ADDENDUM TWO

Addendum Two to the drawings and specifications prepared by Myszak + Palmer for **Pantheon Business Theatre Renovations** for **Pantheon Board of Directors**, Vincennes, Indiana.

All Contractors bidding on this project shall read all of the items covered below and shall comply with all of the requirements as set forth, including any necessary refinements or additions generated by this Addendum and required by the intent of the original contract documents. All Contractors shall acknowledge on their bid form that they have received this Addendum, Subsequent Addenda, and include the appropriate content of same within their bid proposal

ADDENDUM TWO

SPECIFICATIONS

1. Section 062000 FINISH CARPENTRY SPECIFICATION

A. Crown molding wood trim 'E'. Basis of design by Mirror Reflections.
   a. Mirror Reflections Custom Moulding Knives – Two-piece crown moulding 12-3/8"

2. Section 093000 TILING SPECIFICATION

A. Sheet A6.0 – Room Finish Schedule
   a. Walls (See attached addendum drawing)
      i. Material
         1. Note 3 shall be noted as 12x12 ceramic tile

3. Section 096510 DECORATIVE EPOXY FLOORING SPECIFICATION

A. Acceptable Manufacturer of Decorative Epoxy Flooring
   a. Sherwin Williams, Ceramic Carpet #400 Decorative Broadcast

4. Section 270500 PATHWAYS FOR COMMUNICATIONS SYSTEMS SPECIFICATION

A. See the attached specification section 270500 Pathways for Communications Systems

5. Section 270503 COMMUNICATIONS EQUIPMENT ROOM FITTINGS SPECIFICATION

A. See the attached specification section 270503 Communications Equipment Room Fittings

6. Section 270506 TELECOMMUNICATIONS GROUNDING AND BONDING SPECIFICATION

A. See the attached specification section 270506 Telecommunications Grounding and Bounding

7. Section 271500 COMMUNICATIONS COPPER HORIZONTAL CABLING SPECIFICATION

A. See the attached specification section 271500 Communications Copper Horizontal Cabling

8. Drawing ST1.4 (Revised Drawing Attached) DRAWING CLARIFICATION

A. Detail 4 – Crown Molding on bulkhead shall be trim 'E'. Bulkhead heights included.

9. Drawing A6.0 (Revised Drawing Attached) DRAWING CLARIFICATION

A. Interior Trim Detail – Trim 'E' added

10. Drawing E.5 DRAWING CLARIFICATION

A. Interior Elevations (Men's 112 & Women's 114) – 12x12 Ceramic tile shall be placed on all walls at indicated height.
B. Interior Elevations (Men's 112) – One urinal added to men's restroom.

11. Drawing E.5 DRAWING CLARIFICATION

A. MDF Room – Electrical contractor to provide 4' x 8' painted plywood to demarc location. Electrical contractor to provide swing gate wall rack, 26U, 19" EIA, 24 depth, 53.6 height, 21.7 width. Equip with 48 port modular patch panels, as needed. Equip with CAT6 modular jacks. Rack should be grounded to main electrical ground.
B. Technology contractor to coordinate sleeve locations with electrical contractor.

12. Drawing E.6 (Revised Drawing Attached) DRAWING CLARIFICATION

A. Provide (2) CCTV data and conduit on either side of main entry.
B. Provide (4) (2) CCTV data and conduit in open office.
C. Add (2) data drops at open office area.
D. Add (1) data drop in kitchen.

13. Drawing E.7 (Revised Drawing Attached) DRAWING CLARIFICATION

A. Add (2) data drops at conference room floor box.
B. Add (2) data drops at conference room wall.
C. Relocate power and data drops to desk location in south office.

14. Drawing E.8 (Revised Drawing Attached) DRAWING CLARIFICATION

A. Add (1) data drop at each desk. Provide 1" conduit for mic cables at each desk.
B. Add (2) CCTV data and conduit.
C. Provide 120V power and conduits at cabinet for audio cables and data drops. This will tie to room speakers and mics. Locate outlets at 60" from floor. Add (2) data drops at this location.
D. Provide conduit for (5) speakers located throughout room. Owner will provide and install speakers.

DRAWINGS

Addendum 2 Drawing ST1.4
Addendum 2 Drawing A6.0
Addendum 2 Drawing A6.1
Addendum 2 Drawing E.6
Addendum 2 Drawing E.7
Addendum 2 Drawing E.8

Pages 1 through 57 constitute the total makeup of **Addendum Two** with attached drawings and other supporting data following page 3. Contractor shall notify Architect if all pages are not received.

myszak + palmer
ARCHITECTS

SECTION 062000 - FINISH CARPENTRY

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Samples for mouldings.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Lumber: DOC PS 20 and grading rules of inspection agencies certified by American Lumber Standards Committee Board of Review.

B. MDF: ANSI A208.2, Grade 130, made with binder containing no urea-formaldehyde resin.

C. Particleboard: ANSI A208.1, M-2, made with binder containing no urea-formaldehyde resin.

D. Melamine-Faced Particleboard: Particleboard complying with ANSI A208.1, Grade M-2, finished on both faces with thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.

2.2 INTERIOR STANDING AND RUNNING TRIM

A. Interior Softwood Lumber Trim: Finish or 1 Common (Colonial) eastern white, Idaho white, lodgepole, ponderosa, or sugar pine .

1. Maximum Moisture Content: 19 percent.

B. Wood Moldings: WMMPA WM 4 made to patterns in WMMPA WM 12 from kiln-dried stock.

1. Moldings for Painted Finish: P-Grade eastern white, Idaho white, lodgepole, ponderosa, radiata, or sugar pine or primed medium-density fiberboard.
2. Base: See drawings.
3. Casing: See drawings.
4. Chair Rail: See drawings.

2.3 SHELVING AND CLOTHES RODS

A. Shelving: White, coated steel wire shelving with integral rod by Rubbermaid or equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Condition finish carpentry in installation areas for 24 hours before installing.

B. Install finish carpentry level, plumb, true, and aligned with adjacent materials. Scribe and cut to fit adjoining work. Refinish and seal cuts.

C. Install standing and running trim with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Stagger joints in adjacent and related trim. Cope at returns and miter at corners.

END OF SECTION 062000

SECTION 093000 - TILING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data and Samples.

B. Obtain tile of each type and color or finish from same production run for each contiguous area

C. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling ceramic tile packages.

PART 2 - PRODUCTS

2.1 CERAMIC TILE

A. Ceramic tile that complies with Standard grade requirements in ANSI A137.1, "Specifications for Ceramic Tile."

B. Tile Type 1: Factory-mounted unglazed, porcelain cushion-edged ceramic mosaic tile.

1. Manufacturers: One of the following:
2. Basis-of-Design Product: Product indicated on Drawings a comparable product of one of the following:
    a. Crossville, Inc. Notorious

3. Module Size: 12 by 24 inch
4. Surface: Slip resistant, with abrasive admixture.
5. Finish: Mat, clear glaze.
6. Color and Pattern: As selected
7. Grout Color: As selected
8. Trim Units: Coordinated with sizes and coursing of adjoining flat tile and matching characteristics of adjoining flat tile:

    a. Base: Coved.
    b. Base Cap for Thin-Set Mortar Installations: Surface bullnose.
    c. Wainscot Cap for Thin-Set Mortar Installations: Surface bullnose.
    d. External Corners for Thin-Set Mortar Installations: Surface bullnose.
    e. Internal Corners: Cove.

2.2 INSTALLATION MATERIALS

A. Waterproofing Membranes for Thin-Set Installations: ANSI A118.10, urethane waterproofing and adhesive.

B. Setting and Grouting Materials: Comply with material standards in ANSI's "Specifications for the Installation of Ceramic Tile" that apply to materials and methods indicated.

1. Thin-Set Mortar Type: Dry-set Portland cement.

a. Manufacturers: One of the following:
b. Basis-of-Design Product: or a comparable product of one of the following:
1) Bostik, Inc.
2) MAPEI Corporation.
3) TEC; a subsidiary of H. B. Fuller Company.

2. Grout Type: Standard cement, unless otherwise indicated.

a. Manufacturers: One of the following:
b. Basis-of-Design Product: or a comparable product of one of the following:
1) Bostik, Inc.
2) MAPEI Corporation.
3) TEC; a subsidiary of H. B. Fuller Company.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. For installations indicated below, follow procedures in ANSI's "Specifications for the Installation of Ceramic Tile" for providing 95 percent mortar coverage.

a. Tile floors in wet areas.
b. Tile floors composed of tiles 8 by 8 inches or larger.
c. Tile floors composed of rib-backed tiles.

B. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

C. Lay tile in grid pattern unless otherwise indicated. Align joints where adjoining tiles on floor, base, walls, and trim are the same size.

D. Install cementitious backer units and treat joints according to ANSI A108.11.

E. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.

F. Install waterproofing to comply with ANSI A108.13.

G. Do not install tile over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

H. Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in latex-portland cement mortar (thin set).

I. Apply sealer to cleaned stone tile flooring according to sealer manufacturer's written instructions.

J. Interior Floor Tile Installation Method(s):

1. Over Concrete Subfloors: TCA F113 (thin-set mortar)

K. Interior Wall Tile Installation Method(s):
1. Over Metal Studs or Furring: TCA W243 (thin-set mortar on gypsum board)

END OF SECTION 093000

SECTION 096510 – DECORATIVE EPOXY FLOOR SYSTEM

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Section Includes

1. Special decorative epoxy flooring system materials including underlayments, waterproofing membranes, primers, fillers, and other applied materials used as prime, body coat and finish coats and the application of these materials.

B. Provisions established within the Contract, Division 1, General Requirements, and the Drawings are collectively applicable to this Section.

1.2 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

B. Military Specification (MIL)
MIL-D-24613 Deck Covering Materials, Interior Cosmetic Polymeric

1.3 SUBMITTALS

A. Prior to commencing work, submit manufacturer's technical information and installation details to describe materials to be used. The same manufacturer shall supply all polymer wall and floor finishes.

B. Owner and Contractor shall review and mutually agree upon color, grade and final texture of special decorative floor system before starting installation.

C. Before beginning work, samples of the type of flooring shall be provided for the owners/architect's approval.

1.4 QUALITY ASSURANCE

A. Contractor shall be an established firm regularly engaged in satisfactory installation of similar materials and provide a list of 3 projects of similar nature and complexity completed in the last 5 years. Contractor shall provide a letter of certification by manufacturer that Contractor is a current qualified installer.

B. Single source responsibility: Provide fillers, underlayments, waterproof membrane, primers, body coats and top coats produced by the same manufacturer with no less than 10 years of experience in the manufacture and supply of princi-

pal materials for work in this section.

C. Prior to commencing the installation, the Contractor shall install, with Owner's approval, a mutually agreed upon sample ("mock-up") to show final color and texture of the system. This mock-up shall serve as a job standard for the final installation.

1.5 DELIVERY AND STORAGE

A. Material shall be delivered to project site in manufacturer's original unopened containers bearing manufacturer's name, product and color.

B. Materials shall be stored indoors, protected from damage, moisture, direct sunlight and temperatures below 50 degrees F or above 80 degrees F.

1.6 WARRANTY

A. Contractor shall furnish a written warranty covering both material and workmanship for a period of one full year from the date of installation.

PART 2 - PRODUCTS

2.1 Manufacturer: BASF

A. Product: MasterTop 1234

1. Special decorative flooring shall be a two-component epoxy floor system with colored quartz aggregate applied to a minimum finished thickness of 1/8 inch. Decorative special flooring shall be finished with a minimum of two clear topcoats to achieve the texture selected.

a. Physical Properties - The Special Decorative Flooring Systems shall comply with the following minimum test standards

Compressive Strength, ASTM C 579	12,300 psi
Tensile Strength, ASTM D 638	1,160 psi
Flexural Strength, ASTM D 790	4,600 psi
Indentation, MIL-D-24613	24 hrs. residual, 0.0008 inch
Impact Resistance, MIL-D-24613	No chipping, cracking or delamination
Fire Resistance, MIL-D-24613	Fire retardant
Nonslip properties, MIL-D-24613	Static Friction .6
	Static Friction .6
Abrasion Resistance, CS17 Wheel 1000 gram load, 1000 cycles	.060 gram loss

A. MasterTop TC 493 Chemical Resistance Polyurethane Top Coat

1. Chemical resistant aliphatic polyurethane sealer applied by squeegee or trowel and roller at a minimum dry film thickness of 4 mils.

a. Physical Properties - The chemical resistant sealer shall comply with the following minimum test standards:

Composition	*Aliphatic Polyurethane*
Taber Abrasion, ASTM D 4060, CS 17 wheels @ 1,000 cycles, 1,000 gram load	*75 mg loss*
Impact Resistance 160 IN-LBS, Gardner Impact Test	*PASS*
Slip resistance (Coefficient of Friction) ASTM D-2047	*0.74 dry* *0.73 wet*
bMixed VOC	*335g/L, 39 % solids*
Mixed .Viscosity	*350-450 cps*
Pot Life	*1.5 hours +/- 15 minutes*
RecoaCInterval	*3 – 4 hours*

h

Chemical Resistance. The flooring system shall show no chemical attack or discoloration when tested in accordance with ASTM D 1308 at 72 degrees F. against the following reagents and concentrations noted for 7 days.

Reagent	*Reagent*
Acetic Acid 20%	*Benzene*
Acetone	*Benzoic Acid*
Hydrofluoric Acid	*Butyl Alcohol*
Lactic Acid 50%	*Citric Acid*
Nitric Acid 10%	*Diesel Fuel*
Phenol	*Stearic Acid*
Sulfuric Acid 45%	*Amyl Acetate*
Toluene	*Dichloracetic Acid*
Trichloroethylene	*Chlorobenzene*

B. Supplier: CSS Coatings; 3362 Industrial Dr.
Bowling Green, KY 42101
Phone (270) 793-9069
Fax (270) 793-9082
Contact: Matt Nelson

C. Installer: CSS Coatings, or equal

D. Color: Selected by Owner (3 colors)

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. After concrete curing period (28 days minimum) has elapsed, surface must be clean and dry, physically sound and free of contamination. Surfaces must be free
of holes, voids, or defects. Cracks and abrupt changes in surface profile must be corrected. Fins and projections must be removed. All curing compounds and sealers must be removed.

B. Verify that moisture content is within range acceptable to flooring manufacturer, using a calcium chloride test kit in accordance with ASTM F-1869.

C. Contractor must report, in writing, surfaces left in improper condition by other trades. Application will constitute acceptance of surfaces by the applicator.

3.2 PREPARATION

A. Prepare surfaces as required, per manufacturer's printed instructions. Preferred surface preparation is shotblast or similar mechanical method.

B. Patch all depressions, divots, honeycombed or scaled concrete with filler as recommended by manufacturer.

C. Level and slope floor, as required, with manufacturer's acrylic or epoxy modified mortar underlayment.

D. Fill all non-moving cracks or control joints with joint filler as recommended by manufacturer.

E. Fill all moving cracks or joints with a firm but flexible (or non-rigid) sealant material as recommended by manufacturer. Expansion joints should be re-cut in finished floor, if required, and filled with sealant.

F. Masking: Mask surfaces that require protection.

3.3 INSTALLATION

A. Comply with flooring system manufacturer's recommendation.

1. Materials shall be prepared and mixed in compliance with flooring manufacturer's instructions.

3. Apply primer/receiving coat of epoxy resin.

4. Broadcast selected pattern of colored quartz aggregate into wet epoxy to complete saturation, dry appearance. Allow to cure overnight.

5. Vacuum excess aggregate. Apply second broadcast application to achieve necessary thickness of 1/8 inch.

6. After overnight cure, vacuum excess aggregate and apply clear polyurethane grout coat.

7. Apply clear polyurethane finish to achieve desired finish and texture selected.

B. Cove Base: Where specified, install a 4-inch-high with a nominal 1-inch radius onto wall surfaces. All cove bases shall terminate into cap strips, unless otherwise noted on drawings.

3.4 CLEANUP

A. Remove waste materials, rubbish and debris and dispose of them at Owner's direction. Leave work areas in a clean condition.

3.5 PROTECTION

A. Protect the completed work from water, airborne particles or other surface contaminants until cured, tack free, approximately 18-24 hours after application.

B. Protect completed system from traffic and physical abuse for approximately 72 hours. Protect completed system from immersion and chemical exposure until thoroughly cured, approximately seven (7) days at 70° F.

B. Protection from migrating plasticizers from tires that may discolor the floor rubber mats made specifically for this purpose should be utilized as protection under the tires

END OF SECTION 096510

SECTION 270500 – 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. Surface pathways.

B. Related Requirements:

Division 27 Section "Intercommunications System".
1. Division 270500 Pathways for Communications Systems
2. Division 270503 Communications Equipment Room Fittings
3. Division 270506 Telecommunications Grounding Systems
4. Division 271500 Communicatins Copper Horizontal Cabling

C. Install: Operations at project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

D. Provide: Furnish and install, complete and ready for the intended use.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

AFC Cable Systems, Inc.
1. Allied Tube & Conduit; a Tyco International Ltd. Co.
2. Southwire Company.
3. Thomas & Betts Corporation.

4. Misc. equal

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. EMT: Comply with ANSI C80.3 and UL 797.

D. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
2. Fittings for EMT:

a. Material: Steel or die cast.
b. Type: Setscrew.

2.2 OPTICAL-FIBER-CABLE PATHWAYS AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

Alpha Wire Company.
1. B-Line
2. Erico
3. Panduit
4. Approved Equal

B. Description: Comply with UL 2024; flexible-type pathway, approved for plenum 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.

2.3 SURFACE PATHWAYS

General Requirements for Surface Pathways:

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.

Surface Nonmetallic Pathways: Two- or three-piece construction, complying with UL 5A, and manufactured of rigid PVC with texture and color selected by Architect from manufacturer's standard colors. Product shall comply with UL-94 V-0 requirements for self-extinguishing characteristics.

3. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Hubbell Incorporated; Wiring Device-Kellems Division.
    b. Lamson & Sessions; Carlon Electrical Products.
    c. Mono-Systems, Inc.
    d. Panduit Corp.
    e. Wiremold / Legrand.
    f. Approved Equal

General Requirements for Boxes, Enclosures and Cabinets:

2.4 BOXES, ENCLOSURES, AND CABINETS

Manufacturers: Subject to compliance with requirements, provide products by the following:

General Requirements for Boxes, Enclosures and Cabinets.

1. Chatsworth (CPI).
2. Panduit
3. Hubbell
4. Approved Equal
5. Comply with TIA-569-B.
6. Boxes, enclosures and cabinets installed in wet locations shall be listed for use in wet locations.

Sheet-Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

B. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy or aluminum, Type FD, with gasketed cover.

C. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

D. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum or galvanized, cast iron with gasketed cover.

E. Device Box Dimensions: 4 inches square by 2-1/2 inches deep.

F. Gangable boxes are allowed.

G. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise indicated.

Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.

Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

Cabinets:

NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.

1. Hinged door in front cover with flush latch and concealed hinge.
2. Key latch to match panelboards.
3. Metal barriers to separate wiring of different systems and voltage.
4. Accessory feet where required for freestanding equipment.
5. **NO CABINETS INSTALLED ON THIS PROJECT.**

2.5 PATHWAY

1. Exposed, Not Subject to Physical Damage: EMT or RNC.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: GRC. Pathway locations include the following:

    a. Loading dock.
    b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
    c. Mechanical rooms.
    d. Gymnasiums

4. Concealed in Ceilings and Interior Walls and Partitions: EMT RNC, Type EPC-40-PVC or innerduct.
5. Damp or Wet Locations: GRC IMC.

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 Insert pathway type.
7. Pathways for Optical-Fiber or Communications-Cable Risers in Vertical Shafts: Riser-type, optical-fiber-cable pathway Riser-type, communications-cable pathway EMT Insert pathway type.
8. Pathways for Concealed General-Purpose Distribution of Optical-Fiber or Communications Cable: General-use, optical-fiber-cable pathway Riser-type, optical-fiber-cable pathway Plenum-type, optical-fiber-cable pathway General-use, communications-cable pathway Riser-type, communications-cable pathway Plenum-type, communications-cable pathway EMT.
9. Boxes and Enclosures: NEMA 250 Type 1, except use NEMA 250 Type 4 stainless steel nonmetallic in institutional and commercial kitchens and damp or wet locations.

B. Minimum Pathway Size: 3/4-inch trade size. Minimum size for optical-fiber cables is 1 inch.

C. 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 setscrew, steel or cast-metal fittings. Comply with NEMA FB 2.10.

D. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

E. Install surface pathways only where indicated on Drawings.

F. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

2.6 INSTALLATION

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.

A. 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.

B. Complete pathway installation before starting conductor installation.

C. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

D. Arrange stub-ups so curved portions of bends are not visible above finished slab.

E. Install no more than the equivalent of two 90-degree bends in any pathway run. Support within 12 inches of changes in direction. Utilize long radius ells for all optical-fiber cables.

F. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

G. Support conduit within 12 inches of enclosures to which attached.

H. 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 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 ENT to RNC, Type EPC-40-PVC, GRC or IMC before rising above floor.

Stub-ups to Above Recessed Ceilings:

6. Use EMT, IMC, or RMC for pathways.
7. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

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.

I. Coat field-cut threads on PVC-coated pathway with a corrosion-preventing conductive compound prior to assembly.

J. 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.

K. Install pathways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

L. 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.

M. Cut conduit perpendicular to the length. For conduits of 2-inc. Cap underground pathways designated as spare above grade alongside pathways in use.h trade size and larger, use roll cutter or a guide to ensure cut is straight and perpendicular to the length.

N. **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.

O. 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.

4. 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.

P. 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.

Comply with manufacturer's written instructions for solvent welding PVC conduit and fittings.

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.

Q. 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.

R. Horizontally separate boxes mounted on opposite sides of wall so they are not in the same vertical channel.

S. 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.

T. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

U. Set metal floor boxes level and flush with finished floor surface.

2.7 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. Warning Planks: Bury warning planks approximately 12 inches above direct-buried conduits, but a minimum of 6 inches below grade. Align planks along centerline of conduit.

7. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

2.8 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."

2.9 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

2.10 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

SECTION 270503 – 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:

Telecommunications mounting elements.
1. Telecommunications equipment racks and cabinets.
2. Grounding.

B. Related Requirements:

Division 27 Section "Intercommunications System".
1. Division 270500 Pathways for Communications Systems
2. Division 270503 Communications Equipment Room Fittings
3. Division 270506 Telecommunications Grounding Systems
4. Division 271500 Communicatins Copper Horizontal Cabling

1.3 DEFINITIONS

A. BICSI: Building Industry Consulting Service International.

Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

EMI: Electromagnetic interference.

IDC: Insulation displacement connector.

LAN: Local area network.

RCDD: Registered Communications Distribution Designer.

UTP: Unshielded twisted pair.

A. Furnish: Supply and deliver to Project site, ready for unloading, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

B. Install: Operations at project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

C. Provide: Furnish and install, complete and ready for the intended use.

1.2 ACTION SUBMITTALS

A. Product Data with Shop Drawings:

1. Product Data: For each type of product.

a. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for equipment racks and cabinets.
b. Provide as a single complete system submittal with master product list referencing each paragraph in this section specifying product.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, qualified layout technician, installation supervisor, and field inspector.

1.4 QUALITY ASSURANCE

A. All Work specified under this Section shall be fully compliant with following:

1. ANSI/TIA-568-C.1-2009 "Commercial Building Telecommunications Cabling Standard (Currently Ratified) including all addenda and subsets."
2. ANSI/TIA-569-C-2012 "Telecommunications Pathways and Spaces (Currently Ratified) including all addenda and subsets."
3. ANSI/TIA-606-B-2012 "Administrative Standard for the Telecommunications Infrastructure (Currently Ratified) including all addenda and subsets."
4. ANSI/TIA-607-B-2012 "Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises (Currently Ratified) including all addenda and subsets."
5. ANSI/TIA-758-B-2012 "Customer-owned Outside Plant Telecommunications Infrastructure Standard (Currently Ratified) including all addenda and subsets."
6. In addition, all Work shall fully comply with these specifications and related Drawings and all manufacturers' recommended installation practices.

B. Installer Qualifications: Cabling Installer must have personnel certified by to install all equipment called out bid on staff. **Please provide supporting documentation with bid package. Provide any Certifications available.**

Installation Supervision: Installation shall be under the direct supervision of Registered Technician, who shall be present when work of this Section is performed at Project site.

PART 2 - PRODUCTS

2.1 PATHWAYS

A. General Requirements: Comply with TIA/EIA-569-A.

Cable Support: NRTL labeled. Cable support brackets shall be designed to prevent degradation of cable performance and pinch points that could damage cable. Cable tie slots fasten cable ties to brackets.

Comply with NFPA 70 and UL 2043 for fire-resistant and low-smoke-producing characteristics.

1. Support brackets with cable tie slots for fastening cable ties to brackets.
2. Cable supporting devises with round surfaces (i.e., bridal rings) are not acceptable.
3. Do not route communications cabling through structural roof joists.
4. **Do not share or allow sharing of pathways with other system wiring such as alarm and audio wiring.**
5. Straps and other devices.

B. Cable Trays:

Manufacturers: Subject to compliance with requirements, provide products by one of the following if required:

- a. Chatsworth Products, Inc. or equal.

b. Include all manufacturer recommended hardware and accessories where applicable for a complete system including, but not limited to, washers, mounting brackets, splice extension clamps, horizontal tee splice kits, corner support kits, adjustable vertical bend kits, adjustable vertical splice kits, runway support kits designed for ceiling support from all threaded rod, threaded rod protectors, wall brackets and supports, dividers, blind ends, cable rollers, toolless clips, strut monuting clips, conduit connectors, rack clamps, adaptor kits, radius shields, rubber caps, ground bolts, ground wire supports, runway drop-out at equipment racks and cabinets, runway end caps, etc.
c. Support with wall bracing at tray ends
d. Use only manufacturer-recommended installation tools and practices.
e. In the main Telecommunications Equipment Room on the Mezzaninne level provide provide 2 sections 18-inches wide ladder Tray. Exact location of lader tray will be provided by electrical engineer later. Provide for mounting this with angled wall brackets and an equipment rack mounting plate.

2.2 EQUIPMENT RACKS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Chatsworth Products, Inc.
2. PANDUIT
3. HUBBELL
4. Approved Equal

B. General MDF Requirements:

Ladder Tray:
1. Module Dimension: Width compatible with EIA 310-D standard, 19-inch panel mounting.
a. In the Telecommunication Room (TR) provide a minimum 18-inches wide ladder Tray.
b. All racks require a CPI Tray to Rack mounting attachment or equal.
c. Mount all ladder tray on Floormounted Rack.
2. Finish: Manufacturer's standard, baked-polyester powder coat.

C. Floor-Mounted Racks: Modular-type, aluminum construction. Vertical and horizontal cable management channels, top and bottom cable troughs, grounding lug, grounding busbar, one rack-mounted horizontal power strip.
1. Baked-polyester powder coat finish.
2. Provide 19” x 84” x 3” Universal Rack equipped with 4” front and rear Vertical Wire manangers with doors on front.

D. Cable Management for Equipment Frames:

Metal, with integral wire retaining fingers.

1. Baked-polyester powder coat finish.
2. Vertical cable management panels shall have front and rear channels, with covers.

2.3 POWER STRIPS

A. Power Strips: Comply with UL 1363.

Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1. Provide one 20amp rack strip for this project.
2. Corded horizontal Cabinet/Rack mounting.
3. Provide PANDUIT CMRPSH20 or approved equal.

2.4 GROUNDING

A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems." for grounding conductors and connectors.

Telecommunications Main Bus Bar:

Connectors: Mechanical type, cast silicon bronze, solderless -type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

1. Ground Bus Bar: Copper, minimum ¼” thick by 4 inches wide with 9/32-inch holes spaced 1-1/8 inches apart.
2. Stand-Off Insulators: Comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.

B. Comply with ANSI/TIA-607-B-2012.

2.5 LABELING

Comply with TIA/EIA-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 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install equipment frames and cable trays until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and work above ceilings is complete.

3.2 CLEANING AND PROTECTION

A. Protect system components from damage and deterioration during installation. Protect equipment from dust and debris during installation. After installation maintain equipment protection. Notify other trades of equipment sensitivity to dust and debris. Clean equipment upon completion of Work.

Before final acceptance, clean system components.

3.3 COORDINATION

A. Coordinate layout and installation of communications equipment with Owner's telecommunications and LAN equipment and service suppliers. Coordinate service entrance arrangement with local exchange carrier.

1. Meet jointly with telecommunications and LAN equipment suppliers, local exchange carrier representatives, and Owner to exchange information and agree on details of equipment arrangements and installation interfaces. Record agreements reached in meetings and distribute them to other participants.
2. Adjust arrangements and locations of distribution frames, cross-connects, and patch panels in equipment rooms to accommodate and optimize arrangement and space requirements of telephone switch and LAN equipment.
3. Adjust arrangements 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 the equipment room.

B. Coordinate location of power raceways and receptacles with locations of communications equipment requiring electrical power to operate.

3.4 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 Division 27 Section "Communications Entrance Conduits" for materials and installation requirements for underground pathways.

3.5 INSTALLATION

A. Comply with NECA 1.

Comply with BICSI TDMM for layout and installation of communications equipment rooms.

Cable Trays: Comply with NEMA VE 2 and TIA/EIA-569-A-7.

Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

Coordinate layout and installation of communications equipment with Owner's telecommunications and LAN equipment and service suppliers. Coordinate service entrance arrangement with local exchange carrier.

Meet jointly with telecommunications and LAN equipment suppliers, local exchange carrier representatives, and Owner to exchange information and agree on details of equipment arrangements and installation interfaces.

1. Record agreements reached in meetings and distribute them to other participants.
2. Adjust arrangements and locations of distribution frames, cross-connects, and patch panels in equipment rooms to accommodate and optimize arrangement and space requirements of telephone switch and LAN equipment.
3. Adjust arrangements 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 the equipment room.

B. Coordinate location of power raceways and receptacles with locations of communications equipment requiring electrical power to operate.

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 Division 27 Section "Sleeves and Sleeve Seals for Communications Pathways and Cabling."

3.7 FIRESTOPPING

A. Comply with requirements in Division 07 Section "Penetration Firestopping."

Comply with TIA-569-B, Annex A, "Firestopping."

Comply with BICSI TDMM, "Firestopping Systems" Article.

3.8 GROUNDING

A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

Comply with ANSI/TIA-607-B-2012.

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.

Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

Bond the shield of shielded cable to the grounding bus bar in communications rooms and spaces.

3.9 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA/EIA-606-B. Comply with requirements in Division 26 Section "Identification for Electrical Systems."

Comply with requirements in Division 09 Section "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.

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.

Labels shall be preprinted or computer-printed type.

END OF SECTION

SECTION 270506 – TELECOMMUNICATIONS GROUNDING AND BOUNDING

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.

Refer to the T Series Drawings for work related to this Specification Section.

Related Sections:

Division 27 Section "Intercommunications System".
1. Division 270500 Pathways for Communications Systems
2. Division 270503 Communications Equipment Room Fittings
3. Division 270506 Telecommunications Grounding Systems
4. Division 271500 Communicatins Copper Horizontal Cabling

1.2 DEFINITIONS

A. Bonding - The permanent joining of metallic parts to form an electrically conductive path that will assure electrical continuity and the capacity to conduct safely any current likely to be imposed.

Bonding Conductor for Telecommunications (BCT) - A conductor that interconnects the telecommunications bonding infrastructure to the building's service equipment (power) ground.

Telecommunications Bonding Backbone (TBB) - A conductor that interconnects the telecommunications main grounding busbar (TMGB) to the telecommunications grounding busbar (TGB).

Telecommunications Grounding Busbar (TGB) - The interface to the building telecommunications grounding system generally located in telecommunications room. A common point of connection for telecommunications system and equipment bonding to ground, and located in the telecommunications room or equipment room.

Telecommunications Main Ground Busbar (TMGB) - A busbar placed in a convenient and accessible location and bonded by means of the bonding conductor for telecommunications to the building service equipment (power) ground.

1.3 SUMMARY

This Section specifies the minimum requirements for a complete telecommunications bonding and grounding infrastructure and its interconnection to electrical systems and telecommunications systems.

Provide, install, and test a complete grounding (earthing) and bonding system for the telecommunications infrastructure. Telecommunications Infrastructure components will achieve a common ground with the Building's electrical system ground.

1. Reference the Grounding and Bonding Diagram in the associated drawings for a schematic of the minimum required connectivity.

    a. At minimum, the system shall bond together all racks/cabinets, cable tray, ladder rack, and other metallic components within each ER/TR, bond each TR to the ER, and bond the resulting grounding system with the Electrical grounding system.
    b. Label, Test, and document the entire system.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1. Provide as a single complete system submittal with master product list referencing each paragraph in this section specifying product.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For grounding to include the following in operation, and maintenance manuals:

1. Instructions for periodic testing and inspection of grounding features at grounding connections.

1.6 QUALITY ASSURANCE

A. All installation practices shall be fully compliant with:

ANSI-J-STD-607-B-2011, "Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises."

1. ANSI/NECA/BICSI-607, "Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings."

B. All Work shall fully comply with these Specifications and related Drawings and all manufacturers recommended installation practices.

PART 2 - PRODUCTS

2.1 GROUNDING AND BONDING BUSBARS

A. General:

Locate TMGB and TGB at working height. Coordinate location with Engineer.

B. Telecommunications Main Grounding Busbar (TMGB):

Erico Electrical Products 1/4 inch thick x 4 inches high x 16 inches wide ground busbar assembly Part Number B544A028 or approved equal.

Telecommunications Grounding Busbar (TGB):

Erico Electrical Products 1/4 inch thick x 2 inches high x 16 inches wide ground busbar assembly Part Number B544A028 or approved equal.

C. Equipment rack busbar:

As specified in Division 270503 “Communications Equipment Room Fittings.”

2.2 BONDING CONDUCTORS

A. All bonding conductors shall be green insulated copper unless otherwise noted. Unless otherwise specified, size conductors as required by ANSI-J-STD-607-A. In plenum spaces bare copper may be used.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All Work shall fully comply with these Specifications and related Drawings and all manufacturers recommended installation practices.

B. Provide all grounding and bonding as specified in the Contract Documents.

C. Ground electrical systems and equipment as required by code, utility, local ordinances, and requirements herein.

D. Bonding conductors shall be continuous and routed in a direct path to point of termination.

E. All grounding busbars shall be isolated from the structure support by a 2 inch minimum separation using manufacturer's recommended insulating stand-offs and hardware.

F. Clean grounding busbars before terminating conductors.

G. Do not place busbars on exterior walls.

3.2 LABELING

A. Label the ends of all conductors.

1. Label conductors consecutively within each ER/TR 01 through “xx” with “xx” representing the last number in order.

2. Label all TGBs and the TMGB as identified on the Drawings and with the following:

WARNING!!!

IF THIS CONNECTOR OR CABLE IS

LOOSE OR MUST BE REMOVED

PLEASE CALL THE BUILDING

TELECOMMUNICATIONS MANAGER.

3.3 CONNECTIONS

A. Bond the TMGB to the service equipment (power) ground, typically located in the electrical entrance facility, using the most direct route possible to minimize conductor length. THIS WILL BE PROVIDED BY THE ELECTRICAL CONTACTOR.

B. Bond all TGBs to the TMGB using specified conductor.

C. Bond the following to the TMGB when present:

Telecommunications panelboard:

a. Alternating Current Equipment Ground Bus (ACEG), if equipped, or its enclosure.

1. Building structural steel, if exposed. (Steel rebars of reinforced concrete are not required to be bonded.)
2. Metallic equipment racks.
3. Cable shields.
4. All metal raceways and cable trays for telecommunications cabling extending from the same room or space where the TMGB is located.
5. Floor tile ground tab if provided.
6. Others as identified on the Drawings.

B. Bond the following to the TGB when present:

Telecommunications panelboard: Alternating Current Equipment Ground Bus (ACEG), if equipped, or its enclosure.

1. Building structural steel, if exposed. (Steel rebars of reinforced concrete are not required to be bonded.)
2. TGBs within the same space if provided.
3. TBBs terminated on the same floor to other TGBs.
4. Metallic equipment racks.
5. Cable shields.
6. All metal raceways and cable trays for telecommunications cabling extending from the same room or space where the TMGB is located.
7. Floor tile ground tab if provided.
8. Others as identified on the Drawings.

A. Terminate Bonding Conductor for Telecommunications and TBB conductors with two-hole compression lugs.

B. Terminate all other conductors with one-hole compression lugs.

3.4 BONDING

General:

Make connections in such a manner as to minimize possibility of galvanic action or electrolysis. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

a. Use electroplated or hot-tin-coated materials to assure high conductivity and make contact points closer in order of galvanic series.
b. Make connections with clean bare metal at points of contact.
c. Coat and seal connections involving dissimilar metals with inert material such as red lead paint to prevent future penetration of moisture to contact surfaces.

3.5 TESTING

A. Purpose:

The purpose of this test is to ensure proper grounding of the telecommunications system.

B. Test equipment:

Biddle Instruments, Megger DET2/2 Ground Tester or later approved model.

C. Testing guidelines:

The following testing guidelines apply to all test procedures and shall be followed to promote efficient and accurate testing:

a. Be sure all connections are tight. Loose connections will drastically affect the test results.
b. The test lead shall be No. 14 AWG, stranded, insulated copper conductor. The test lead shall be long enough to reach all TGBs from the TMGB. One test lead shall be used for all tests.
c. The test lead may be spooled. However, the Biddle meter may produce inaccurate or erratic resistance measurements if the quantity of cable on the spool is too great. If the meter behaves erratically, first try to perform the test in the “low current” setting. If the behavior persists, the lead should be unspoiled.
d. The current shall be set to “High.”
e. The filter shall be set to “On.”
f. The frequency shall be set to “150 Hz.”
g. Connect Terminals C2 and P2 by a jumper wire (if not connected by the manufacturer).
h. Connect Terminals P1 and C1 by a jumper wire (if not connected by the manufacturer).
i. Once the test lead is attached to the meter it should not be removed as identified in the specific test procedure.

D. Reference test:

The reference test procedure is necessary to calibrate the test setup. Perform the reference test procedure before performing any test.

1. Record the reference value and subtract from all other measurements. If the length of the test lead is changed, perform and record new test data.

E. Reference test procedure:

Perform the test procedure as follows:

a. Connect one end of the test lead to Terminal C1 and the other end to Terminal C2.
b. Perform the Biddle Meter Resistance Test.
c. Record test lead resistance on the data sheet.
d. Disconnect the test lead from Terminal C1 ONLY. The test lead shall remain connected to Terminal C2 throughout the test.

F. Ground reference system continuity test:

The ground reference system shall be tested to validate the continuity and integrity of the interconnection of the system and the building's grounding electrode.

G. Ground reference system continuity test procedure:

Perform the test procedure as follows:

a. Remove all conductors except the TBB and the Bonding Conductors for Telecommunications from the TMGB and the TGBs.
b. Move the meter and test lead to the first TGB to be tested. Route and connect the test lead to the TMGB. The other end of the test lead should still be connected to Terminal C2 from the reference test. Connect a short test lead from Terminal C1 to the TGB to be tested.
c. Perform the Biddle Meter Resistance Test.
d. Record the resistance on the data sheet.
e. Attach the equipment bonding conductor from the panelboard located within the room to the TGB and repeat the test. Record the resistance on the data sheet.
f. Attach the equipment bonding conductor from the building steel (if applicable) and repeat the test. Record the resistance on the data sheet.

Leave the building steel and panelboard ground connected to this TGB. Repeat the test for all other TGBs.

END OF SECTION

SECTION 271500 – COMMUNICATIONS COPPER 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.

- Refer to the Electrical Series Drawings for work related to this Specification Section.

- Related Sections:

  - Division 27 Section "Intercommunications System".
  1. Division 270500 Pathways for Communications Systems
  2. Division 270503 Communications Equipment Room Fittings
  3. Division 270506 Telecommunications Grounding Systems
  4. Division 271500 Communicatins Copper Horizontal Cabling

1.2 WORK INCLUDED

A. Provide all labor, material, tools, and equipment for the complete installation of work called for in the construction documents.

B. The contractor is directed to examine each section of the specifications, all drawings relating to the Contract Documents, any and all Addenda, etc., for work described that may relate to the provision of the work described herein. Materials and performance are specified herein that relate to these systems.

C. The use of proprietary or copyrighted names or reference to patented trade items with this specification or elsewhere in the Contract Documents is meant to establish a standard of quality and performance. All materials and equipment proposed for installation must meet or exceed all specified requirements.

D. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SCOPE OF WORK

1. Install Data / WAP / CCTV drops as called out on prints. This includes installing new Cat6 cable, Cat6 modular jacks, faceplates or surface boxes, patch panels, grounding, terminating and labeling to provide a complete and working communication system. Active equipment (switches, routers, poe, etc…) will be provided by the owner.

2. Install blue data drops to each outlet and install blue Cat6 modules. There should be two Cat6 drops installed to each location indicated on the prints with the following exceptions:

A. WAP locations get one Yellow Cat6 drop. Terminate in a 1 port surface mount box in a Yellow Cat6 module jack. Terminate in the I.T. room on the modular patch panel with a Yellow Cat6 module jack. Coil 10' and hang from a .75" J hook. Label the ceiling grid directly below the location. **WAP's will be provided and installed by the owners wireless vendor unless other arrangements are made between the owner and the communications vendor.**

3. Build out the IDF as called out for in the prints. Provide all material needed to complete the installation. **MEET WITH THE OWNERS REP BEFORE STARTING BUILDOUT TO VERIFY EXACT LOCATION OF EQUIPMENT.**

a. Build out will include a wall rack, patch panels, power strip, grounding and labeling. All cable should be fully enclosed in conduit from the ceiling down into the cabinet.

4. Install Caddy J hooks for cable installation or equal. Sound system cables are not allowed in the same J Hooks as communications cables.

5. Build-out Racks as called out. Install straight patch panels in racl. Install wire managers, blanks panel, install black blanks in any ports that do not have modules. Cabling into the back of patch panels will be neat and supported without excess slack. All cables will be straped with Velcro. **NO CABLE TIES ALLOWED ON ANY DATA CABLING.**

7. Test all cables and have certified with a Fluke Tester or equal. Provide paper documents of all test results. Each page should have the signature of the installer responsible for the results. Provide a signed set of results to the owner.

8. Provide CAD AS BUILT DRAWINGS to the owner in electronic and paper versions. As builds should reflect approximate cable routing, rack details and print out of drop locations showing room, IDF, Patch Panel and Port numbers. **Please set up a meeting with the owner's rep, electricl engineer and I.T. Dept. to discuss final requirement. This can be done in conjunction with the IDF Build out meeting.**

9. Install Strain Relief bars on back of all patch panels.

10. CCTV locations are Cat6 drops only. Include all termination, testing and labeling. **Cameras would be provided and installed by owner**. CCTV drops will be purple with Purple Cat6 modules on both ends.

11. This project is not Brand Specific, but all cables and hardware must meet mimium requirements as called out in this specification. The Specifications is based on General Cable GenSpeed 6 23 AWG cable.

1.3 SUMMARY

A. Section Includes:

1. Category 6 twisted pair cable.
2. Twisted pair cable hardware, including plugs and jacks.
3. Cabling identification products.
4. Grounding provisions for twisted pair cable.
5. Source quality control requirements for twisted pair cable.

1.3 DEFINITIONS

A. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

B. EMI: Electromagnetic interference.

C. FTP: Shielded twisted pair.

D. F/FTP: Overall foil screened cable with foil screened twisted pair.

E. F/UTP: Overall foil screened cable with unscreened twisted pair.

F. IDC: Insulation displacement connector.

G. LAN: Local area network.

H. Jack: Also commonly called an "outlet," it is the fixed, female connector.

I. Plug: Also commonly called a "connector," it is the removable, male telecommunications connector.

J. RCDD: Registered Communications Distribution Designer.

K. Screen: A metallic layer, either a foil or braid, placed around a pair or group of conductors.

L. Shield: A metallic layer, either a foil or braid, placed around a pair or group of conductors.

M. S/FTP: Overall braid screened cable with foil screened twisted pair.

N. S/UTP: Overall braid screened cable with unscreened twisted pairs.

O. UTP: Unscreened (unshielded) twisted pair.

1.4 COPPER 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 "permanent link," a term that is used in the testing protocols. Cabling system consists of horizontal cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for horizontal-to-horizontal cross-connection.

1. TIA-568-C.1 requires that a minimum of two equipment outlets 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 equipment outlet. **This is not allowed on this project.**
3. Bridged taps and splices shall not be installed in the horizontal cabling.

B. A work area is approximately 100 sq. ft., and includes the components that extend from the equipment outlets 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.

1.5 ACTION SUBMITTALS

A. Product Data:

1. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for equipment racks and cabinets. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories. Provide as a single complete system submittal with master product list referencing each paragraph in this section specifying product.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For installation supervisor, and field inspector.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For splices and connectors to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by the equipment manufactors on staff.

1. Installation Supervision: Installation shall be under the direct supervision of Registered Technician, who shall be present any time work of this Section is performed at Project site. The technician shall have experience in installing the cable and equipment bid on this project.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1. Test each pair of twisted pair cable for open and short circuits.

1.10 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.

1.11 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 PERFORMANCE REQUIREMENTS

A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA-568-C.1, when tested according to test procedures of this standard.

B. Telecommunications Pathways and Spaces: Comply with TIA-569-D.

C. Grounding: Comply with TIA-607-B.

2.2 GENERAL CABLE CHARACTERISTICS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with the applicable standard and NFPA 70 for the following types:

1. Communications, Non-plenum: Type CMR complying with UL 1666.
2. Communications, Non-plenum: Type CMP or Type CMR in listed plenum or riser communications raceway.
3. Communications, Non-plenum: Type CMP or Type CMR in metallic conduit installed according to NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."

2.3 CATEGORY 6 TWISTED PAIR CABLE

A. Description: Four-pair, balanced-twisted pair cable, with internal spline, certified to meet transmission characteristics of Category 6 cable at frequencies up to 350MHz.

Cable shall be equal or exceed General GenSpeed6 (23 AWG).

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. General Cable; General Cable Corporation.
2. Panduit
3. Hubbell
4. Approved Equal

C. Standard: Comply with NEMA WC 66/ICEA S-116-732 and TIA-568-C.2 for Category 6 cables.

D. Conductors: 100-ohm, 23 AWG solid copper.

E. Shielding/Screening: Unshielded twisted pairs (UTP).

F. Cable Rating: Non-Plenum.

G. Jacket: color thermoplastic as follows:
1. Data – BLUE (Cat6)
2. WIFI – YELLOW (Cat6)
3. CCTV – PURPLE OR VIOLET (Cat6)

2.4 TWISTED PAIR CABLE HARDWARE

A. Description: Hardware designed to connect, splice, and terminate twisted pair copper communications cable.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

C. General Requirements for Twisted Pair Cable Hardware:

1. Comply with the performance requirements of Category 6e and 6A.
2. Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools.
3. Cables shall be terminated with connecting hardware of same category or higher.

D. Connecting Blocks:

1. 110-style IDC for Category 6e and 6A.
2. 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.

E. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.

1. Number of Terminals per Field: One for each conductor in assigned cables.

F. Patch Panel: Modular panels housing numbered jack units with IDC-type connectors at each jack location for permanent termination of pair groups of installed cables.

1. Features:

a. Universal T568A and T568B wiring labels.
b. Labeling areas adjacent to conductors.
c. Replaceable connectors.
d. 24 or 48 ports.

2. Construction: 16-gauge steel and mountable on 19-inch equipment racks.
3. Number of Jacks per Field: One for each four-pair cable indicated, plus spares and blank positions adequate to suit specified expansion criteria.

G. Patch Cords: Factory-made, four-pair cables in 36-inch lengths at the patch panel and 10-foot lengths at the Workstation Outlet; terminated with an eight-position modular plug at each end.

1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure performance. Patch cords shall have latch guards to protect against snagging.
2. Patch cords shall have color-coded boots for circuit identification.
3. Provide (2) per horizontal cable installed; lengths as described above. Excessive slack at the patch panel is not acceptable. Coordinate with Architect/Owner.

H. Plugs and Plug Assemblies:

1. Male; eight position; color-coded modular telecommunications connector designed for termination of a single four-pair, 100-ohm, unshielded or shielded twisted pair cable.
2. Standard: Comply with TIA-568-C.2.

I. Jacks and Jack Assemblies:

1. Female; eight position; modular; fixed telecommunications connector designed for termination of a single four-pair, 100-ohm, unshielded or shielded twisted pair cable.
2. Designed to snap-in to a patch panel or faceplate.
3. Standard: Comply with TIA-568-C.2.

J. Faceplate:

1. Two, Four, or Six port, vertical plastic single gang faceplates designed to mount to single gang wall boxes. Faceplate port quantity determined by the number of cables to be installed per the drawings at each location. Any unused ports to be blanked off.
2. Eight, Ten, or Twelve port, vertical double gang plastic faceplates designed to mount to double gang wall boxes. Faceplate port quantity determined by the number of cables to be installed per the drawings at each location. Any unused ports to be blanked off.
3. All faceplates will be plastic.
4. For use with snap-in jacks accommodating any combination of twisted pair, optical fiber, and coaxial work area cords.
5. Wall locations will require stainless steel plates with lugs for mounting phone.

    a. Flush mounting jacks, positioning the cord at a 90-degree angle.

K. Legend:

1. Machine printed, in the field, using adhesive-tape label.

2.5 IDENTIFICATION PRODUCTS

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.

2.6 GROUNDING

A. Comply with requirements in Section 270526 "Grounding and Bonding for Communications Systems" for grounding conductors and connectors.

B. Comply with TIA-607-B.

2.7 SOURCE QUALITY CONTROL

A. Factory test cables on reels according to TIA-568-C.1.

B. Factory test twisted pair cables according to TIA-568-C.2.

C. Cable will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 WIRING METHODS

A. Wiring Method: Install cables in raceways and cable trays, except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces, attics, and gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables, except in unfinished spaces.

1. Install plenum cable.
2. Comply with requirements for raceways and boxes specified in Section 270528 "Pathways for Communications Systems."

B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

C. 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. Install conductors parallel with or at right angles to sides and back of enclosure.

3.2 INSTALLATION OF PATHWAYS

A. Comply with requirements for demarcation point, cabinets, and racks specified in Section 271100 "Communications Equipment Room Fittings."

B. Comply with Section 270528 "Pathways for Communications Systems."

C. Comply with Section 270536 "Cable Trays for Communications Systems."

3.3 INSTALLATION OF TWISTED-PAIR HORIZONTAL CABLES

A. Comply with NECA 1 and NECA/BICSI 568.

B. General Requirements for Cabling:

1. Comply with TIA-568-C.0, TIA-568-C.1, and TIA-568-C.2.
2. Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section.
3. Install 110-style IDC termination hardware unless otherwise indicated.
4. Do not untwist twisted pair cables more than 1/2 inch from the point of termination to maintain cable geometry.
5. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
6. MUTOA shall not be used as a cross-connect point.
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, prevent straining connections, and 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 ITSIMM, Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section. Use 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. Cable should be coiled and suspended above wall rack. Do not leave excess cable in back of wall rack.
13. Pulling Cable: Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems," "Pulling and Installing Cable" Section. Monitor cable pull tensions.

C. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend twisted pair cabling, 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.

D. Group connecting hardware for cables into separate logical fields.

E. Separation from EMI Sources:

1. Comply with recommendations from BICSI's "Telecommunications Distribution Methods Manual" and TIA-569-D for separating unshielded copper 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, 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-D, Annex A, "Firestopping."

C. Comply with "Firestopping Systems" Article in BISCI's "Telecommunications Distribution Methods Manual."

3.5 GROUNDING

A. Install grounding according to the "Grounding, Bonding, and Electrical Protection" chapter in BICSI's "Telecommunications Distribution Methods Manual."

B. Comply with TIA-607-B and NECA/BICSI-607.

C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall, allowing at least a 2-inch clearance behind the grounding bus bar. Connect grounding bus bar to suitable electrical building ground, using a minimum No. 4 AWG grounding electrode conductor.

D. Bond metallic equipment to the grounding bus bar, using not smaller than a No. 6 AWG equipment grounding conductor.

3.6 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA-606-B. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

1. Administration Class: Class 2.

2. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.

B. Paint and label colors for equipment identification shall comply with TIA-606-B for Class 2 level of administration, including optional identification requirements of this standard.

C. Cable Schedule: Install in a prominent location in the IDF room. 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.

D. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.

E. Cable and Wire Identification:

1. Label each cable within 6 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated**. This will be required behind patch panels and faceplates.**

2. Each wire connected to building-mounted devices is not required to be numbered at the device if wire color is consistent with associated wire connected and numbered within panel or cabinet.

3. 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, extended from a panel or cabinet to a building-mounted device, with the name and number of a particular device.

b. Label each unit and field within distribution racks and frames.

4. 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.

F. Labels shall be preprinted or computer-printed type, with a printing area and font color that contrast with cable jacket color but still comply with TIA-606-B requirements for the following:

1. Cables use flexible vinyl or polyester that flexes as cables are bent.

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Visually inspect twisted pair cabling 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-568-C.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Test twisted pair 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-568-C.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.

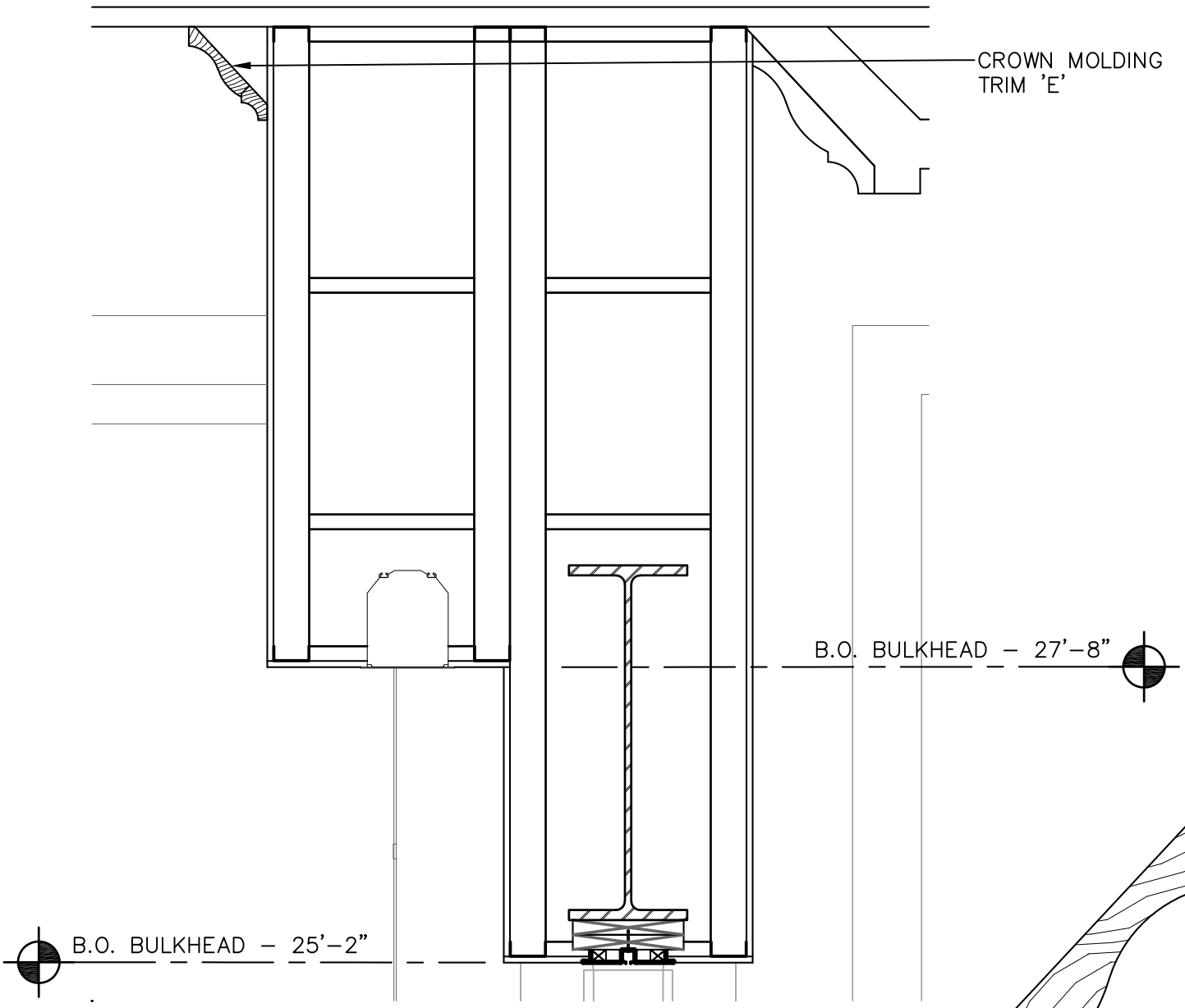
C. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similarly to Table 10.1 in BICSI's "Telecommunications Distribution Methods Manual," or shall be transferred from the instrument to the computer, saved as text files, printed, 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 report.

END OF SECTION



4 BULKHEAD DETAIL

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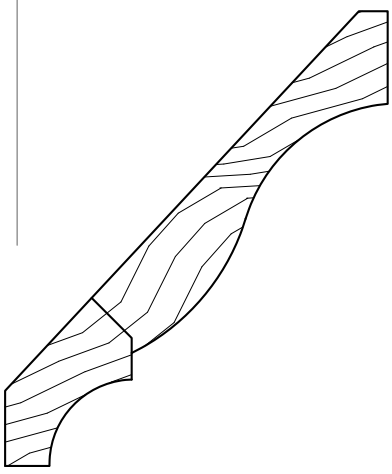

TWO PIECE CROWN MOLDING
12-3/8"
TRIM 'E'

INTERIOR TRIM DETAIL

SCALE: 3"=1'–0"

PANTHEON BUSINESS THEATER | **REFERENCE SHEET ST1.4 & A6.0**

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VINCENNES, IN

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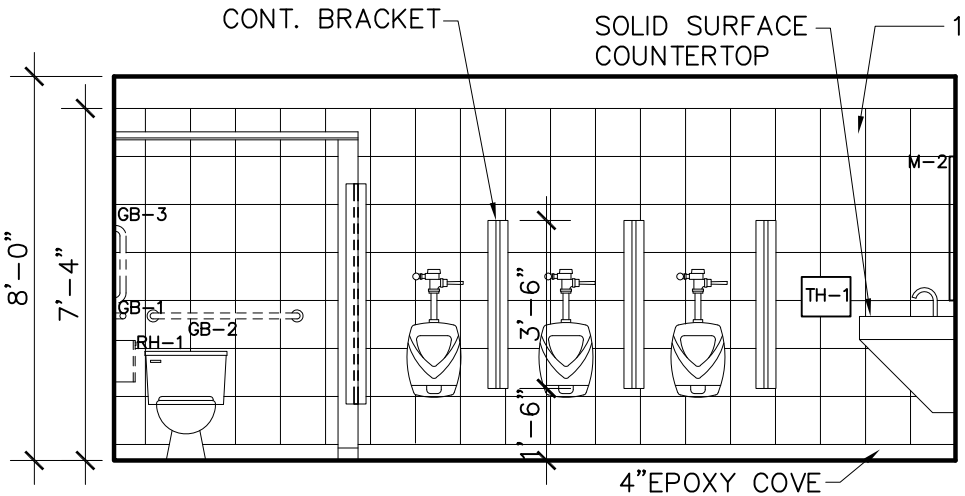

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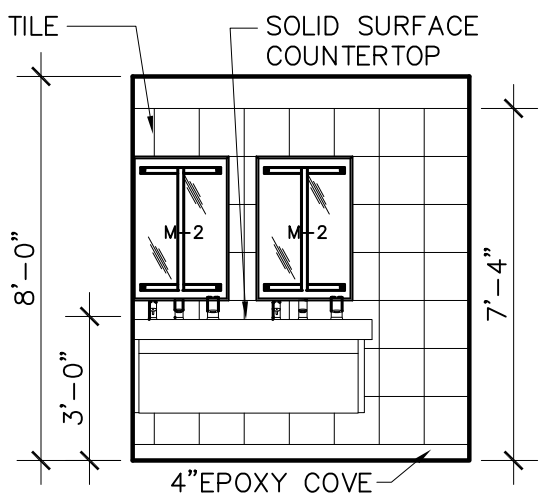

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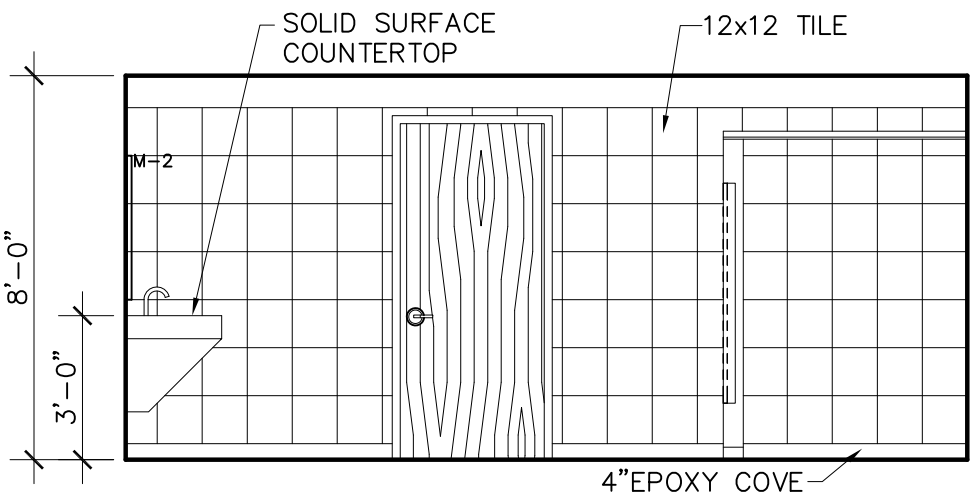

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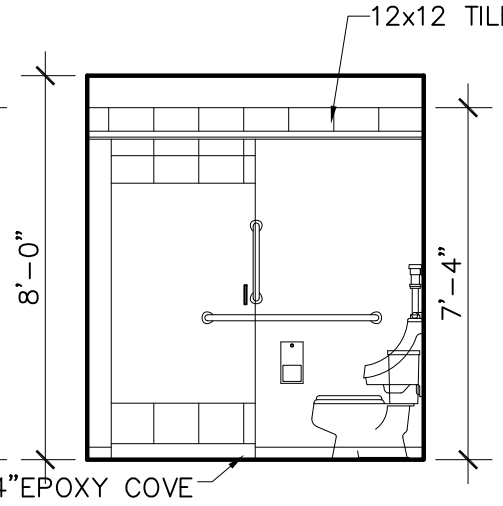

4 RESTROOM ELEV.

SCALE: 1/4"=1'-0"

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MEN'S 112

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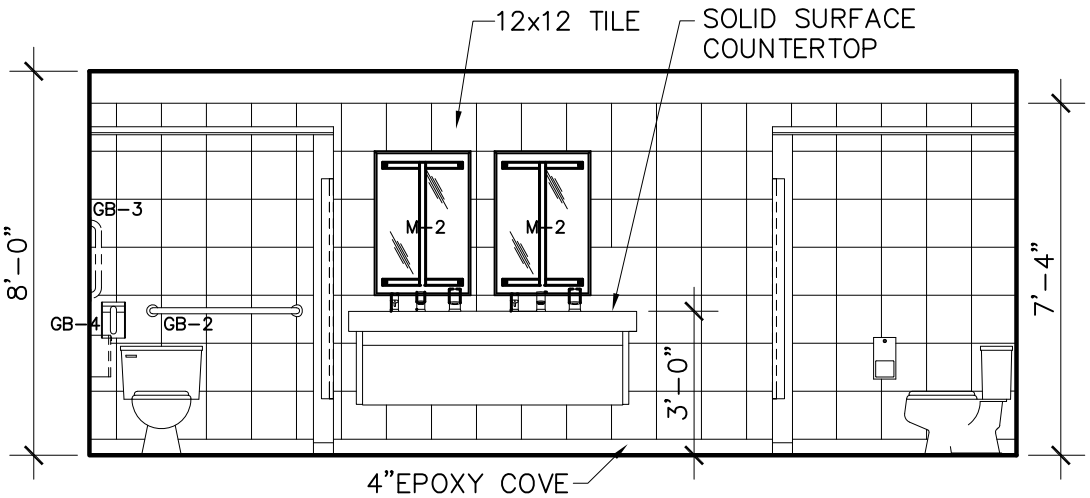

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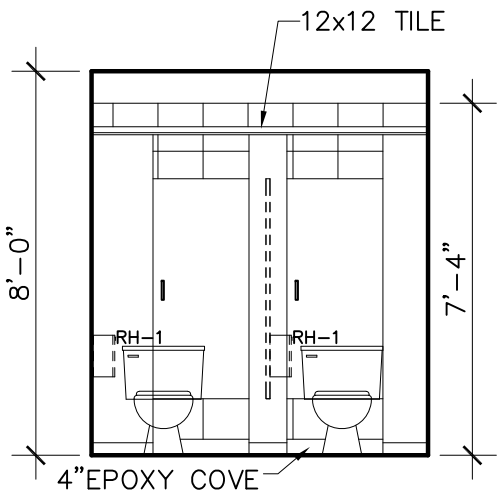

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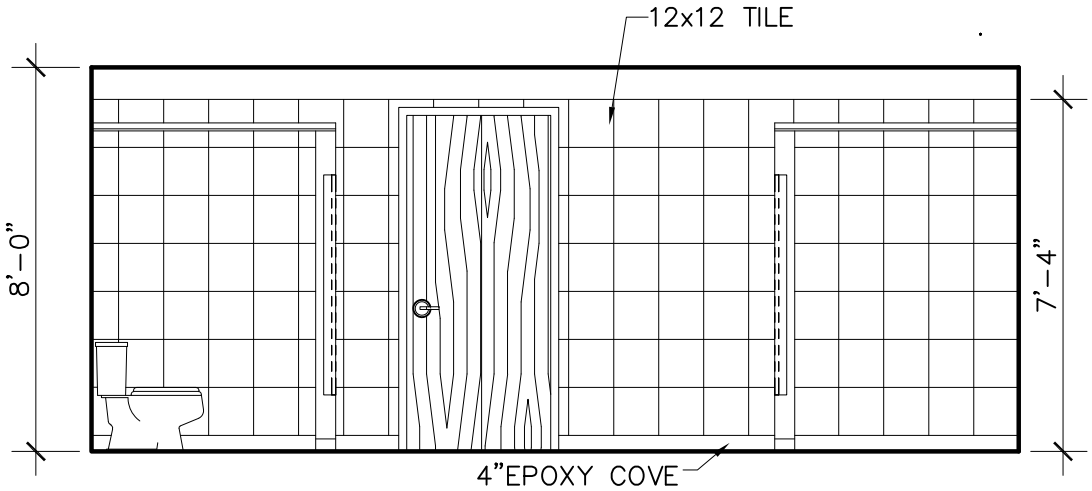

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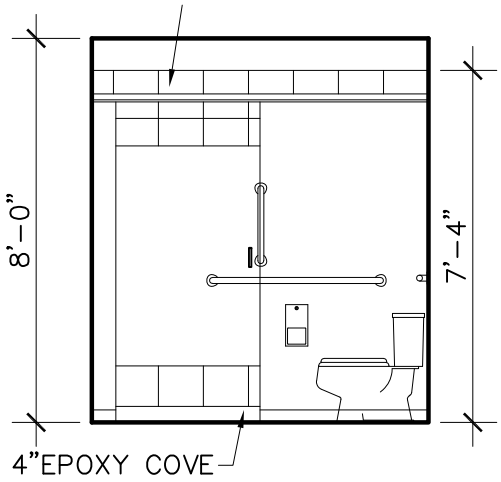

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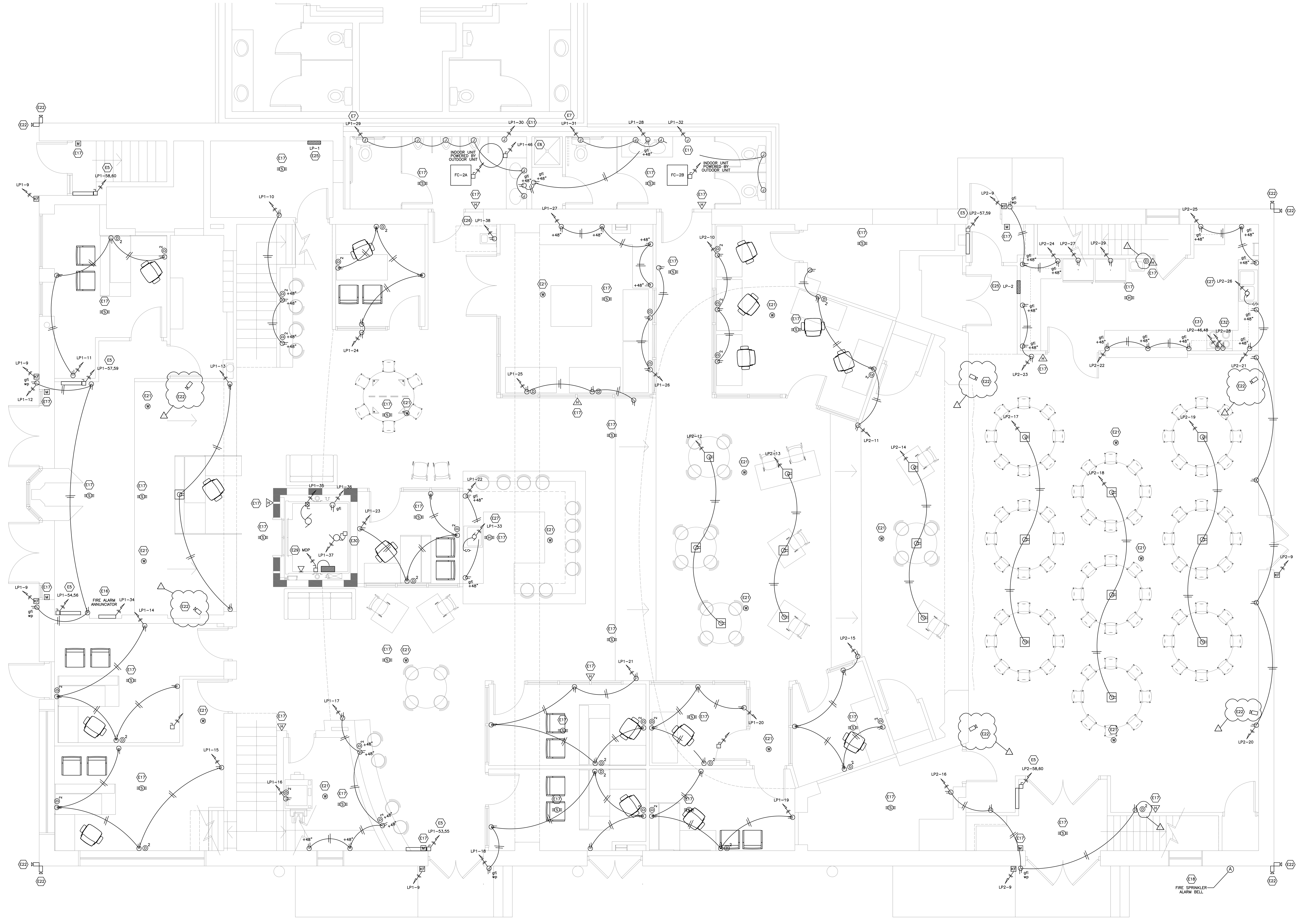
WOMEN'S 114



FIRST FLOOR ELECTRICAL POWER / SYSTEMS PLAN

SCALE: 1/4" = 1'-0"

MICHAEL J. HEINZ
REGISTERED
No. PE 60021243
State of INDIANA
PROFESSIONAL ENGINEER

DATE: JANUARY 2019

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FACILITY RENOVATIONS
FOR

PANTHEON BUSINESS THEATRE

PROJECT NO. 15_02

VINCENNES, INDIANA

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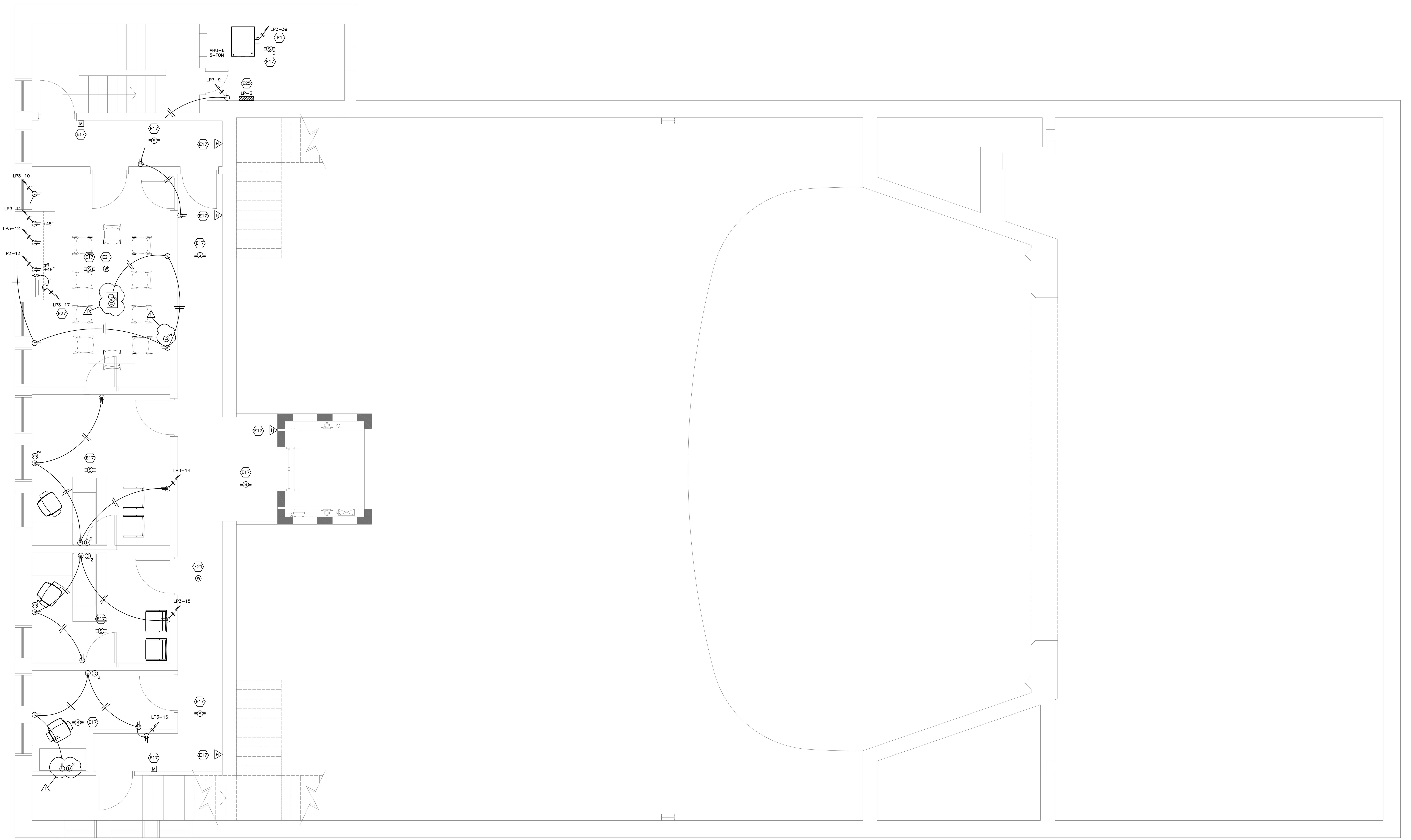
CHECKED: KEH

E.6

FIRST FLOOR
ELEC POWER/SYST PLAN



SECOND FLOOR ELECTRICAL POWER / SYSTEMS PLAN

SCALE: 1/4" = 1'-0"

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DATE: JANUARY 2019

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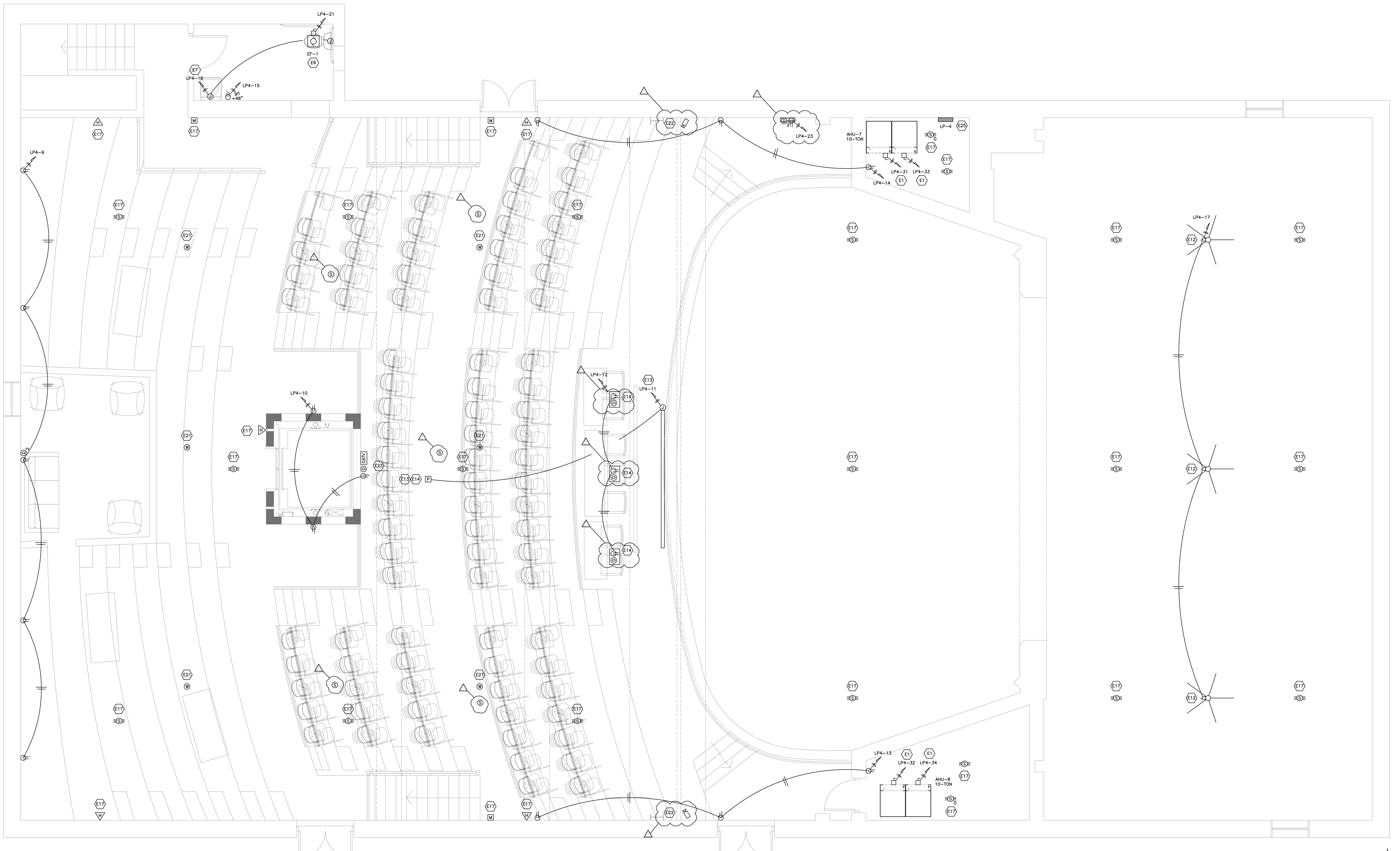
SECOND FLOOR
ELEC POWER/SYST PLAN



THIRD FLOOR ELECTRICAL POWER / SYSTEMS PLAN

SCALE: 1/4" = 1'-0"

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E.8
THIRD FLOOR
ELEC POWER/SYST PLAN