOURCE QUALITY CONTROL

A. Factory test cables on reels according to TIA/EIA-568-B.1.

B. Factory test UTP cables according to TIA/EIA-568-B.2.

C. Factory test multimode optical fiber cables according to TIA/EIA-526-14-A and TIA/EIA-568-B.3.

D. Cable will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 ENTRANCE FACILITIES

A. Coordinate backbone cabling with the protectors and demarcation point provided by communications service provider.

3.2 WIRING METHODS

A. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters. Conceal raceway and cables except in unfinished spaces.

1. Install plenum cable in environmental air spaces, including plenum ceilings.
2. Comply with requirements for raceways and boxes specified in Section 260533 "Raceway and Boxes for Electrical Systems."

B. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.3 INSTALLATION OF PATHWAYS

A. Cable Trays: Comply with NEMA VE 2 and TIA/EIA-569-A.

B. Comply with requirements for demarcation point, pathways, cabinets, and racks specified in Section 271100 "Communications Equipment Room Fittings." Drawings indicate general arrangement of pathways and fittings.

C. Comply with TIA/EIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.

D. Comply with requirements in Section 260533 "Raceway and Boxes for Electrical Systems" for installation of conduits and wireways.

E. Install manufactured conduit sweeps and long-radius elbows whenever possible.

F. Pathway Installation in Communications Equipment Rooms:

1. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed, or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
2. Install cable trays to route cables if conduits cannot be located in these positions.
3. Secure conduits to backboard when entering room from overhead.
4. Extend conduits 3 inches above finished floor.
5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

G. Backboards: Install backboards with 96-inch dimension vertical. Butt adjacent sheets tightly, and form smooth gap-free corners and joints.

3.4 INSTALLATION OF CABLES

A. Comply with NECA 1.

B. General Requirements for Cabling:

1. Comply with TIA/EIA-568-B.1.
2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
3. Install 110-style IDC termination hardware unless otherwise indicated.
4. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
5. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
6. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
7. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Use lacing bars and distribution spools.
8. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
9. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
10. In the communications equipment room, install a 10-foot-long service loop on each end of cable.
11. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.

C. UTP Cable Installation:

1. Comply with TIA/EIA-568-B.2.
2. Do not untwist UTP cables more than 1/2 inch from the point of termination to maintain cable geometry.

D. Optical Fiber Cable Installation:

1. Comply with TIA/EIA-568-B.3.
2. Cable may be terminated on connecting hardware that is rack or cabinet mounted.

E. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.

2. Suspend UTP cable not in a wireway or pathway, a minimum of 8 inches above ceilings by cable supports not more than 60 inches apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

F. Installation of Cable Routed Exposed under Raised Floors:

1. Install plenum-rated cable only.
2. Install cabling after the flooring system has been installed in raised floor areas.
3. Coil cable 6 feet long not less than 12 inches in diameter below each feed point.

G. Outdoor Coaxial Cable Installation:

1. Install outdoor connections in enclosures complying with NEMA 250, Type 4X. Install corrosion-resistant connectors with properly designed O-rings to keep out moisture.
2. Attach antenna lead-in cable to support structure at intervals not exceeding 36 inches.

H. Group connecting hardware for cables into separate logical fields.

I. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA/EIA-569-A recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.

3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.

4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.

5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.

6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.5 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping."

B. Comply with TIA/EIA-569-A, Annex A, "Firestopping."

C. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.6 GROUNDING

A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. Comply with ANSI-J-STD-607-A.

C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.

D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.7 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

1. Administration Class: 2.
2. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.

B. Comply with requirements in Section 099123 "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.

C. Paint and label colors for equipment identification shall comply with TIA/EIA-606-A for Class 2 level of administration including optional identification requirements of this standard.

D. Comply with requirements in Section 271500 "Communications Horizontal Cabling" for cable and asset management software.

E. Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with

rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.

F. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, entrance pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.

G. Cable and Wire Identification:

1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet.
4. Label each terminal strip and screw terminal in each cabinet, rack, or panel.

    a. Individually number wiring conductors connected to terminal strips and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device with name and number of particular device as shown.
    b. Label each unit and field within distribution racks and frames.

5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

H. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA 606-A, for the following:

1. Cables use flexible vinyl or polyester that flexes as cables are bent.

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Visually inspect UTP and optical fiber jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-B.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.

3. Test UTP copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.

    a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

4. Optical Fiber Cable Tests:

    a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
    b. Link End-to-End Attenuation Tests:

        1) Horizontal and multimode backbone link measurements: Test at 850 or 1300 nm in 1 direction according to TIA/EIA-526-14-A, Method B, One Reference Jumper.
        2) Attenuation test results for backbone links shall be less than 2.0 dB. Attenuation test results shall be less than that calculated according to equation in TIA/EIA-568-B.1.

C. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

D. Remove and replace cabling where test results indicate that they do not comply with specified requirements.

E. End-to-end cabling will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

END OF SECTION 271300

SECTION 271500 - COMMUNICATIONS HORIZONTAL CABLING

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. UTP cabling.
2. 50/125-micrometer, optical fiber cabling.
3. Coaxial cable.
4. Multiuser telecommunications outlet assemblies.
5. Cable connecting hardware, patch panels, and cross-connects.
6. Telecommunications outlet/connectors.
7. Cabling system identification products.
8. Cable management system.

B. Related Requirements:

1. Section 271300 "Communications Backbone Cabling" for voice and data cabling associated with system panels and devices.

1.3 DEFINITIONS

A. BICSI: Building Industry Consulting Service International.

B. Consolidation Point: A location for interconnection between horizontal cables extending from building pathways and horizontal cables extending into furniture pathways.

C. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

D. EMI: Electromagnetic interference.

E. IDC: Insulation displacement connector.

F. LAN: Local area network.

G. MUTOA: Multiuser telecommunications outlet assembly, a grouping in one location of several telecommunications outlet/connectors.

H. Outlet/Connectors: A connecting device in the work area on which horizontal cable or outlet cable terminates.

I. RCDD: Registered Communications Distribution Designer.

J. UTP: Unshielded twisted pair.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordinate layout and installation of telecommunications cabling with Owner's telecommunications and LAN equipment and service suppliers.

B. Coordinate telecommunications outlet/connector locations with location of power receptacles at each work area.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For coaxial cable, include the following installation data for each type used:

a. Nominal OD.
b. Minimum bending radius.
c. Maximum pulling tension.

B. Shop Drawings:

1. System Labeling Schedules: Electronic copy of labeling schedules, in Microsoft Excel software.
2. Cabling administration drawings and printouts.
3. Wiring diagrams to show typical wiring schematics, including the following:

a. Cross-connects.
b. Patch panels.
c. Patch cords.

4. Cross-connects and patch panels. Detail mounting assemblies, and show elevations and physical relationship between the installed components.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified layout technician, installation supervisor, and field inspector.

B. Source quality-control reports.

C. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For splices and connectors to include in maintenance manuals.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Patch-Panel Units: One of each type.
2. Connecting Blocks: One of each type.
3. Device Plates: One of each type.
4. Multiuser Telecommunications Outlet Assemblies: One of each type.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings, Cabling Administration Drawings, and field testing program development by an RCDD.
2. Installation Supervision: Installation shall be under the direct supervision of Level 2 Installer, who shall be present at all times when Work of this Section is performed at Project site.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1. Test optical fiber cables to determine the continuity of the strand end to end. Use optical fiber flashlight or optical loss test set.
2. Test optical fiber cables while on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connector; including the loss value of each. Retain test data and include the record in maintenance data.
3. Test each pair of UTP cable for open and short circuits.

PART 2 - PRODUCTS

2.1 HORIZONTAL CABLING DESCRIPTION

A. Horizontal cable and its connecting hardware provide the means of transporting signals between the telecommunications outlet/connector and the horizontal cross-connect located in the communications equipment room. This cabling and its connecting hardware are called a "permanent link," a term that is used in the testing protocols.

1. TIA/EIA-568-B.1 requires that a minimum of two telecommunications outlet/connectors be installed for each work area.
2. Horizontal cabling shall contain no more than one transition point or consolidation point between the horizontal cross-connect and the telecommunications outlet/connector.
3. Bridged taps and splices shall not be installed in the horizontal cabling.
4. Splitters shall not be installed as part of the optical fiber cabling.

B. A work area is approximately 100 sq. ft., and includes the components that extend from the telecommunications outlet/connectors to the station equipment.

C. The maximum allowable horizontal cable length is 295 feet. This maximum allowable length does not include an allowance for the length of 16 feet to the workstation equipment or in the horizontal cross-connect.

2.2 PERFORMANCE REQUIREMENTS

A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA/EIA-568-B.1 when tested according to test procedures of this standard.

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-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

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.

D. Grounding: Comply with J-STD-607-A.

2.3 BACKBOARDS

A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches. Comply with requirements in Section 061000 "Rough Carpentry" for plywood backing panels.

2.4 UTP CABLE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hubbell Premise Wiring.
2. 3M.
3. AMP NETCONNECT; a TE Connectivity Ltd. company.
4. Belden CDT Networking Division/NORDX.
5. Berk-Tek Leviton; a Nexans/Leviton alliance.
6. CommScope, Inc.
7. Draka USA.
8. General Cable; General Cable Corporation.
9. Genesis Cable Products; Honeywell International, Inc.
10. Mohawk; a division of Belden Networking, Inc.
11. Superior Essex Inc.
12. SYSTIMAX Solutions; a CommScope Inc. brand.

B. Description: 100-ohm, four-pair UTP, formed into 25-pair, binder groups covered with a blue thermoplastic jacket.

1. Comply with ICEA S-90-661 for mechanical properties.
2. Comply with TIA/EIA-568-B.1 for performance specifications.
3. Comply with TIA/EIA-568-B.2, Category 6.
4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:

a. Communications, General Purpose: Type CM or CMG.
b. Communications, Plenum Rated: Type CMP, complying with NFPA 262.
c. Communications, Riser Rated: Type CMR, complying with UL 1666.
d. Communications, Limited Purpose: Type CMX.
e. Multipurpose: Type MP or MPG.
f. Multipurpose, Plenum Rated: Type MPP, complying with NFPA 262.
g. Multipurpose, Riser Rated: Type MPR, complying with UL 1666.

2.5 UTP CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Leviton Manufacturing Co., Inc.

B. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-B.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.

C. Connecting Blocks: 110-style IDC for Category 6. Provide blocks for the number of cables terminated on the block, plus 25 percent spare. Integral with connector bodies, including plugs and jacks where indicated.

D. Jacks and Jack Assemblies: Modular, color-coded, eight-position modular receptacle units with integral IDC-type terminals.

E. Patch Cords: Factory-made, four-pair cables in 48-inch lengths; terminated with eight-position modular plug at each end.

1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure Category 6 performance. Patch cords shall have latch guards to protect against snagging.

2.6 OPTICAL FIBER CABLE

A. 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:

1. 3M.
2. AMP NETCONNECT; a TE Connectivity Ltd. company.
3. Belden CDT Networking Division/NORDX.
4. Berk-Tek Leviton; a Nexans/Leviton alliance.
5. CommScope, Inc.
6. Corning Cable Systems.
7. CSI Technologies Inc.
8. General Cable; General Cable Corporation.
9. Mohawk; a division of Belden Networking, Inc.
10. Superior Essex Inc.
11. SYSTIMAX Solutions; a CommScope Inc. brand.

B. Description: Multimode, 50/125-micrometer, 24-fiber, nonconductive, tight buffer, optical fiber cable.

1. Comply with ICEA S-83-596 for mechanical properties.
2. Comply with TIA/EIA-568-B.3 for performance specifications.
3. Comply with TIA-492AAAB for detailed specifications.
4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:

a. General Purpose, Nonconductive: Type OFN or OFNG.
b. Plenum Rated, Nonconductive: Type OFNP, complying with NFPA 262.
c. Riser Rated, Nonconductive: Type OFNR, complying with UL 1666.
d. General Purpose, Conductive: Type OFC or OFCG.
e. Plenum Rated, Conductive: Type OFCP, complying with NFPA 262.
f. Riser Rated, Conductive: Type OFCR, complying with UL 1666.

5. Maximum Attenuation: 3.50 dB/km at 850 nm; 1.5 dB/km at 1300 nm.
6. Minimum Modal Bandwidth: 160 MHz-km at 850 nm; 500 MHz-km at 1300 nm.

C. Jacket:

1. Jacket Color: Aqua for 50/125-micrometer cable.
2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA-598-C.
3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches.

2.7 OPTICAL FIBER CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Leviton Manufacturing Co., Inc.

B. Cross-Connects and Patch Panels: Modular panels housing multiple-numbered, duplex cable connectors.

1. Number of Connectors per Field: One for each fiber of cable or cables assigned to field, plus spares and blank positions adequate to suit specified expansion criteria.

C. Patch Cords: Factory-made, dual-fiber cables in 36-inch lengths.

D. Cable Connecting Hardware:

1. Comply with Optical Fiber Connector Intermateability Standards (FOCIS) specifications of TIA-604-2-B, TIA-604-3-B, and TIA/EIA-604-12. Comply with TIA/EIA-568-B.3.
2. Quick-connect, simplex and duplex, Type SC or Type LC connectors. Insertion loss not more than 0.75 dB.
3. Type SFF connectors may be used in termination racks, panels, and equipment packages.

2.8 COAXIAL CABLE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Alpha Wire.
2. Belden CDT Networking Division/NORDX.
3. Coleman Cable, Inc.
4. CommScope, Inc.
5. Draka USA.

B. Cable Characteristics: Broadband type, recommended by cable manufacturer specifically for broadband data transmission applications. Coaxial cable and accessories shall have 75-ohm nominal impedance with a return loss of 20 dB maximum from 7 to 806 MHz.

C. RG-11/U: NFPA 70, Type CATV.

1. No. 14 AWG, solid, copper-covered steel conductor.
2. Gas-injected, foam-PE insulation.
3. Double shielded with 100 percent aluminum polyester tape and 60 percent aluminum braid.
4. Jacketed with sunlight-resistant, black PVC or PE.
5. Suitable for outdoor installations in ambient temperatures ranging from minus 40 to plus 85 deg C.

D. RG59/U: NFPA 70, Type CATVR.

1. No. 20 AWG, solid, silver-plated, copper-covered steel conductor.
2. Gas-injected, foam-PE insulation.
3. Triple shielded with 100 percent aluminum polyester tape and 95 percent aluminum braid; covered by aluminum foil with grounding strip.
4. Color-coded PVC jacket.

E. RG-6/U: NFPA 70, Type CATV or CM.

1. No. 16 AWG, solid, copper-covered steel conductor; gas-injected, foam-PE insulation.
2. Double shielded with 100 percent aluminum-foil shield and 60 percent aluminum braid.
3. Jacketed with black PVC or PE.
4. Suitable for indoor installations.

F. RG59/U: NFPA 70, Type CATV.

1. No. 20 AWG, solid, copper-covered steel conductor; gas-injected, foam-PE insulation.
2. Double shielded with 100 percent aluminum polyester tape and 40 percent aluminum braid.
3. PVC jacket.

G. RG59/U (Plenum Rated): NFPA 70, Type CMP.

1. No. 20 AWG, solid, copper-covered steel conductor; foam fluorinated ethylene propylene insulation.
2. Double shielded with 100 percent aluminum-foil shield and 65 percent aluminum braid.
3. Copolymer jacket.

H. NFPA and UL compliance, listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 1655 and with NFPA 70 "Radio and Television Equipment" and "Community Antenna Television and Radio Distribution" Articles. Types are as follows:

1. CATV Cable: Type CATV.

2. CATV Plenum Rated: Type CATVP, complying with NFPA 262.
3. CATV Riser Rated: Type CATVR, complying with UL 1666.
4. CATV Limited Rating: Type CATVX.

2.9 MULTIUSER TELECOMMUNICATIONS OUTLET ASSEMBLY (MUTOA)

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Belden CDT Networking Division/NORDX.
2. Chatsworth Products, Inc.
3. Hubbell Premise Wiring.
4. Molex Premise Networks.
5. Ortronics, Inc.
6. Panduit Corp.
7. Siemon Co. (The).

B. Description: MUTOAs shall meet the requirements for cable connecting hardware.

1. Number of Terminals per Field: One for each conductor in assigned cables.
2. Number of Connectors per Field:

a. One for each four-pair UTP cable indicated.
b. One for each four-pair conductor group of indicated cables, plus 25 percent spare positions.

3. Mounting: Wall.
4. NRTL listed as complying with UL 50 and UL 1863.
5. Label shall include maximum length of work area cords, based on TIA/EIA-568-B.1.
6. When installed in plenums used for environmental air, NRTL listed as complying with UL 2043.

2.10 TELECOMMUNICATIONS OUTLET/CONNECTORS

A. Jacks: 100-ohm, balanced, twisted-pair connector; four-pair, eight-position modular. Comply with TIA/EIA-568-B.1.

B. Workstation Outlets: Four-port-connector assemblies mounted in single faceplate.

1. Plastic Faceplate: High-impact plastic. Coordinate color with Section 262726 "Wiring Devices."
2. For use with snap-in jacks accommodating any combination of UTP, optical fiber, and coaxial work area cords.

a. Flush mounting jacks, positioning the cord at a 45-degree angle.

3. Legend: Machine printed, in the field, using adhesive-tape label.

2.11 GROUNDING

A. Comply with requirements in Section 270526 "Grounding and Bonding for Communications Systems" for grounding conductors and connectors.

B. Comply with J-STD-607-A.

2.12 IDENTIFICATION PRODUCTS

A. Comply with TIA/EIA-606-A and UL 969 for labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

B. Comply with requirements in Section 260553 "Identification for Electrical Systems."

2.13 SOURCE QUALITY CONTROL

A. Factory test UTP and optical fiber cables on reels according to TIA/EIA-568-B.1.

B. Factory test UTP cables according to TIA/EIA-568-B.2.

C. Factory test multimode optical fiber cables according to TIA-526-14-A and TIA/EIA-568-B.3.

D. Factory-sweep test coaxial cables at frequencies from 5 MHz to 1 GHz. Sweep test shall test the frequency response, or attenuation over frequency, of a cable by generating a voltage whose frequency is varied through the specified frequency range and graphing the results.

E. Cable will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 ENTRANCE FACILITIES

A. Coordinate backbone cabling with the protectors and demarcation point provided by communications service provider.

3.2 WIRING METHODS

A. Install cables in pathways and cable trays except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces and in gypsum board partitions where

unenclosed wiring method may be used. Conceal pathways and cables except in unfinished spaces.

1. Install plenum cable in environmental air spaces, including plenum ceilings.
2. Comply with requirements in Section 270528 "Pathways for Communications Systems."
3. Comply with requirements in Section 270536 "Cable Trays for Communications Systems."

B. Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

C. Wiring within Enclosures:

1. Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.
2. Install lacing bars and distribution spools.
3. Install conductors parallel with or at right angles to sides and back of enclosure.

3.3 INSTALLATION OF CABLES

A. Comply with NECA 1.

B. General Requirements for Cabling:

1. Comply with TIA/EIA-568-B.1.
2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
3. Install 110-style IDC termination hardware unless otherwise indicated.
4. MUTOA shall not be used as a cross-connect point.
5. Consolidation points may be used only for making a direct connection to telecommunications outlet/connectors:

    a. Do not use consolidation point as a cross-connect point, as a patch connection, or for direct connection to workstation equipment.
    b. Locate consolidation points for UTP at least 49 feet from communications equipment room.

6. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
7. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
8. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
9. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.

10. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
11. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
12. In the communications equipment room, install a 10-foot-long service loop on each end of cable.
13. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.

C. UTP Cable Installation:

1. Comply with TIA/EIA-568-B.2.
2. Do not untwist UTP cables more than 1/2 inch from the point of termination to maintain cable geometry.

D. Optical Fiber Cable Installation:

1. Comply with TIA/EIA-568-B.3.
2. Cable may be terminated on connecting hardware that is rack or cabinet mounted.

E. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend UTP cable not in a wireway or pathway a minimum of 8 inches above ceilings by cable supports not more than 60 inches apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

F. Installation of Cable Routed Exposed under Raised Floors:

1. Install plenum-rated cable only.
2. Install cabling after the flooring system has been installed in raised floor areas.
3. Coil cable 6 feet long not less than 12 inches in diameter below each feed point.

G. Outdoor Coaxial Cable Installation:

1. Install outdoor connections in enclosures complying with NEMA 250, Type 4X. Install corrosion-resistant connectors with properly designed O-rings to keep out moisture.
2. Attach antenna lead-in cable to support structure at intervals not exceeding 36 inches.

H. Group connecting hardware for cables into separate logical fields.

I. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA-569-B for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.

3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.

4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.

5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.4 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping."

B. Comply with TIA-569-B, Annex A, "Firestopping."

C. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.5 GROUNDING

A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. Comply with J-STD-607-A.

C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.

D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.6 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

1. Administration Class: 2.
2. Color-code cross-connect fields. Apply colors to voice and data service backboards, connections, covers, and labels.

B. Using cable management system software specified in Part 2, develop Cabling Administration Drawings for system identification, testing, and management. Use unique, alphanumeric designation for each cable and label cable, jacks, connectors, and terminals to which it connects with same designation. At completion, cable and asset management software shall reflect as-built conditions.

C. Comply with requirements in Section 099123 "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.

D. Paint and label colors for equipment identification shall comply with TIA/EIA-606-A for Class 2 level of administration, including optional identification requirements of this standard.

E. Cable Schedule: Post in prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.

F. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, entrance pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors. Follow convention of TIA/EIA-606-A. Furnish electronic record of all drawings, in software and format selected by Owner.

G. Cable and Wire Identification:

1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.

2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet.
4. Label each terminal strip and screw terminal in each cabinet, rack, or panel.

    a. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with name and number of particular device as shown.
    b. Label each unit and field within distribution racks and frames.

5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
6. Uniquely identify and label work area cables extending from the MUTOA to the work area. These cables may not exceed the length stated on the MUTOA label.

H. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA-606-A.

1. Cables use flexible vinyl or polyester that flex as cables are bent.

3.7 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Visually inspect UTP and optical fiber cable jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-B.1.
2. Visually confirm Category 6, marking of outlets, cover plates, outlet/connectors, and patch panels.
3. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
4. Test UTP backbone copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.

    a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

5. Optical Fiber Cable Tests:

    a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
    b. Link End-to-End Attenuation Tests:

        1) Horizontal and multimode backbone link measurements: Test at 850 or 1300 nm in 1 direction according to TIA-526-14-A, Method B, One Reference Jumper.
        2) Attenuation test results for backbone links shall be less than 2.0 dB. Attenuation test results shall be less than that calculated according to equation in TIA/EIA-568-B.1.

6. UTP Performance Tests:

    a. Test for each outlet and MUTOA. Perform the following tests according to TIA/EIA-568-B.1 and TIA/EIA-568-B.2:

        1) Wire map.
        2) Length (physical vs. electrical, and length requirements).
        3) Insertion loss.
        4) Near-end crosstalk (NEXT) loss.
        5) Power sum near-end crosstalk (PSNEXT) loss.
        6) Equal-level far-end crosstalk (ELFEXT).
        7) Power sum equal-level far-end crosstalk (PSELFEXT).
        8) Return loss.
        9) Propagation delay.
        10) Delay skew.

7. Optical Fiber Cable Performance Tests: Perform optical fiber end-to-end link tests according to TIA/EIA-568-B.1 and TIA/EIA-568-B.3.
8. Final Verification Tests: Perform verification tests for UTP and optical fiber systems after the complete communications cabling and workstation outlet/connectors are installed.

    a. Voice Tests: These tests assume that dial tone service has been installed. Connect to the network interface device at the demarcation point. Go off-hook and listen and receive a dial tone. If a test number is available, make and receive a local, long distance, and digital subscription line telephone call.
    b. Data Tests: These tests assume the Information Technology Staff has a network installed and is available to assist with testing. Connect to the network interface device at the demarcation point. Log onto the network to ensure proper connection to the network.

B. Document data for each measurement. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

C. End-to-end cabling will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.8 DEMONSTRATION

A. Train Owner's maintenance personnel in cable-plant management operations, including changing signal pathways for different workstations, rerouting signals in failed cables, and keeping records of cabling assignments and revisions when extending wiring to establish new workstation outlets. Include training in cabling administration spreadsheet software.

END OF SECTION 271500

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SECTION 274133 - MASTER ANTENNA TELEVISION SYSTEM

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. MATV equipment using cable television service as the signal source.
2. MATV head-end components.
3. Distribution components.

B. Related Sections:

1. Section 271300 "Communications Backbone Cabling" for coaxial, UTP, and fiber-optic cables and connectors.
2. Section 271500 "Communications Horizontal Cabling" for coaxial, UTP, and fiber-optic cables and connectors.

1.3 DEFINITIONS

A. Agile Receiver: A broadband receiver that can be tuned to any desired channel.

B. A/V: Audio/Visual.

C. Broadband: For the purposes of this Section, wide bandwidth equipment or systems that can carry signals occupying in the frequency range of 54 to 1002 MHz. A broadband communication system can simultaneously accommodate television, voice, data, and many other services.

D. Carrier: A pure-frequency signal that is modulated to carry information. In the process of modulation, the signal is spread out over a wider band. The carrier frequency is the center frequency on any television channel.

E. CATV: Community antenna television. A communication system that simultaneously distributes several different channels of broadcast programs and other information to customers via a coaxial cable.

F. CCTV: Closed-circuit television.

G. CEA: Consumer Electronics Association.

H. dBmV: Decibels relative to 1 mV across 75 ohms. Zero dBmV is defined as 1 mV across 75 ohms. dBmV = 20 log 10(V_1/V_2) where V_1 is the measurement of voltage at a point having identical impedance to V_2 (0.001 V across 75 ohms).

I. Headend: The control center of the MATV system, where incoming signals are amplified, converted, processed, and combined into a common cable along with any locally originated television signals, for transmission to user-interface points. It is also called the "central retransmission facility."

J. I/O: Input/Output.

K. MATV: Master antenna television. A small television antenna distribution system usually restricted to one or two buildings.

L. RF: Radio frequency.

M. User Interface: End point of Contractor's responsibility for Work of this Section. User interfaces are the 75-ohm terminals on device plates.

1.4 SYSTEM DESCRIPTION

A. System shall consist of cable television service and a coaxial cable distribution system.

1. Distribution of cable television service signals, which includes coordinating with Owner's selected service provider for installation of cable to the service point ready for connection into the distribution system. Obtain signal levels and noise and distortion characteristics from service provider as the point of departure for system layout and final equipment selection.
2. Cable distribution system consisting of coaxial cables, user interfaces, signal taps and splitters, RF amplifiers, signal equalizers, power supplies, and required hardware, complying with CEA-310-E and CEA-2032 and resulting in performance parameters specified in this Section. System shall be capable of distributing television channels according to CEA-542-B.

B. Hardware Requirements: Use plug-in, modular, solid-state electronic components. Mount amplifiers and other powered equipment in standard 19-inch cabinet complying with CEA-310-E.

1.5 PERFORMANCE REQUIREMENTS

A. Minimum acceptable performance of distribution system at all user-interface points shall be as follows:

1. RF Video-Carrier Level: Between 3 and 12 dBmV.
2. Relative Video-Carrier Level: Within 3 dB to adjacent channel.

3. Carrier Level Stability, Short Term: Level shall not change more than 0.5 dB during a 60-minute period.
4. Carrier Level Stability, Long Term: Level shall not change more than 2 dB during a 24-hour period.
5. Channel Frequency Response: Across any 6-MHz channel in the 54- to 220-MHz frequency range, referenced to video; signal amplitude shall be plus or minus 1 dB, maximum.
6. Carrier-to-Noise Ratio: 45 dB or more.
7. RF Visual Signal-to-Noise Ratio: 43 dB or more.
8. Antenna Combiner Insertion Loss: 40 dB maximum.
9. Signal Power Splitter and Isolation Tap Return Loss: 17 dB maximum.
10. Cable Connectors Attenuation: Less than 0.1 dB.
11. Cross Modulation: Less than minus 50 dB.
12. Carrier-to-Echo Ratio: More than 40 dB.
13. Composite Triple Beat: Less than minus 53 dB.
14. Second Order Beat: Less than minus 60 dB.
15. Terminal Isolation from Television to Television: 25 dB, minimum.
16. Terminal Isolation between Television and FM: 35 dB, minimum.
17. Hum Modulation: 2 percent, maximum.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For headend and distribution system. Include plans, elevations, sections, details, and attachments to other work.

1. Show fabrication and installation details for television equipment.
2. Wiring Diagrams: For power, signal, and control wiring. For UTP or fiber-optic cable, include cross connects, patch panels, and patch cords.

1.7 INFORMATIONAL SUBMITTALS

A. Equipment List: Include each piece of equipment and include model number, manufacturer, serial number, location, and date of original installation. Insert testing record of each piece of adjustable equipment, listing name of person testing, date of test, and description of as-left set points.

B. Field quality-control reports.

1.8 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For headend and distribution system to include in emergency, operation, and maintenance manuals.

1.9 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Provide no fewer than one of each item listed below. Deliver extra materials to Owner.

1. Fuses: One for every 10 of each type and rating.
2. Splitters: One for every 10 installed.
3. MATV Distribution Power Amplifiers: One for every 10of each type installed.
4. MATV Signal Traps: One for every 10 of each type used.
5. MATV Attenuators: One for every 10 of each type used.
6. Cable: 100 feet of each type used.

1.10 QUALITY ASSURANCE

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.

1.11 PROJECT CONDITIONS

A. Environmental Limitations: System components shall be equipped and rated for the environments in which they are installed.

1.12 COORDINATION

A. Coordinate size and location of raceway system and provisions for electrical power to equipment specified in this Section.

B. Coordinate Work of this Section with requirements of cable television service service provider.

C. Coordinate sizes and locations of concrete bases with actual equipment provided.

D. Coordinate installation of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

PART 2 - PRODUCTS

2.1 SYSTEMS REQUIREMENTS

A. Components: Plug-in, modular, heavy-duty, industrial- or commercial-grade units.

B. Equipment: Silicon-based, solid-state, integrated circuit devices.

C. Power Supply Characteristics: Devices shall be within specified parameters for ac supply voltages within the range of 105 to 130 V.

D. Protect signal cables and connected components against transient-voltage surges by suppressors and absorbers designed specifically for that purpose. Comply with requirements in Section 264313 "Surge Protection for Low-Voltage Electrical Power Circuits."

E. Provide ac-powered equipment with integral surge suppressors complying with UL 1449.

F. RF and Video Impedance Matching: Signal-handling components, including connecting cable, shall have end-to-end impedance-matched signal paths. Match and balance devices used at connections where it is impossible to avoid impedance mismatch or mismatch of balanced circuits to unbalanced circuits.

2.2 MATV EQUIPMENT

A. Description: Signal-source components, signal-processing and amplifying equipment, distribution components, and interconnecting wiring. System shall receive, amplify, process, and distribute signals to outlets for receiving sets. Equipment shall translate UHF channels to VHF channels before distribution to outlets.

B. MATV System Qualitative and Quantitative Performance Requirements: Reception quality of color-television program transmissions at each system outlet from each service and source shall be equal to or superior than that obtained with performance checks specified in "Field Quality Control" Article, using standard, commercial, cable-ready, multiple A/V input color-television receivers.

2.3 MATV HEADEND COMPONENTS

A. Headend Equipment: Broadband amplifier and/or Single-channel amplifiers for receiving off-air television and FM signals and outputting the signals to cable distribution system. Equip coaxial down-leads of the off-air antennas with preamplifiers to send signals at strength required by headend. Headend component performance specified in this article is minimum acceptable; better performance may be required to comply with minimum acceptable system performance standard in "Performance Requirements" Article.

1. House units in standard 19-inch electronic equipment cabinet complying with EIA 310.

B. Broadband Amplifier:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. ATX Networks Inc.
    b. Blonder Tongue Laboratories, Inc.
    c. Channel Master.
    d. Cisco Systems, Inc.
    e. Leviton Manufacturing Co., Inc.

2. Frequency Range: 54 to 220 MHz.

3. Frequency Response: Plus or minus 1.0 dB across passband.
4. Maximum Noise: 10 dB.
5. Minimum Return Loss: 16 dB.
6. I/O Impedance: 75 ohms.

C. Single-Channel Amplifiers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. ATX Networks Inc.
    b. Blonder Tongue Laboratories, Inc.
    c. Channel Master.
    d. Cisco Systems, Inc.
    e. Leviton Manufacturing Co., Inc.

2. Frequency: 6 MHz for specified channel.

3. Frequency Response: Plus or minus 0.5 dB.
4. Maximum Noise: 10 dB.
5. Minimum Return Loss: 14 dB.
6. Automatic Gain Control: Plus or minus 1-dB output variation for rated input level range variation.
7. Skirt Rejection: Minus 26 dB at plus or minus 5 MHz from channel center.
8. Sound Trap: Adjustable to 10 VdB of attenuation of the sound carrier.
9. I/O Impedance: 75 ohms.

2.4 DISTRIBUTION COMPONENTS

A. Signal Power Splitters and Isolation Taps: Metal-enclosed directional couplers with brass connector parts. Where installed in signal circuits used to supply cable-powered amplifiers, power throughput capacity shall exceed load by at least 25 percent.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. ATX Networks Inc.
    b. Cisco Systems, Inc.
    c. Leviton Manufacturing Co., Inc.

2. Return Loss: 17 dB.

3. RFI Shielding: 100 dB.
4. Isolation: 25 dB.
5. I/O Impedance: 75 ohms.

B. Distribution System Amplifiers: Powered by coaxial cable system and equipped with surge protection device and external test points to allow convenient signal monitoring.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. ARRIS.
    b. ATX Networks Inc.
    c. Cisco Systems, Inc.
    d. Leviton Manufacturing Co., Inc.

C. Cable System Power Supplies: Plug-in, modular construction, with surge, short-circuit, and overload protection.

D. Signal Traps: Packaged filters tuned to interference frequencies encountered in Project.

E. Attenuators: Passive, of fixed value, and used to balance signal levels.

F. Terminating Resistors: Enclosed units rated 0.5 W and matched for coaxial impedance.

G. User-Interface Device: Flush, female-type outlets, designed to mimic power duplex outlet; for mounting in standard outlet box; with metallic parts of anodized brass, beryllium copper, or phosphor bronze. Cable connector mounting shall be semirecessed so its protrusion is flush with the plane of device plate.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. ARRIS.
    b. ATX Networks Inc.
    c. Canare Corporation of America.
    d. Cisco Systems, Inc.
    e. Cisco Systems, Inc.
    f. Leviton Manufacturing Co., Inc.

2. Cable Connector: Female, Type F.

3. Wall Plates: Match materials and finish of power outlets in same space.
4. Attenuation: Less than 0.1 dB.
5. Voltage Standing-Wave Ratio: Less than 1.15 to 1.

2.5 ENCLOSURES

A. Enclosures for Interior, Controlled Environments: NEMA 250, Type 1.

B. Enclosures for Interior, Uncontrolled Environments: NEMA 250, Type 4.

C. Enclosures for Exterior Environments: NEMA 250, Type 3R.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for antenna to verify actual locations of cable connections before antenna installation.

B. Examine walls, floors, roofs, equipment bases, and roof supports for suitable conditions where television equipment is to be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

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 tests and inspections.

B. Inspection: Verify that units and controls are properly installed, connected, and labeled, and that interconnecting wires and terminals are identified.

C. Tests and Inspections:

1. Align and adjust system and pretest components, wiring, and functions to verify that they comply with specified requirements.
2. Replace malfunctioning or damaged items.
3. Retest until satisfactory performance and conditions are achieved.
4. Prepare television equipment for acceptance and operational testing.
5. Use an agile receiver and signal strength meter or spectrum analyzer for testing.
6. Test Schedule: Schedule tests after pretesting has successfully been completed and system has been in normal functional operation for at least 14 days. Provide a minimum of 10 days' notice of test schedule.
7. Operational Tests: Perform tests of operational system to verify that system complies with Specifications. Include all modes of system operation. Test equipment for proper operation in all functional modes.
8. Distribution System Acceptance Tests:

    a. Field-Strength Instrument: Rated for minus 40-dBmV measuring sensitivity and a frequency range of 54 to 812 MHz, minimum. Provide documentation of recent calibration against recognized standards.
    b. Signal Level and Picture Quality: Use a field-strength meter or spectrum analyzer, and a standard television receiver to measure signal levels and check picture quality at all user-interface outlets.

1) Test the signal strength in dBmV at 55, 151, 547, and 750 MHz.
2) Minimum acceptable signal level is 0 dBmV (1000 mV).
3) Maximum acceptable signal level over the entire bandwidth is 15 dBmV.
4) Television receiver shall show no evidence of cross-channel intermodulation, ghost images, or beat interference.

9. Signal-to-Noise-Ratio Test: Use a field-strength meter to make a sequence of measurements at the output of the last distribution amplifier or of another agreed-on location in system. With system operating at normal levels, tune meter to the picture carrier frequency of each of the designated channels in turn and record the level. With signal removed and input to corresponding headend amplifier terminated at 75 ohms, measure the level of noise at same tuning settings. With meter correction factor added to last readings, differences from first set must not be less than 45 dB.
10. Qualitative and Quantitative Performance Tests: Demonstrate reception quality of color-television program transmissions at each user interface from each designated channel and source. Quality shall be equal to or superior than that obtained with performance checks specified below, using a standard, commercial, cable-ready, color-television receiver. Level and quality of signal at each outlet and from each service and source shall comply with the following Specifications when tested according to 47 CFR 76:

a. RF video-carrier level.
b. Relative video-carrier level.
c. Carrier level stability, during 60-minute and 24-hour periods.
d. Broadband frequency response.
e. Channel frequency response.
f. Carrier-to-noise ratio.
g. RF visual signal-to-noise ratio.
h. Antenna combiner insertion loss.
i. Signal power splitter loss.
j. Cable connector attenuation.

D. Headend and distribution system will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

F. Cap all unused connectors and seal weathertight.

3.4 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain MATV equipment.

1. Train Owner's maintenance personnel on procedures and schedules for troubleshooting, servicing, and maintaining equipment.

END OF SECTION 274133

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SECTION 281300 – ACCESS CONTROL SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 and Division 28 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The SSI shall provide and install an access control system as specified herein. The system shall include all equipment, installation, installation materials, set up, and testing to form a complete operating system. Independent system functions shall be fully verified as part of system testing and commissioning.

B. For those doors that are connected to the PLC door control and GUI control station system, the access control system shall provide a dry contact interface between the node(s) and the PLC system. The access control system shall make requests (outputs) to the PLC system (PLC inputs) to open the doors upon a successful read by a reader of a valid credential.

C. The access control system network controller shall be connected to the facility LAN. The SSI shall coordinate the configuration of the network controller and network nodes as required with the Owner's IT facility administrator. The Division 26 contractor shall provide and install all necessary data cabling to connect the network controller to the facility LAN.

D. The access control system shall be implemented through network appliance architecture with a three-tiered modular hardware hierarchy and embedded three-tier software architecture.

1. The network appliance shall be capable of running on a TCP/IP network and shall be accessible, configurable, and manageable from any network-connected PC with a browser.
2. Browser access for configuration and administration of the system shall be possible from a PC on the same subnet, through routers and gateways from other subnets, and from the Internet. Control and management of the system shall therefore be geographically independent.
3. Security of the data communicated over the network to and from the browser, network controller, and nodes is protected by encryption (SSL 128-bit) and authentication (SHA-1).
4. The top hardware tier is the network controller. Embedded on the Network Controller are an operating system, a web server, security application software, and the database of personnel and system activity.
5. The middle hardware tier is the network node. The network node shall make and manage access control decisions with data provided by the network controller, and it shall manage the communication between the network controller and Application

blades connected to the system's inputs, outputs, and readers. This modular design makes it possible, even during network downtime, for the system to continue to manage access control and store system activity logs. When network connectivity is re-established, the system activity logs are automatically re-integrated.

6. The bottom hardware tier is the Application Blades. Four unique Application blades shall be available:

    a. Access Control Blade: shall support two readers, four supervised inputs, and four relay outputs.
    b. Alarm Input Blade: shall support eight supervised inputs.
    c. Relay Output Blade: shall support eight relay outputs.
    d. Temperature Blade: shall support eight analog temperature sensor inputs.

E. The access control system shall integrate, within a browser interface, access control, alarm monitoring, video monitoring, and temperature monitoring applications. These applications shall be embedded in a three-tier software architecture.

1. The database tier shall use PostgreSQL. PostgreSQL is a full featured, high performance database management system that supports ODBC. This shall provide a small footprint, low administration, and high reliability relational database that is embedded without requiring the use of a separate PC server.
2. The web server tier shall be based on an Apache™ embedded web server. This shall provide a graphically rich security management application through a standard web browser.
3. The security application software tier contains the business logic. This application shall also be embedded on the network device and requires no additional memory or processing power.
4. This three-tiered embedded software design runs within an embedded Linux Ubuntu operating system and shall require no client-side software other than a web browser.

F. Client-server based access control systems that require the access control software to be installed on a PC or server-type machine shall NOT be approved.

G. Systems that utilize serial-based proximity readers with Ethernet-serial converters shall NOT be approved.

H. All equipment and materials used shall be standard components, regularly manufactured, and regularly utilized in the manufacturer's system.

I. All access control systems and components shall have been thoroughly tested and proven in actual use.

J. All access control systems and components shall be provided with an explicit manufacturer warranty of one year for software and two years for hardware.

K. The access control system shall include the following main components:

1. Network Controllers
2. Network Nodes

3. Access Control Blades
4. Access Management Software
5. iCLASS SE Readers
6. iCLASS SE + Proximity Smart Cards
7. Request-to-exit motion detector
8. Optical Weigand Data Extender

L. Related Sections:

1. Division 08 Section – “Door Hardware”.

M. Codes and References: Comply with the current version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. State Building Codes, Local Amendments.

1.3 DEFINITIONS

A. AJAX: Asynchronous Javascript™ and XML technology

B. NAS: Network attached storage

C. FTP: File transfer protocol

D. SSI: Security Systems Integrator

1.4 SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, and accessories.

B. System Operational Descriptions: Complete system operational narratives for the integrated access controlled openings defining the owner's prescribed requirements for the opening functionality. Narratives include, but are not limited to, the following situations: normal secured/unsecured state of door; authorized access; authorized egress; unauthorized access; unauthorized egress; fire alarm and loss of power conditions, and interfaces with other building control systems.

C. Shop Drawings: Detail equipment enclosure assemblies and indicate dimensions, loads, required clearances, components, and location of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.

a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.

D. Coordination Drawings: Details, drawn to scale, on which the following items are shown and coordinated with each other:

1. Readers
2. Network Switches
3. Network Controllers
4. Network Nodes

E. Proof of Certification: Provide copy of manufacturer(s) official certification or accreditation document indicating proof of status as a qualified and authorized provider of the primary access control components.

F. Operation and Maintenance Data: For access control system to include in operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Schedules detailing locations, titles, and termination locations of all readers, network controllers and network nodes.

1.5 QUALITY ASSURANCE

A. All work shall conform to applicable National Electrical Codes (NEC). SSI shall adhere to applicable state and local ordinances and the requirements of the authority having jurisdiction.

B. The SSI shall be an authorized integrator of the access control system.

C. The installed access control system shall conform to all local jurisdiction requirements.

1.6 COORDINATION

A. Coordinate quantity and arrangement of assemblies with ceiling space configuration and with components occupying ceiling space, including structural members, pipes, air-distribution components, raceways, cable trays, recessed lighting fixtures, and other items.

1.7 WARRANTY

A. Warranty Period: 12 months from date of Substantial Completion. The manufacturer shall repair or replace software and hardware that fails in materials or workmanship within specified warranty period. The SSI shall provide the Owner with an active software subscription agreement that allows the Owner access to software updates during the full 1-year warranty period.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Proximity Readers: Furnish 1 spare proximity reader for each type provided.

PART 2 - PRODUCTS

2.1 NETWORK CONTROLLERS

A. Manufacturer: LenelS2

B. Description: At the top tier is the Network Controller, which shall contain the database engine, web server, application software, and configuration data. It is at this level that System Users, through a browser interface, shall interact with the access control system, set configurations, monitor activities, run reports, and manage alarms.

C. Network Controller:

1. The network controller shall include the following features:

a. Network Nodes Supported: 64
b. Processor: Intel® Atom™ N2800
c. Portals: Configured for 128
d. RAM: 4 GB total
e. Storage Capacity: 20 GB
f. Ethernet Ports: 1 (10/100)
g. Operating Temperature: 32° to 95° F (0° to 35° C)
h. Relative Humidity: 85% at 35°C non-condensing
i. Power Supply: 86 to 264 VAC, 47/440Hz, 1.5A
j. MTBF: 213,447 hrs
k. Weight: 9.7 lbs. (4.4 kg)

2.2 NETWORK NODES

A. Manufacturer: LenelS2

B. Description: The Network Node, an intelligent device with native TCP/IP support, shall make and manage access control decisions with data provided by the network controller, and it shall manage the communication between the Network Controller and Application blades connected to the system’s inputs, outputs, and readers. The Node shall be supplied with 12V DC at a minimum of 3 amps. The Node blade shall supply all Application blades in the node

with power. The Network Node shall be available in three configurations: a combined network controller/network node blade; a standalone Network Node blade, and a MicroNode with included Access Control blade. Each Network Node shall support up to seven Application blades except for the MicroNodes. Communications between the node and network controller shall be encrypted and authenticated (SHA-1). SSI shall provide and install the required number of network nodes to support all proximity readers.

C. Network Nodes:

1. Each network node shall include the following capabilities:

a. Application blades: 7
b. Access control readers: 14
c. Access Levels: 512
d. Portals: 14
e. Portal Groups: 64
f. Readers: 14
g. Reader Groups: 128
h. Supervised Inputs: 56
i. Input Groups: 64
j. Relay Outputs: 56
k. Output Groups: 64
l. Temperature Monitor Inputs: 56
m. Elevators: 14
n. Floors: 52
o. Floor Groups: 64
p. Credential storage: 20,000
q. Activity Log records: 27,000

2.3 ACCESS CONTROL BLADES

A. Manufacturer: LenelS2

B. Description: The Application blades shall interface with the network controller through the Network Node. The Application blades shall be blade-style circuit cards. This project shall utilize one type of application blade, the “access control blade”. The access control blade shall support 2 readers (input devices such as keypads, RFID devices or Biometric readers), 4 supervised inputs and 4 relay outputs. SSI shall provide and install the required number of access control blades to support all readers.

C. Access Control Blade:

1. The access control blade shall receive power via the ribbon cable bus directly from the Node Blade. The access blade shall supply up to 400 milliamps of power to one reader or 200 milliamps of power to each of two readers.
2. The access control blade shall include the following features:

a. 7-pin reader connectors: 2
b. Maximum reader wire length: 500 feet (152 m) (18 AWG twisted, shielded)
c. Power available to readers: 400 milliamps
d. 2-pin supervised input connectors: 4
e. Maximum input wire length: 2000 feet (610 m) (22 AWG twisted, shielded)
f. 3-pin relay output connectors: 4
g. Maximum output wire length: Determined by the peripheral device

2.4 ACCESS MANAGEMENT SOFTWARE

A. Manufacturer: LenelS2

B. Description: The access control system shall integrate, within a web browser interface, access control and alarm monitoring applications. These applications shall be embedded in a three-tier software architecture.

C. Operating System and Application Software:

1. The embedded operating system for the solid-state Network Controller shall be the Linux Ubuntu operating system. The operating system kernel shall be open-source and no operating system training or certification shall be necessary.
2. The application software shall be embedded in the system. The database shall be an embedded PostgreSQL relational database requiring a small footprint and provides high reliability. The web server shall be based on an embedded Apache™ web server enabling users to access and operate the system using a standard web browser.

D. Software Licensing:
1. Software licensing shall be based upon the number of readers, cameras, and select features for one Network Controller. Software license upgrades shall be available if system reader and camera capacity must be raised. The user license shall be valid in perpetuity and shall include one year of software updates from the date of shipment from the factory.
2. Licensing shall be controlled by a Product Key and an Activation Key. The Product Key contains the licensed system features and limits. To upgrade your system license to enable more cameras or more doors you will need a new Product Key. The Activation Key contains the warranty expiration date. The keys are locked to the system license number. The system license number shall be viewable on-screen on the Support: About page

E. Software Upgrades: Software upgrades shall be possible from a browser on any network-connected PC, by uploading a software update to the Controller. Controllers shall automatically upgrade all connected nodes. No client software installation shall be necessary.

F. Personnel Data: The access control system shall maintain person data relating to access control, system user privileges, photo identification, system activity, and contact information.

1. All person data in the system shall be integrated onto one tabbed page for viewing, editing, and deletion by system users.

2. A system user holding at least an ‘Administer’ user role shall be able to create, delete, and modify person records, including access levels.
3. A system user holding at least a “Setup” user role shall be able to configure the display of person records. For example, the user shall be able to hide various tabs, and configure the User-defined tab by changing the tab label and customizing any of the 20 data fields that appear on the tab. The user shall also be able to define UDF value lists, which can be displayed as pre-entered drop-down lists for user-defined data fields.

G. Data Import and Export: A Data Management Tool shall be provided that supports, via an API, the import and export of personnel data. This tool shall make possible the pre-populating, and ongoing populating, of cardholders into the access control system database.

H. Data Security:

1. Communication between the network controller and the browser shall be secured using SSL. In addition, administrative access to the security management application and the personnel data shall be password protected and controlled by roles-based authorizations.
2. Communication between the network controller and the network nodes shall be encrypted and authentication/tamper detection shall be done using the SHA-1 algorithm.
3. Communication between the network controller and other systems (when using the API) shall be secured using SSL and authentication/tamper detection shall be done using the SHA-1 algorithm.

I. Data Backups: It shall be possible to configure regular automatic database backups.

1. It shall be possible to back up a solid-state Network Controller to a built-in solid state hard drive.
2. It shall also be possible to save backups from any controller to separate network attached storage (NAS) and file transfer protocol (FTP) servers.
3. It shall also be possible to setup regular automatic creation of database archive files.

J. On-board Data Management: Each night the system shall truncate a sufficient number of the oldest records held on-board to reduce the database to its set limit, if required. This shall create the needed storage space for additional system activity records. Truncation will be performed on a First-in, First-out (FIFO) basis.

K. User Roles and Permissions: There shall be 4 pre-programmed levels of User Roles, and a total of 16 possible Custom User Roles that can be configured in the system, with different permissions for each user:

1. Master Partition Monitor: These users may use the functions in the Monitor menu only within the Master (default) partition. Monitor functions shall include viewing the activity log, cameras, and floor plans.
2. Master Partition Administer: These users may use the functions of both the Administration and Monitor menus only within the Master (default) partition. Administrative functions shall include adding and editing person information in the

enrollment database, issuing and revoking cards, generating reports, and performing database backups.

3. Master Partition Setup: These users may use the functions of the Setup, Administration, and Monitor menus only within the Master (default) partition. Setup functions shall include defining access control, alarm event behavior, camera settings, floor plan images and configurations, holiday and time specifications. Setup functions shall also include: designation of network resources such as time and DNS servers, email and network storage settings; performance of system maintenance such as database backup and restore, software updates and file cleanups; designation of time zone, daily backup schedule and enrollment readers.
4. Full System Setup: These users may use the functions of all menus in all partitions.
5. Custom User Roles: In addition to the roles above the system shall also support the creation of detailed user permissions regarding which cameras, floor plans, elevators, events, access levels, portals, reports, and personal data fields the system user may see, edit, delete, or control.

L. Alarm Events: The system shall be capable of managing alarm events.

1. It shall be possible to delay an input's change to the Alarm state by a specified number of seconds. The range of delay options shall be .5 seconds or 1-120 seconds.
2. It shall be possible to associate specific actions with each alarm event. These actions may include, but are not limited to:
    a. Lock and Unlock portals.
    b. Activate and Deactivate relay outputs.
    c. Arm and Disarm input groups.
    d. Pulse outputs or output groups.
    e. Arm and Disarm alarm panels.
    f. Send emails and SMS messages.
    g. Move cameras to preset positions.
    h. Switch to a video monitor.
    i. Record video.
    j. Momentarily unlock portals.
    k. Display ID photos.
    l. Change the threat level for a location, and (optionally) for its sub-locations.
    m. Make entries in the activity log.
    n. Play a digital sound file; it shall be possible to specify that it play in a loop until cleared or acknowledged.
    o. Display alarms in different colors.
    p. Set a priority for an alarm (one of 20 levels, with 1 being the highest).
    q. Require a duty log entry.
    r. Clear alarm automatically or require an acknowledgement.

3. A system user holding at least a “Setup” user role shall be able to create, delete, and modify alarm system inputs, input groups, outputs, output groups, alarm panels, and events.
4. It shall be possible to trigger events based on system activity such as:
    a. Failed login attempts.
    b. Video motion detection.
    c. Camera failure and camera restore events.
    d. Valid or Invalid card reads.
    e. Portals held or forced open.
    f. Valid card reads with a specified access level.
    g. Inputs entering an alarm state.
    h. High and low temperature events.
    i. Alarm panel arming failures.
    j. Alarm panel zone faults.
    k. Tailgating and pass-back violations.
    l. Occupancy limit violations.
    m. Zone empty violations.
    n. Node power failure, communication failure, timeout, and tamper events.
5. It shall be possible to clone an event which creates an event with all attributes of the original, needing to change only the event’s name and any attributes it will not have in common.

M. Network-based Camera and Video Surveillance: The system shall provide live IP video surveillance capability. The number of supported cameras shall be limited only by license. The system’s video capabilities shall include video monitor switching based on access activity. The system shall provide monitoring, configuration, and administration of IP video. Cameras can be separately monitored or monitored in groups.
1. Presets: The system shall support the creation, deletion, and editing of camera preset positions in the system. It shall also be possible to save changes in preset positions directly to a camera website.
2. Views: The system shall support the creation, deletion, and editing of multiple camera views, specifically Quad views (four cameras). The application shall provide a drop-down pick list for selecting current views or naming of new views.

N. Activity Monitoring:
1. The system shall support a Monitoring Desktop that integrates video, system activity logs, floorplans, ID photos, and alarm notifications.
2. Activity Log viewing includes one-click navigation to person records.
3. The system shall support a Widget Desktop that allows the creation of custom monitoring layouts. Within a custom layout, widgets display live video, system activity logs, alarm notifications, ID photos, floorplans, duty log entries, portal status displays, and DMP intrusion panels.

4. Many widgets support multiple partition viewing and filtering. For example, the Activity Log widget can display data from multiple partitions and data filtered by event type or reader group, and/or based on the text content of the event.
5. It shall also be possible to view cameras, activity logs, and floorplans on separate monitoring pages within the application.
6. The system shall support tracing a person's activity in the current partition if the "Trace this person" check box is selected on the person record. The traced activity is displayed in bold in the color selected for "Trace person log color" on the Network Controller page. In addition, if an event is selected for "Trace person event" on the Network Controller page, it is triggered each time a traced person makes an access attempt. These event activations can be reported using a Trace people filter in a custom history report.

O. Access Control:

1. The access control system shall be able to make access control decisions, define a variety of access levels and time specifications, write system activity into a log file, maintain a personnel enrollment database, receive signals from input devices such as door switch monitors, card readers and motion detectors, energize devices such as door locks and alarms via outputs.

P. Threat Levels:

1. It shall be possible to configure up to eight threat levels. It shall be possible to alter security system behavior through the use of threat levels. Groups of threat levels may be created and assigned to portal groups, access levels, input groups, output groups, floor groups, and event actions. The behavior of groups, access levels, and event actions with assigned threat level groups shall change based upon the current system threat level.
2. The system shall support 32 threat level groups.
3. It shall also be possible to change the system threat level in response to an alarm event.
4. The current system threat level shall display in the title bar of the security application interface and on floorplans.

Q. Location-based threat levels: The system administrator shall have the ability to define locations. This allows for threat levels to be assigned to individual locations.

1. Within each parent location, sub-locations can be created, and additional sub-locations can be created within each of these, and so on. This creates a location hierarchy.
2. Portals can be assigned, and threat levels applied, to any location within the hierarchy.

R. Appropriate Use banner: The system administrator shall have the ability to enter text (such as an appropriate use statement) to be displayed on the login page.

S. Reports:

1. The access control system shall be capable of producing a variety of predefined reports regarding software and security hardware configuration, event history, and the administration of people within the system. In addition, an easy to use query language shall be included to create ad hoc reports. The query language shall be documented in

the online help system. Alternatively, it shall be possible to specify a query by use of point-and-click.

2.5 iCLASS SE READERS

A. Manufacturer: HID

B. Description: SSI shall provide and install iCLASS SE readers as specified herein. The basis for the specification is HID.

C. iCLASS SE Readers:
1. HID model 920NTNNEK00000 for proximity only. HID model 921NTNNEK00000 for proximity/keypad.
2. The readers shall include the following features:

a. Typical read range: Up to 13 cm (5.2”) using iCLASS ID-1 cards
b. Dimensions: 8.4 cm x 12.2 cm x 2.4 cm (3.3” x 4.8” x 1.0”)
c. Material: Polycarbonate UL 94
d. Power Supply: 5-16VDC
e. Current requirements (standard power mode): 65mA (16VDC)
f. Operating temperature: -35° C to +65° C (-31° F to 150° F)
g. Transmission frequency: 13.56 MHz
h. Color: black
i. Environmental: IP55
j. Use: Indoor/outdoor
k. Maximum controller distance: 150 meters (500 ft)
l. Type of cable: 3 pairs twisted 22 AWG, overall shield

2.6 iCLASS SE + Proximity SMART CARDS

A. Manufacturer: HID

B. Description: SSI shall provide two hundred (200) iCLASS SE + Proximity smart cards and two hundred (200) printable overlays to the Owner upon substantial completion. The Owner shall be responsible for enrolling the smart cards into the Access Control System. The basis for the specification is HID.

C. Smart Cards:

1. HID model 2080PMSMV.
2. The iCLASS SE + proximity smart cards shall include the following features:

a. Dimensions: 5.4 cm x 8.57 cm x 0.084 cm (2.127” x 3.375” x 0.033”)
b. Operating frequency: 13.56 MHz for iCLASS, 125KHz for HID Prox
c. Weight: 0.24 oz
d. Construction: Thin PVC laminate
e. Operating Temperature: -40° C to + 50° C (-40 ° F to 122 ° F)

f. Memory Type: EEPROM, read/write
g. Write Endurance: Min 100,000 cycles
h. Data Retention: Min 10 years non-volatile data retention
i. Slot Punch: Vertical Slot Punch
j. Printable Overlay: Provide HID P/N 1324GAV21

2.7 REQUEST-TO-EXIT MOTION DETECTOR

A. Manufacturers:

1. Kantech
2. Securitron
3. Bosch

B. Description: SSI shall provide request-to-exit motion detectors as shown on the plans. The PLC system shall provide the required number of inputs to integrate with all request-to-exit detectors. The basis for the specification is Kantech.

C. Request-to-Exit Motion Detector:

1. Kantech model T.REX-LT.
2. The request-to-exit detectors shall include the following features:

a. Detector Type: Passive Infrared
b. Filter Technology: Digital Signal Processing (DSP)
c. Detector Lens: Curtain-type Fresnel lens
d. Detection Range: Narrow Targeting Area; 3m. Whole Body; 6m.
e. Main Relay Contacts: SPDT, 1A max @ 30VDC max
f. Tamper Switch: N.C., 100mA max @ 30VDC max
g. Indicator Light: Red/Green LED
h. Physical Dimensions: 4.5 x 19 x 4.75cm (H x W x D)
i. Power Consumption: 12-28 VDC, 50mA
j. Accessories: Provide T.REX-PLATE for mounting to single-gang box

2.8 OPTICAL WIEGAND DATA EXTENDER

A. Manufacturer: COMNET

B. Description: SSI shall provide and install Optical Wiegand Data Extenders for control and monitoring of the site-located proximity readers and gate control. The remote extenders shall be located in Nema 4X enclosures as specified in section 281105 and the central units shall be located at the security electronics head-end equipment racks. The basis for the specification is Comnet.

C. Optical Wiegand Data Extender:
1. Comnet model FDW1000M/C and FDW1000M/R.
2. The extender shall include the following features:

a. Interface: Wiegand, Strobed (Clock and Data), and F-2F
b. Relays: Maximum switching voltage and current; 220VDC 30W, 1A, resistive load only, 250VAC, 37.5VA, 1A
c. Fibers: Multimode; Loss Budget 13dB, 850nm, 2 fibers
d. Connectors: Optical – ST; Data/Power/Relay – removable screw terminal blocks
e. Power: Input; 8 to 16VDC @ 200 mA Max
f. Operating Temperature: -40° C to +75° C
g. Storage Temperature: -40° C to + 85° C
h. Relative Humidity: 0% to 95% (non-condensing)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

B. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance of the installed access control system.

C. Examine roughing-in for electrical source power to verify actual locations of wiring connections before electrified and integrated access control door hardware installation.

D. Examine roughing-in for LAN and control cable conduit systems to controllers, card readers, and other cable-connected devices to verify actual locations of conduit and back boxes before device installation.

E. Verify the accuracy of all dimensions, allowances, and clearances on site prior to commencing with any work that may be affected by those dimensions, allowances, and clearances.

F. Comply with manufacturer’s installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in the Contract Documents.

G. Precautions shall be taken to guard against electrostatic and electromagnetic susceptibility and interference.

H. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Doors and frames at scheduled access controlled openings to be properly prepared to receive specified electrified and access control hardware and connections without additional in-field modifications.

3.3 INSTALLATION

A. Provide complete access control system as specified herein.

B. All material furnished shall be new and conform to the applicable requirements of the Underwriters Laboratories and the National Standards Institute.

C. All system head-end equipment to be contained within equipment cabinets or enclosures.

D. All system equipment and field devices to be held securely in place. Fastenings and supports shall be selected to provide a safety factor of three.

E. All system equipment equipped with plug in power connectors to be connected to a dedicated receptacle. Do not use tap connectors for plugging in multiple plugs into a single receptacle.

F. All cable within equipment racks, and cabinets, or on backboards, to be neatly bundled and secured.

G. Wires shall not be nicked, have strands removed, or have frayed strands when removing insulation or terminating.

3.4 CONNECTIONS

A. Ground equipment according to manufacturer’s recommendations.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust the access control system components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare pass/fail reports:

1. Proximity reader inspection: SSI shall perform an inspection of each proximity reader to ensure that each device works correctly.

2. Request to exit detector inspection: SSI shall perform an inspection of each request-to-exit motion detector to ensure that each device works correctly.

C. Remove and replace malfunctioning units and retest as specified above.

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all integrated access control door hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by access control system installation.

C. Clean operating items as necessary to restore proper finish and provide final protection and maintain conditions that ensure access control door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. A trained service representative will perform system maintenance training at the owner’s facility once the final inspection is complete. Refer to Division 01 Section "Demonstration and Training."

B. Training shall be video recorded.

END OF SECTION 281300

SECTION 282300 – IP VIDEO COMMUNICATION SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 01 and Division 28 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the requirements for an IP video communication system. The IP video communication system shall be integrated with the overall Electronic Security System.

B. The video management system shall be integrated with the PLC system and GUI software to allow automatic (connecting intercom stations or alarm activities) or manual call-up of any camera connected to the system. Reference section 284620 for software functionality.

C. System shall include a complete IEEE 802.3 100/1000 BASE-T Local Area Network that interfaces the GUI control stations to the IP camera servers. This security network shall be a closed network. The IP camera servers shall include multiple NICs. One NIC in each IP camera server shall be connected to the Owner's LAN.

D. The SSI shall provide the following quantities of video client workstations and monitors:

1. One (1) video client workstation with two (2) 24" monitors located in Control D1000.
2. One (1) video client workstation with two (2) 24" monitors located in Control E1000.
3. One (1) video client workstation with two (2) 24" monitors located in Booking Counter B1053A.
4. One (1) video client workstation with two (2) 24" monitors located in Workstation B1096.
5. Two (2) video client workstations with one (1) 24" monitor and one (1) 55" monitor located in Master Control B1016.
6. One (1) video client workstation with two (2) 55" monitors located in Master Control B1016.

E. PCs (provided by the Owner) shall be capable of accessing the IP video communication system using the video management system software. Software shall be configured to only allow those users with valid credentials (i.e. logins and passwords) to access the IP video communication system. The SSI shall train the Owner on the installation and configuration of the video management system software. Installation of the software on Owner-provided PCs shall be the responsibility of the Owner. The Owner shall provide PCs that meet the recommended software and hardware requirements of the video management system.

F. The video management system shall include the ability to mask areas of the video images. SSI shall mask toilet and shower areas of video images from cameras located in the detention

areas of the facility. SSI shall coordinate with the Owner's requirements during final configuration of the system.

G. The SSI shall provide initial configuration of the camera views for the video client software for each GUI control station location, with input from the Owner.

H. All cameras in the video management system shall be licensed as required for proper viewing and recording. SSI shall provide exacq Technologies Enterprise-series licenses for all cameras and encoders in the system.

I. The video management system shall include the required quantity of IP camera servers and storage devices required to accommodate all cameras as shown on the plans, with cameras configured at their maximum allowable resolution and adhering to the following recording parameters:

1. 10 IPS per camera (or if not possible with specified camera, the maximum allowable rate for that camera).
2. Inmate Property "transaction" camera shall be configured to record at 22 IPS.
3. Record based on motion. SSI shall assume a 50% overall motion activity level.
4. Parking Lot-located cameras shall be configured for minimum stored image retention of 60 days. All other cameras shall be configured for minimum stored image retention of 240 days.
5. SSI shall provide a minimum of 1,837TB of usable storage after RAID6. SSI shall configure servers and storage units with enough drives in RAID 6 configuration to support the required storage. Architect shall verify installed storage prior to issuing substantial completion certificate.

J. For stand-alone microphone locations, provide Louroe model Verifact A and Verifact D line level microphones. Microphones shall terminate to Axis P7216 encoder.

K. The IP video communication system shall include the following main components:

1. Cameras
2. Video Management System
3. Encoders
4. Multi-View Surveillance Appliance
5. Microphones
6. Media Converter Cabinet
7. CAT6 Patch Panels
8. Network switches
9. Video Client Workstations

1.3 DEFINITIONS

A. VMS: Video Management System

B. PoE: Power-Over-Ethernet

C. NIC: Network Interface Card

1.4 SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, and accessories.

B. Shop Drawings: Detail equipment enclosure assemblies and indicate dimensions, loads, required clearances, components, and location of each field connections.

1. Wiring Diagrams: Power, signal, and control wiring.

C. Operation and Maintenance Data: For IP video communication system to include in operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Schedules detailing model numbers, locations, titles, and termination locations of all cameras, switches and video management system equipment in the system.

1.5 QUALITY ASSURANCE

A. All work shall conform to applicable National Electrical Codes (NEC). SSI shall adhere to applicable state and local ordinances and the requirements of the authority having jurisdiction.

1.6 COORDINATION

A. The SSI shall coordinate the exact location of cameras with the Architect and Owner to obtain the best possible view.

1.7 WARRANTY

A. Warranty Period: 12 months from date of Substantial Completion. The manufacturer shall repair or replace software and hardware that fails in materials or workmanship within specified warranty period.

B. Special warranty: The IP camera servers shall include a 5-year warranty from the manufacturer from the date of purchase. The Video Management System manufacturer shall warranty the software licensing and update subscription (SSA) for a period of 5 years from date of purchase. During this 5-year period, all software updates shall be free of charge.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Cameras: Furnish 1 spare “Type 6” and “Type 21” camera.

PART 2 - PRODUCTS

2.1 CAMERAS

A. Manufacturers:

1. Axis
2. Hanwha

B. Description: This specification is based on cameras manufactured by Axis and Hanwha. Multiple camera types have been defined below. Each camera TYPE includes a description of what hardware shall be included. SSI shall reference the camera schedule included in this specification section for a complete list of cameras and TYPES for the project.

C. Camera TYPE 1 (High-Speed PTZ with IR, 1080p, 30x Zoom, WDR, IK08, IK10, IP66, Nema 4X)

1. Axis model Q6125-LE

D. Camera TYPE 2 (Outdoor Bullet with IR, 1080p, IP66, IK08, Nema 4X)

1. Axis model M2025-LE

E. Camera TYPE 3 (180° Panoramic, 8MP, WDR, IP66, IK10, Nema 4X)

1. Axis model P3807-PVE

F. Camera TYPE 4 (360° Multi-directional with IR, 8MP, remote focus and zoom, WDR, IP66, IP67, IK09, Nema 4X)

1. Axis model P3717-PLE

G. Camera TYPE 5 (Outdoor Bullet with IR, remote focus and 32x zoom, 1080p, IP66, IP67, Nema 4X)

1. Axis model Q1785-LE

H. Camera TYPE 6 (Fixed mini dome, 1080p, WDR, IP42, IK08)

1. Axis model M3045-V

I. Camera TYPE 7 (Fixed dome, 5MP, remote focus and zoom, WDR, built-in microphone, IK10)

1. Axis model P3367-V

J. Camera TYPE 8 (360° Indoor/Outdoor Dome with IR, 12MP, WDR, IP66, IK10, Nema 4X)

1. Axis model M3058-PLVE

K. Camera TYPE 9 (Fixed dome, 1080p, remote focus and zoom, WDR, built-in microphone, IK10)

1. Axis model P3375-V

L. Camera TYPE 10 (Corner-mount with IR, 1.3MP, built-in microphone, IP66, IK10+, Nema 4X)

1. Axis model Q8414-LVS

M. Camera TYPE 11 (360°/180° Panoramic, 5MP, built-in microphone, IP66, IK10, Nema 4X)

1. Axis model M3037-PVE

N. Camera TYPE 12 (360° Multi-directional, 8MP, WDR, IP66, IP67, IK09, Nema 4X)

1. Axis model P3707-PE

O. Camera TYPE 13 (360° Indoor/Outdoor Dome with IR, 6MP, WDR, IP66, IK10, Nema 4X)

1. Axis model M3057-PLVE

P. Camera TYPE 14 (Corner-mount, 3MP, WDR, IP66, IK10)

1. Axis model P9106

Q. Camera TYPE 15 (Fixed mini dome, 720p, WDR, IP42, IK08)

1. Axis model M3044-V

R. Camera TYPE 16 (Fixed dome, 1080p, remote focus and zoom, WDR, IP52, IK08)

1. Axis model P3225-V MKII

S. Camera TYPE 17 (Dome Sensor Unit, 1080p, WDR)

1. Axis model F4005

T. Camera TYPE 18 (Sensor Unit, 1080p, WDR)

1. Axis model F1015

U. Camera TYPE 19 (Fixed dome, 1080p, remote focus and zoom, WDR, IP66, IK10, Nema 4X)

1. Axis model P3225-VE MKII

V. Camera TYPE 20

1. N/A

W. Camera TYPE 21 (Fixed dome with IR, 4MP, remote focus and zoom, WDR, IP66, IK10)

1. Hanwha model QNV-7080R

X. Camera TYPE 22 (180° Panoramic, 33MP, WDR, IP66, IK10, Nema 4X)

1. Axis model Q3709-PVE

CAMERA SCHEDULE

CAMERA #	CAMERA TYPE	MODEL	ACCESSORY	MOUNT	TERMINATION LOCATION
1	TYPE 1	Q6125-LE	T91G61/T91A64	CORNER	SQE14
2	TYPE 2	M2025-LE	-	WALL	SQE5
3	TYPE 3	P3807-PVE	-	WALL	SQE5
4	TYPE 1	Q6125-LE	T91G61/T91A64	CORNER	SQE5
5	TYPE 1	Q6125-LE	T91G61/T91A64	CORNER	SQE5
6	TYPE 3	P3807-PVE	-	WALL	SQE5
7	TYPE 4	P3717-PLE	T94N01D/T91D61/T91A64	CORNER	SQE5
8	TYPE 4	P3717-PLE	T94N01D/T91D61/T91A64	CORNER	SQE4
9	TYPE 4	P3717-PLE	T94N01D/T91D61/T91A64	CORNER	SQE4
10	TYPE 5	Q1785-LE	-	WALL	SQE4
11	TYPE 4	P3717-PLE	T94N01D/T91D61/T91A64	CORNER	SQE4
12	TYPE 5	Q1785-LE	-	WALL	SQE4
13	TYPE 3	P3807-PVE	-	WALL	SQE4
14	TYPE 4	P3717-PLE	T94N01D/T91D61/T91A64	CORNER	SQE4
15	TYPE 4	P3717-PLE	T94N01D/T91D61/T91A64	CORNER	SQE4
16	TYPE 5	Q1785-LE	-	WALL	SQE4
17	TYPE 4	P3717-PLE	T94N01D/T91D61/T91A64	CORNER	SQE4
18	TYPE 2	M2025-LE	-	WALL	SQE1
19	TYPE 1	Q6125-LE	T91G61/T91A64	CORNER	SQE15
20	TYPE 3	P3807-PVE	-	WALL	SQE15
21	TYPE 6	M3045-V	T94B01P	WALL	SQE5
22	TYPE 6	M3045-V	T94B01P	WALL	SQE5
23	TYPE 6	M3045-V	T94B01P	WALL	SQE5
24	TYPE 7	P3367-V	-	WALL	SQE5
25	TYPE 7	P3367-V	-	WALL	SQE5
26	TYPE 7	P3367-V	-	WALL	SQE5
27	TYPE 7	P3367-V	-	WALL	SQE5
28	TYPE 8	M3058-PLVE	T94S01P	CEILING	SQE5
29	TYPE 9	P3375-V	-	CEILING	SQE1
30	TYPE 9	P3375-V	-	CEILING	SQE1
31	TYPE 6	M3045-V	T94B02M	CEILING	SQE1
32	TYPE 10	Q8414-LVS	-	CEILING/CORNER	SQE1
33	TYPE 10	Q8414-LVS	-	CEILING/CORNER	SQE1
34	TYPE 9	P3375-V	-	CEILING	SQE1

35	TYPE 9	P3375-V	-	CEILING	SQE1
36	TYPE 9	P3375-V	-	CEILING	SQE1
37	TYPE 11	M3037-PVE	T94F01M	CEILING	SQE1
38	TYPE 9	P3375-V	-	CEILING	SQE1
39	TYPE 10	Q8414-LVS	-	CEILING/CORNER	SQE1
40	TYPE 10	Q8414-LVS	-	CEILING/CORNER	SQE1
41	TYPE 6	M3045-V	T94B02M	CEILING	SQE1
42	TYPE 12	P3707-PE	-	CEILING	SQE1
43	TYPE 13	M3057-PLVE	-	CEILING	SQE1
44	TYPE 12	P3707-PE	-	CEILING	SQE1
45	TYPE 11	M3037-PVE	T94F01M	CEILING	SQE1
46	TYPE 14	P9106	-	CEILING/CORNER	SQE1
47	TYPE 14	P9106	-	CEILING/CORNER	SQE1
48	TYPE 14	P9106	-	CEILING/CORNER	SQE1
49	TYPE 14	P9106	-	CEILING/CORNER	SQE1
50	TYPE 14	P9106	-	CEILING/CORNER	SQE1
51	TYPE 14	P9106	-	CEILING/CORNER	SQE1
52	TYPE 14	P9106	-	CEILING/CORNER	SQE1
53	TYPE 14	P9106	-	CEILING/CORNER	SQE1
54	TYPE 14	P9106	-	CEILING/CORNER	SQE1
55	TYPE 14	P9106	-	CEILING/CORNER	SQE1
56	TYPE 14	P9106	-	CEILING/CORNER	SQE1
57	TYPE 14	P9106	-	CEILING/CORNER	SQE1
58	TYPE 14	P9106	-	CEILING/CORNER	SQE1
59	TYPE 14	P9106	-	CEILING/CORNER	SQE1
60	TYPE 14	P9106	-	CEILING/CORNER	SQE1
61	TYPE 14	P9106	-	CEILING/CORNER	SQE1
62	TYPE 14	P9106	-	CEILING/CORNER	SQE1
63	TYPE 21	QNV-7080R	SBD-120GP	CEILING	SQE1
64	TYPE 21	QNV-7080R	SBD-120GP	CEILING	SQE1
65	TYPE 9	P3375-V	-	CEILING	SQE1
66	TYPE 9	P3375-V	-	CEILING	SQE1
67	TYPE 6	M3045-V	T94B02M	CEILING	SQE1
68	TYPE 13	M3057-PLVE	-	CEILING	SQE1
69	TYPE 13	M3057-PLVE	-	CEILING	SQE1
70	TYPE 13	M3057-PLVE	-	CEILING	SQE1
71	TYPE 6	M3045-V	T94B02M	CEILING	SQE1
72	TYPE 16	P3225-V MKII	-	CEILING	SQE1
73	TYPE 14	P9106	-	CEILING/CORNER	SQE1

74	TYPE 14	P9106	-	CEILING/CORNER	SQE1
75	TYPE 14	P9106	-	CEILING/CORNER	SQE1
76	TYPE 10	Q8414-LVS	-	CEILING/CORNER	SQE1
77	TYPE 14	P9106	-	CEILING/CORNER	SQE1
78	TYPE 10	Q8414-LVS	-	CEILING/CORNER	SQE1
79	TYPE 10	Q8414-LVS	-	CEILING/CORNER	SQE1
80	TYPE 14	P9106	-	CEILING/CORNER	SQE1
81	TYPE 10	Q8414-LVS	-	CEILING/CORNER	SQE1
82	TYPE 10	Q8414-LVS	-	CEILING/CORNER	SQE1
83	TYPE 14	P9106	-	CEILING/CORNER	SQE1
84	TYPE 10	Q8414-LVS	-	CEILING/CORNER	SQE1
85	TYPE 14	P9106	-	CEILING/CORNER	SQE1
86	TYPE 14	P9106	-	CEILING/CORNER	SQE1
87	TYPE 14	P9106	-	CEILING/CORNER	SQE1
88	TYPE 14	P9106	-	CEILING/CORNER	SQE1
89	TYPE 14	P9106	-	CEILING/CORNER	SQE1
90	TYPE 14	P9106	-	CEILING/CORNER	SQE1
91	TYPE 14	P9106	-	CEILING/CORNER	SQE1
92	TYPE 14	P9106	-	CEILING/CORNER	SQE1
93	TYPE 14	P9106	-	CEILING/CORNER	SQE1
94	TYPE 14	P9106	-	CEILING/CORNER	SQE1
95	TYPE 14	P9106	-	CEILING/CORNER	SQE1
96	TYPE 14	P9106	-	CEILING/CORNER	SQE1
97	TYPE 14	P9106	-	CEILING/CORNER	SQE1
98	TYPE 14	P9106	-	CEILING/CORNER	SQE1
99	TYPE 14	P9106	-	CEILING/CORNER	SQE1
100	TYPE 6	M3045-V	T94B02M	CEILING	SQE1
101	TYPE 21	QNV-7080R	SBD-120GP	CEILING	SQE1
102	TYPE 6	M3045-V	T94B02M	CEILING	SQE1
103	TYPE 8	M3058-PLVE	-	CEILING	SQE1
104	TYPE 8	M3058-PLVE	-	CEILING	SQE1
105	TYPE 6	M3045-V	T94B02M	CEILING	SQE1
106	TYPE 8	M3058-PLVE	-	CEILING	SQE1
107	TYPE 6	M3045-V	T94B02M	CEILING	SQE1
108	TYPE 6	M3045-V	T94B02M	CEILING	SQE1
109	TYPE 6	M3045-V	T94B02M	CEILING	SQE1
110	TYPE 6	M3045-V	T94B02M	CEILING	SQE1
111	TYPE 6	M3045-V	T94B02M	CEILING	SQE1
112	TYPE 6	M3045-V	T94B02M	CEILING	SQE1
113	TYPE 6	M3045-V	T94B02M	CEILING	SQE4

114	TYPE 6	M3045-V	T94B02M	CEILING	SQE4
115	TYPE 15	M3044-V	T94B02M	CEILING	SQE4
116	TYPE 15	M3044-V	T94B02M	CEILING	SQE4
117	TYPE 15	M3044-V	T94B02M	CEILING	SQE4
118	TYPE 15	M3044-V	T94B02M	CEILING	SQE4
119	TYPE 15	M3044-V	T94B02M	CEILING	SQE4
120	TYPE 15	M3044-V	T94B02M	CEILING	SQE4
121	TYPE 15	M3044-V	T94B02M	CEILING	SQE4
122	TYPE 15	M3044-V	T94B02M	CEILING	SQE4
123	TYPE 15	M3044-V	T94B02M	CEILING	SQE4
124	TYPE 15	M3044-V	T94B02M	CEILING	SQE4
125	TYPE 15	M3044-V	T94B02M	CEILING	SQE4
126	TYPE 6	M3045-V	T94B02M	CEILING	SQE4
127	TYPE 13	M3057-PLVE	-	CEILING	SQE4
128	TYPE 12	P3707-PE	-	CEILING	SQE4
129	TYPE 12	P3707-PE	-	CEILING	SQE4
130	TYPE 6	M3045-V	T94B02M	WALL	SQE4
131	TYPE 6	M3045-V	T94B02M	CEILING	SQE4
132	TYPE 6	M3045-V	T94B02M	CEILING	SQE4
133	TYPE 6	M3045-V	T94B02M	CEILING	SQE4
134	TYPE 9	P3375-V	-	CEILING	SQE4
135	TYPE 6	M3045-V	T94B02M	CEILING	SQE4
136	TYPE 8	M3058-PLVE	-	CEILING	SQE4
137	TYPE 6	M3045-V	T94B02M	CEILING	SQE4
138	TYPE 6	M3045-V	T94B02M	CEILING	SQE4
139	TYPE 6	M3045-V	T94B02M	CEILING	SQE4
140	TYPE 17	F4005	-	CEILING	SQE2
141	TYPE 18	F1015	CUSTOM	WALL	SQE2
142	TYPE 17	F4005	-	CEILING	SQE2
143	TYPE 18	F1015	CUSTOM	WALL	SQE2
144	TYPE 6	M3045-V	T94B02M	CEILING	SQE4
145	TYPE 8	M3058-PLVE	-	CEILING	SQE4
146	TYPE 6	M3045-V	T94B02M	CEILING	SQE4
147	TYPE 6	M3045-V	T94B02M	CEILING	SQE4
148	TYPE 6	M3045-V	T94B02M	CEILING	SQE4
149	TYPE 6	M3045-V	T94B02M	CEILING	SQE4
150	TYPE 6	M3045-V	T94B02M	CEILING	SQE4
151	TYPE 8	M3058-PLVE	-	CEILING	SQE1
152	TYPE 6	M3045-V	T94B02M	CEILING	SQE1

153	TYPE 6	M3045-V	T94B02M	CEILING	SQE1
154	TYPE 6	M3045-V	T94B02M	CEILING	SQE1
155	TYPE 6	M3045-V	T94B02M	CEILING	SQE1
156	TYPE 6	M3045-V	T94B02M	CEILING	SQE1
157	TYPE 6	M3045-V	T94B01P	CEILING	SQE1
158	TYPE 6	M3045-V	T94B01P	CEILING	SQE1
159	TYPE 12	P3707-PE	-	CEILING	SQE1
160	TYPE 13	M3057-PLVE	-	CEILING	SQE1
161	TYPE 13	M3057-PLVE	-	CEILING	SQE1
162	TYPE 13	M3057-PLVE	-	CEILING	SQE1
163	TYPE 13	M3057-PLVE	-	CEILING	SQE1
164	TYPE 6	M3045-V	T94B02M	CEILING	SQE1
165	TYPE 12	P3707-PE	-	CEILING	SQE1
166	TYPE 12	P3707-PE	-	CEILING	SQE1
167	TYPE 8	M3058-PLVE	-	CEILING	SQE1
168	TYPE 6	M3045-V	T94B02M	CEILING	SQE1
169	TYPE 6	M3045-V	T94B02M	CEILING	SQE1
170	TYPE 6	M3045-V	T94B02M	CEILING	SQE1
171	TYPE 6	M3045-V	T94B02M	CEILING	SQE1
172	TYPE 6	M3045-V	T94B02M	CEILING	SQE1
173	TYPE 6	M3045-V	T94B02M	CEILING	SQE1
174	TYPE 6	M3045-V	T94B02M	CEILING	SQE1
175	TYPE 12	P3707-PE	-	CEILING	SQE1
176	TYPE 6	M3045-V	T94B02M	CEILING	SQE1
177	TYPE 6	M3045-V	T94B02M	CEILING	SQE1
178	TYPE 6	M3045-V	T94B02M	CEILING	SQE1
179	TYPE 6	M3045-V	T94B02M	CEILING	SQE1
180	TYPE 6	M3045-V	T94B02M	CEILING	SQE1
181	TYPE 6	M3045-V	T94B02M	CEILING	SQE1
182	TYPE 6	M3045-V	T94B02M	CEILING	SQE1
183	TYPE 6	M3045-V	T94B01P	WALL	SQE15
184	TYPE 6	M3045-V	T94B01P	WALL	SQE15
185	TYPE 6	M3045-V	T94B01P	WALL	SQE15
186	TYPE 6	M3045-V	T94B01P	WALL	SQE15
187	TYPE 6	M3045-V	T94B01P	WALL	SQE15
188	TYPE 6	M3045-V	T94B01P	WALL	SQE15
189	TYPE 6	M3045-V	T94B01P	WALL	SQE14
190	TYPE 6	M3045-V	T94B01P	WALL	SQE14
191	TYPE 6	M3045-V	T94B01P	WALL	SQE14

192	TYPE 6	M3045-V	T94B01P	WALL	SQE14
193	TYPE 6	M3045-V	T94B01P	WALL	SQE14
194	TYPE 6	M3045-V	T94B01P	WALL	SQE14
195	TYPE 6	M3045-V	T94B01P	WALL	SQE14
196	TYPE 6	M3045-V	T94B02M	CEILING	SQE3
197	TYPE 6	M3045-V	T94B02M	CEILING	SQE3
198	TYPE 6	M3045-V	T94B02M	CEILING	SQE3
199	TYPE 6	M3045-V	T94B02M	CEILING	SQE3
200	TYPE 6	M3045-V	T94B02M	CEILING	SQE3
201	TYPE 13	M3057-PLVE	-	CEILING	SQE3
202	TYPE 6	M3045-V	T94B01P	WALL	SQE3
203	TYPE 6	M3045-V	T94B02M	CEILING	SQE3
204	TYPE 6	M3045-V	T94B02M	CEILING	SQE3
205	TYPE 6	M3045-V	T94B02M	CEILING	SQE3
206	TYPE 6	M3045-V	T94B02M	CEILING	SQE3
207	TYPE 6	M3045-V	T94B02M	CEILING	SQE3
208	TYPE 13	M3057-PLVE	-	CEILING	SQE3
209	TYPE 19	P3225-VE MKII	-	V. SALLYPORT BOLLARD	SQE5
210	TYPE 6	M3045-V	T94B02M	CEILING	SQE3
211	TYPE 21	QNV-7080R	SBP-122HM/SBP-300WM1	WALL	SQE3
212	TYPE 21	QNV-7080R	SBP-122HM/SBP-300WM1	WALL	SQE3
213	TYPE 6	M3045-V	T94B02M	CEILING	SQE3
214	TYPE 6	M3045-V	T94B02M	CEILING	SQE3
215	TYPE 6	M3045-V	T94B02M	CEILING	SQE3
216	TYPE 6	M3045-V	T94B02M	CEILING	SQE3
217	TYPE 6	M3045-V	T94B02M	CEILING	SQE3
218	TYPE 6	M3045-V	T94B02M	CEILING	SQE3
219	TYPE 3	P3807-PVE	-	WALL	SQE14
220	TYPE 21	QNV-7080R	SBD-120GP	CEILING	SQE14
221	TYPE 21	QNV-7080R	SBD-120GP	CEILING	SQE14
222	TYPE 21	QNV-7080R	SBD-120GP	CEILING	SQE14
223	TYPE 3	P3807-PVE	-	WALL	SQE14
224	TYPE 21	QNV-7080R	SBD-120GP	CEILING	SQE14
225	TYPE 21	QNV-7080R	SBD-120GP	CEILING	SQE14
226	TYPE 3	P3807-PVE	-	WALL	SQE14
227	TYPE 21	QNV-7080R	SBD-120GP	CEILING	SQE14
228	TYPE 21	QNV-7080R	SBD-120GP	CEILING	SQE14
229	TYPE 3	P3807-PVE	-	WALL	SQE14

230	TYPE 21	QNV-7080R	SBD-120GP	CEILING	SQE14
231	TYPE 21	QNV-7080R	SBD-120GP	CEILING	SQE14
232	TYPE 3	P3807-PVE	-	WALL	SQE14
233	TYPE 21	QNV-7080R	SBD-120GP	CEILING	SQE14
234	TYPE 21	QNV-7080R	SBD-120GP	CEILING	SQE14
235	TYPE 21	QNV-7080R	SBD-120GP	CEILING	SQE14
236	TYPE 3	P3807-PVE	-	WALL	SQE14
237	TYPE 3	P3807-PVE	-	WALL	SQE14
238	TYPE 21	QNV-7080R	SBD-120GP	CEILING	SQE14
239	TYPE 21	QNV-7080R	SBD-120GP	CEILING	SQE14
240	TYPE 21	QNV-7080R	SBD-120GP	CEILING	SQE3
241	TYPE 3	P3807-PVE	-	WALL	SQE3
242	TYPE 21	QNV-7080R	SBD-120GP	CEILING	SQE3
243	TYPE 21	QNV-7080R	SBD-120GP	CEILING	SQE3
244	TYPE 3	P3807-PVE	-	WALL	SQE3
245	TYPE 21	QNV-7080R	SBD-120GP	CEILING	SQE3
246	TYPE 3	P3807-PVE	-	WALL	SQE3
247	TYPE 21	QNV-7080R	SBD-120GP	CEILING	SQE3
248	TYPE 21	QNV-7080R	SBD-120GP	CEILING	SQE3
249	TYPE 6	M3045-V	T94B01P	WALL	SQE3
250	TYPE 4	P3717-PLE	T94N01D/T91D61/T91A64	CORNER	SQE3
251	TYPE 21	QNV-7080R	SBD-120GP	CEILING	SQE3
252	TYPE 3	P3807-PVE	-	WALL	SQE3
253	TYPE 21	QNV-7080R	SBD-120GP	CEILING	SQE3
254	TYPE 21	QNV-7080R	SBD-120GP	CEILING	SQE3
255	TYPE 3	P3807-PVE	-	WALL	SQE3
256	TYPE 21	QNV-7080R	SBD-120GP	CEILING	SQE3
257	TYPE 21	QNV-7080R	SBD-120GP	CEILING	SQE3
258	TYPE 3	P3807-PVE	-	WALL	SQE3
259	TYPE 21	QNV-7080R	SBD-120GP	CEILING	SQE3
260	TYPE 21	QNV-7080R	SBD-120GP	CEILING	SQE15
261	TYPE 3	P3807-PVE	-	WALL	SQE15
262	TYPE 21	QNV-7080R	SBD-120GP	CEILING	SQE15
263	TYPE 21	QNV-7080R	SBD-120GP	CEILING	SQE15
264	TYPE 3	P3807-PVE	-	WALL	SQE15
265	TYPE 21	QNV-7080R	SBD-120GP	CEILING	SQE15
266	TYPE 21	QNV-7080R	SBD-120GP	CEILING	SQE15
267	TYPE 3	P3807-PVE	-	WALL	SQE15
268	TYPE 21	QNV-7080R	SBD-120GP	CEILING	SQE15
269	TYPE 21	QNV-7080R	SBD-120GP	CEILING	SQE15
270	TYPE 3	P3807-PVE	-	WALL	SQE15
271	TYPE 21	QNV-7080R	SBD-120GP	CEILING	SQE15

272	TYPE 21	QNV-7080R	SBD-120GP	CEILING	SQE15
273	TYPE 3	P3807-PVE	-	WALL	SQE15
274	TYPE 21	QNV-7080R	SBD-120GP	CEILING	SQE15
275	TYPE 21	QNV-7080R	SBD-120GP	CEILING	SQE15
276	TYPE 3	P3807-PVE	-	WALL	SQE15
277	TYPE 21	QNV-7080R	SBD-120GP	CEILING	SQE15
278	TYPE 3	P3807-PVE	-	WALL	SQE15
279	TYPE 21	QNV-7080R	SBD-120GP	CEILING	SQE15
280	TYPE 21	QNV-7080R	SBD-120GP	CEILING	SQE15
281	TYPE 21	QNV-7080R	SBP-122HM/SBP-300WM1	WALL	SQE3
282	TYPE 21	QNV-7080R	SBP-122HM/SBP-300WM1	WALL	SQE3
283	TYPE 10	Q8414-LVS	-	CEILING/CORNER	SQE14
284	TYPE 10	Q8414-LVS	-	CEILING/CORNER	SQE14
285	TYPE 10	Q8414-LVS	-	CEILING/CORNER	SQE14
286	TYPE 10	Q8414-LVS	-	CEILING/CORNER	SQE14
287	TYPE 10	Q8414-LVS	-	CEILING/CORNER	SQE14
288	TYPE 10	Q8414-LVS	-	CEILING/CORNER	SQE14
289	TYPE 10	Q8414-LVS	-	CEILING/CORNER	SQE14
290	TYPE 10	Q8414-LVS	-	CEILING/CORNER	SQE14
291	TYPE 10	Q8414-LVS	-	CEILING/CORNER	SQE15
292	TYPE 10	Q8414-LVS	-	CEILING/CORNER	SQE15
293	TYPE 10	Q8414-LVS	-	CEILING/CORNER	SQE15
294	TYPE 10	Q8414-LVS	-	CEILING/CORNER	SQE15
295	TYPE 10	Q8414-LVS	-	CEILING/CORNER	SQE15
296	TYPE 10	Q8414-LVS	-	CEILING/CORNER	SQE15
297	TYPE 10	Q8414-LVS	-	CEILING/CORNER	SQE15
298	TYPE 10	Q8414-LVS	-	CEILING/CORNER	SQE15
299	TYPE 10	Q8414-LVS	-	CEILING/CORNER	SQE14
300	TYPE 10	Q8414-LVS	-	CEILING/CORNER	SQE14
301	TYPE 10	Q8414-LVS	-	CEILING/CORNER	SQE14
302	TYPE 10	Q8414-LVS	-	CEILING/CORNER	SQE14
303	TYPE 10	Q8414-LVS	-	CEILING/CORNER	SQE14
304	TYPE 10	Q8414-LVS	-	CEILING/CORNER	SQE14
305	TYPE 10	Q8414-LVS	-	CEILING/CORNER	SQE14
306	TYPE 10	Q8414-LVS	-	CEILING/CORNER	SQE14
307	TYPE 10	Q8414-LVS	-	CEILING/CORNER	SQE15
308	TYPE 10	Q8414-LVS	-	CEILING/CORNER	SQE15
309	TYPE 10	Q8414-LVS	-	CEILING/CORNER	SQE15
310	TYPE 10	Q8414-LVS	-	CEILING/CORNER	SQE15
311	TYPE 10	Q8414-LVS	-	CEILING/CORNER	SQE15
312	TYPE 10	Q8414-LVS	-	CEILING/CORNER	SQE15

313	TYPE 10	Q8414-LVS	-	CEILING/CORNER	SQE15
314	TYPE 10	Q8414-LVS	-	CEILING/CORNER	SQE15
315	TYPE 3	P3807-PVE	T94V01C/T91B67/T95A67/T98A18-VE/T8133	POLE	SQE1
316	TYPE 3	P3807-PVE	T8133	POLE	SQE1
317	TYPE 3	P3807-PVE	T94V01C/T91B67/T95A67/T98A18-VE/T8133	POLE	SQE1
318	TYPE 3	P3807-PVE	T8133	POLE	SQE1
319	TYPE 22	Q3709-PVE	T91L61/T95A67/T98A18-VE/T8133	POLE	SQE1
320	TYPE 22	Q3709-PVE	T91L61/T95A67/T98A18-VE/T8133	POLE	SQE1
321	TYPE 19	P3225-VE MKII	-	GATE BOLLARD	SQE1
322	TYPE 19	P3225-VE MKII	-	GATE BOLLARD	SQE1
323	TYPE 21	QNV-7080R	SBD-120GP	WALL	SQE14
324	TYPE 21	QNV-7080R	SBD-120GP	WALL	SQE14
325	TYPE 6	M3045-V	T94B02M	CEILING	SQE14
326	TYPE 6	M3045-V	T94B02M	CEILING	SQE15
327	TYPE 21	QNV-7080R	SBD-120GP	WALL	SQE15
328	TYPE 21	QNV-7080R	SBD-120GP	WALL	SQE15
329	TYPE 13	M3057-PLVE	-	WALL	SQE3
330	TYPE 13	M3057-PLVE	-	WALL	SQE3
331	TYPE 8	M3058-PLVE	-	CEILING	SQE1
332	TYPE 9	P3375-V	-	CEILING	SQE1
333	TYPE 9	P3375-V	-	CEILING	SQE1
334	TYPE 3	P3807-PVE	-	WALL	SQE1
335	TYPE 6	M3045-V	T94B01P	CEILING	SQE1
336	TYPE 6	M3045-V	T94B02M	CEILING	SQE1
337	TYPE 6	M3045-V	T94B02M	CEILING	SQE1
338	TYPE 6	M3045-V	T94B02M	CEILING	SQE1
339	TYPE 6	M3045-V	T94B02M	CEILING	SQE1
340	TYPE 6	M3045-V	T94B02M	CEILING	SQE1
341	TYPE 6	M3045-V	T94B02M	CEILING	SQE1
342	TYPE 6	M3045-V	T94B01P	WALL	SQE5
343	TYPE 6	M3045-V	T94B01P	WALL	SQE5
344	TYPE 6	M3045-V	T94B02M	CEILING	SQE1
345	TYPE 6	M3045-V	T94B02M	CEILING	SQE1
346	TYPE 6	M3045-V	T94B02M	CEILING	SQE4
347	TYPE 12	P3707-PE	-	CEILING	SQE4

348	TYPE 6	M3045-V	T94B02M	CEILING	SQE1
349	TYPE 6	M3045-V	T94B02M	CEILING	SQE1
350	TYPE 6	M3045-V	T94B02M	CEILING	SQE1
351	TYPE 6	M3045-V	T94B02M	CEILING	SQE1
352	TYPE 6	M3045-V	T94B02M	CEILING	SQE1
353	TYPE 14	P9106	-	CEILING/CORNER	SQE1
354	TYPE 6	M3045-V	T94B01P	CEILING	SQE1
355	TYPE 6	M3045-V	T94B01P	CEILING	SQE1
356	TYPE 8	M3058-PLVE	-	CEILING	SQE1
357	TYPE 6	M3045-V	T94B02M	CEILING	SQE4
358	TYPE 15	M3044-V	T94B02M	CEILING	SQE3
359	TYPE 15	M3044-V	T94B02M	CEILING	SQE3
360	TYPE 15	M3044-V	T94B02M	CEILING	SQE3
361	TYPE 15	M3044-V	T94B02M	CEILING	SQE3
362	TYPE 2	M2025-LE	-	WALL	SQE4

2.2 VIDEO MANAGEMENT SYSTEM

A. Video Management System Software Manufacturer:

1. exacq Technologies (Enterprise-series)

B. IP Camera Server System Manufacturers:

1. BCDVideo
2. Exacq Technologies

C. Description: SSI shall provide the required quantity of IP camera servers and storage to support all cameras as shown on the plans and specifications.

D. IP Camera Servers:
1. Processor: Intel® Xeon® scalable processor product family
2. Processor Passmark: Intel® Xeon® Silver 4116: 15,320
3. Server Operating System: Windows Server 2016
4. Memory: Up to 192GB RAM, configured for 32GB
5. Video Outputs: (1) VGA
6. NIC: 4 x 1 Gbe
7. USB(s): Rear (2) USB 3.0, Front (2) USB 2.0, Internal (1) USB 3.0
8. RAID: OS RAID Configured RAID 1; Data Configured RAID 6
9. RAID Controller: PERC H740P/8G
10. Expansion Slots: Up to (2) PCIe slots (in default configuration)
11. Remote Management: iDRAC Express
12. Hard Drive Bays: (18) 3.5” Bays – LFF Hot Plug; (2) M.2 SSD Slots, Configured RAID1

13. Configured Storage: 204TB, RAID6
14. Input Voltage: 120/240 VAC auto-sensing
15. Power Supplies: (2) 1100W, 100-240VAC
16. Operating Temperature: (Min) 50°F – (Max) 95°F [(Min) 10°C – (Max) 35°C]
17. Operating Humidity: 5-90% (non-condensing)
18. Dimensions (HxWxD): 3.4” x 19” x 29.7”
19. Weight (max): 73 lbs.
20. Approved Manufacturers: BCDVideo Enterprise Series model BCD218-EVS 2U 18-Bay Server, Exacq Technologies 4U “Z-Series” with optional P/Ns 5000-40383, 5000-40141, 5000-40221, 5000-20070, EX-4 (Year 4 warranty for Z-series hardware) and EX-5 (Year 5 warranty for Z-series hardware).
21. SSIs providing Exacq Technologies 4U Z-Series recorders shall provide P/N EVESM (Enterprise System Manager Server) loaded on separate server. Server shall meet the current performance requirements of the EVESM software.
22. Provide Raritan model RKP117 (or approved equal) 1U 17" LCD Keyboard Drawer w/touchpad, 18.12" deep.
23. Provide Tripp-Lite model B042-016 16-Port KVM USB VGA Switch with required quantity of USB/PS2 Combo Cable Kits, 10', model P780-010 to administer the system.

2.3 ENCODERS

A. Manufacturer:

1. Axis

B. Description: SSI shall provide the required number of encoders to support all microphones to be incorporated into the overall video surveillance system. The basis for the specification is Axis.

C. Encoder:

1. The encoder shall include the following features:

a. Video Compression: H.264, Motion JPEG
b. Resolutions: 176x120 to 720x576
c. Frame rate H.264: Up to 30/25 (NTSC/PAL) per channel in all resolutions
d. Video streaming: Multiple streams if identical or limited in frame rate/resolution. Controllable frame rate and bandwidth, VBR/CBR H.264
e. Image settings: Compression, color, brightness. Rotation; 90°, 180°, 270°. Aspect ratio correction, mirroring of images, text and image overlay, privacy mask, enhanced de-interlace filter, video termination, anti-aliasing, temporal noise filtering
f. IP address: Four IP addresses, one per four channels
g. Security: Password protection, IP address filtering, HTTPS encryption, IEEE 802.1X network access control, Digest authentication, User access log
h. Analytics: Video motion detection, Active tampering alarm, audio detection
i. Event triggers: Analytics, External Input, Edge Storage Events, Video loss

j. Casing: Metal casing, stand-alone, rackmount or wall mount
k. Memory: 4x 512 MB RAM, 4x 128MB Flash
l. Power: Axis PS-P power supply
m. Connectors: 16 x Analog composite video BNC inputs, NTSC/PAL auto-sensing, 8 x 3.5mm audio input sockets, 4 x 3.5mm audio output sockets, 1 x 1000 Base TX Ethernet (RJ45), 1 x Auxiliary Ethernet (RJ45), 1 x Gbps SFP slot, 4 x Terminal block for up to 4 configurable external inputs/outputs, 4 x Terminal block for RS485/RS422 serial communication (full duplex), 1 x DC input terminal block
n. Storage: Four microSD/microSDHC/microSDXC slots
o. Operating conditions: 0°C to 50°C (32°F to 122°F), Humidity 20-80% non-condensing)
p. Approved manufacturer: Axis model P7216.

2.4 MULTI-VIEW SURVEILLANCE APPLIANCE

A. Manufacturer:

1. Axis

B. Description: SSI shall provide multi-view surveillance appliances to support the quantity of cameras, microphones, activation switches, indicator lights and other equipment in the interview rooms. The basis for the specification is Axis.

C. Multi-View Surveillance Appliance:

1. The multi-view surveillance appliance shall include the following features:

a. Video Compression: H.264, Motion JPEG
b. Resolution: 1920x1080 to 480x270, 1280x720 to 480x270
c. Wide Dynamic Range: Forensic WDR
d. Frame rate: In 1080p with no WDR: 12.5/15 fps (50/60 Hz), In 720p with no WDR: 25/30fps (50/60 Hz), In 720p with WDR: 12.5/15 fps (50/60 Hz)
e. Video streaming: Multiple, individually configurable streams in H.264 and Motion JPEG, Axis Zipstream technology in H.264, Controllable frame rate and bandwidth, VBR/MBR H.264, Quad View, max 1080p resolution, 25/30 fps (50/60 Hz) with 720p capture mode, 12.5/15 fps (50/60 Hz) with 1080p capture mode
f. Image settings: Compression, color, brightness, sharpness, contrast, white balance, exposure value, exposure control, exposure zones, local contrast, rotation, Corridor Format, text and image overlay, privacy mask, mirroring of images
g. Audio Streaming: Two-way, full duplex and half duplex
h. Audio input/output: External microphone or line input (2 microphone or line inputs with included Axis Stereo-to-mono Adapter), Line Output
i. Security: Password protection, IP address filtering, HTTPS encryption, IEEE 802.1X network access control, Digest authentication, User access log, Centralized Certificate Management

j. Analytics: Video motion detection, Active tampering alarm, audio detection, Cross Line Detection
k. Event triggers: Analytics, External Input, Edge Storage Events
l. Casing: Aluminum
m. Memory: 1024 MB RAM, 256 MB Flash
n. Power: Power over Ethernet (PoE) IEEE 802.3af/802.3at Type 1 Class 3 max 12.95W, 8-28VDC, max 13.33W
o. Connectors: RJ45 for 10BASE-T/100BASE-TX PoE, RJ12 for sensor units, 6-pin terminal block for four configurable inputs/outputs (12VDC output), max load 50mA, 3.5mm mic/line in, 3.5mm line out, 5-pin terminal block RS232, 2-pin terminal block for 8-28VDC input
p. Storage: Two SD/SDHC/SDXC slots, support for recording to network-attached storage (NAS)
q. Operating conditions: -30°C to 60°C (-22°F to 140°F), Humidity 10-85% RH (non-condensing)
r. Dimensions: 51 mm x 121 mm x 121 mm
s. Weight: 542 g (1.19 lb)
t. Approved manufacturer: Axis model F44 Dual Audio Input Main Unit.

2.5 MICROPHONES

A. Manufacturer:

1. Louroe

B. Description: SSI shall provide microphones as shown on the plans. The microphones shall be omni-directional, low impedance, electret condenser microphones with built-in preamps for producing line level audio. The basis for the specification is Louroe.

C. Microphones:

1. The microphones shall include the following features:

a. Sensitivity: -45 dBV/Pa
b. Frequency response: 50 Hz to 15 kHz
c. Output: Line Level (0 dBV, 600Ω @1kHz)
d. Current drain: 10 mA
e. Supply Voltage: 12 VDC
f. Microphone housing: High-impact anti-static ABS (VERIFACT-A), Stainless faceplate (VERIFACT-D)
g. Dimensions: 4” dia x 1 ½”H (VERIFACT-A), 2 ¾” W x 4 ½” H (VERIFACT-D)
h. Approved manufacturer: Louroe model VERIFACT-A for ceiling applications and model VERIFACT-D for wall-mount applications

2.6 MEDIA CONVERTER CABINET

A. Manufacturer:

1. Axis

B. Description: SSI shall provide media converter cabinets to support cameras covering parking lot areas and located on camera poles. The basis for the specification is Axis.

C. Media Converter Cabinet:

1. The media converter cabinet shall include the following features:

a. Casing: Polycarbonate cabinet and stainless-steel mounting plate
b. Environment: Indoor/Outdoor
c. Power: Input (120VAC), 90-175 VAC, Max. 4A; Input (230VAC): 90-264 VAC, Max. 4A
d. Connectors: 2 x RJ45 connectors (10/100 Mbps), 2 x SFP connectors (100/1000Mbps) for SFP fiber optic modules or SFP to copper modules
e. Operating Conditions: -40°C to 65°C (-40°F to 149°F), humidity 10-100% RH (condensing)
f. Weight: 4.4kg (9.7 lb)
g. Included accessories: Unit shall include power supply, electrical safety kit, media converter, DIN Clip for midspan.
h. Approved manufacturer: Axis model T98A18-VE Media Converter Cabinet A
i. Provide Axis pole-mount adapter model T95A67 and Axis 30W midspan model T8133 per cabinet location. Provide SFP module compatible with media converter and installed fiber optic cable.

2.7 CAT6 PATCH PANELS

A. Manufacturers:

1. Leviton
2. ICC
3. Commscope

B. Description: SSI shall provide 24-port and 48-port CAT6 patch panels to support all network field cabling terminations at rack-mount security equipment enclosure locations. Cabling for cameras, PCs, and other network devices shall terminate to these CAT6 patch panels. The SSI shall provide CAT6 patch cables between patch panels and network switch equipment. The basis for the specification is ICC.

C. CAT6 Patch Panels:

1. The CAT6 patch panels shall include the following features:

a. 24-port and 48-port Patch Panel: 16GA CRS
b. Jack Housing: High-impact, Flame Retardant Plastic, UL 94V-0
c. Spring Wire: Phosphor Bronze
d. 110 Connector: Phosphor Bronze Alloy with 100 micro-inch Alloy
e. Gold Rating: 50 Micro-inches of Gold over 100 micro inches of Nickel
f. Surface Finish: Black Powder Coat
g. Mating Force: 100 Grams MIN/Contact
h. Temperature Range: -40°C to 70°C
i. Plug Retention in Jack: 50N (11 LBS SQ)
j. IDC Wire Gauge: 22-24 AWG
k. Current Rating: 1.5A DC
l. Contact Resistance: 2.5 MILOHMS MAX

2.8 NETWORK SWITCHES

A. Manufacturers:

1. Dell
2. HP
3. BCDVideo
4. Comnet

B. Description: The SSI shall provide the quantity of 24-port to 48-port Layer 2/3, Layer 3 and Layer 3 Core Network and PoE switches to support all network devices on the security network. Stacking cables shall be installed to connect similar switches at the same location(s). SSI shall provide and install the required quantity of 1GbE and 10GbE SFP optical transceivers at switch locations as required. The SSI shall provide self-managed switches for site-located gate control equipment.

C. 24 to 48-port Layer 2/3 PoE Switches:

1. The Layer 2/3 PoE switches shall include the following features:

a. Maximum Number of Ports: (48) PoE Ports, up to (4) 2.5GbE Multi-gigabit ports, up to (4) 1G/10G SFP+ ports
b. PoE per Port: 30W on PoE+ ports, up to 60W on multi-gigabit PoE ports
c. Static Routes: 256 (IPV4), 128 (IPV6)
d. Dynamic Routes: 256 (IPV4)
e. Switch Fabric Capacity: Up to 220Gbps
f. Forwarding Rate: Up to 256Mpps
g. Flash Memory: Up to 512MB
h. CPU Memory: Up to 2GB
i. Total MAC Addresses: 32K
j. Form Factor: 1U Rackmount
k. Maximum Power Consumption: 1,738W
l. Power Supply(s): (1) Internal 1000W | 100-240VAC, External 1000W | 100-240VAC supported
m. Max. Heat Dissipation: 6,069.8 BTU/h

n. Operating Temperature: (Min) 32°F – (Max) 113°F [(Min) 0°C – (Max) 45°C]
o. Operating Humidity: 5 – 95% Non-condensing
p. Dimensions (WxDxH): 17.33” x 13.78” x 1.73” (440mm x 350mm x 44mm)
q. Max. Weight: 15.05 lbs (6.8 kg)

D. 24 to 48-port Layer 3 PoE Switches:

1. The Layer 3 PoE switches shall include the following features:

a. Maximum Number of Ports: (48) PoE Ports, up to (8) 2.5/5GbE Multi-gigabit ports, up to (4) 1G/10G SFP+ ports
b. PoE per Port: 30W on PoE+ ports, up to 60W on multi-gigabit PoE ports
c. Static Routes: 1,024 (IPV4), 1,024 (IPV6)
d. Dynamic Routes: 8,160 (IPV4), 4.096 (IPV6)
e. Switch Fabric Capacity: Up to 328Gbps
f. Forwarding Rate: Up to 428Mpps
g. Flash Memory: Up to 512MB
h. CPU Memory: Up to 2GB
i. Total MAC Addresses: 32K
j. Form Factor: 1U Rackmount
k. Maximum Power Consumption: 2,145W
l. Power Supply(s): (1) Internal 1100W | 100-240VAC, External 1000W | 100-240VAC supported
m. Max. Heat Dissipation: 7,216.68 BTU/h
n. Operating Temperature: (Min) 32°F – (Max) 113°F [(Min) 0°C – (Max) 45°C]
o. Operating Humidity: 5 – 95% Non-condensing
p. Dimensions (WxDxH): 17.08” x 16.02” x 1.71” (440mm x 350mm x 44mm)
q. Max. Weight: 15.7 lbs (7.12 kg)

E. 24 to 48-port Layer 3 Core Network Switches:

1. The Layer 3 Core Network Switches shall include the following features:

a. Maximum Number of Ports: Up to (48) 10GbE SFP+ Ports, (4) 40GbE QSFP+ Ports
b. Static Routes: 1,024 (IPV4), 1,024 (IPV6)
c. Dynamic Routes: 8,160 (IPV4), 4.096 (IPV6)
d. Switch Fabric Capacity: Up to 1.2Tbps
e. Forwarding Rate: Up to 952Mpps
f. Flash Memory: Up to 256MB
g. CPU Memory: Up to 2GB
h. Total MAC Addresses: 131,072
i. Form Factor: 1U Rackmount
j. Maximum Power Consumption: 220W
k. Power Supply(s): (2) Internal 460W | 100-240VAC
l. Max. Heat Dissipation: 754.82 BTU/h
m. Operating Temperature: (Min) 32°F – (Max) 113°F [(Min) 0°C – (Max) 45°C]

n. Operating Humidity: 5 – 95% Non-condensing
o. Dimensions (WxDxH): 17.08” x 18.11” x 1.71” (440mm x 350mm x 44mm)
p. Max. Weight: 23.28 lbs (10.56 kg)

F. Self-Managed Switch:

1. SSI shall provide 6-port switches to support site-located PoE equipment at gate control locations. The switches shall include the following features:

a. Data Rate: 10/100/1000 Mbps IEEE 802.3 Compliant, Full Duplex or Half Duplex Electrical Ports/Full Duplex Optical Port
b. Electrical: Ports 1 - 4: 30W Max
c. Optical Connectors: Requires SFP-SX modules
d. Physical characteristics (cm): 15.5 x 13.5 x 2.8
e. Weight:0.9 kg
f. Operating Voltage: 48 to 57 VDC PoE, 12 to 24 VDC non-PoE
g. Current Draw: 5A max, with PoE, 1A w/o PoE
h. Operating temperature: -40°C to 75°C
i. Operating relative humidity: 0% to 95%, noncondensing
j. Mounting: Wall or Flat Surface Screw Attachment
k. Approved manufacturer: Comnet CNGE2FE4SMSPoE
l. Provide Comnet Power Supply model PS48VDC-5ADIN, or approved equal

2.9 VIDEO CLIENT WORKSTATIONS

A. Manufacturers:

1. Dell
2. HP

B. Description: Video client workstations and monitors shall be provided at GUI control station locations to allow the operator(s) to view cameras around the facility. Reference Section 1.2, D for workstation and monitor quantities, locations and sizes. SSI shall coordinate the exact location of the workstations and monitors with the Architect, Owner and other trades as necessary. Each workstation shall be loaded with the exacqVision Enterprise VMS software. The basis for the specification is Dell.

C. Video Client Workstations:

1. The Video Client Workstations shall include the following (minimum) features:

a. Processor: Intel® Core™ i7-9700, 8 Core, 12MB Cache, 3.0GHz
b. Operating System: Windows 10 Professional, 64-bit
c. Memory: 8GB 1x8GB DDR4 2666MHz UDIMM Non-ECC
d. Hard Drive: 2.5” 256GB SATA Class 20 Solid State Drive
e. Video Card (4K): NVIDIA Quadro P400 2GB, 3 MDP to DP Adapter
f. Keyboard: Dell USB Keyboard, English, Black

g. Mouse: Dell USB Optical Mouse with Scroll, Black
h. 24” Monitor (4K); Dell model P2415Q
i. 55” Monitor (4K); Samsung model QN55Q60RAFXZA

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify the accuracy of all dimensions, allowances, and clearances on site prior to commencing with any work that may be affected by those dimensions, allowances, and clearances. SSI shall confirm that no obstructions exist that would obstruct camera views.

B. Comply with manufacturer’s installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in the Contract Documents.

C. Precautions shall be taken to guard against electrostatic and electromagnetic susceptibility and interference.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Provide complete IP video communication system as specified herein.

B. All material furnished shall be new and conform to the applicable requirements of the Underwriters Laboratories and the National Standards Institute.

C. All VMS head-end equipment to be contained within equipment racks.

D. Provide adequate ventilation for all heat radiating equipment. SSI shall provide fan kits as required to maintain rated operating temperature of installed equipment.

E. All system equipment and field devices to be held securely in place. Fastenings and supports shall be selected to provide a safety factor of three.

F. All system equipment equipped with plug in power connectors to be connected to a dedicated receptacle. Do not use tap connectors for plugging in multiple plugs into a single receptacle.

G. All cable within equipment racks, and cabinets, or on backboards, to be neatly bundled and secured.

H. Wires shall not be nicked, have strands removed, or have frayed strands when removing insulation or terminating.

I. Cameras located in rooms with small footprints (sally ports, holding rooms, etc.) shall be ceiling-mounted and shall be near vertical walls to maximize the field of view.

J. Seal-tite flexible conduits, NEMA-rated weatherproof junction boxes connectors shall be utilized for exterior camera locations.

3.3 CONNECTIONS

A. All IP video communication system equipment connections shall be completed per manufacturer’s recommendations and per SSI shop drawings.

B. Ground equipment according to manufacturer’s recommendations.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust IP video communication system components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare pass/fail reports:

1. Video image inspection: SSI shall perform a visual inspection of each video image to ensure that each camera is properly focused, aimed, and properly configured for its location.
2. Video client PCs shall be initially configured for camera views applicable to their areas, coordinated with the Owner, and tested for proper operation.

C. Remove and replace malfunctioning units and retest as specified above.

3.5 ADJUSTING

A. All cameras shall be adjusted for optimum performance.

B. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to four visits to Project for this purpose.

3.6 DEMONSTRATION

A. Provide qualified personnel to train Owner's maintenance personnel to adjust, operate, and maintain the IP video communication system. Refer to Division 01 Section "Demonstration and Training."

B. Training shall be video recorded.

END OF SECTION 282320

SECTION 284621.11 - ADDRESSABLE FIRE-ALARM SYSTEMS

PART 1 - GENERAL

1.1 OVERVIEW

A. The fire alarm system is an addressable system. The VESDA system is extremely sensitive smoke detection system intended for use in locations as indicated on Electrical Construction Sheets. The VESDA system indicated has been selected for use in the inmate occupied pod cells and dayrooms; benefits of VESDA detection, in lieu of photoelectric smoke detectors, at these locations include:

a. Very early smoke detection of inmate normally occupied areas.

b. It minimizes disruptions to these large inmate housing areas for ongoing maintenance/testing/servicing and for code required periodic testing and certification of detectors using a code required smoke test.

1) The VESDA system allows for smoke tests to be performed remote from the VESDA smoke heads located in these inmate-occupied pod cells and dayrooms. This reduces logistical, security, and coordination efforts otherwise required by the Owner to facilitate a service technician with periodic testing and certification in the pods.
2) These pods, which house large numbers of inmates, cannot be easily shifted to other building spaces during smoke tests. Smoke testing in these spaces could be expected to extend over a 2 to 3-day period; further exasperating the planning and logistical efforts required by the Owner to facilitate smoke testing directly at smoke heads.

c. The VESDA smoke heads are a passive device and are less susceptible to costly vandalism within inmate occupied pod cells and dayrooms. In comparison, use of photoelectric smoke detectors in these areas requires a vandal-guard and more susceptibility to costly vandalism.

1.2 SUBSTITUTE REQUESTS

A. A substitute request, where approved by the Owner, Engineer, and AHJ, could be considered for use of VESDA detection in areas other than as indicated on Electrical Construction Sheets (i.e. - in lieu of the photoelectric smoke or heat detectors). Locations that may be considered may include:

1. Non-normally occupied inmate cells such as in Booking and Medical; i.e. where potential for vandalism would be more-costly to maintain the fire alarm detection system.
2. Areas where a higher smoke hazard could exist (i.e. Laundry) and very early detection would better-protect life, limb, or property.

B. Under no circumstance, during the bidding period, will a substitute request be initiated, considered, evaluated, or approved during the bid period. It would be the Contractor's responsibility to present and coordinate all necessary modifications and engineering efforts for such a substitute request.

1.3 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.4 SUMMARY

A. Section Includes:

1. Fire-alarm control unit.
2. Pre-action system.
3. Manual fire-alarm boxes.
4. System smoke detectors.
5. System Heat detectors.
6. Notification appliances.
7. Firefighters' smoke-control system.
8. Interactive Firefighter's Display.
9. Graphic annunciator workstation.
10. System printer.
11. Non-powered graphic annunciator panel.
12. Addressable interface device.
13. Network communications.
14. Remote fire alarm annunciators.
15. Remote status and alarm indicators
16. Addressable interface device.
17. Digital Telco Alarm Communicator Transmitter.
18. Digital Cellular Radio Alarm Communicator Transmitter.
19. Device guards.
20. Fire Alarm Cabling
21. VESDA Air-sampling smoke detectors.

B. Related Requirements:

1. Section 017823 "Operation and Maintenance Data."

2. Section 230993.11 "Sequence of Operations for HVAC DDC" for Firefighters' Smoke Control System and sequence of operation.

3. Section 260548.16 "Seismic Controls for Electrical Systems."

1.5 DEFINITIONS

A. EMT: Electrical Metallic Tubing.

B. BMS: Building Management System.

C. FACP: Fire Alarm Control Panel.

D. HLI: High Level Interface.

E. LED: Light Emitting Diode.

F. LCD: Liquid Crystal Display.

G. NAC: Notification Appliance Circuit.

H. NICET: National Institute for Certification in Engineering Technologies.

I. PC: Personal computer.

J. VESDA: Very Early Smoke-Detection Apparatus.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product, including furnished options and accessories.

1. Include construction details, material descriptions, dimensions, profiles, and finishes.
2. Include rated capacities, operating characteristics, and electrical characteristics.

B. Shop Drawings: For fire-alarm system.

1. Comply with recommendations and requirements in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
2. Include plans, elevations, sections, details, and attachments to other work.
3. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and locations. Indicate conductor sizes, indicate termination locations and requirements, and distinguish between factory and field wiring.
4. Include network diagrams, field wiring diagrams, and detailed equipment wiring and termination diagrams.
5. Detail assembly and support requirements.
6. Include voltage drop calculations for notification-appliance circuits.
7. Include battery-size calculations.
8. Include input/output matrix.
9. Include statement from manufacturer that all equipment and components have been tested as a system and meet all requirements in this Specification and in NFPA 72.
10. Include performance parameters and installation details for each detector.

11. Verify that each duct detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
12. Provide program report showing that air-sampling detector pipe layout balances pneumatically within the airflow range of the air-sampling detector.
13. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale; coordinate location of duct smoke detectors and access to them.

    a. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators.
    b. Show field wiring and equipment required for HVAC unit shutdown on alarm and override by Firefighters' Smoke Control Station.
    c. Locate detectors according to manufacturer's written recommendations.
    d. Show air-sampling detector pipe routing.

C. General Submittal Requirements:

1. Submittals shall be approved by Authorities Having Jurisdiction prior to submitting them to Engineer.
2. Shop Drawings shall be prepared by persons with the following qualifications:

    a. Trained and certified by manufacturer in fire-alarm system design.
    b. NICET-certified, fire-alarm technician; Level IV minimum.
    c. Licensed or certified by Authorities Having Jurisdiction.

D. Delegated-Design Submittal: For notification appliances and smoke and heat detectors, in addition to submittals listed above, indicate compliance with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Drawings showing the location of each notification appliance and smoke and heat detector, ratings of each, and installation details as needed to comply with listing conditions of the device.
2. Design Calculations: Calculate requirements for selecting the spacing and sensitivity of detection, complying with NFPA 72. Calculate spacing and intensities for strobe signals and sound-pressure levels for audible appliances.
3. Indicate audible appliances required to produce square wave signal per NFPA 72.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Seismic Qualification Data: Certificates, for fire-alarm control unit, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Field quality-control reports.

1.8 Sample Warranty: For special warranty.

1.9 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following and deliver copies to Authorities Having Jurisdiction:

a. Comply with the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
b. Provide "Fire Alarm and Emergency Communications System Record of Completion Documents" according to the "Completion Documents" Article in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
c. Complete wiring diagrams showing connections between all devices and equipment. Each conductor shall be numbered at every junction point with indication of origination and termination points.
d. Riser diagram.
e. Device addresses.
f. Air-sampling system sample port locations and modeling program report showing layout meets performance criteria.
g. Record copy of site-specific software.
h. Provide "Inspection and Testing Form" according to the "Inspection, Testing and Maintenance" chapter in NFPA 72, and include the following:

1) Equipment tested.
2) Frequency of testing of installed components.
3) Frequency of inspection of installed components.
4) Requirements and recommendations related to results of maintenance.
5) Manufacturer's user training manuals.

i. Manufacturer's required maintenance related to system warranty requirements.
j. Abbreviated operating instructions for mounting at fire-alarm control unit and each annunciator unit.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On magnetic media or compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

1.10 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps for Remote Indicating Lamp Units: Quantity equal to 10 percent of amount installed, but no fewer than one unit.
2. Lamps for Strobe Units: Quantity equal to 10 percent of amount installed, but no fewer than one unit.
3. Smoke Detectors, Fire Detectors: Quantity equal to 10 percent of amount of each type installed, but no fewer than one unit of each type.
4. Detector Bases: Quantity equal to two percent of amount of each type installed, but no fewer than one unit of each type.
5. Keys and Tools: One extra set for access to locked or tamper-proofed components.
6. Audible and Visual Notification Appliances: One of each type installed.
7. Fuses: Two of each type installed in the system. Provide in a box or cabinet with compartments marked with fuse types and sizes.
8. Filters for VESDA Air-Sampling Detectors: Quantity equal to two percent of amount of each type installed, but no fewer than one unit of each type.
9. VESDA Air-Sampling Fan: Quantity equal to one (1) for every five (5) VESDA detectors, but no fewer than one (1) unit of each type.

1.11 QUALITY ASSURANCE

A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.

B. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level III technician.

C. NFPA Certification: Obtain certification according to NFPA 72 by an NRTL (nationally recognized testing laboratory).

1.12 PROJECT CONDITIONS

A. Perform a full test of the existing system prior to starting work. Document any equipment or components not functioning as designed.

B. Use of Devices during Construction: Protect devices during construction unless devices are placed in service to protect the facility during construction.

1.13 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace fire-alarm system equipment and components that fail in materials or workmanship within specified warranty period.

1. Warranty Extent: All equipment and components not covered in the Maintenance Service Agreement.
2. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Source Limitations for Fire-Alarm System and Components: Components shall be compatible with, and operate as an extension of, the same system. Provide system manufacturer's certification that all components provided have been tested as, and will operate as, a system.

B. Non-coded, UL-certified addressable system, with multiplexed signal transmission and horn/strobe evacuation.

C. Automatic sensitivity control of certain smoke detectors.

D. All components provided shall be listed for use with the selected system.

E. 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.

2.2 SYSTEMS OPERATIONAL DESCRIPTION

A. Fire-alarm signal initiation shall be by one or more of the following devices and systems:

1. Manual stations.
2. Heat detectors.
3. Smoke detectors.
4. Duct smoke detectors.
5. Air-sampling smoke-detection system (VESDA).
6. Automatic sprinkler system water flow.
7. Pre-action system.
8. Fire-extinguishing system operation.
9. ANSUL
10. VESDA Air-Sampling Detectors

B. Fire-alarm signal shall initiate the following actions:

1. Continuously operate alarm notification appliances.
2. Identify alarm and specific initiating device at fire-alarm control unit, connected network control panels, off-premises network control panels, and remote annunciators.
3. Transmit an alarm signal to the remote alarm receiving station.
4. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
5. Activate smoke-control system (smoke management) at Firefighters' Smoke Control Station.
6. Close smoke dampers in air ducts of designated air-conditioning duct systems.
7. Activate pre-action system.
8. Activate emergency shutoffs for gas and fuel supplies.
9. Record events in the system memory.
10. Record events by the system printer.
11. Indicate device in alarm on the graphic annunciator.

C. Supervisory signal initiation shall be by one or more of the following devices and actions:

1. Valve supervisory switch.
2. High- or low-air-pressure switch of a pre-action sprinkler system.
3. Alert and Action signals of air-sampling detector system.
4. Independent fire-detection and -suppression systems.
5. User disabling of zones or individual devices.
6. Loss of communication with any panel on the network.

D. System trouble signal initiation shall be by one or more of the following devices and actions:

1. Open circuits, shorts, and grounds in designated circuits.
2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
3. Loss of communication with any addressable sensor, input module, relay, control module, remote annunciator, printer interface, or Ethernet module.
4. Loss of primary power at fire-alarm control unit.
5. Ground or a single break in internal circuits of fire-alarm control unit.
6. Abnormal ac voltage at fire-alarm control unit.
7. Break in standby battery circuitry.
8. Failure of battery charging.
9. Abnormal position of any switch at fire-alarm control unit or annunciator.

E. System Supervisory Signal Actions:

1. Initiate notification appliances.
2. Identify specific device initiating the event at fire-alarm control unit, connected network control panels, and remote annunciators.
3. Record the event on system printer.
4. After a time delay of 200 seconds, transmit a trouble or supervisory signal to the remote alarm receiving station.
5. Transmit system status to building management system.
6. Display system status on graphic annunciator.

2.3 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Fire-alarm control unit and raceways shall withstand the effects of earthquake motions determined according to the minimum requirements in ASCE 7-10 Chapter 13.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Seismic Requirements for Nonstructural Components:

a. Site Class: D.
b. Building Risk Category: III.
c. Seismic Design Category: C.
d. Component Importance Factor: 1.5.
e. Amplification Factors and Component Response Modification Factors: As required in ASCE 7-10 Table 13.6-1 (Mechanical and Electrical) for components and raceways and supports.

2.4 MANUFACTURERS (FIRE ALARM CONTROL UNITS, DEVICES, AND APPURTENANCES)

A. Manufacturer (Basis-of-Design): Owner has pre-approved the following manufacturer's system as the Basis-of-Design:

1. Gamewell, Security and Fire; a division of Honeywell.

2. This Owner pre-approved manufacturer shall be bid separately as an Alternate; refer to front end specifications for Alternate numbering and description.

a. Pricing for this manufacturer's system shall be listed separately in the Contractor's bid tab.

1) Bid tab shall break out pricing for this manufacturer's system separate from manufacturers; systems listed below.
2) Pricing for this manufacturer's system, shall be reviewed by the Owner and Engineer to determine if this Alternate is accepted in lieu of manufacturers' systems listed below which are submitted for approval as a performance equal and which are submitted for approval for pricing.

B. Manufacturers (Equals): Subject to compliance with requirements, products by one of the following manufacturers may be considered as an equal to the Basis-of-Design manufacturer listed above:

1. Edwards; UTC Climate, Controls & Security; a division of United Technologies Corporation.
2. Siemens Industry, Inc.; Fire Safety Division.

3. Either of these manufacturers' systems, if elected by Contractor for consideration for approval by Owner and Engineer, shall be 1) A performance equal to the Basis-of-Design manufacturer's system listed above and 2) Pricing shall be broken out separately by Contractor in the Bid Tab; separate from pricing for the Basis-of-Design manufacturer's system listed above.

C. Manufacturer shall have a minimum of three (3) independent factory authorized and trained service dealers/technicians, available within a fifty (50) mile radius of the installation, for ongoing and price competitive servicing of the installed system. Submit a listing of all qualified independent dealers/technicians within this radius capable of supporting the installed system.

2.5 FIRE-ALARM CONTROL UNIT (MAIN FIRE ALARM CONTROL PANEL FACP-1)

A. General Requirements for Fire-Alarm Control Unit:

1. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864.

a. System software and programs shall be held in nonvolatile flash, electrically erasable, programmable, read-only memory, retaining the information through failure of primary and secondary power supplies.
b. Include a real-time clock for time annotation of events on the event recorder and printer.
c. Provide communication between the FACP and remote circuit interface panels, annunciators, and displays.
d. The FACP shall be listed for connection to a central-station signaling system service.
e. Provide nonvolatile memory for system database, logic, and operating system and event history. The system shall require no manual input to initialize in the event of a complete power down condition. The FACP shall provide a minimum 500-event history log.

2. Addressable Initiation Device Circuits: The FACP shall indicate which communication zones have been silenced.
3. Addressable Control Circuits for Operation of Notification Appliances and Mechanical Equipment: The FACP shall be listed for releasing service.

B. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

1. Annunciator and Display: Liquid-crystal type, three line(s) of 80 characters, minimum.
2. Keypad: Arranged to permit entry and execution of programming, display, and control commands and to indicate control commands to be entered into the system for control of smoke-detector sensitivity and other parameters.

C. Fire Alarm Control Unit to NAC Unit Communication:

1. Pathway Class Designations: NFPA 72, Class A, redundant pathway.
2. Pathway Survivability: Level 1.

D. Fire Alarm Control Unit to BMS Unit Communication:

1. Pathway Class Designations: NFPA 72, Class A, redundant pathway.
2. Pathway Survivability: Level 1.

E. Network Communication:

1. Pathway Class Designations: NFPA 72, Class C.
2. Pathway Survivability: Level 1.

F. Initiating-Device, Notification-Appliance, and Signaling-Line Circuits:

1. Pathway Class Designations: NFPA 72, Class E.
2. Pathway Survivability: Level 1.
3. Install no more than 50 addressable devices on each signaling-line circuit.

G. Serial Interfaces:
1. One dedicated RS 485 port for central-station operation using point ID DACT.
2. One dedicated RS 485 port for each of the following:

    a. Remote fire alarm annunciators (standard annunciators).
    b. Remote fire alarm annunciator (Interactive Fire Fighters' Display).
    c. Multi-interface module (printer port).

3. One USB port for PC configuration.

H. Gateway Interface to VESDA system

1. One RS 232 port for VESDA HLI communication interface (or gateway interface as required by VESDA).

I. Gateway Interface to Building Management System

1. BACnet port for BACnet communication interface to Building Management System.

J. Ethernet IP Gateways to “The Cloud”

1. Ethernet port for Ethernet IP Interface to “The Cloud” via VPN to Owner’s Intranet network.

a. Used for connection to “The Cloud” for manufacturer’s software solutions, manufacturer test and inspection, and manufacturer’s system manager app.

K. Smoke-Alarm Verification (Smoke detectors, Air-sampling smoke-detection system [VESDA]):

1. Initiate audible and visible indication of an "alarm-verification" signal at fire-alarm control unit.
2. Activate an approved "alarm-verification" sequence at fire-alarm control unit and detector.
3. Record events by the system printer.
4. Sound general alarm if the alarm is verified.
5. Cancel fire-alarm control unit indication and system reset if the alarm is not verified.

L. Smoke-Alarm Verification (Duct smoke detectors): Not required.

M. Notification-Appliance Circuit:

1. Audible appliances shall sound in a three-pulse temporal pattern, as defined in NFPA 72.
2. Where notification appliances provide signals to sleeping areas, the alarm signal shall be a 520-Hz square wave with an intensity 15 dB above the average ambient sound level or 5 dB above the maximum sound level, or at least 75 dBA, whichever is greater, measured at the pillow.
3. Visual alarm appliances shall flash in synchronization where multiple appliances are in the same field of view, as defined in NFPA 72.

N. Door hold-open devices: Not applicable this project.

O. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status-and-sensitivity settings, and change those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory and print out the final adjusted values on system printer.

P. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm receiving station.

Q. Printout of Events: On receipt of signal, print alarm, supervisory, and trouble events. Identify zone, device, and function. Include type of signal (alarm, supervisory, or trouble) and date and time of occurrence. Differentiate alarm signals from all other printed indications. Also, print system reset event, including same information for device, location, date, and time. Commands initiate the printing of a list of existing alarm, supervisory, and trouble conditions in the system and a historical log of events.

R. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory signals, supervisory and digital telco alarm communicator transmitters, and digital cellular radio alarm communicator transmitter shall be powered by 24-V dc source.

1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.

S. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.

1. Batteries: Sealed lead calcium.

T. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

2.6 PRE-ACTION SYSTEM

A. Initiate Pre-signal Alarm: This function shall cause an audible and visual alarm and indication to be provided at the FACP. Activation of an initiation device connected as part of a pre-action system shall be annunciated at the FACP only, without activation of the general evacuation alarm.

2.7 MANUAL FIRE-ALARM BOXES

A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.

1. Double-action mechanism requiring two actions to initiate an alarm, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
2. Station Reset: Key- or wrench-operated switch.
3. Indoor, Detention Grade, Protective Shield (For inmate occupied areas as designated by an asterisk (‘*’) on the Electrical Construction Sheets): Factory-fabricated, clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm. Lifting the cover actuates an integral battery-powered audible horn intended to discourage false-alarm operation.

2.8 SYSTEM SMOKE DETECTORS

A. General Requirements for System Smoke Detectors:

1. Comply with UL 268; operating at 24-V dc, nominal.
2. Detectors shall be two (2) wire type.
3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
4. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
6. Integral Visual-Indicating Light: LED type, indicating detector has operated and power-on status.
7. Remote Control: Unless otherwise indicated, detectors shall be digital-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition and individually adjustable for sensitivity by fire-alarm control unit.

    a. Multiple levels of detection sensitivity for each sensor.
    b. Sensitivity levels based on time of day.

B. Photoelectric Smoke Detectors:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

    a. Primary status.
    b. Device type.
    c. Present average value.
    d. Present sensitivity selected.
    e. Sensor range (normal, dirty, etc.).

C. Duct Smoke Detectors: Photoelectric type complying with UL 268A.

1. Two (2) wire.
2. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
3. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

    a. Primary status.
    b. Device type.
    c. Present average value.
    d. Present sensitivity selected.
    e. Sensor range (normal, dirty, etc.).

4. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector for smoke detection in HVAC system ducts.
5. Each sensor shall have multiple levels of detection sensitivity.
6. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
7. Relay Fan Shutdown: Fully programmable relay rated to interrupt fan motor-control circuit.

D. Remote Test Station for Duct Smoke Detectors

1. Locations as indicated on Electrical Construction Sheets – i.e. Centrally located adjacent to Firefighters' Smoke Control Station.
2. Multi-colored LED Status Light: Light alternates between steady green (normal) and red (alarm).
3. Keyed test station. Provide minimum of two (2) spare keys.
4. Four (4) wire.

2.9 SYSTEM HEAT DETECTORS

A. Heat detector locations are as indicated on Electrical Construction Sheets. As part of the delegated design submittal, select rate of rise and fixed temperature based on performance requirements that are most appropriate for the area/location (i.e. to minimize detection response time for a flame or fire event).

B. Two (2) wire.

C. General Requirements for Heat Detectors: Comply with UL 521.

1. Temperature sensors shall test for and communicate the sensitivity range of the device.

D. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F (or as otherwise required by the delegated design) or a rate of rise that exceeds 15 deg F per minute (or as otherwise determined by the delegated design).

1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

2.10 NOTIFICATION APPLIANCES

A. Non-addressable Notification Appliances shall be acceptable. Non-addressable notification appliances shall be connected to notification-appliance signal circuits and zoned as indicated on Electrical Construction Sheets. Appliances shall be equipped for mounting as indicated, and with screw terminals for system connections.

1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated, and with screw terminals for system connections.

B. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet from the horn, using the coded signal prescribed in UL 464 test protocol.

C. Visible Notification Appliances: Xenon strobe lights complying with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch-high letters on the lens.

1. Rated Light Output:

a. 15/30/75/110 cd, selectable in the field.

2. Mounting: Wall mounted unless otherwise indicated.
3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
4. Flashing shall be in a temporal pattern, synchronized with other units.
5. Strobe Leads: Factory connected to screw terminals.
6. Mounting Faceplate: Factory finished, red.

D. Master Sync: All visual notification devices throughout the building shall be synchronized strobes. Provide a master sync circuit at the fire alarm control panel and connect to the sync input of each NAC power supply.

2.11 FIREFIGHTERS' SMOKE-CONTROL SYSTEM

A. Smoke Control System, equipment, and components shall be supplied by HVAC/Mechanical Contractor. System and components shall comply with UL 864.

B. Fire alarm system shall communicate with the Building Management System (BMS) Panel via BACnet protocol or as otherwise required by the BMS Vendor.

1. The Fire Alarm Control Panel(s) shall be provided with a BACnet interface card. The fire alarm system Vendor shall coordinate with and provide to the BMS Vendor the address registers/descriptions at the Fire Alarm Control Panel(s) necessary for operation of the Smoke Control System.

2. The FACP Vendor shall demonstrate operation of the fire alarm/detection system in conjunction with demonstration of the Smoke Control System by the BMS Vendor. Demonstration shall be provided in the presence of the Owner, Engineer, and Authorities Having Jurisdiction.

C. Initiate Smoke-Management Sequence of Operation:

1. Comply with sequence of operation as described on Mechanical Construction Documents.
2. Fire-alarm system shall provide all interfaces and control points required to properly activate smoke-management systems.
3. First fire-alarm system initiating device to go into alarm condition shall activate the smoke-control functions.
4. Subsequent devices going into alarm condition shall have no effect on the smoke-control mode.

D. Addressable Relay Modules:

1. Provide address-setting means on the module. Store an internal identifying code for control panel use to identify the module type.
2. Allow the control panel to switch the relay contacts on command.
3. Have a minimum of two normally open and two normally closed contacts available for field wiring.
4. Listed for controlling HVAC fan motor controllers.

E. Comply with UL 864.

2.12 INTERACTIVE FIREFIGHTERS' DISPLAY

A. The remote annunciator panel in the Master Control Room shall be an interactive firefighters' display.

B. Features: 22" LCD Touch-Screen; recess mount or semi-recess mount.

C. The touch screen display will provide firefighters information about the building including:

1. A layout of building floor plans with room names and numbers.

2. Detailed site-specific information including:

a. Location of all supervised fire alarm devices.
b. Water supplies.
c. Evacuation routes.
d. Access Routes.
e. Chemical and structural hazards in the building.
f. Shutoffs for gas, power, and HVAC.

3. Status/Indication of Smoke Control equipment shall not be indicated at this display. Refer to Mechanical Specifications for requirements for status/indication/control at the Firefighters' Smoke Control Station.

2.13 GRAPHIC ANNUNCIATOR WORKSTATION

A. Provide a Graphic Annunciator Workstation for the fire alarm/detection system and the VESDA system. Workstation shall be located in the Facility Manager's Office as indicated on the Electrical Construction Sheets. Workstation shall include the following:

1. Workstation Software: PC-based, fire-alarm annunciator software with historical logging, report generation, and a graphic interface showing all alarm points in the system.

a. Provide support software such as:

1) System manager app.

a) Webserver for remote monitoring/troubleshooting/testing for remote users via system manager app.

2) Software for push notifications (text, email, etc.) to remote users.

b. VESDA software (i.e. Xtralis VSM) monitoring VESDAnet networking with annunciate alarms and faults through High Level Interface (HLI), shall reside on the PC.

c. Firmware upgrades.

2. Workstation Equipment: Provide PC with operating system software, hard drive with minimum storage as recommended by Vendor, two (2) large digital display monitors, wireless keyboard, wireless mouse, and other PC accessories for a complete and operable system. PC shall have minimum storage and processing power for Owner installed software such as MS Office. PC shall be configured with communication card for Ethernet IP Connection, PC network card for RS232 or RS485 connection to Fire Alarm Control Panel, RS232 to printer connection, and other network cards and communication ports as necessary or required by the Owner.

2.14 SYSTEM PRINTER

A. Printer shall be located at the Graphic Annunciator Workstation in the Facility Manager's Office as indicated on the Electrical Construction sheets.

B. Printer shall be listed and labeled as an integral part of fire-alarm system.

2.15 NON-POWER GRAPHIC ANNUNCIATOR PANEL

A. A non-powered/non-illuminated Graphic Annunciator Panel shall be located within Facility Office C1055 and mounted above the Fire Alarm Graphic Workstation as indicated on Electrical Construction Sheets. Graphic Annunciator Panel shall be used for the display of the building floor plan(s), room names/numbers, and fire alarm device types and locations.

B. Graphic Annunciator Panel: Mounted in an aluminum frame with nonglare, minimum 3/16-inch-thick, clear acrylic cover over graphic representation of the facility. Detector locations shall be represented by red LED lamps. Normal system operation shall be indicated by a lighted, green LED. Trouble and supervisory alarms shall be represented by an amber LED.

1. Surface mounted in a NEMA 250, Type 1 cabinet, with key lock and no exposed screws or hinges.
2. Graphic representation of the facility shall be a CAD drawing and each detector shall be represented in its actual location. CAD drawing shall be at 1/8-inch per foot scale or as otherwise required by Engineer to fit within the allotted wall space within the room and above the remote fire alarm annunciator panel.

2.16 NETWORK COMMUNICATIONS

A. Provide network communications for fire-alarm system according to fire-alarm manufacturer's written requirements.

B. Provide network communications pathway per manufacturer's written requirements and requirements in NFPA 72 and NFPA 70.

C. Provide integration gateway using BACnet for connection to the Building Management System (BMS).

2.17 REMOTE FIRE ALARM ANNUNCIATORS

A. Description: Annunciator functions shall match those of fire-alarm control unit for alarm, supervisory, and trouble indications. Manual switching functions shall match those of fire-alarm control unit, including acknowledging, silencing, resetting, and testing.

1. Mounting: Flush mount cabinet, NEMA 250, Type 1. Surface mount may be used where indicated on Construction Sheets and approved by Engineer.

B. Display Type and Functional Performance: Alphanumeric display and LED indicating lights shall match those of fire-alarm control unit. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

2.18 REMOTE STATUS AND ALARM INDICATORS

A. Description: Provide remote status and indicators with visual indication of an alarm on a concealed addressable detector.

B. Remote Status and Alarm Indicators: Install in a visible location near each smoke detector, sprinkler water-flow switch, and valve-tamper switch that is not readily visible from normal viewing position.

2.19 ADDRESSABLE INTERFACE DEVICE

A. General:

1. Include address-setting means on the module.
2. Store an internal identifying code for control panel use to identify the module type.
3. Listed for controlling HVAC fan motor controllers.

B. Monitor Module: Microelectronic module providing a system address for alarm-initiating devices for wired applications with normally open contacts.

C. Integral Relay: Capable of providing a direct signal equipment requiring shutdown or other functionality.

1. Allow the control panel to switch the relay contacts on command.
2. Have a minimum of two normally open and two normally closed contacts available for field wiring.

D. Control Module:

1. Operate notification devices.
2. Operate solenoids for use in sprinkler service.

2.20 DIGITAL TELCO ALARM COMMUNICATOR TRANSMITTER

A. A primary (Telco) Digital alarm communicator transmitter (DACT) shall be used as the primary transmission device. DACT shall be acceptable to the remote central station receiver and shall comply with UL 632.

B. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit and automatically capture two (s) POTS (Plain Old Telephone system) telephone line(s) and dial a preset number for a remote central station. When contact is made with central station(s), signals shall be transmitted. If service on either line is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. Transmitter shall automatically report telephone service restoration to the central station. If service is lost on both telephone lines, transmitter shall initiate the local trouble signal.

C. Local functions and display at the digital alarm communicator transmitter shall include the following:

1. Verification that both telephone lines are available.
2. Programming device.
3. LED display.
4. Manual test report function and manual transmission clear indication.
5. Communications failure with the central station or fire-alarm control unit.

D. Digital data transmission shall include the following:

1. Address of the alarm-initiating device.
2. Address of the supervisory signal.
3. Address of the trouble-initiating device.
4. Loss of ac supply.
5. Loss of power.
6. Low battery.
7. Abnormal test signal.
8. Communication bus failure.

E. Power shall be provided from the fire alarm control panel battery/battery charger system.

F. Self-Test: Conducted automatically every 24 hours with report transmitted to remote central station receiver.

2.21 DIGITAL CELLULAR RADIO ALARM COMMUNICATOR TRANSMITTER

A. A secondary (backup) alarm transmitter shall be provided for the fire alarm system. DACT shall be acceptable to the remote central station receiver and shall comply with UL 632.

B. Transmitter shall comply with:
1. NFPA 1221
2. 47 CFR 90
3. UL 864
4. UL 985

C. Description: Manufacturer's standard commercial product; factory assembled, wired, and tested; ready for installation and operation.

1. Packaging: A single, modular, NEMA 250, Type 1 metal enclosure with a tamper-resistant flush tumbler lock.
2. Signal Transmission Mode and Frequency: Cellular frequency coordinated with operating characteristics of the established remote alarm receiving station designated by Owner.
3. Normal Power Input: 120-V ac.
4. Secondary Power: Integral-sealed, rechargeable, 12-V battery and regulated battery charger. Comply with NFPA 72 requirements for battery capacity; submit calculations.

5. Antenna: Provide directional or omnidirectional antenna. Where a remote, outdoor antenna is necessary, provide wind-load strength of antenna and mounting hardware and supports shall withstand 100 mph with a gust factor of 1.3 without failure.
6. Antenna Cable: Coaxial cable with impedance matched to the transmitter output impedance.
7. Antenna-Cable Connectors: Weatherproof.
8. Alarm Interface Devices: Circuit boards, modules, and other auxiliary devices, integral to the transmitter, matching fire-alarm and other system outputs to message-generating inputs of the transmitter that produce required message transmissions.

D. Functional Performance: Unit shall receive alarm, supervisory, or trouble signal from fire-alarm control unit or from its own internal sensors or controls and shall automatically transmit signal along with a unique code that identifies the transmitting station to the remote alarm receiving station. Transmitted messages shall correspond to standard designations for fire-reporting system to which the signal is being transmitted and shall include separately designated messages in response to the following events or conditions:

1. Transmitter Low-Battery Condition: Sent when battery voltage is below 85 percent of rated value.
2. System Test Message: Initiated manually by a test switch within the transmitter cabinet, or automatically at an optionally preselected time, once every 24 hours, with transmission time controlled by a programmed timing device integral to transmitter controls.
3. Transmitter Trouble Message: Actuated by failure, in excess of one-minute duration, of the transmitter normal power source, derangement of the wiring of the transmitter, or any alarm input interface circuit or device connected to it.
4. Local Fire-Alarm-System Trouble Message: Initiated by events or conditions that cause a trouble signal to be indicated on the building system.
5. Local Fire-Alarm-System Alarm Message: Actuated when the building system goes into an alarm state. Identifies device that initiated the alarm.
6. Local Fire-Alarm-System, Supervisory-Alarm Message: Actuated when the building alarm system indicates a supervisory alarm.

2.22 DEVICE GUARDS

A. Devices with detention rated guards are designated with an asterisk (‘*’) on Electrical Construction Sheets.

B. Description: Welded wire mesh of size and shape for the manual station, smoke detector, gong, or other device requiring protection.

1. Factory fabricated and furnished by device manufacturer.
2. Finish: Paint of color to match the protected device.

C. For visible notification units with guards to prevent physical damage, light output ratings shall be determined with guards in place.

D. Guard for smoke detector shall be perforated and shall be UL tested and approved for use with the smoke detector. Refer to perforated smoke detector guard detail on Electrical Construction Detail Sheets.

2.23 FIRE ALARM CABLING

A. Performance Requirements

1. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

a. Flame-Spread Index: 25 or less.
b. Smoke-Developed Index: 50 or less.

2. 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. UTP cabling.

C. Description: 100-ohm, four-pair UTP, covered with a blue thermoplastic jacket.

1. Comply with ICEA S-90-661 for mechanical properties.
2. Comply with TIA/EIA-568-B.1 for performance specifications.
3. Comply with TIA/EIA-568-B.2, Category 6.
4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:

a. Communications, Plenum Rated: Type CMP, complying with NFPA 262.
b. Communications, Riser Rated: Type CMR, complying with UL 1666.

D. RS-232 cabling.

1. Plenum-Rated Cable: NFPA 70, Type CMP.

a. Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors.
b. Plastic insulation.
c. Individual aluminum foil-polyester tape shielded pairs with 100 percent shield coverage.
d. Plastic jacket.
e. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
f. Flame Resistance: Comply with NFPA 262.

E. RS-485 cabling.

1. Plenum-Rated Cable: NFPA 70, Type CMP.

a. Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors.
b. Fluorinated ethylene propylene insulation.
c. Unshielded.
d. Fluorinated ethylene propylene jacket.
e. Flame Resistance: NFPA 262, Flame Test.

F. Low-voltage control cabling.

1. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.

a. One pair, twisted, No. 16 AWG, stranded tinned copper conductors.
b. PVC insulation.
c. Unshielded.
d. PVC jacket.

2. Flame Resistance: Comply with NFPA 262

G. Control-circuit conductors.

1. Class 1 Control Circuits: Stranded copper, [Type THHN-THWN, complying with UL 83, in raceway].
2. Class 2 Control Circuits: Stranded copper, [Type THHN-THWN, complying with UL 83, in raceway].
3. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type TW or TF, complying with UL 83.

H. Fire alarm wire and cable.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Comtran Corporation.
b. Draka Cableteq USA.
c. Genesis Cable Products; Honeywell International, Inc.
d. Rockbestos-Suprenant Cable Corp.
e. West Penn Wire.

2. General Wire and Cable Requirements: NRTL listed and labeled as complying with NFPA 70, Article 760.
3. Signaling Line Circuits: Twisted, shielded pair, not less than No. 18 AWG and/or size as recommended by fire alarm system manufacturer.
4. Circuit Integrity Cable: Twisted shielded pair, NFPA 70, Article 760, Classification CI, for power-limited fire alarm signal service Type FPL. NRTL listed and labeled as complying with UL 1424 and UL 2196 for a 2-hour rating.

5. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation.

    a. Line-Voltage Circuits: No. 12 AWG minimum.

2.24 VESDA AIR-SAMPLING SMOKE DETECTION (ASD) SYSTEM

A. General Description:

1. This VESDA system shall be installed in locations as indicated on Electrical Construction Sheets. This system is a point addressable, early warning fire detection system.
2. Air-sampling smoke detector shall be laser based using a piping system and a fan to transport the particles of combustion to the detector.
3. Provide two levels of alarm from each zone covered by the detector and two supervisory levels of alarm from each detector.
4. The air being sampled shall pass through filters to remove dust particulates greater than 20 microns before entering the detection chamber.
5. Detectors shall have the capability via RS 485 to connect up to 100 detectors in a network.
6. Detectors shall communicate with the fire-alarm control unit via addressable, monitored dry contact closures, RS 485, and interface modules. Provide a minimum of six relays, individually programmable remotely for any function.

B. Manufacturers: The manufacturer shall have a minimum of 35 years production experience in the design and manufacture of high sensitivity air sampling smoke detection systems. The manufacturer shall be certified as meeting ISO 9001:2008 for manufacturing. Subject to compliance with requirements, provide products by the following:

1. Xtralis; a division of Honeywell.
2. No approved performance equal.

C. Manufacturer shall have a minimum of three (3) independent factory authorized and trained service dealers/technicians, available within a fifty (50) mile radius of the installation, for ongoing and price competitive servicing of the installed system. Submit a listing of all qualified independent dealers/technicians within this radius capable of supporting the installed system.

D. Submittals -Submit the following for approval by Engineer:

1. Product Data
2. Shop drawings: Include equipment layout, wiring diagrams, labeling of devices and equipment, bills of material, mounting accessories/boxes/details, pipe layout, operational calculations and performance criteria.

    a. Pipe airflow balancing calculations shall be performed using approved calculation software. Design software tools such as ASPIRE may be used to generate this material.

3. Supplier Qualifications: The equipment supplier shall be authorized and trained by the manufacturer to calculate/design, install, test and maintain the ASD system based on code requirements. The equipment supplier shall submit a certificate of training from the manufacturer.
4. Installer Qualifications: The equipment installer shall be authorized and trained by the manufacturer and shall have the ability to install and test the ASD system. The installer shall submit a certificate of training from the manufacturer. The installation and programming of the ASD shall be completed by a factory-trained installer.
5. Calculations, design, and testing documents for review and approval by Engineer and Authorities Having Jurisdiction.
6. Operation and maintenance manuals.

E. Air Sampling Smoke Detectors [Monitoring/Alarming Panels] (Manufacturer: Xtralis; Model: VESDA-E VEA; Part Number: VEA-040-A10)

1. All tubing for each sample point shall be the same length based on its longest run and shall have a minimum of 100 feet as required me manufactures recommendation.

2. General Description:

    a. 40-point-addressable smoke detection points.

        1) Each detector shall not exceed a maximum of 40 sample points and shall not have less than 10 sample points per detector.

    b. Highly sensitive LASER-based smoke sensor module with replaceable filter.
    c. High capacity pump and a rotary valve connected to a network of individual microbore tubes with individual sampling points on microbore tubes.
    d. Modular
    e. LED and LCD User Interface:
    f. Optional relay module to annunciate individual alarms for the sampling points connected to the microbore tubes.
    g. VESDAnet networking to annunciate alarms and faults through High Level Interface (HLI) and / or on monitoring software such as VSM.

3. System Features:

    a. Approved to provide Early Warning Fire Detection (EWFD) / Class A / Class B and Standard Fire Detection (SFD) / Class C.
    b. Tested and approved to cover up to a 36,000 sq. ft. area subject to system design and local regulatory requirements.
    c. Consists of a highly sensitive LASER-based light scattering smoke sensor module, filter, rotary valve, pump, microbore tubes and sampling points.
    d. Consists of an air sampling microbore tube network with each tube having individual sampling point at the end to transport air to the detection system.
    e. Supports forty (40) point-addressable detection points with two individual smoke detection chambers each supporting 20 detection points.

f. Provide one (1) test port for each of the two (2) detection chambers to facilitate centralized and periodic code required smoke testing under user control of the forty (40) detection points.

4. General Requirements:

a. Housing: Smoke Sensor Module, Filter, Pump, Rotary valve and Relay Outputs shall be housed in a metal enclosure and shall be arranged in such a way that air is drawn from the fire risk area by the pump and a sample is passed through a sample filter and the smoke sensor module.
b. The detector shall have 40 microbore sampling tube inlets and must employ a flow measurement arrangement to detect individual flow per tube.
c. Light Source: The Detection Chamber shall employ a highly sensitive LASER light source and a photodiode.
d. Detection Method: The detection sensing method shall use a laser light source and at least one photodiode spaced inside the detection chamber to detect smoke particles. Smoke detection shall include:

1) Minimizing the effect of large dust particles on the true smoke obscuration.
2) Settable filter life based on the environment with notification when filter maintenance is required.

e. Absolute Calibration: The detection chamber shall be factory calibrated and shall not use adaptive algorithms or drift compensation techniques to adjust the sensitivity or detector output from that established during commissioning.
f. Filters: Disposable filter cartridge shall be capable of filtering particles in-excess-of 20 microns from the air sample. A second filter shall be ultrafine, removing more than 99% of contaminant particles of 0.3microns or larger, to provide a clean air barrier around the detector’s optics to prevent contamination and increased service life.

1) The filter shall be accessible by opening the cover to the field wiring terminal area. Once accessible, the filter shall be removable and replaceable using a readily available tool.

g. Pump: The pump shall be a capable of allowing for multiple microbore sampling tube runs up to 328 feet each with a transport time per applicable local codes.
h. Settable filter life based on the environment with notification when filter maintenance is required.
i. The detector shall have ability to perform leak test by isolating the external microbore tube network to ensure integrity of internal detection air path.
j. The detector shall employ modular construction allowing field replacement of the filter, smoke sensor module, rotary valve and the pump.

k. Provide:

1) Detection of sampling point and microbore tube blockage.
2) Detection of microbore tube breakage and sampling point presence at set intervals.
3) Cleaning of sampling point at set intervals

5. LED User Interface:

a. Include display module within each detector.
b. Each display shall provide the following features at a minimum:

1) A bar-graph display.
2) Four independent, high-intensity alarm indicators (ALERT, ACTION, FIRE-1, and FIRE-2), corresponding to the four alarm thresholds of the indicated sector.
3) Four (4) LED alarm threshold indicators to indicate ALERT, ACTION, FIRE-1 and FIRE-2 alarm events; one TROUBLE LED;
4) LED indication that the first alarm sector is established.
5) Detector fault and airflow fault indicators.
6) LED indicators shall be provided for faults originating in the particular zone (Zone Fault), faults produced by the overall smoke-detection system, and faults resulting from network wiring errors (Network Fault). Minor and urgent LED fault indicators.
7) Provide each of the 40-point addressable smoke detection points provided with a separate indicator LED.
8) Provide LED user interface with a button to support RESET and DISABLE commands; one DISABLE/STANDBY LED; and POWER ON/POWER OFF indication. All LEDs shall have appropriate symbols without any text.

6. LCD User Interface

a. Provide an LCD user interface option showing detector status for each of the 40-point addressable smoke detection points; including fault categories and smoke level relative to the fire alarm setting. Provide with the following characteristics:

1) Color LCD touch screen user interface with bar graph display.
2) Alarm threshold indicators for Alert, Action and Fire 1.
3) Fault icons indicating faults for these categories: detector, chamber, filter, flow, aspirator, network, power and external module where applicable.
4) A touch screen interface to allow scrolling through status screens on the LCD.

7. Monitoring and Alarming:

a. Supports five (5) addressable high-level-interface (HLI) alarms (i.e. general trouble, clean filter, tube blockage, and other field assignable as necessary).

b. Provide individual sampling point tube alarm (FIRE-1), identifying the fire location through addressable sampling point detection point by scanning the rotary valve, once global detector level fire alarm (FIRE-1) alarm is initiated.

c. Supports global detector level fire alarms during a smoke event with:

1) One (1) addressable output level identifying the fire location through addressable detection sampling points by scanning through the rotary valve.

2) Provide four (4) addressable output level alarm thresholds for the global detector alarm corresponding to ALERT, ACTION, FIRE-1, and FIRE-2.

a) Alarm Level 1 (ALERT): Activate a visual and an audible supervisory alarm. ALERT threshold set to a % of Fire-1 threshold

b) Alarm Level 2 (ACTION): Activate shutdown of electrical/HVAC equipment and activate a visual and an audible supervisory alarm. ACTION threshold set in the middle of ALERT and FIRE-1 thresholds

c) Alarm Level 3 (FIRE-1): Activate building alarm systems and initiate call to fire response unit. Global alarm FIRE-1 level shall be selectable from three options corresponding to sampling point sensitivity of High = 1.6% obs/m (0.5% obs/ft), Enhanced = 4% obs/m (1.3% obs/ft), and Standard = 8% obs/m (2.5% obs/ft).

d) Alarm Level 4 (FIRE-2): Activate suppression system or other countermeasures. Global alarm FIRE-2 alarm automatically set to two (2) times (2x) the global alarm (FIRE-1) setting.

e) The detector shall have two (2) adjustable pre-alarm smoke alarm thresholds:

f) Air-Sampling Flow Rates Outside Manufacturer's Specified Range: Result in a trouble alarm.

g) Provide software-programmable relays rated at 2 A at 30-V dc for alarm and fault conditions.

d. Supports High Level Interface (HLI) equipment for communication with the Main Fire Alarm Control Panel.

e. Detector shall also transmit the following faults:

1) DETECTOR
2) AIR FLOW
3) FILTER
4) SYSTEM
5) ZONE
6) NETWORK
7) POWER
8) CHAMBER
9) MODULE

f. Urgent and Minor Faults. Minor faults shall be designated as trouble alarms. Urgent faults, which indicate the unit may not be able to detect smoke, shall be designated as supervisory alarms
g. The detector shall support the generation and transmission of urgent and minor faults. Minor faults shall be considered as servicing or maintenance signals. Urgent faults indicate the unit may not be able to detect smoke.
h. The detector shall contain seven (7) or more relays for alarm and fault conditions. The relays shall be software programmable to the required functions. The relays shall be rated at 2 Amp at 30 VDC. Additional local relays shall be offered as an option to provide an alarm relay output for each of the microbore sampling tube representing a sampling point.
i. The detector shall have built-in event and smoke logging. It shall store smoke levels, alarm conditions, operator actions and faults. The date and time of each event shall be recorded. Each detector (zone) shall allow storage of up to 20,000 events and does not require the presence of a display in order to do so.
j. The detector shall incorporate a galvanically isolated General-Purpose-Input (GPI) which activates in the event of an applied voltage of 5 to 50VDC and can be assigned by configuration to activate one of several functions (Reset, Disable, Reset/Disable, Stand-by, Mains OK, Day/Night).
k. The detector shall incorporate a monitored voltage-free input, to be used with isolated relay contacts, which is supervised using a 10k Ohm terminating resistor.

8. Communication:

a. Report any fault on the detector by using configurable fault relay outputs.
b. Report any fault on the detector by using configurable fault relay outputs and/or via a peer-to-peer communications network. The Peer-to-Peer Communications Networking: A peer-to-peer networking facility shall be provided for the purposes of reporting alarms, faults and monitoring status, history and for configuration of devices. The peer-to-peer network shall:

1) Comprise a physical layer that shall:

a) Comply with the ANSI/TIA/EIA-485-A-1998 electrical specifications.
b) Employ asynchronous serial data transfer.
c) Operate at a baud rate no less than 19.2 kBaud.
d) Detect communications errors due to interference, open and short circuit.
e) Detect ground faults.

2) Support up to 200 devices (detectors, displays and programmers) of which 100 detectors can be supported.
3) Be configurable in a fault tolerant loop for short circuit, open circuit and ground fault. Any communication faults shall be reported unambiguously and shall be clearly attributable to an individual device or wire link in the fault messages.
4) Be configurable by PC based configuration tools that are available to configure and manage the network of detectors.

c. Secondary Communications

1) Detectors shall provide inbuilt secondary communications for monitoring and configuration using the following physical media:

a) USB.
b) 10/100 BaseT Ethernet.
c) WiFi (IEEE 802.11b/g).

d. Provide PC connection port at unit for laptop for programming, maintenance, service, and support.

9. Remote Monitoring from Remote PC Work Station

a. The VESDA system shall be integrated into the Fire Alarm/Detection System for monitoring of the overall building fire alarm/detection system.

1) Software: The VESDA system shall have available PC-hardware-based software to monitor all VESDA devices connected to a Peer-to-Peer VESDA system via High Level Interfaces.

2) Dedicated PC-based monitoring workstation.
a) Software for the Peer-to-Peer VESDA system shall be available to monitor all VESDA devices connected to the VESDA system; however, the software from the Fire Alarm/Detection Panel Manufacturer shall be utilized at this dedicated workstation for this project.
b) Work Station shall be located in the Facility Manager's Office as indicated on Electrical Construction Sheets.

b. VESDA Software Configuration and Programming

1) Configuration and programming may be performed using a Windows application such as Xtralis VSC running on a PC connected through a High-Level-Interfacing unit (PC-Link HLI) or by direct connection to a detector or through Ethernet network.
2) Configuration and programming tool shall support the following features at a minimum:

a) Programming of any device on the VESDAnet system as per the device documentation.
b) Viewing of the status of any device in the system.
c) Adjustment of the alarm thresholds of a nominated detector.
d) Setting of Day/Night, weekend and holiday sensitivity threshold settings.
e) Multi-level password control.
f) Programmable latching or non-latching relay operation.
g) Programmable energized or de-energized relays.

h) Programmable high and low flow settings for airflow supervision.
i) Number of microbore tubes in use and input maximum length of a microbore tube.
j) Programming if sampling points are used on a VEA detector.
k) Programmable maintenance intervals.
l) Facilities for referencing with time dilution compensation.
m) Testing of relays assigned to a specific zone to aid commissioning.

c. Security for WiFi Access

1) The following security measures shall be provided for secondary communications utilizing WiFi for a VESDA Peer-to-Peer system:

a) Connectivity via wireless access shall support WPA2 encryption with encryption key.
b) Access to a detector via Ethernet or WiFi shall be protected using a detector password specific to the detector and in addition to the WiFi encryption key.
c) All software connecting to a detector or peripheral shall support an authentication protocol to verify that it has been supplied by the manufacturer of the system.

d. Software Upgrades

1) There shall be provision for field upgrading the firmware in the system using a USB memory key connected directly to the detector, avoiding the need for a separate PC for this function.

F. Smoke detection sampling points (Non-Tamper Resistant)

1. Color: White
2. Mounting: Flush or surface mount as required.
3. The sampling points shall comply with the following requirements:

a. Sampling points shall not be separated by more than the maximum distance allowed for conventional point detectors as specified in the local codes and standards. Intervals may vary according to calculations. For AS1670.1-2004 the maximum allowable distance is 10.2m. For FIA the maximum allowable distance is 10.6m. For NFPA the maximum allowable distance is 30ft.
b. Each sampling point shall be identified in accordance with Codes or Standards.
c. Sample point shall have a built-in mechanism to enable sampling point testing and microbore tube integrity testing from the detector.

G. Smoke detection sampling points (Tamper Resistant)

1. Tamper-resistant, detention grade detection points shall be used for inmate occupied areas. These detection point locations are designated with an asterisk '*' on the Electrical Construction Sheets. Provide Torx-Center-Pin screws as specified in Specification Section 050553.

   a. Tamperproof detection points shall be stainless steel.
   b. Mounting options: Ceiling, Cabinet or open duct.
   c. Compatible with 6mm microbore tube.

2. The sampling points shall comply with the following requirements:

   a. Sampling points shall not be separated by more than the maximum distance allowed for conventional point detectors as specified in the local codes and standards. Intervals may vary according to calculations. For NFPA the maximum allowable distance is 30 feet.
   b. Each sampling point shall be identified in accordance with Codes or Standards.
   c. Sample point shall have a built-in mechanism to enable sampling point testing and microbore tube integrity testing from the detector.

H. High-Level-Interface (HLI) Units

1. Provide High-Level-Interface equipment at each VESDA smoke detector.

   a. HLI shall be capable of communicating directly with the Main Fire Alarm Control Panel for the following manufacturers:

      1) Notifier
      2) Edwards

   b. For other than the Main Fire Alarm Control Panel manufacturers listed above, provide a zone addressable module (ZAM) relay for monitoring of all alarms and status of detection points including:

      1) Each of the forty (40) point-addressable detection points and
      2) Each of the five (5) addressable high-level-interface (HLI) alarms and
      3) Each of the five (5) "global detector level fire" alarms.

I. Power Supply (Battery Charger and Batteries)

1. Each VESDA detector shall be powered from a Battery/Battery Charger Cabinet. Power shall be a regulated supply of nominally 24V DC. The 120VAC battery charger and 24VDC batteries shall comply with relevant Codes, Standards and Regulations.

   a. The VESDA detector shall be powered from a regulated supply of nominally 24V DC. The battery charger and batteries shall comply with the relevant Codes, Standards or Regulations.

      1) Battery backup shall provide 24 hours' standby, followed by 30 minutes in an alarm condition at maximum connected load.
      2) Primary Power: 24-V dc obtained from 120 VAC service.
      3) Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.
      4) Batteries: Sealed lead calcium.

   b. Battery sizing calculations for the cabinet shall include the VESDA detector loads. Power supply shall comply with the following:

      1) UL 1481 Listed - Power supply and standby batteries shall be appropriately sized/rated to accommodate the system’s power requirements.

2. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

J. Microbore Sampling Tubes

1. The microbore sampling tube shall comply with the following requirements:

   a. Tubes used shall be 0.24” (6mm) OD / 0.16” (4mm) ID and 0.16” (4mm) OD / 0.1” (2.5mm) ID.
   b. Tubes shall have adequate markings to meet local codes and standards.
   c. Tubes shall be UL listed / recognized.
   d. Tubes shall be approved for use in the protected environment.

2. Where false ceilings are installed, the sampling tubes shall be installed above the ceiling, and sampling points shall be installed on the ceiling and connected to the sampling tube.
3. The sampling tubes shall be of the same length or use the manufacturer’s guidelines to run tubes of the required lengths using two diameter tubes 0.24” (6mm) and 0.16” (4mm) OD.

4. Maximum tube length shall be up to 328 feet (100m), however shorter tube lengths may be accommodated in accordance with the manufacturer’s guidelines.

    a. Extra tube lengths shall be neatly coiled and supported in a workmanlike manner. Locate coiling where readily accessible and to not obstruct working clearance.
    b. All tubing for each sample point shall be the same length based on its longest run and shall have a minimum length of 100 feet as required by manufacturer’s recommendations.

5. All joints in the sampling tubes must be air tight and made by using manufacturer recommended connectors.
6. Sampling tubes shall be installed in raceways and/or sleeves in the following areas:

    a. Above inaccessible ceilings.
    b. Finished areas.
    c. Areas subject to physical damage.
    d. Ceiling and/or wall penetrations.

7. Pipe Material: CPVC and complying with UL 1887, "Safety Fire Test of Plastic Sprinkler Pipe for Visible Flame and Smoke Characteristics."
8. Joints in the sampling pipe shall be airtight. Use solvent cement approved by the pipe manufacturer on all joints except at entry to the detector.
9. Identify piping with labels reading: "Aspirating Smoke Detector Pipe - Do Not Paint or Disturb" along its entire length at regular intervals according to NFPA 72.
10. Support pipes at not more than 60-inch centers.
11. Fit end of each trunk or branch pipe with an end cap and drilled with a hole appropriately sized to achieve the performance as specified and as calculated by the system design.

K. Sampling Holes:

1. Sampling holes of 5/64 inch, or other sized holes per manufacturer's written instructions, shall be separated by not more than the maximum distance allowable for conventional smoke detectors. Intervals may vary according to calculations.
2. Follow manufacturer's written recommendations to determine the number and spacing of sampling points and the distance from sampling points to ceiling or roof structure and to forced ventilation systems.
3. Each sampling point shall be identified by an applied decal.

L. Warranty

1. VESDA system and components shall comply with the warranty as indicated by Part 1 of this specification.

M. Spare Parts

1. Provide a list of recommended spare parts with the O&M manual. I.e. spare parts list for detector would include:

    a. Replaceable Pump.
    b. Replaceable Smoke Sensor Module/Chamber Assembly.
    c. Replaceable Rotary Valve.
    d. Replaceable LED Front Cover/LCD Front Cover

N. Installation

1. Contractor shall install the entire detection system in accordance with National and Local Codes and the Manufacturer's System Design Manual.

O. Testing, Demonstration, and Training

1. Commissioning Tests

    a. The VESDA Manufacturer’s Representative shall attend commissioning and demonstration of the entire installation in the presence of the Owner, Engineer, and Authorities Having Jurisdiction.
    b. All necessary instrumentation, equipment, materials and labor shall be provided by the Contractor.
    c. The Contractor shall record all tests and system configuration and a copy of these results shall be retained on site in the System Log Book.

2. System Check

    a. Visually check all microbore tubes to ensure that all tube joints, fittings, sampling points, etc. comply with this Specification.
    b. Check the system to ensure the following features are operational and programmed in accordance with the specification.

        1) Alarm threshold levels (for both day and night settings),
        2) Time delays,
        3) Number of tubes in use,
        4) Detector address,
        5) Display address where applicable,
        6) Clock time and date,
        7) Air flow fault thresholds,
        8) Reset button operable,
        9) Touch screen operable where applicable,
        10) Units set to United States standards.
        11) Check to ensure that all ancillary warning devices operate as specified.
        12) Check interconnection with Fire Alarm Control Panel to ensure correct operation.

c. Final Tests

1) The Contractor shall:

a) Introduce smoke into each detection chamber through the local test ports provided on the detector to ensure test ports are functional.
b) Verify that transport time from the sampling port connected to the longest microbore tube does not exceed the local code requirements using smoke signal rise on the VSC / VSM or the LCD display.
c) Activate the appropriate Fire Alarm zones and advise all concerned that the system is fully operational. Fill out the logbook and commissioning report accordingly.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions for compliance with requirements for ventilation, temperature, humidity, and other conditions affecting performance of the Work.

1. Verify that manufacturer's written instructions for environmental conditions have been permanently established in spaces where equipment and wiring are installed, before installation begins.

B. Examine roughing-in for electrical connections to verify actual locations of connections before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EQUIPMENT INSTALLATION

A. Comply with NFPA 72, NFPA 101, and requirements of Authorities Having Jurisdiction for installation and testing of fire-alarm equipment. Install all electrical wiring to comply with requirements in NFPA 70 including, but not limited to, Article 760, "Fire Alarm Systems."

1. Devices placed in service before all other trades have completed cleanup shall be replaced.
2. Devices installed but not yet placed in service shall be protected from construction dust, debris, dirt, moisture, and damage according to manufacturer's written storage instructions.

B. Equipment Mounting: Install fire-alarm control unit on concrete base. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete."

1. Install seismic bracing. Comply with requirements in Section 260548.16 "Seismic Controls for Electrical Systems."
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
3. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.

C. Install wall-mounted equipment, with tops of cabinets not more than 78 inches above the finished floor.

1. Comply with requirements for seismic-restraint devices specified in Section 260548.16 "Seismic Controls for Electrical Systems."

D. Manual Fire-Alarm Boxes:

1. Install manual fire-alarm box in the normal path of egress within 60 inches of the exit doorway.
2. Mount manual fire-alarm box on a background of a contrasting color.
3. The operable part of manual fire-alarm box shall be between 42 inches and 48 inches above finished floor level. All devices shall be mounted at the same height unless otherwise indicated.

E. Smoke- or Heat-Detector Spacing:

1. Comply with the "Smoke-Sensing Fire Detectors" section in the "Initiating Devices" chapter in NFPA 72, for smoke-detector spacing.
2. Comply with the "Heat-Sensing Fire Detectors" section in the "Initiating Devices" chapter in NFPA 72, for heat-detector spacing.
3. Smooth ceiling spacing shall not exceed 30 feet.
4. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Annex A or Annex B in NFPA 72.
5. HVAC: Locate detectors not closer than 60 inches from air-supply diffuser or return-air opening.
6. Lighting Fixtures: Locate detectors not closer than 12 inches from any part of a lighting fixture and not directly above pendant mounted or indirect lighting.

F. Install a cover on each smoke detector that is not placed in service to protect during construction. Cover shall remain in place except during system testing. Remove cover prior to system turnover.

G. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct. Tubes more than 36 inches long shall be supported at both ends.

1. Do not install smoke detector in duct smoke-detector housing during construction. Install detector only during system testing and prior to system turnover.

H. Air-Sampling Smoke Detectors: If using multiple pipe runs, the runs shall be pneumatically balanced.

I. Remote Status and Alarm Indicators: Install in a visible location near each smoke detector, sprinkler water-flow switch, and valve-tamper switch that is not readily visible from normal viewing position.

J. Audible Alarm-Indicating Devices: Install not less than 6 inches below the ceiling. Install horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille. Install all devices at the same height unless otherwise indicated.

K. Visible Alarm-Indicating Devices: Install adjacent to each alarm horn and at least 6 inches below the ceiling. Install all devices at the same height unless otherwise indicated.

L. Device Location-Indicating Lights: Locate in public space near the device they monitor.

M. Antenna for Digital Cellular Radio Alarm Communicator Transmitter: Mount to building structure where indicated. Use mounting arrangement and substrate connection that resists 100-mph wind load with a gust factor of 1.3 without damage.

3.3 PATHWAYS

A. Pathways shall be installed in EMT.

B. Exposed EMT shall be painted red enamel.

C. Boxes shall be painted red enamel.

3.4 CONNECTIONS

A. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 36 inches from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.

1. Data communication circuit(s) for connection to Building Management System (BMS) Panel for smoke management system.
2. Alarm-initiating connection to smoke-control system (smoke management) at Firefighters' Smoke-Control System Panel.
3. Alarm-initiating connection to Access System Control Panel.
4. Supervisory connections at standalone Fire Suppression Panels.

5. Supervisory connections at VESDA smoke detectors.
6. Supervisory connections at ANSUL.
7. Supervisory connections at valve supervisory switches.

3.5 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals.

B. Install framed instructions in a location visible from fire-alarm control unit.

C. Identify system components, wiring, and cabling. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems

3.6 GROUNDING

A. For communications wiring, comply with J-STD-607-A and with BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. For low-voltage wiring and cabling, comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

C. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

D. Ground shielded cables at the control panel location only. Insulate shield at device location.

3.7 CABLING INSTALLATION

A. Do not install conductors and cables that are wet, moisture damaged, or mold damaged.

1. Indications that wire and cables are wet or moisture damaged include, but are not limited to, discoloration and sagging of factory packing materials.

B. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

C. Comply with NECA 1.

D. Conductors: Size according to system manufacturer's written instructions unless otherwise indicated.

E. General Requirements for Cabling:

1. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlet and terminals.
2. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
3. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii.
4. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
5. Cold-Weather Installation: Bring cable to room temperature before de-reeling. Heat lamps shall not be used for heating.
6. Pulling Cable: Monitor cable pull tensions.

F. Fire Alarm Wiring Installation

1. Comply with NECA 1 and NFPA 72.
2. Wiring Method: Install wiring in metal raceway according to Section 260533 "Raceways and Boxes for Electrical Systems."

    a. Install plenum cable in environmental air spaces, including plenum ceilings.
    b. Fire alarm circuits and equipment control wiring associated with the fire alarm system shall be installed in a dedicated raceway system. This system shall not be used for any other wire or cable.

3. Wiring Method:

    a. Cables and raceways used for fire alarm circuits, and equipment control wiring associated with the fire alarm system, may not contain any other wire or cable.
    b. Fire-Rated Cables: Use of 2-hour, fire-rated fire alarm cables, NFPA 70, Types MI and CI, is permitted.
    c. Signaling Line Circuits: Power-limited fire alarm cables shall not be installed in the same cable or raceway as signaling line circuits.

4. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.
5. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.

6. Color-Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and another for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.
7. Wiring to Remote Alarm Transmitting Device: 1-inch conduit between the fire alarm control panel and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.

G. Power and Control-Circuit Conductors

1. 120-V Power Wiring: Install according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables" unless otherwise indicated.
2. Minimum Conductor Sizes:

a. Class 1 remote-control and signal circuits, No. 14 AWG.
b. Class 2 low-energy, remote-control and signal circuits, No. 16 AWG.
c. Class 3 low-energy, remote-control, alarm and signal circuits, No. 12 AWG.

3.8 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping."

3.9 FIELD QUALITY CONTROL

A. Field tests shall be witnessed by Engineer and Authorities Having Jurisdiction.

B. Manufacturer's Field Service

1. Fire Alarm System - Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
2. VESDA System - Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

D. Perform the following tests and inspections with the assistance of a factory-authorized service representative(s):

1. Visual Inspection: Conduct visual inspection prior to testing.

a. Inspection shall be based on completed record Drawings and system documentation that is required by the "Completion Documents, Preparation" table in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
b. Comply with the "Visual Inspection Frequencies" table in the "Inspection" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.

2. System Testing: Comply with the "Test Methods" table in the "Testing" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
4. Test audible appliances for the private operating mode according to manufacturer's written instructions.
5. Test visible appliances for the public operating mode according to manufacturer's written instructions.
6. Factory-authorized service representative(s) shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" section of the "Fundamentals" chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

E. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.

F. Fire-alarm system will be considered defective if it does not pass tests and inspections. Refer to Specification Section 014000 "Quality Requirements" for re-testing and re-inspecting requirements. Refer to Specification Section 017300 "Execution" for requirements for correcting the Work.

G. Prepare test and inspection reports.

H. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

I. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

3.10 FIELD QUALITY CONTROL - CABLING

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Visually inspect UTP cable jacket materials for NRTL certification markings. Inspect cabling terminations to confirm color-coding for pin assignments and inspect cabling connections to confirm compliance with TIA/EIA-568-B.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.

3. Test UTP cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross connection.

    a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

B. Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide or transfer the data from the instrument to the computer, save as text files, print, and submit.

C. End-to-end cabling will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.11 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, provide maintenance service for twelve (12) month with skilled employees of manufacturer's designated service organization. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

1. Include visual inspections according to the "Visual Inspection Frequencies" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
2. Perform tests in the "Test Methods" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
3. Perform tests per the "Testing Frequencies" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

3.12 SOFTWARE SERVICE AGREEMENT

A. Comply with UL 864.

B. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for two (2) years.

C. Firmware Service Upgrades: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within two (2) years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.

1. Upgrade Notice: Provide at least thirty (30) days of advanced notice to the Owner to allow the Owner to schedule access to system and to upgrade computer equipment if necessary.

3.13 DEMONSTRATION AND TRAINING

A. Engage factory-authorized service representative(s) demonstrate the complete and operable system. Demonstration shall be coordinated with all other Vendors as necessary and shall include demonstration of all components including smoke control systems.

B. Train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system. Include training materials with Operation and Maintenance Manual. Training shall include a minimum of four (4) hours of field training and four (4) hours of classroom training for up to thirty (30) persons. Coordinate with Owner to determine classroom/conference room size and location and to determine the number of maintenance personnel that will attend.

C. Training shall include presentation, demonstration, and pricing to Owner for all the Manufacturer’s available software solutions for additional utilization features such as alarming (push notifications) to users at remote locations or monitoring/troubleshooting/testing by users at remote locations.

END OF SECTION 284621.11

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SECTION 333245 – HORIZONTAL SHAFT COMMINUTERS

PART 1 - GENERAL

1.1 SUMMARY

A. This section specifies equipment for the mechanical reduction in size of debris from incoming wastewater by means of a hydraulically driven comminutor. The comminutor shall be self-cleaning by means of the liquid flow through the device. The equipment shall be installed as shown on the plans, as recommended by the supplier, and in compliance with all OSHA, local, state and federal codes and regulations.

B. Each comminutor shall include an overflow bar rack, drive system and electrical control panel.

1.2 REFERENCES

A. The following industry standards shall be used in the manufacture of the comminutor:

1. American Society for Testing and Materials (ASTM) D3753-81: Fiber-Reinforced Polyester Manholes. American Society for Testing and Materials (ASTM) A36: Carbon Steel Plate
2. American Society for Testing and Materials (ASTM) A536-84: Ferritic Ductile Iron Castings
3. American Society for Testing and Materials (ASTM) A48-83: Grey Iron Casting
4. American National Standards Institute (ANSI) B16.42-1979, Class 150 Flanges
5. American Iron and Steel Institute (AISI) 303 Stainless Steel
6. American Iron and Steel Institute (AISI) 304 Stainless Steel
7. American Iron and Steel Institute (AISI) 316 Stainless Steel
8. American Iron and Steel Institute (AISI) 4130 Heat Treated Alloy Steel
9. American Iron and Steel Institute (AISI) 4140 Heat Treated Alloy Steel
10. American Iron and Steel Institute (AISI) 8620 Heat Treated Alloy Steel
11. American Iron and Steel Institute (AISI) 17-4 Stainless Steel
12. Society of Automotive Engineers (SAE) 660 Bearing Bronze

B. Controllers shall, as applicable, meet the requirements of the following Regulatory Agencies:

1. National Electrical Manufacturer’s Association (NEMA) Standards

2. National Electric Code (NEC)

3. Underwriters Laboratory (UL and cUL)

4. International Electrotechnical Commission (IEC)

1.3 SUBMITTALS

A. Shop drawings and product data shall be provided for engineering approval 30 days from receipt of order. Operating & Maintenance Manuals shall include equipment descriptions, operating instructions, drawings, troubleshooting techniques, a recommended schedule, and the recommended lubricants.

1.4 WARRANTY

A. The horizontal shaft comminutor shall be covered against manufacturing defects in materials and workmanship during normal use and service, as long as periodic maintenance procedures are followed and performed, for a period of one (1) year from date of substantial completion.

B. Cutting blades are not covered by the warranty.

1.5 SYSTEM STARTUP

A. Initial horizontal shaft comminutor equipment startup procedures shall be performed by the Manufacture's personnel and/or authorized representative. Detailed startup procedure instructions shall be included in the Manufacturer's Operating & Maintenance Manual.

1.6 OWNER'S INSTRUCTIONS

A. Operating & Maintenance Manuals that include the following sections shall be supplied with the equipment:
   1. Mechanical, Electrical & Hydraulic Drawings
   2. Job Information, Product Brochures, Warranty Information
   3. Mechanical Specifications

B. Standard Operating Procedures
   1. Sequence of Operation
   2. Startup, Manual, and Automatic Operation Procedures
   3. Shutdown Procedure
   4. Alarms & Troubleshooting

C. Maintenance Procedures

D. Mechanical Equipment Information

E. Electrical Equipment Information

F. Hydraulic Equipment Information

G. Spare Parts Information

1.7 Quality Assurance

A. Identification

1. Equipment shall be identified with a corrosion resistant nameplate affixed in a conspicuous location.

2. Nameplate information shall include manufacturer's name and address, equipment model number, and serial number.

B. Manufacturer

1. Supplier shall be ISO9001 certified and have a minimum 30 years experience as a manufacturer of municipal waste water equipment and a minimum 5,000 prior installations of similar equipment.

2. Supplier shall provide a list of reference sites for similar equipment for verification by the Engineer or Owner's Representative.

3. Supplier shall conduct factory testing and verification of equipment prior to shipment.

4. Supplier shall have factory owned bi-coastal service centers.

C. Installation & Start-up

1. Supplier shall provide services of a factory trained representative to check installation and review start-up of equipment and controls.

2. Supplier Representative shall inspect and approve site installation and supervise a review of the operation of the equipment.

3. Supplier Representative shall provide training on operation and maintenance requirements of the equipment.

1.8 Delivery, Storage and Handling

A. Packaging

1. Containers or skids shall be constructed for normal shipping, handling, and storage.

2. Containers shall provide adequate protection for the equipment in a dry indoor environment between +40° F (+4.5° C) and +100° F (+37.8° C).

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Mechanical Muffin Monster Manhole shall be in accordance with these specification and plans and shall be supplied by one of the following manufacturers:

1. JWC Environmental, 2850 Red Hill Avenue, Suite #125, Santa Ana, CA 92705
Tel: 800-331-2277
www.jwce.com

2. Approved equal.

B. Manufacturers requesting to be selected as an approved equal shall submit certified documentation including installation lists with phone numbers, equipment drawings, flow performance curves, electrical schematics and cut sheets, O&M draft showing compliance with these specifications a minimum of ten (10) days prior to bid opening. Selected equipment manufacturers shall be added to the list of approved manufacturers.

C. Selected approved equal manufacturers shall conduct an onsite test within ten (10) days of installation demonstrating compliance with all areas of this specification.

2.2 MUFFIN MONSTER MANHOLE

A. Summary

Grinder shall reduce or shred influent solids for protection of downstream equipment. Grinder shall be two shafted design consisting of individual cutters and spacers of equal diameter on both shafts. Grinder shall have high flow or slotted side rails. Grinder shall have an immersible motor and speed reducer for cutter drive.

Each manhole shall have a minimum ½-inch wall thickness, able to withstand a static load of 150 lb/ft per foot of depth with less than ¼-inch deflection. The manhole shall be fabricated with polyester resin, in one integral piece that is structurally strong, lightweight, watertight and corrosion resistant to salt water, ground water, corrosive soil conditions and many commonly encountered industrial chemicals.

The interior surface shall have a smooth white isophthalic gelcoat surface integral to the laminate and not applied as a spray on secondary process.

B Grinder Components

1. Cutters and Spacers

a. Cutting stack shall be a nominal height of 8 inches (203 mm).

b. Cutter shall be an individual disk constructed of hardened alloy steel surface ground to thickness of .438-inches +.000/-.001 (11 mm +.000/-.003).

c. Cutters shall be heat treated to produce a hardness of 60-65 Rockwell C.

d. Cutters shall have 17 Serrated cam shaped teeth. Tooth height shall not be greater than ½-inch (13 mm) above the root diameter of the cutter.

e. Spacers shall be an individual disk constructed of hardened alloy steel surface ground to a thickness of .446-inches +.001/-.000 (11.3 mm +.003/-.000).

f. Spacers shall have a hardness of 40-45 Rockwell C.

g. Spacers shall have a smooth outside diameter with no tooth profiles.

2. Shafts

a. Shafts shall be ASTM 4140 alloy steel with a minimum tensile strength of 149,000 PSI (1,027 kPA).

b. Shafts shall be measure a nominal 2-inches (51 mm) across flats of hex.

c. Shafts shall be hardened to 38-42 Rockwell C.

3. Seal Cartridges

a. Seal cartridges shall be rated to a maximum of 90 PSI (620 kPA).

b. Seal cartridges shall not require flushing.

c. Dynamic and rotating seal faces shall be tungsten carbide with 6% nickel binder.

d. O-rings shall be constructed of Buna-N (Nitrile).

e. Radial and axial loads shall be borne by sealed, oversized, deep-groove ball bearings.

4. Housings and Covers

a. Top cover and end housings shall be ASTM A536-84 ductile iron.

b. Bottom cover shall be ASTM A36 steel.

c. End housing shall have integral bushing deflectors to guide solids away from seal cartridges.

d. End housings shall have directional flow arrows cast into the external side walls.

5. Side Rails

a. Side rails shall be ASTM A536-84 ductile iron.

b. Side rails shall have evenly-spaced horizontal slots to increase flow and decrease water head loss through the grinder. Slots shall only be located on the upstream or influent side of the rail and the effluent side of the rail shall be void of slots to allow for unobstructed flow.

c. Inside profile of the cutters shall be concave and follow the radial arc of the cutters.

d. Clearance between the outside diameter of cutters and concave arc of the side rail shall not exceed 5/16-inch (7.9 mm).

6. Speed Reducer

a. Reducer shall be manufactured by Sumitomo Machinery Corporation of America.

b. Reducer shall be internal planetary mechanism with trochoidal curved tooth profile.

c. Reducer shall be a vertically mounted with 29:1 single reduction.

d. Reducer shall be grease lubricated.

7. Motor

a. Motor shall be manufactured by Baldor Electric Company.

b. Motor shall be XPNV immersible – type, 5 hp (3.75 kW), 1770 rpm, 208- 230/460 volt, 3 phase, 60 Hz. and shall have a 40’ power cable factory installed.

c. Motor shall have a minimum service factor of 1.15, 91% minimum efficiency factor at full load, minimum 76% power factor at full load and rated at UL NEMA 6P (IP67+).

C. Manhole Components

1. Fiberglass barrel shall be 48 inches (121.92 cm) in diameter.

2. Inlet and outlet pipe stubs, 6 inch (15.24 cm), 8 inch (20.32 cm), 10 inch (25.4 cm), or 12 inch (30.48 cm) with corresponding slip flange bolting connections for connection to incoming and outgoing pipes shall be supplied.

5. Stainless steel (T-304) anchoring brackets (4) for anchoring manhole to concrete base shall be supplied.

6. A ½ inch (1.27 cm) thick expanded polystyrene bead board for placement on concrete slab under manhole shall be supplied.

7. Internally-mounted fiberglass ladder with non-slip traction surface (meet or exceed OSHA General Industry Standards, Part 1910.27 for “Fixed Ladders” shall be supplied.

8. Non-traffic areas above grade manhole shall have lockable fiberglass lid able to withstand 1000 lbs. (453.6 kg) topload.

9. Traffic area manhole shall have concentric manway able to withstand 16,000 (7257.5 kg) vertical dynamic wheel load plus lateral forces with opening of 28 inches (71.12 cm) I.D. min. for use with cast-iron cover. To be supplied by other.

10. Factory installed and tested internally-mounted 306 SS (316 SS optional) guide rails for grinder installation and removal shall be supplied.

D. CONTROLLER

1. Controller shall provide control of the grinder and be designed to control one (1) 5 hp motor at 208-230/460 volts, 3 phase, 60 Hz. The controller shall have indicator lights, switches and other control devices.

   a. Enclosure shall be fiberglass reinforced polyester NEMA 4X .

   b. Enclosure shall house the control devices, motor starters, and PLC.

   c. Grinder ON-OFF/RESET-REMOTE three-position 22mm type, NEMA 4X selector switch

   d. In the OFF/RESET position, the grinder shall not run.

2.3 GRINDER PERFORMANCE

1. The grinder will be capable of processing up to 335 GPM (31 L/S) with a minimum headloss of eight (8) inches (203 mm) based on clear wastewater at a typical downstream water level of four (4) inches (102 mm).

2. Grinder shall provide peak shaft torque of 4,756 lb-in/hp (721 Nm/kW).

3. Grinder shall provide peak force at cutter tip of 2,051 lb_f/hp (12,234 N/kW).

   a. In the ON position, the grinder shall run continuously.

   b. In the REMOTE position, the grinder shall start and stop as controlled by an external device.

   c. Selector switch shall be the only method for resetting the controller after a failure.

4. Pilot Lights

   a. Lights shall be LED type 22 mm, rated NEMA 4X.

   b. Lights shall indicate POWER ON, RUN, and FAIL.

5. Programmable Logic Controller (PLC)

    a. PLC shall be manufactured by Panasonic.

    b. PLC shall have a minimum of 16K of memory.

6. Motor Starter

    a. Starter shall be a full-voltage reversing type with 120 volt operating coils.

    b. Overload relays shall be adjustable and sized to full load amperes (FLA) of the motor.

7. Control Transformer

    a. Control transformer shall be minimum 130 VA.

    b. Control transformer primary and secondary shall be fused for over current protection.

8. Current Transducer

    a. Current transducer shall be manufactured by Veris Industries.

    b. Current transducer shall have adjustable set point from 1-135A with 200 ms or less response time.

9. Fail Conditions

    a. When a grinder jam obstruction occurs, the controller shall stop the grinder and reverse the rotation to clear the obstruction. If the obstruction is cleared, the controller shall return the grinder to normal operation. If three (3) reverses occur within a 30 second interval, the controller shall stop the grinder motor in a jam condition and activate the grinder FAIL indicator and relay.

    b. When a power failure occurs while the grinder is operating, the grinder will resume operation once power is restored.

    c. When a power failure occurs while the grinder is in a fail condition, once power is restored the fail indicator shall reactivate and remain until reset.

    d. Reset of the grinder shall be accomplished from the controller only.

2.6 SOURCE QUALITY CONTROL

A. The machine shall be factory assembled and tested before shipping.

PART 3 - EXECUTION

3.1 PREPARATION

A. Equipment shall be supervised and installed by manufacturer and/or an authorized manufacturer representative.

3.2 INSTALLATION

A. Shall be installed in accordance with supplier's installation instructions, and in accordance with all OSHA, local, state, and federal codes and regulations.

3.3 FIELD QUALITY CONTROL

If required, an authorized manufacturer representative shall be provided to assist in the installation and startup of the unit, and to provide training to equipment operator personnel. A field training course shall be provided for operation and supervisory staff members. Field instruction shall cover items for successful operation contained in the operation & maintenance manuals.

END OF SECTION 333245

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