

ADDENDUM NO. 3
to the
PROJECT DOCUMENTS AND SPECIFICATIONS
for
T-HANGAR DEVELOPMENT

Prepared for:
CALHOUN COUNTY

Prepared By:



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AVCON Project No. 2022.0241.01

Addendum Date: November 21, 2024

Note: The bidder shall acknowledge receipt of this addendum on the Bid Form, Page B1-3 in the space provided.

ADDENDUM NO. 3
T-HANGAR DEVELOPMENT
Calhoun County Airport

- Date of Issue:** November 21, 2024
- Bid Submittal Deadline:** Monday, December 2, 2024 @ 4:00 pm central time (Unchanged)
20859 Central Avenue East, Room 130, Blountstown, Florida 32424
- Notice to all Plan Holders:** Please insert this addendum (2 pages including cover, excluding attachments) into your copy of the Project Contract Documents.

The following changes to the Project Documents and Specifications are issued by the Engineer and shall have the same force and effect as though part of the original issue:

A. Changes to the Project Documents and Specifications:

1. Technical Specifications **ADD** Electrical Specifications attached as **Attachment A** (98 pages) hereto.

B. Changes to the Drawings:

1. Civil Sheets **REPLACE** Sheet C-15 in its entirety with Sheet C-15 attached as **Attachment B** (1 page) hereto.
2. Electrical Sheets **REPLACE** Sheets E002 through E701 in their entirety with Sheets E002 through E701 attached as **Attachment C** (11 pages) hereto.
3. Mechanical Sheets **ADD** Sheets MP001 through MP701 attached at **Attachment D** (7 pages) hereto.

END OF ADDENDUM NO. 3

ITEM 26 05 00 GENERAL ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including Contractual Conditions and other Division 01 Specification sections apply to this section.

1.2 SUMMARY

- A. This section includes Basic Electrical Requirements specifically applicable to Division 26 Sections.

1.3 DESCRIPTION

- A. Provide and install all equipment, labor, material and accessories, and mounting hardware for a complete and operating system as described within these Division 26 Specification Sections.
- B. Furnish, perform, or provide all labor including planning, purchasing, transporting, storing, installing, testing, cutting and patching, trenching, excavating, backfilling, coordination, field verification, equipment (installation and safety), supplies, and materials necessary for the installation of complete electrical systems (as described or implied by these specifications and the applicable drawings) in strict accordance with applicable codes, which may not be repeated in these specifications, but are expected to be common knowledge of qualified Bidders.
- C. All work shall comply with all applicable codes as a minimum and with the additional requirements called for in these Contract Documents.
- D. Only trained and licensed personnel shall perform work. No Work shall be performed which violates applicable Codes, even if called for in the Contract Documents.
- E. Coordinate requirements with Utility Company.
- F. Make connections of all items in the Work using electric power including wire, conduit, circuit protection, disconnects and accessories. Securing of roughing-in drawings and connection information for equipment involved shall also be included under this division. See other divisions for specifications for electrically operated equipment.

1.4 QUALITY ASSURANCE

- A. Install Work in locations shown or described in the Contract Documents, unless prevented by Project conditions.
- B. Install all equipment so that all Code and Manufacturer recommended working and servicing clearances are maintained. Properly arrange and install all equipment within designated spaces. If a departure from the Contract Documents is necessary, submit to the Engineer for approval, detailed drawings of the proposed changes with written reasons for the changes. No change shall be implemented without the issuance of a change order or other directive permitted by the General Conditions.
- C. The Contractor shall verify finish dimensions at the project site in preference to using dimensions noted on Contract Documents.

1.5 INVESTIGATION OF SITE

- A. Investigate the site and existing conditions thoroughly before bidding. Advise ENGINEER of discrepancies or questions noted.
- B. During the course of the site visit, electrical bidder shall become familiar with all aspects of the proposed work and existing field conditions of the work. No compensation or reimbursement for additional expenses for failure to investigate the existing facilities will be authorized. This shall include rerouting around existing obstructions.
- C. Submission of a proposal will be construed as evidence that such examination has been made and later claims for labor, equipment or materials required because of difficulties encountered will not be recognized.
- D. Existing conditions and utilities indicated are taken from existing construction documents, surveys, and field investigations. Unforeseen conditions probably exist, and existing conditions shown on drawings may differ from the actual existing installation with the result being that new work may not be field located exactly as shown on the drawings. Notify ENGINEER if deviations are found.
- E. All existing electrical is not shown. The Contractor shall become familiar with all existing conditions prior to bidding, and include in his bid the removal of all electrical equipment, wire, conduit, devices, fixtures, etc. that is abandoned due to renovation.
- F. Protect all existing electrical raceways within concrete slabs, below concrete slabs, overhead raceways, equipment, etc. from damage due to renovation. Repair or replacement of utilities or other property damaged by operations in conjunction with the work will be at no cost to the Owner.

- G. Remove existing power, lighting, systems, material and equipment which are made obsolete or which interfere with the construction of the project. Reinstall power, lighting, systems, materials and equipment which are required to remain active for the facility to be fully functional.
- H. Reroute conduit and wiring in area of construction remaining active. Include temporary connections necessary to maintain continuity of existing circuitry required to remain active during renovation. Existing conduits indicated in Contract Documents are approximate locations only. Determine routing of existing conduits and pipes prior to any excavation, cutting or demolition.
- I. Occupied existing buildings must remain in operation while work is being performed. Schedule work for a minimum outage to Owner. Notify the ENGINEER appropriately for any shut-down of existing systems.
- J. Bid shall include all removal and relocation of all piping, fixtures or other items required for completion of alterations and new construction.

1.6 CONTRACT DOCUMENTS

- A. The drawings are diagrammatic and are not intended to include every detail of construction, materials, methods, and equipment. They indicate the result to be achieved by an assemblage of various systems. Coordinate equipment locations with Architectural and Structural drawings. Layout equipment before installation so that all trades may install equipment in spaces available. Coordinate installation in a neat and workmanlike manner.
- B. Contractor shall provide 1/4" scale coordination drawings for all electrical, mechanical and communications rooms during the shop drawing submittal phase, utilizing detailed dimensions from equipment actually submitted (all disciplines) and field-measured/verified existing conditions. These drawings are also required for any room where conduits equal to or over 1-1/4" in size, equipment (panels, HVAC, disconnects, comm. racks) or other large objects are being installed. Drawings shall show all electrical, mechanical, plumbing, fire protection, structural, etc. coordinated so that problems are discovered/prevented prior to installation. Claims during construction for additional funding in rooms where properly coordinated drawings were not submitted will not be considered.
- C. Wiring arrangements for equipment shown on the drawings are intended to be diagrammatic and do not show all required conductors and functional connections. All such items incidental to a complete and operating system shall be provided.
- D. Submit specific shop drawings which indicate the fabrication, assembly, installation, and erection of particular systems' components. Drawings that are part of the Contract Documents shall not be considered a substitute for required shop drawings, field installation drawings, code requirements, or applicable standards.

- E. Locations indicated for outlets, switches, and equipment are approximate and shall be coordinated with the Contract Documents. Where instructions or notes are insufficient to locate the item, notify the ENGINEER.

1.7 MATERIALS AND EQUIPMENT

- A. Unless otherwise noted, all material shall be new and UL listed or labeled. In lieu of UL listing or labeling, a statement or data demonstrating compliance with contract documents from a nationally recognized testing agency shall be submitted to the ENGINEER.
- B. Where Contract Documents list design selection, manufacturer or type, this model shall set the standard of quality and performance required. Where no brand name is specified, the source and quality shall be subject to Designers/ENGINEER review and approval. Where Contract Documents list approved substitutions, these items shall comply with Division 01 requirements for substitutions.
- C. When a product is specified to be in accordance with a trade association or government standard and at the request of Designers/ENGINEER the Contractor shall furnish a certificate that the product complies with the referenced standard and supporting test data to substantiate compliance.
- D. Where multiple items of the same equipment or materials are required, they shall be the product of the same Manufacturer.
- E. Prior to placing equipment orders, verify the physical size of specified equipment to fit spaces allotted on the drawings and with NEC working clearances. Internal access for proposed equipment substitutions shall be provided. Provide 1/4" scale drawings showing that this coordination has taken place.
- F. Electrical equipment shall be protected from the weather, during shipment, storage, and construction per manufacturer's recommendations. Should any apparatus be subjected to possible damage by water, it shall be thoroughly dried and put through a dielectric test, at the expense of the Contractor, to ascertain the suitability of the apparatus, or it shall be replaced without additional cost to the Owner.
- G. Inspect all electrical equipment and materials prior to installation. Damaged equipment and materials shall not be installed or placed in service. Replace or repair and test damaged equipment in compliance with industry standards at no additional cost to the Owner. Equipment required for the test shall be provided by the Contractor.
- H. Material and equipment shall be provided complete and shall function up to the specified capacity/function. Should any material or equipment as a part or as a whole fail to meet performance requirements, replacements shall be made to bring performance up to specified requirements. Damages to finish by such replacements, alterations, or repairs shall be restored to prior conditions, at no additional cost to the Owner.

- I. Where tamperproof screws are specified or required, Phillips head or Allen head devices shall not be accepted. For each type used, provide ENGINEER with three tools. ENGINEER will designate the specific hardware design to correspond with existing devices elsewhere in the building, to limit special tool requirements.
- J. Communications backboards shall be 3/4" A/B grade, Class A, flame spread, painted with light gray fire-retardant paint. Neatly mask off a minimum of one (1) plywood Manufactures pre-printed certified fire rating stamp per section of board prior to application of paint. Remove masking after paint has cured.

1.8 COORDINATION

- A. Provide all required coordination and supervision where work connects to or is affected by work of others, and comply with all requirements affecting this Division. Work required under other divisions, specifications or drawings to be performed by this Division shall be coordinated with the Contractor and such work performed at no additional cost to Owner.
- B. Provide electrical subcontractor a set of Contract Documents for all areas of Electrical Work.
- C. Installation studies shall be made to coordinate the electrical work with other trades. Work shall be preplanned. Unresolved conflicts shall be referred to the ENGINEER prior to installation of the equipment.
- D. Coordination drawings shall be prepared prior to the start of work. Drawings shall show the actual physical dimension required for the installation to assure proper integration of equipment with building systems and NEC required clearances. Location of conduit racking, etc., shall be provided. Coordination drawings shall be provided for all areas. Comply with the requirements of Division 01.
- E. Secure approved shop drawings from all required disciplines and verify final electrical characteristics before roughing power feeds to any equipment. When electrical data on approved shop drawings differs from that shown or called for in Construction Documents, make adjustments to the wiring, disconnects, and branch circuit protection to match that required for the equipment installed. Adjustments to contract value will not be considered due to lack of coordination.
- F. Damage from interference caused by inadequate coordination shall be corrected at no additional cost to the Owner.
- G. Coordinate the exact location of floor outlets, floor ducts, floor stub-ups, etc. with ENGINEER and Designer (and receive their approval) prior to rough-in. Locations indicated in Contract Documents are only approximate locations.

- H. The Contract Documents describe specific sizes of switches, breakers, fuses, conduits, conductors, motor starters and other items of wiring equipment. These sizes are based on specific items of power consuming equipment (heaters, lights, motors for fans, compressors, pumps, etc.). Coordinate the requirements of each load with each load's respective circuitry shown and with each load's requirements as noted on its nameplate data and manufacturer's published electrical criteria. Adjust circuit breaker, fuse, conduit, and conductor sizes to meet the actual requirements of the equipment being provided and installed and change from single point to multiple points of connection (or vice versa) to meet equipment requirements. Changes shall be made at no additional cost to the Owner.

1.9 PROVISION FOR OPENINGS

- A. Locate openings required for work. Provide sleeves, guards or other approved methods to allow passage of items installed.
- B. Coordinate with roofing Contractor on installation of electrical items which penetrate the roof. Roof penetrations shall be installed so as to not void roof warranty.
- C. Where work pierces waterproofing, it shall maintain the integrity of the waterproofing. Coordinate roofing materials which pierce roof for compatibility with membrane or other roof types with Contractor.

1.10 CONCRETE PADS

- A. Furnish and install reinforced concrete pads for transformers, switchgear, generators, motor control centers, and other free-standing equipment. Unless otherwise noted, pads shall be four (4) inches high and shall exceed dimensions of equipment being set on them, including future sections, by six (6) inches each side, except when equipment is flush against a wall where the side against the wall shall be flush with the equipment. Pads shall be reinforced with W1.4 x 1.4 6 x 6 welded wire mesh. Chamfer top edges 1/2". Trowel all surfaces smooth. Provide 3000 psi concrete.

1.11 SURFACE MOUNTED EQUIPMENT

- A. Surface mounted fixtures, outlets, cabinets, conduit, panels, etc. shall have finish or shall be painted as directed by designer. Paint shall be in accordance with applicable sections and/or divisions of these specifications.

1.12 CUTTING AND PATCHING

- A. Reference Division 01 - General Requirements.
- B. New Construction:

1. Cutting of work in place shall be cut, drilled, patched and refinished by trade responsible for initial installation.
2. Backfill new grades to match adjacent undisturbed surface.

1.13 INSTALLATION

- A. Erect equipment to minimize interference and delays with the execution of the Work.
- B. Take care in erection and installation of equipment and materials to avoid marring finishes or surfaces. Any damage shall be repaired or replaced as determined by the designer/ENGINEER at no additional cost to the Owner.
- C. Equipment requiring electrical service shall not be energized or placed in service until ENGINEER is notified and is present or have waived their right to be present. Where equipment to be placed in service involves service or connection from another Contractor or the ENGINEER, notify the ENGINEER in writing as appropriate when the equipment will be ready.
- D. Equipment supports shall be secured and supported from structural members unless written approval is granted by ENGINEER.
- E. Plywood material shall not be used as a backboard for mounting panel boards, disconnects, motor starters, and dry type transformers. Provide "cast in place" type inserts or install expansion type anchor bolts. Electrical equipment shall not be mounted directly to dry wall for support without additional channels as anchors. Channels shall be anchored to the floor and structure above. Panelboards and terminal cabinets shall be provided with structural framing located within drywall partitions.
- F. Inserts, pipe sleeves, supports, and anchorage of electrical equipment shall be provided. Where items are to be set or embedded in concrete or masonry, the items shall be furnished and layout made for setting or embedment thereof so as to cause no delay.
- G. Conduit or piping systems that contain water or liquid of any kind shall not be installed over the top of any electrical equipment, transformers, racks, cabinets, or enclosures without prior written approval from the OAR.

1.14 AS-BUILT DOCUMENTS

- A. As-Built Documents: As-built Documents include Drawings, Shop Drawings, Specifications, Addenda, Change Orders, and other modifications permitted by the General Conditions.
- B. Comply with all requirements of Division 01

- C. Verify aspects of redlined as-builts for accuracy. As-Built Documents shall show all components including but not limited to:
1. All raceways 1-1/4" and above, cable tray systems, and grouped raceway racking as installed, including dimensions from fixed building lines such as column lines.
 2. All site underground raceways and duct banks indicating burial depths and distances from fixed building lines or global tracking coordinates.
 3. Underground pull boxes and manholes including elevations. Detail manhole and pull boxes, conduit terminations (butterfly layout) including conduit sizes, designated systems and cabling description.
 4. General conduit routing from receptacle to receptacle, fixture to fixture, device to device. (Exact routing is not required for raceways 1" and smaller.)
 5. Lighting: Diagrammatically show junction boxes that are located above accessible ceiling with flexible conduit connections to luminaries.
 6. The first junction box within each homerun, regardless of size shall be shown in the installed location.
 7. All junction boxes and pull boxes located above non-accessible ceilings shall be shown in exact location. All junction boxes 6"X6" and larger shall be shown in exact location.
 8. Any combining of circuits (which is only allowed by specific permission) or change in homerun outlet box shall be indicated.
 9. Any circuit number changes.
 10. All conductors and cables, conductors and cable sizes, raceway sizes, etc not shown on contract documents and any changes from the documents.
 11. Any switchboard, panelboard, motor control center, relay panel, or dimming control panel schedule changes, including load changes.
 12. All access panels.
 13. All existing conditions.
 14. Location of lighting control devices such as photocell controls, space occupancy sensors, etc.
 15. Exact quantity of conductors and cables shall be shown for all raceway systems.
 16. All devices, wall outlet boxes, and control components.
 17. All wireway and cable tray systems.
 18. Exact location of all driven grounding electrodes including burial depths and dimensions from fixed building lines. Location of all grounding system busbars.
 19. All building automation system (BAS) control panels and associated electrical devices, connections, power supplies, and dampers.
 20. Riser diagrams exactly as installed.
 21. Motor control devices, terminal cabinets, equipment racks, disconnects and switches and surge protection devices.
 22. Change the equipment schedules (i.e. symbol legends, light fixture schedule, etc) to agree with items actually furnished.
 23. Change plan notes to agree with items actually furnished, actual installation methods, etc. respectfully.
 24. Cross-out all items, circuitry, devices, etc. not applicable.
- D. As-Built red line information shall not compromise the clarity of the Contract Documents and Shop Drawings. Major components such as grouped raceway assemblies, cable tray systems, larger conduits, duct banks, racking, elevations, dimensions, etc. shall be

shown on a clean architectural base plan(s) separate from the Contract Electrical Documents, as required to clearly delineate work. Obtain electronic base plan file from ENGINEER.

1.15 "OBSERVATION OF WORK" REPORT

- A. Reference the General Conditions.
- B. Items noted by designer/ENGINEER during construction and before final acceptance which do not comply with the Contract Documents will be listed in a "Observation of Work" report which will be sent to the Contractor for action. Correct all deficiencies in a prompt concise manner. After completion of the outstanding items, provide a written confirmation report for each item. The report shall indicate each item noted, and method of correction. Enter the date on which the item was corrected, and return the signed reports so items can be rechecked. Failure to correct the deficiencies in a prompt concise manner or failure to return the signed reports shall be cause for disallowing request for payments.
- C. The electrical project superintendent shall be present at all required observation of work reviews as project progresses. Provide the ENGINEER with equipment for access and review of all Work in place, as well as personnel fully familiar with all aspects of the work. Provide access to all electrical components such as junction boxes, panelboards, switchboards, devices and fixtures for their review by the designer/ENGINEER.
- D. Prior to start of Substantial Completion inspection, provide access to and prepare all electrical equipment and related components complete and ready for review by designer/OAR including but not limited to the following:
 - 1. All panelboard covers removed
 - 2. Switchboard and distributions panelboards readily for immediate removal of covers
 - 3. Terminal cabinet covers open or removed.
 - 4. Wireway covers open or removed
 - 5. Underground pull boxes ready for immediate removal of cover(s)
 - 6. Access to all grounding/bonding terminations
 - 7. Access to rated wall and through floor fire stopping
 - 8. Access to all control systems for the CCTV, Voice, Data, Fire Alarm, and Sound/Paging.
 - 9. Access to mechanical equipment, electrical connection points, and control devices
 - 10. Access to elevator and escalator machine rooms, hoistway, pits, etc.
 - 11. Access to all raceways crossing structural expansion/deflection joints.
 - 12. Access to all components of the fire alarm control system including control devices and fire dampers.
 - 13. Access to power company equipment
 - 14. Removal of access panels
 - 15. Removal of a minimum of one (1) acoustical lay-in ceiling tile throughout each area of work. Larger areas shall have one (1)-ceiling tile removed for every 30 square foot of ceiling area.

16. Each and every item deemed necessary by A/E to perform a comprehensive review of the work as installed relative to the contract documents.

- E. Items noted after acceptance during one-year guarantee period shall be checked by the Contractor in the same manner as above. The signed reports are to be returned by him when the items have been corrected.

1.16 SYSTEMS WARRANTY

- A. Reference the General Conditions.
- B. Warranty shall be by the Contractor to the Owner and shall cover for a period of one year from the date of the Substantial Completion. Warranty shall not include light bulbs lamps in service after one month from date of substantial completion of the System.
 - 1. Explain the provisions of warranty to the Owner at the "Demonstration of Completed System" meeting to be scheduled with the OAR upon project completion.
- C. Where items of equipment or materials carry a manufacturer's warranty for any period in excess of twelve (12) months, then the manufacturer's warranty shall apply for that particular piece of equipment or material.
- D. Where extended Guarantees are called for herein, furnish three copies to be inserted in Operation and Maintenance Manuals.
- E. All preventative maintenance and normal service will be performed by the Owner's maintenance personnel after final acceptance of the work which shall not alter the Contractor's warranty.

1.17 WASTE MATERIALS DISPOSAL

- A. Include in base bid the transport and disposal or recycling of all waste materials generated by this project in accordance with all rules, regulations and guidelines applicable. Comply fully with Florida Statute 403.7186 regarding mercury containing devices and lamps. Lamps, ballasts and other materials shall be transported and disposed of in accordance with all DEP and EPA guidelines applicable at time of disposal.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

PART 4 – BASIS OF PAYMENT

- A. 26 05 00 Unless specifically indicated otherwise, no separate measurement or payment shall be made for General Electrical Requirements, or for the requirements of other individual Division 26 Specifications. All such work shall be considered incidental to the major portions of work for which the electrical work is a component part.

END OF SECTION 26 05 00

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ITEM 26 05 19 POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.

B. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN-2-THWN-2.

2.2 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 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 NFPA 70.

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. Branch Circuits: Copper. Solid for No. 14 AWG and smaller; stranded for No. 12 AWG and larger

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type THHN-2-THWN-2, single conductors in raceway
- B. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN-2-THWN-2, single conductors in raceway
- C. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-2-THWN-2, single conductors in raceway
- D. Feeders Installed below Raised Flooring: Type THHN-2-THWN-2, single conductors in raceway
- E. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-2-THWN-2, single conductors in raceway
- F. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-2-THWN-2, single conductors in raceway

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B. Complete raceway installation between conductor and cable termination points according to Section 26 05 33 "Raceways and Boxes" 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 26 05 29 "Hangers and Supports."

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 12 inches of slack.

3.5 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Section 26 05 53 "Identification."
- 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.

3.7 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly.

3.8 FIELD QUALITY CONTROL

- A. Perform the following 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. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
- B. Test and Inspection Reports: Prepare a written report 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.
- C. Cables will be considered defective if they do not pass tests and inspections.

END OF ITEM 26 05 19

ITEM 26 05 26 GROUNDING AND BONDING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes grounding and bonding systems and equipment.

1.2 ACTION SUBMITTALS

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

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 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.
 - 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.

2.3 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. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.4 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel; 5/8 inch by 10 feet. Thread together to get length as indicated on plans.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 14 AWG and smaller, and stranded conductors for No. 12 AWG and larger unless otherwise indicated.
- B. Underground Grounding Conductors: Install bare copper conductor, No. 2/0 AWG minimum.
 - 1. Bury at least 24 inches below grade.
- 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.

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 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
 - 1. Feeders and branch circuits.
 - 2. Lighting circuits.
 - 3. Receptacle circuits.
 - 4. Single-phase motor and appliance branch circuits.
 - 5. Three-phase motor and appliance branch circuits.
 - 6. Flexible raceway runs.
- C. 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.
- D. Water Heater, Heat-Tracing, and Anti-frost 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.
- E. 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.
- F. 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.

3.4 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 Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

- C. 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. 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.

- D. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Section 26 05 43 "Underground Ducts and Raceways" and shall be at least 12 inches deep, with cover.
 - 1. Test Wells: 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.

- E. 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.

- F. Grounding and Bonding for Piping:
 - 1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
 - 2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
 - 3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

3.5 FIELD QUALITY CONTROL

- A. Perform tests and inspections. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.

END OF ITEM 26 05 26

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ITEM 26 05 29 HANGERS AND SUPPORTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

1.2 PERFORMANCE REQUIREMENTS

- A. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.3 ACTION SUBMITTALS

- A. Product Data: For steel slotted support systems.

- B. Shop Drawings: fabrication and installation details and include calculations for the following:

1. Trapeze hangers. Include Product Data for components.
2. Steel slotted channel systems. Include Product Data for components.
3. Equipment supports.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
 - 1. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 - 2. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 - 3. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 - 4. Channel Dimensions: Selected for applicable load criteria.
- B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- C. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored 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 malleable iron.
- E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- F. 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, stainless steel, for use in hardened Portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
 - 3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
 - 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
 - 5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
 - 6. Toggle Bolts: All-steel springhead type.
 - 7. Hanger Rods: Threaded steel.

2.2 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 NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
- C. 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 single-bolt conduit clamps using spring friction action for retention in support channel.
- D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT and RMC may be supported by openings through structure members, as permitted in 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: Beam clamps (MSS 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 meet seismic-restraint strength and anchorage requirements.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid 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. Concrete materials, reinforcement, and placement requirements
- C. Anchor equipment to concrete base.

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: 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.
- B. Touchup: Comply with requirements for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF ITEM 26 05 29

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ITEM 26 05 33 RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Metal wireways and auxiliary gutters.
4. Boxes, enclosures, and cabinets.
5. Handholes and boxes for exterior underground cabling.

B. Related Requirements:

1. Section 26 05 43 "Underground Ducts and Raceways" for exterior ductbanks, handholes, and underground utility construction.

1.2 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

1. Structural members in paths of conduit groups with common supports.
2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

B. Seismic Qualification Certificates: For enclosures, cabinets, and conduit racks and their mounting provisions, including those for internal components, from manufacturer.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

- A. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. GRC: Comply with ANSI C80.1 and UL 6.
- C. EMT: Comply with ANSI C80.3 and UL 797.
- D. FMC: Comply with UL 1: aluminum.
- E. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- F. 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.
 - b) Type: Setscrew or compression.
 - 3. 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.
 - 4. 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, TUBING, AND FITTINGS

- A. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

- C. LFNC: Comply with UL 1660
- D. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- E. Solvent cements and adhesive primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

- A. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 or Type 3R(exterior/wet locations) 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.
- B. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

2.4 BOXES, ENCLOSURES, AND CABINETS

- A. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- B. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A
- C. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.
- D. 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.
- E. Nonmetallic Floor Boxes: Nonadjustable, rectangular.

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.
- F. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lbs. Outlet boxes designed for attachment of luminaires weighing more than 50 lbs. shall be listed and marked for the maximum allowable weight.
- G. Special Fan Outlet Boxes: As per manufacturer's recommendation and in compliance with NEC requirements
- H. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- I. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.
- J. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
- K. Device Box Dimensions: 4 inches square by 2-1/8 inches deep
- L. Gangable boxes are allowed.
- M. 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. Nonmetallic Enclosures: Fiberglass.
 3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.
- N. Cabinets:
 1. NEMA 250, Type 1 or Type 3R galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
 2. Hinged door in front cover with flush latch and concealed hinge.
 3. Key latch to match panelboards.
 4. Metal barriers to separate wiring of different systems and voltage.
 5. Accessory feet where required for freestanding equipment.
 6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.5 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

- A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
 2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.
1. Standard: Comply with SCTE 77.
 2. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
 3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
 4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
 5. Cover Legend: Molded lettering, "ELECTRIC."
 6. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
1. Exposed Conduit: GRC
 2. Concealed Conduit, Aboveground: GRC or EMT.
 3. Underground Conduit: RNC, Type EPC-40-PVC direct buried or concrete encased.
 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.
 6. Exposed, Not Subject to Physical Damage: EMT or RMC.
 7. Exposed, Not Subject to Severe Physical Damage: EMT
 8. Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:
 - 1) Corridors used for traffic of mechanized carts, forklifts, etc.
 - 2) Mechanical rooms.
 9. Concealed in Ceilings and Interior Walls and Partitions: EMT or RMC
 10. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
 11. Damp or Wet Locations: GRC.
 12. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4X stainless steel in damp or wet locations.
- B. Minimum Raceway Size: 3/4-inch trade size.

- C. Raceway Fittings: Compatible with raceways and suitable for use and location.
 - 1. Rigid 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 or compression, fittings. Comply with NEMA FB 2.10.
 - 4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- D. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
- E. Install surface raceways only where indicated on Drawings.
- F. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F

3.2 INSTALLATION

- A. 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.
- B. 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.
- 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 three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.
- 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. 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.
- I. Stub-ups to Above Recessed Ceilings:
1. Use EMT or RMC for raceways.
 2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- J. 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.
- K. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
- L. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- M. 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.
- N. 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.
- O. 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.
- P. 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. Where otherwise required by NFPA 70.

Q. 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.
2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
 - a. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
3. Formula in first subparagraph below provides about 15 percent safety factor (extra expansion-contraction capability).
4. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per degree F of temperature change for PVC conduits.
5. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
6. 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.

R. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC in damp or wet locations not subject to severe physical damage.

S. 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.

T. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between the box and cover plate or the supported equipment and box.

U. Horizontally separate boxes mounted on opposite sides of walls, so they are not in the same vertical channel.

V. Locate boxes so that cover or plate will not span different building finishes.

W. 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.

- X. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
- Y. Set metal floor boxes level and flush with finished floor surface.
- Z. 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 for pipe less than 6 inches in nominal diameter.
2. Install backfill.
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
4. Retain one of first two subparagraphs below to specify type of stub-up for direct-buried conduits in Project.
5. Install manufactured duct elbows for stub-up at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
6. 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.
7. Underground Warning Tape: Comply with requirements in Section 26 05 53 "Identification."

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. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.6 FIRESTOPPING

- A. Install firestopping at penetrations of fire-rated floor and wall assemblies.

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 ITEM 26 05 33

ITEM 26 05 43 UNDERGROUND DUCTS AND RACEWAYS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Direct-buried conduit, ducts, and duct accessories.
2. Concrete-encased conduit, ducts, and duct accessories.
3. Handholes and boxes.

1.2 ACTION SUBMITTALS

A. Product Data: For ducts and conduits, duct-bank materials, handholes, and boxes, and their accessories.

B. Shop Drawings:

1. Precast or Factory-Fabricated Underground Utility Structures:

- a) Include plans, elevations, sections, details, attachments to other work, and accessories.
- b) Include duct entry provisions, including locations and duct sizes.
- c) Include reinforcement and joint details, frame and cover design, and manhole frame support rings.

2. Factory-Fabricated Handholes and Boxes Other Than Precast Concrete:

- a) Include dimensioned plans, sections, elevations, accessory locations, and fabrication and installation details.
- b) Include duct entry provisions, including locations and duct sizes.

1.3 INFORMATIONAL SUBMITTALS

A. Duct-Bank Coordination Drawings: Show duct profiles, locations of expansion fittings, and coordination with other utilities and underground structures on Drawings signed and sealed by a qualified professional engineer.

B. Product Certificates: For concrete and steel used in precast concrete handholes, as required by ASTM C 858.

C. Qualification Data: For professional engineer and testing agency responsible for testing nonconcrete handholes and boxes.

D. Source quality-control reports.

E. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

1.5 FIELD CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted by Owner and then only after arranging to provide temporary electrical service.

B. Ground Water: Assume ground-water level is 24 inches below ground surface unless a higher water table is noted on Drawings.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR DUCTS AND RACEWAYS

A. Comply with ANSI C2.

2.2 CONDUIT

A. RNC: NEMA TC 2, Type EPC-40-PVC UL 651, with matching fittings by same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B.

2.3 NONMETALLIC DUCTS AND DUCT ACCESSORIES

A. Underground Plastic Utilities Duct: NEMA TC 2, UL 651, ASTM F 512, Type EPC-40, with matching fittings complying with NEMA TC 3 by same manufacturer as the duct.

B. Duct Accessories:

1. Duct Separators: Factory-fabricated rigid PVC interlocking spacers.
2. Warning Tape: Underground-line warning tape specified in Section 26 05 53 "Identification."
3. Concrete Warning Planks: Nominal 12 by 24 by 3 inches in size, manufactured from 6000-psi red concrete and labeled "ELECTRIC."

PART 3 - EXECUTION

3.1 UNDERGROUND DUCT APPLICATION

- A. Ducts for Electrical Feeders 600 V and Less: RNC, NEMA Type EPC-40-PVC, in direct-buried duct bank unless otherwise indicated.
- B. Ducts for Electrical Branch Circuits: RNC, NEMA Type EPC-40-PVC, in direct-buried duct bank unless otherwise indicated.
- C. Underground Ducts Crossing Driveways and Roadways: RNC, NEMA Type EPC-40-PVC, encased in reinforced concrete.

3.2 UNDERGROUND ENCLOSURE APPLICATION

- A. Handholes and Boxes for 600 V and Less:
 - 1. Units in Roadways and Other Deliberate Traffic Paths: Precast concrete, AASHTO HB 17, H-10 structural load rating.
 - 2. Units in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Polymer concrete, SCTE 77, Tier 15 structural load rating.
 - 3. Cover design load shall not exceed the design load of the handhole or box.

3.3 EARTHWORK

- A. Excavation and Backfill: Do not use heavy-duty, hydraulic-operated, compaction equipment.
- B. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary top-soiling, fertilizing, liming, seeding, sodding, sprigging, and mulching.

3.4 DUCT INSTALLATION

- A. Install ducts according to NEMA TCB 2.
- B. Slope: Pitch ducts a minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope ducts from a high point in runs between two manholes, to drain in both directions.
- C. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 48 inches both horizontally and vertically, at other locations unless otherwise indicated.

- D. Joints: Use solvent-cemented joints in ducts and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent ducts do not lie in same plane.
- E. Installation Adjacent to High-Temperature Steam Lines: Where duct banks are installed parallel to underground steam lines, perform calculations showing the duct bank will not be subject to environmental temperatures above 40 deg C. Where environmental temperatures are calculated to rise above 40 deg C, and anywhere the duct bank crosses above an underground steam line, install insulation blankets listed for direct burial to isolate the duct bank from the steam line.
- F. Duct Entrances Concrete and Polymer Concrete Handholes: Use end bells, spaced approximately 10 inches o.c. for 5-inc ducts, and vary proportionately for other duct sizes.
1. Begin change from regular spacing to end-bell spacing 10 feet from the end bell without reducing duct line slope and without forming a trap in the line.
 2. Direct-Buried Duct Banks: Install an expansion and deflection fitting in each conduit in the area of disturbed earth adjacent to manhole or handhole. Install an expansion fitting near the center of all straight line direct-buried duct banks with calculated expansion of more than 3/4 inch.
 3. Grout end bells into structure walls from both sides to provide watertight entrances.
- G. Building Wall Penetrations: Make a transition from underground duct to rigid steel conduit at least 10 feet outside the building wall, without reducing duct line slope away from the building, and without forming a trap in the line. Use fittings manufactured for duct-to-conduit transition. Install conduit penetrations of building walls.
- H. Sealing: Provide temporary closure at terminations of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15-psig hydrostatic pressure.
- I. Pulling Cord: Install 100-lbf test nylon cord in empty ducts.
- J. Concrete-Encased Ducts: Support ducts on duct separators.
1. Excavate trench bottom to provide firm and uniform support for duct bank. Prepare trench bottoms for pipes less than 6 inches in nominal diameter.
 2. Depth: Install top of duct bank at least 24 inches below finished grade in areas not subject to deliberate traffic, and at least 30 inches below finished grade in deliberate traffic paths for vehicles unless otherwise indicated.
 3. Support ducts on duct separators coordinated with duct size, duct spacing, and outdoor temperature.
 4. Separator Installation: Space separators close enough to prevent sagging and deforming of ducts, with not less than four spacers per 20 feet of duct. Secure separators to earth and to ducts to prevent floating during concreting. Stagger separators approximately 6 inches between tiers. Tie entire assembly together using

fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.

5. Minimum Space between Ducts: 3 inches between ducts and exterior envelope wall, 2 inches between ducts for like services, and 4 inches between power and signal ducts.
6. Elbows: Use manufactured rigid steel conduit elbows for stub-ups at poles and equipment, at building entrances through floor, and at changes of direction in duct run.
 - a) Couple steel conduits to ducts with adapters designed for this purpose and encase coupling with 3 inches of concrete.
 - b) Stub-Ups to Equipment: For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of base. Install insulated grounding bushings on terminations at equipment.
7. Reinforcement: Reinforce concrete-encased duct banks where they cross disturbed earth and where indicated. Arrange reinforcing rods and ties without forming conductive or magnetic loops around ducts or duct groups.
8. Forms: Use walls of trench to form side walls of duct bank where soil is self-supporting and concrete envelope can be poured without soil inclusions; otherwise, use forms.
9. Concrete Cover: Install a minimum of 3 inches of concrete cover at top and bottom, and a minimum of 2 inches on each side of duct bank.
10. Pouring Concrete: Place concrete carefully during pours to prevent voids under and between conduits and at exterior surface of envelope. Do not allow a heavy mass of concrete to fall directly onto ducts. Allow concrete to flow to center of bank and rise up in middle, uniformly filling all open spaces. Do not use power-driven agitating equipment unless specifically designed for duct-bank application.

K. Direct-Buried Duct Banks:

1. Excavate trench bottom to provide firm and uniform support for duct bank.
2. Support ducts on duct separators coordinated with duct size, duct spacing, and outdoor temperature.
3. Space separators close enough to prevent sagging and deforming of ducts, with not less than four spacers per 20 feet of duct. Secure separators to earth and to ducts to prevent displacement during backfill and yet permit linear duct movement due to expansion and contraction as temperature changes. Stagger spacers approximately 6 inches between tiers.
4. Depth: Install top of duct bank at least 36 inches below finished grade unless otherwise indicated.
5. Set elevation of bottom of duct bank below frost line.
6. Install ducts with a minimum of 3 inches between ducts for like services and 6 inches between power and signal ducts.
7. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment, at building entrances through floor, and at changes of direction in duct run.

- a) Couple steel conduits to ducts with adapters designed for this purpose and encase coupling with 3 inches of concrete.
 - b) For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.
8. After installing first tier of ducts, backfill and compact. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process. Repeat procedure after placing each tier. After placing last tier, hand place backfill to 4 inches over ducts and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction.
- a) Place minimum 3 inches of sand as a bed for duct bank. Place sand to a minimum of 6 inches above top level of duct bank.
- L. Warning Planks: Bury warning planks approximately 12 inches above direct-buried ducts and duct banks, placing them 24 inches o.c. Align planks along the width and along the centerline of duct bank. Provide an additional plank for each 12-inch increment of duct-bank width over a nominal 18 inches. Space additional planks 12 inches apart, horizontally.
- M. Warning Tape: Bury warning tape approximately 12 inches above all concrete-encased ducts and duct banks. Align tape parallel to and within 3 inches of centerline of duct bank. Provide an additional warning tape for each 12-inch increment of duct-bank width over a nominal 18 inches. Space additional tapes 12 inches apart, horizontally.
- 3.5 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE
- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting ducts, to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of ducts, and seal joint between box and extension as recommended by manufacturer.
 - B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
 - C. Elevation: In paved areas and trafficways, set cover flush with finished grade. Set covers of other handholes 1 inch above finished grade.
 - D. 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.

- E. Field cut openings for ducts and 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.

3.6 GROUNDING

- A. Ground underground ducts and utility structures according to Section 26 05 26 "Grounding and Bonding."

3.7 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections and prepare test reports:
 - 1. Demonstrate capability and compliance with requirements on completion of installation of underground ducts and utility structures.
 - 2. Pull solid aluminum or wood test mandrel through duct to prove joint integrity and adequate bend radii, and test for out-of-round duct. Provide a minimum 6-inch long mandrel equal to 80 percent fill of duct. If obstructions are indicated, remove obstructions and retest.
 - 3. Test handhold grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Section 26 05 26 "Grounding and Bonding."
- B. Correct deficiencies and retest as specified above to demonstrate compliance.

3.8 CLEANING

- A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of ducts. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.

END OF ITEM 26 05 43

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ITEM 26 05 53 IDENTIFICATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Underground-line warning tape.
5. Warning labels and signs.
6. Instruction signs.
7. Equipment identification labels.
8. Miscellaneous identification products.

1.2 ACTION SUBMITTALS

- A. Product Data: For each electrical identification product indicated.

1.3 QUALITY ASSURANCE

- A. Comply with ANSI 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. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

PART 2 - PRODUCTS

2.1 POWER RACEWAY IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.
- B. Colors for Raceways Carrying Circuits at 600 V or Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage and system or service type.

- C. Self-Adhesive Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

2.2 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
- B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

2.3 CONDUCTOR IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

2.4 UNDERGROUND-LINE WARNING TAPE

- A. Tape:
1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical 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 degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

2.5 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.
- B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

2.6 INSTRUCTION SIGNS

- A. Engraved, laminated acrylic or melamine plastic, minimum 1/16-inch-thick for signs up to 20 sq. inches and 1/8-inch-thick for larger sizes.
1. Engraved legend with black letters on white face.

2. Punched or drilled for mechanical fasteners.
3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.7 EQUIPMENT IDENTIFICATION LABELS

- A. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

2.8 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Apply identification devices to surfaces that require finish after completing finish work.
- C. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- D. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- E. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands 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. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.
- G. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

- A. Accessible Raceways 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30A, and 120V to ground: Install labels at 30-foot maximum intervals.
- B. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:
 - 1. Emergency Power.
 - 2. Power.
 - 3. UPS.
- C. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
 - 1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.
 - a) Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit
 - b) Colors for 208/120-V Circuits:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - c) Colors for 480/277-V Circuits:
 - 1) Phase A: Brown.
 - 2) Phase B: Orange.
 - 3) Phase C: Yellow.
 - d) Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- D. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.
- E. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source.
- F. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
 2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
 3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.
- G. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.
1. Limit use of underground-line warning tape to direct-buried cables.
 2. Install underground-line warning tape for both direct-buried cables and cables in raceway.
- H. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.
- I. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels
1. Comply with 29 CFR 1910.145.
 2. Identify system voltage with black letters on an orange background.
 3. Apply to exterior of door, cover, or other access.
 4. 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.
- J. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
- K. 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
- L. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
1. Labeling Instructions:

- a) Indoor Equipment: Self-adhesive, engraved, laminated acrylic or melamine label. 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.
- b) Outdoor Equipment: Engraved, laminated acrylic or melamine label
- c) Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
- d) Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

END OF ITEM 26 05 53

ITEM 26 09 23 - 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. This Section includes the following lighting control devices:
 - 1. Power Pack and Switches.
 - 2. Indoor occupancy sensors.
 - 3. Lighting contactors.

1.3 DEFINITIONS

- A. LED: Light-emitting diode.
- B. PIR: Passive infrared.

1.4 SUBMITTALS

- A. Product Data: Include dimensions and data on features, components, options, NRTL listings, wiring diagrams, and electrical ratings for each type of product to be utilized.
- B. Shop Drawings: Show installation details for occupancy and light-level sensors.
 - 1. Interconnection diagrams showing field-installed wiring.
- C. Field quality-control test reports.
- D. Operation and Maintenance Data: For each type of product to include in operation and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.6 COORDINATION

- A. 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 system, and partition assemblies.
- B. Coordinate features of devices specified in this Section with systems and components specified in other Sections to form an integrated system of compatible components. Match components and interconnections for optimum performance of specified functions

1.7 SPECIAL WARRANTIES

- A. Occupancy Sensors shall be provided with a 5 year extended warranty.

PART 2 - PRODUCTS

2.1 IN WALL TIMER SWITCH

- A. In wall single pole timer switch (120/277V, 6A).
- B. Automatically turns lights off after a preset time adjustable time setting from 5 min to 12 hours. Set default time out period to 2 hours
- C. Visual warning alert before lights turn off. One flash at 2 to 5 min prior to turn off and flash twice at 1 min to 15 sec prior to turn off.
- D. Basis of design is Wattstopper TS-400

2.2 OUTDOOR PHOTOELECTRIC SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Intermatic, Inc.
 - 2. TORK.
- B. Description: Solid state, with SPST dry contacts rated for 2000-W tungsten or 1800VA ballast, to operate connected relay, contactor coils, or microprocessor input; complying with UL 773A.
 - 1. Light-Level Monitoring Range: 1.5 to 15 fc (16.14 to 162 lx), with an adjustment for turn-on and turn-off levels within that range, and a sliding light level selector in front of photocell to prevent fixed light sources from causing turn-off.
 - 2. Time Delay: Up to 2 minutes to prevent false operation.
 - 3. Mounting: 1/2" conduit or box mounting as required to direct sensor to the north sky exposure.
 - 4. Temperature Range: -40 Deg F to +140 Deg F (-40 Deg C to +60 Deg C)

5. Heavy-duty die cast zinc, gasket for maximum weather protection.

2.3 INDOOR OCCUPANCY SENSORS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following.
 1. Legrand Watt Stopper.
 2. Approved Equal.
- B. Line Voltage Wall switch: Wall mounting, solid-state units with an integral relay unit.
 1. Operation: Unless otherwise indicated, turn lights on manually and off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 30 minutes. Set switches for manual on and 30 minute delay to off in unoccupied state.
 2. Mounting:
 - a. Sensor: Suitable for mounting in a standard outlet box.
 - b. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
 3. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.
 4. Bypass Switch: Override the on function in case of sensor failure or fail safe in the on position.
 5. Sensor: Dual-Technology Type, wall mounting; detect occupancy by using a of PIR detection and retain detection with microphonic or ultrasonic detection methods in area of coverage. Particular technology or combination of technologies that controls on-off functions shall be selectable in the field by operating controls on unit.
 6. Sensitivity Adjustment: Separate for each sensing technology.
 7. Detection Coverage (Standard Room): Detect occupancy anywhere within area of installation at a minimum. See drawings for type of detector to be utilized.
 8. Design selection: Wattstopper DW-100 or equal
- C. Low Voltage Sensors with Power Pack: Ceiling-mounting, solid-state units with a separate relay unit (Power Pack).
 1. Operation: Occupant must press the low voltage momentary switch ON to turn on the lighting load. When the occupancy sensor is the only input keeping the load ON, the load turns off when the sensor's time delay expires. If the sensor input retriggers with 30 seconds after the load turns OFF, the load turns ON again. After 30 seconds with no sensor input, press momentary switch to turn load ON.
 2. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit. Up to 14 sensors may control 1 relay unit.
 3. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70 for up to 14 sensors.

4. Mounting:
 - a. Sensor: Suitable for mounting in any position on a standard outlet box.
 - b. Relay: Externally mounted through a 1/2-inch (13-mm) knockout in a standard electrical enclosure.
 - c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
5. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.
6. Bypass Switch: Override the on function in case of sensor failure or fail safe in the on position.
7. Sensor: 360 deg passive infrared (PIR) detector (up to 1200sf) to turn lights on and off based on occupancy, isolation relay and light level sensor . Particular technology that controls on-off functions shall be selectable in the field by operating controls on unit.
8. Accepts low-voltage switch input for manual-on operation
9. Sensitivity Adjustment: PIR high to low.
10. Detection Coverage (Standard Room): Detect occupancy anywhere within area of installation at a minimum. See drawings for type of detector to be utilized.
11. Design Selection:
 - a. Occupancy Sensor: Wattstopper DT-200
 - b. Power Pack: BZ-250 series power pack.
 - c. Low Voltage Momentary Switch: Legrand LVSW-101

2.4 LIGHTING CONTACTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Eaton Electrical Inc: Model C30CN.
 2. Approved Equal.
- B. Operation: Contactor shall operate on 3 wire control. Shall turn on lights from input of photocell. Lights turn off with input from Timer.
- C. Description: Electrically operated and mechanically held complying with NEMA ICS 2 and UL 508.
- D. The contactors shall be designed to withstand the large initial inrush currents of tungsten and ballast lamp loads as well as non-motor (resistive) loads without contact welding
- E. The contactors shall be rated 30 amperes with 2 to 12 poles as indicated on the drawings.
- F. The contactors shall have an interlock that removes the power from the pickup coil and shall require application of power to release the contactor to the OFF position
- G. The contactors shall be capable of operating such that it will not switch to OFF during power failure to the control circuit

- H. The contactor shall be installed in a NEMA 1 enclosure
- I. 30 ampere rated contactor have finger safe terminals and normally open and normally closed poles shall be interchangeable where the installation of the pole on the contactor base determines if the pole is normally open or normally closed and not the pole itself. Contactor shall be field configurable from electrically held to mechanically held.

2.5 CONDUCTORS AND CABLES

- A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."
- B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION

- A. Install equipment level and plumb and according to manufacturer's written instructions.
- B. Mount lighting control devices according to manufacturer's written instructions and requirements in Division 26 Section "Basic Electrical Materials and Methods."
- C. Mounting heights indicated are to bottom of unit for suspended devices and to center of unit for wall-mounting devices.
- D. Connections: 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
- E. Bundle, train, and support wiring in enclosures.
- F. Ground equipment.

3.2 SENSOR INSTALLATION

- A. Install and aim sensors in locations to achieve not less than 95 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.
- B. Install in accordance with manufacturers recommendations, which shall determine final sensor location. All sensors shall have non-adjustable factory calibrated sensitivity for maximum performance. Set all time delays for 30 min to avoid nuisance turn off's.

3.3 CONTACTOR INSTALLATION

- A. Mount electrically held lighting contactors with elastomeric isolator pads, to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.4 WIRING INSTALLATION

- A. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.
- B. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.
- C. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in terminal cabinets; and equipment enclosures.

3.5 IDENTIFICATION

- A. Identify components and power and control wiring according to Division 26 Section "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.
- C. Provide warning labels on all equipment with more than one source of power located within the enclosure in accordance with Division 26 Section "Identification for Electrical Systems".

3.6 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. After installing time switches and sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.
 - 2. Operational Test: Verify operation of each lighting control device, and adjust time delays.

3.7 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting sensors to suit occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.8 DEMONSTRATION

- A. Demonstrate products specified in this Section to train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices. Refer to Division 01 Section "Demonstration and Training."

END OF ITEM 26 09 23

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ITEM 26 24 16 PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes distribution panelboards and lighting and appliance branch-circuit panelboards.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For each panelboard and related equipment.
 - 1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
 - 2. Detail enclosure types and details for types other than NEMA 250, Type 1.
 - 3. Detail bus configuration, current, and voltage ratings.
 - 4. Short-circuit current rating of panelboards and overcurrent protective devices.
 - 5. Include evidence of NRTL listing for series rating of installed devices.
 - 6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
 - 7. Include wiring diagrams for power, signal, and control wiring.
 - 8. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards.

1.3 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Certificates: Submit certification that panelboards, overcurrent protective devices, accessories, and components will withstand seismic forces
- B. Field quality-control reports.
- C. Panelboard schedules for installation in panelboards.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.5 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. Comply with NEMA PB 1.
- C. Comply with NFPA 70.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices 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 GENERAL REQUIREMENTS FOR PANELBOARDS

- A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces
- B. Enclosures: Surface-mounted 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 or Type 4X stainless steel depending on the Owners Standards or requirements
 - 2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
 - 3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
 - 4. Directory Card: Inside panelboard door, mounted in transparent card holder.
- C. Incoming Mains Location: Top and bottom.
- D. Phase, Neutral, and Ground Buses: Hard-drawn copper, 98 percent conductivity.
- E. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Main and Neutral Lugs: Mechanical type.
3. Ground Lugs and Bus Configured Terminators: Mechanical type.

- F. Service Equipment Label: NRTL labeled for use as service equipment for panelboards with one or more main service disconnecting and overcurrent protective devices.
- G. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
- H. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to SEI/ASCE 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."

2.3 DISTRIBUTION PANELBOARDS

- A. Acceptable Manufacturers:
1. Eaton/Cutler Hammer
 2. Square D
 3. Siemens
 4. General Electric
- B. Panelboards: NEMA PB 1, power and feeder distribution type.
- C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
- D. Mains: Circuit breaker.
- 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. Acceptable Manufacturers:
 - 1. Eaton/Cutler Hammer
 - 2. Square D
 - 3. Siemens
 - 4. General Electric
- B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- C. Mains: Circuit breaker or lugs only as shown on contract drawings.
- D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.
- F. Column-Type Panelboards: Narrow gutter extension, with cover, to overhead junction box equipped with ground and neutral terminal buses.

2.5 OVERCURRENT PROTECTIVE DEVICES

- A. Acceptable Manufacturers:
 - 1. Eaton/Cutler Hammer
 - 2. Square D
 - 3. Siemens
 - 4. General Electric
- B. 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-replaceable electronic trip; and the following field-adjustable settings:
 - a) Instantaneous trip.
 - b) Long- and short-time pickup levels.
 - c) Long- and short-time time adjustments.
 - d) Ground-fault pickup level, time delay, and $I^2 t$ response.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
5. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
6. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
7. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
8. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
 - a) Standard frame sizes, trip ratings, and number of poles.
 - b) Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
 - c) Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
 - d) Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable
 - e) Shunt Trip: 24-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.

2.6 ACCESSORY COMPONENTS AND FEATURES

- A. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Receive, inspect, handle, store and install panelboards and accessories according to **NEMA PB 1.1**.
- B. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."
- C. Mount top of trim 90 inches above finished floor unless otherwise indicated.
- D. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- E. Install overcurrent protective devices and controllers not already factory installed.
 1. Set field-adjustable, circuit-breaker trip ranges.

- F. Install filler plates in unused spaces.
- G. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or below slab not on grade.
- H. Arrange conductors in gutters into groups and bundle and wrap with wire ties.
- I. Comply with NECA 1.

3.2 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Section 26 05 53 "Identification."
- B. Create a directory to indicate installed circuit loads and incorporating Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification."
- D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification."

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- C. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- D. Panelboards will be considered defective if they do not pass tests and inspections.

- E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF ITEM 26 24 16

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ITEM 26 27 13.15 METER CENTERS AND METER STACKS

PART 1 - GENERAL

1.1 SCOPE

- A. The Contractor shall furnish and install the meter centers as specified herein and as shown on the contract drawings.

1.2 RELATED SECTIONS

- A. Section 16475 – Circuit Breakers and Fusible Switches – Low Voltage

1.3 REFERENCES

- A. The meter centers and all components shall be designed, manufactured and tested in accordance with the latest applicable following standards:
 - 1. UL 67
 - 2. UL 869
 - 3. UL 486B

1.4 SUBMITTALS – FOR REVIEW/APPROVAL

- A. The following information shall be submitted to the Engineer:

- 1. Master drawing index
- 2. Front view elevation
- 3. Floor plan
- 4. Single line
- 5. Schematic diagram
- 6. Component list
- 7. Conduit entry/exit locations
- 8. Assembly ratings including:
 - a. Short-circuit rating
 - b. Voltage
 - c. Continuous current
- 9. Major component ratings including:
 - a. Voltage
 - b. Continuous current
 - c. Interrupting ratings

- 10. Cable terminal sizes

1.5 SUBMITTALS – FOR CONSTRUCTION

- A. The following information shall be submitted for record purposes:
 - 1. Final as-built drawings and information for items listed in Paragraph 1.04, and shall incorporate all changes made during the manufacturing process
 - 2. Wiring diagrams
 - 3. Installation information

1.6 QUALIFICATIONS

- A. The manufacturer of the assembly shall be the manufacturer of the major components within the assembly.
- B. For the equipment specified herein, the manufacturer shall be ISO 9001 or 9002 certified.
- C. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.
 - 1. The following minimum mounting and installation guidelines shall be met, unless specifically modified by the above referenced standards.
 - a. The Contractor shall provide equipment anchorage details, coordinated with the equipment mounting provision, prepared and stamped by a licensed civil engineer in the state. Mounting recommendations shall be provided by the manufacturer based upon the above criteria to verify the seismic design of the equipment.
 - b. The equipment manufacturer shall certify that the equipment can withstand, that is, function following the seismic event, including both vertical and lateral required response spectra as specified in above codes.
 - c. The equipment manufacturer shall document the requirements necessary for proper seismic mounting of the equipment. Seismic qualification shall be considered achieved when the capability of the equipment, meets or exceeds the specified response spectra.

1.7 REGULATORY REQUIREMENTS

- A. The meter centers shall be UL labeled.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Equipment shall be handled and stored in accordance with manufacturer's instructions. One (1) copy of these instructions shall be included with the equipment at time of shipment.

1.9 FIELD MEASUREMENTS

1.10 OPERATION AND MAINTENANCE MANUALS

- A. Equipment operation and maintenance manuals shall be provided with each assembly shipped and shall include instruction leaflets and instruction bulletins for the complete assembly and each major component.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Eaton 3MM Modular Metering Stack
- B. Square D EZ Meter-Pak
- C. GE Meter Mod

The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety. Products in compliance with the specification and manufactured by others not named will be considered only if pre-approved by the Engineer ten (10) days prior to bid date.

2.2 RATINGS

- A. The assembly shall be rated to withstand mechanical forces exerted during short-circuit conditions when connected directly to a power source having available fault current 42,000 amperes symmetrical at rated voltage.

2.3 CONSTRUCTION

- A. The entire assembly shall be front accessible and shall include a main disconnect device.
- B. Tenant disconnects shall be wired for hot sequence and shall be molded case circuit breakers.
- C. The meter sockets shall be ringless type rated 125 amperes and a bypass shall be a lever type. The meter sockets and associated branch protective device positions shall be completely pre-wired and shipped ready for installation of the meters and tenant main breakers. Meter sockets shall include covers with sealing provisions.

2.4 BUS

- A. All bus bars shall be copper. Main horizontal bus bars shall be mounted with all three phases arranged in the same vertical plane. Bus sizing shall be based on UL standard temperature rise criteria for multi-metering equipment.
- B. Provide a full capacity neutral bus where a neutral bus is indicated on the drawings.

- C. All hardware used for aluminum bus bar connections shall be high-tensile strength, zinc-plated. Provide Belleville-type spring washers for all bus joints.

2.5 WIRING/TERMINATION

- A. Mechanical-type terminals shall be provided for all line terminations suitable for copper or aluminum cable and rated at 75 degrees C.
- B. Lugs shall be provided in the incoming line section for connection of the main grounding conductor.

2.6 MAIN PROTECTIVE DEVICES

- A. Provide circuit breaker type and compartment sized as indicated on electrical one-line diagram.
- B. Amp rating to be same as and connected to horizontal busbars
- C. Phase and Neutral lugs included in main terminal box.
- D. Provide with Shunt Trip Main.
- E. Bottom cable entry type.

2.7 TRIP UNITS

- A. Provide main breaker with 24Vac/dc shunt trip circuit breaker accessory.
- B. Provide wiring necessary to connection to main breaker auxiliary contract.
- C. Refer to electrical plans for shunt trip location
- D. Install shunt trip button with protective covering such as spring-loaded cover over button. Provide with necessary signage over button. Sign to read "MAIN SERVICE DISCONNECT"

2.8 TENANT UTILITY METERING

- A. Meter centers shall incorporate metering sections with tenant feeder circuits using ringless-type meter sockets rated 125mperes to meet local utility or customer requirements. Provide meter sockets with individual covers having sealing provisions.
- B. Meter sockets shall have manual lever bypass.

2.9 SURGE PROTECTION DEVICE

- A. The Surge Protection Device (SPD) device shall be mounted at the service entrance location between the main device and the meter stack(s) and shall provide surge protection for downstream group metering.
- B. The SPD enclosure shall be NEMA 1 with a pad-lockable cover and a window for surge status viewing. Boxes and trims shall be primed and finished with ANSI 61 light gray enamel.
- C. The SPD device shall include a circuit breaker wired in-line with the device as a disconnecting means. The circuit breaker and the TVSS device shall be of the same manufacturer and shall be tested as a complete assembly. The SPD device shall incorporate removable fuses with a 200,000 AIC rating. The assembly shall be rated to withstand mechanical forces exerted during short circuit conditions when connected directly to the Utility power source.
- D. The SPD device shall draw a maximum of 10 watts to power the internal power supply and leakage current to ground shall be 200 Micro-Amps or less. The device shall be grounded through the enclosure and a ground lug shall be provided for equipment grounding when needed.
- E. The SPD device shall have UL approval and product specifications shall be in accordance with applicable UL standards.
- F. The SPD device shall be Eaton SPD Series or equal as outlined below:
 - 1. Surge Current per Phase: 200 kA.
 - 2. System: 208 Volts,3-Phase

2.10 ENCLOSURES

- A. NEMA 1 Enclosure

2.11 FINISH

- A. Boxes and trims shall be primed and finished with ANSI 61 light gray enamel.

PART 3 - EXECUTION

3.1 FACTORY TESTING

- A. Standard factory tests shall be performed on the equipment provided under this section. All tests shall be in accordance with the latest version of ANSI and NEMA standards.

3.2 INSTALLATION

- A. The Contractors shall install all equipment per the manufacturer's recommendations and the contract drawings.
- B. All necessary hardware to secure the assembly in place shall be provided by the Contractor.

END OF ITEM 26 27 13.15

ITEM 26 27 26 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Weather-resistant receptacles.
3. Snap switches and wall-box dimmers.
4. Solid-state fan speed controls.
5. Wall-switch and exterior occupancy sensors.
6. Communications outlets.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Receptacles for Owner-Furnished Equipment: Match plug configurations.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and process used for pre-marking wall plates.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 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 application.
- B. Comply with NFPA 70.
- C. Device 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 the requirements in this Section.

2.3 STRAIGHT-BLADE RECEPTACLES

- A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

2.4 GFCI RECEPTACLES

- A. General Description:
 - 1. Straight blade, non-feed-through type.
 - 2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
 - 3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.
- B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

2.5 TOGGLE SWITCHES

- A. Comply with NEMA WD 1, UL 20, and FS W-S-896.
- B. Switches, 120/277 V, 20 A:
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a) Single Pole:
 - 1) Cooper; AH1221.
 - 2) Hubbell; HBL1221.
 - 3) Leviton; 1221-2.
 - 4) Pass & Seymour; CSB20AC1.
 - b) Two Pole:

- 1) Cooper; AH1222.
- 2) Hubbell; HBL1222.
- 3) Leviton; 1222-2.
- 4) Pass & Seymour; CSB20AC2.

c) Three Way:

- 1) Cooper; AH1223.
- 2) Hubbell; HBL1223.
- 3) Leviton; 1223-2.
- 4) Pass & Seymour; CSB20AC3.

2.6 WALL PLATES

A. 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 0.035-inch
3. Material for Damp Locations: Cast aluminum with spring-loaded lift cover and listed and labeled for use in wet and damp locations.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant die-cast aluminum with lockable cover.

2.7 FINISHES

A. 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 Emergency Power System: Red
3. TVSS Devices: Blue.

B. Wall Plate Color: For plastic covers, match device color.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. 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 meet provisions of 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) Pig-tailing 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. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

F. 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.

G. 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.

H. 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, multi-gang wall plates.

I. Adjust locations of service poles to suit arrangement of partitions and furnishings.

3.2 GFCI RECEPTACLES

- A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

B. Tests for Convenience 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.

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

D. Prepare test and inspection reports.

END OF ITEM 26 27 26

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ITEM 26 28 16 ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fusible switches.
 - 2. Nonfusible switches.
 - 3. Shunt trip switches.
 - 4. Molded-case circuit breakers (MCCBs).
 - 5. Enclosures.

1.2 DEFINITIONS

- A. NC: Normally closed.
- B. NO: Normally open.
- C. SPDT: Single pole, double throw.

1.3 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."

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated.
- B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Certificates: For enclosed switches and circuit breakers, accessories, and components, from manufacturer.

- B. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.7 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. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

- A. Type HD, Heavy Duty, Six Pole, Single Throw, 600-V ac, 200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- B. 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. Lugs: Suitable for number, size, and conductor material.
 - 5. Service-Rated Switches: Labeled for use as service equipment.

2.2 NONFUSIBLE SWITCHES

- A. Type HD, Heavy Duty, Six Pole, Single Throw, 600-V ac, 200 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.
- B. 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. Lugs: Suitable for number, size, and conductor material.

2.3 SHUNT TRIP SWITCHES

- A. General Requirements: Comply with ASME A17.1, UL 50, and UL 98, with 200-kA interrupting and short-circuit current rating when fitted with Class J fuses.
- B. Switches: Three-pole, horsepower rated, with integral shunt trip mechanism and Class J fuse block; lockable handle with capability to accept three padlocks; interlocked with cover in closed position.
- C. Control Circuit: 120-V ac; obtained from with a control power source of enough capacity to operate shunt trip, connected pilot, and indicating and control devices.
- D. Accessories:
 - 1. Oiltight key switch for key-to-test function.
 - 2. Oiltight ON pilot light.
 - 3. Isolated neutral lug.
 - 4. Mechanically interlocked auxiliary contacts that change state when switch is opened and closed.
 - 5. Form C alarm contacts that change state when switch is tripped.
 - 6. Three-pole, double-throw, fire-safety and alarm relay; 120-V ac coil voltage.
 - 7. Three-pole, double-throw, fire-alarm voltage monitoring relay complying with NFPA 72.

2.4 MOLDED-CASE CIRCUIT BREAKERS

- A. Acceptable Manufacturers:
 - 1. Eaton/Cutler Hammer
 - 2. Square D
 - 3. Siemens
 - 4. General Electric
- B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.
- C. 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
- D. Features and Accessories:
 - 1. Standard frame sizes, trip ratings, and number of poles.
 - 2. Lugs: Suitable for number, size, trip ratings, and conductor material.

2.5 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1
2. Outdoor Locations: NEMA 250, Type 3R or Type 4X stainless steel-Owner Preference

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- B. Comply with mounting and anchoring requirements
- C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- D. Install fuses in fusible devices.
- E. Comply with NECA 1.

3.2 IDENTIFICATION

- A. Comply with requirements in Section 26 05 53 "Identification."
 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
 2. Test continuity of each circuit.
- C. Tests and Inspections:
 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

- E. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF ITEM 26 28 16

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ITEM 26 43 13 - SURGE PROTECTION POWER CIRCUITS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes field-mounted SPDs for low-voltage (120 to 600 V) power distribution and control equipment.

1.2 ACTION 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.

1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.
- B. Sample Warranty: For manufacturer's special warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.5 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to replace or replace SPDs 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 GENERAL SPD REQUIREMENTS

- A. SPD with Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.

- C. Comply with UL 1449.
- D. MCOV of the SPD shall be the nominal system voltage.

2.2 SERVICE ENTRANCE AND TRANSFER SWITCH SUPPRESSOR

- A. SPDs: Comply with UL 1449, Type 1
 - 1. SPDs with the following features and accessories:
 - a) Integral disconnect switch.
 - b) Internal thermal protection that disconnects the SPD before damaging internal suppressor components.
 - c) Indicator light display for protection status.
- B. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 200 kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.
- C. Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277 V three-phase, four-wire circuits shall not exceed the following:
 - 1. Line to Neutral: 1200 V for 480Y/277 V
 - 2. Line to Ground: 1200 V for 480Y/277 V
 - 3. Line to Line: 2000 V for 480Y/277 V
- D. Protection modes and UL 1449 VPR for 240/120 V, single-phase, three-wire circuits shall not exceed the following:
 - 1. Line to Neutral: 700 V.
 - 2. Line to Ground: 700 V
 - 3. Line to Line: 1000 V.
- E. SCCR: Equal or exceed 200 kA
- F. Inominal Rating: 20 kA.

2.3 PANEL SUPPRESSORS

- A. SPDs: Comply with UL 1449, Type 1
 - 1. Include LED indicator lights for power and protection status.
 - 2. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.
- B. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 100 kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.

- C. Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277 V three-phase, four-wire circuits shall not exceed the following:
 - 1. Line to Neutral: 1200 V for 480Y/277 V
 - 2. Line to Ground: 1200 V for 480Y/277 V
 - 3. Neutral to Ground: 1200 V for 480Y/277 V
 - 4. Line to Line: 2000 V for 480Y/277 V
- D. Protection modes and UL 1449 VPR for 240/120-V, single-phase, three-wire circuits shall not exceed the following:
 - 1. Line to Neutral: 700 V.
 - 2. Line to Ground: 700 V.
 - 3. Neutral to Ground: 700 V.
 - 4. Line to Line: 1200 V.
- E. SCCR: Equal or exceed 200 kA
- F. Inominal Rating: 20 kA

2.4 ENCLOSURES

- A. Indoor Enclosures: NEMA 250, Type 1.
- B. Outdoor Enclosures: NEMA 250, Type 3R

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1.
- B. Install an OCPD or disconnect as required to comply with the UL listing of the SPD.
- C. Install SPDs with conductors between suppressor and points of attachment as short and straight as possible and adjust circuit-breaker positions to achieve shortest and straightest leads. Do not splice and extend SPD leads unless specifically permitted by manufacturer. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.
- D. Use crimped connectors and splices only. Wire nuts are unacceptable.
- E. Complete startup checks according to manufacturer's written instructions. Energize SPDs after power system has been energized, stabilized, and tested.

3.2 FIELD QUALITY CONTROL

- A. Perform the following 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.

B. An SPD will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.3 DEMONSTRATION

A. Train Owner's maintenance personnel to operate and maintain SPDs.

END OF ITEM 26 43 13

ITEM 26 51 00 INTERIOR & EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior and exterior lighting fixtures, lamps, and drivers
2. Emergency lighting units.
3. Exit signs.
4. Lighting fixture supports.

B. Related Sections:

1. Section 26 092 3 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.
2. Section 26 27 26 "Wiring Devices"

1.2 ACTION SUBMITTALS

A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, and finishes.

B. Shop Drawings: Show details of nonstandard or custom lighting fixtures. Indicate dimensions, weights, methods of field assembly, components, features, and accessories. Product Certificates: For each type of ballast for bi-level and dimmer-controlled fixtures, from manufacturer.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 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. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements

2.2 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS- INTERIOR

- A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.
- B. Metal Parts: Free of burrs and sharp corners and edges.
- C. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging.
- D. 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.
- E. Diffusers and Globes:
 - 1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 - a) Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.
 - b) UV stabilized.
 - 2. Glass: Annealed crystal glass unless otherwise indicated.
- F. Air-Handling Fluorescent Fixtures: For use with plenum ceiling for air return and heat extraction and for attaching an air-diffuser-boot assembly specified in Section 233713 "Diffusers, Registers, and Grilles."
 - 1. Air-Supply Units: Slots in one or both side trims join with air-diffuser-boot assemblies.
 - 2. Heat-Removal Units: Air path leads through lamp cavity.
 - 3. Combination Heat-Removal and Air-Supply Unit: Heat is removed through lamp cavity at both ends of the fixture door with air supply same as for air-supply units.
 - 4. Dampers: Operable from outside fixture for control of return-air volume.
 - 5. Static Fixture: Air-supply slots are blanked off, and fixture appearance matches active units.

2.3 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS- EXTERIOR

- A. Luminaires shall comply with UL 1598 and be listed and labeled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction.

- B. Lateral Light Distribution Patterns: Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.
- C. Metal Parts: Free of burrs and sharp corners and edges.
- D. Sheet Metal Components: Corrosion-resistant aluminum unless otherwise indicated. Form and support to prevent warping and sagging.
- E. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.
- F. 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. Designed to disconnect ballast when door opens.
- G. Exposed Hardware Material: Stainless steel.
- H. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
- I. Light Shields: Metal baffles, factory installed and field adjustable, arranged to block light distribution to indicated portion of normally illuminated area or field.
- J. 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.
- K. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.
- L. 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.
- M. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."

2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.

a) Color: As selected from manufacturer's standard catalog of colors.

N. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20; and seal aluminum surfaces with clear, hard-coat wax.

3. Class I, Clear Anodic Finish: AA-M32C22A41 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

4. Class I, Color Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 611.

a) Color: Dark bronze

O. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and drivers. 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 and ballast characteristics:

a) "USES ONLY" and include specific lamp type.

b) CCT and CRI for all luminaires.

2.4 DRIVERS FOR LED LAMPS

A. General Requirements:

1. Comply with UL 935 and with ANSI C82.11.

2. Designed for type and quantity of lamps served.

3. Drivers shall be designed for full light output unless another BF,

4. Sound Rating: Class A

5. Total Harmonic Distortion Rating: Less than 20 percent.

6. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.

7. Operating Frequency: 42 kHz or higher.

8. Lamp Current Crest Factor: 1.7 or less.

9. BF: 0.88 or higher.

10. Power Factor: 0.95 or higher.

2.5 EXIT SIGNS

- A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.
- B. Internally Lighted Signs:
 - 1. Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.
 - 2. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
 - a) Battery: Sealed, maintenance-free, nickel-cadmium type.
 - b) Charger: Fully automatic, solid-state type with sealed transfer relay.
 - c) Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
 - d) Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
 - e) LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

2.6 EMERGENCY LIGHTING UNITS

- A. General Requirements for Emergency Lighting Units: Self-contained units complying with UL 924.
 - 1. Battery: Sealed, maintenance-free, lead-acid type.
 - 2. Charger: Fully automatic, solid-state type with sealed transfer relay.
 - 3. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
 - 4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
 - 5. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
 - 6. Wire guard in first subparagraph below is optional feature. Coordinate with Drawings.
 - 7. Wire Guard: Heavy-chrome-plated wire guard protects lamp heads or fixtures.
 - 8. Retain "Integral Time-Delay Relay" Subparagraph below for time-delay option if units are indicated for areas normally lighted by HID fixtures that will not relight for a period after power is restored due to lengthy arc restrike delays.
 - 9. Integral Time-Delay Relay: Holds unit on for fixed interval of 15 minutes when power is restored after an outage.

2.7 LED LIGHT SOURCES

- A. The LED light source must indicate and/or take into consideration the key parameters and components

1. UL listing and label
2. Minimum lumen output
3. Light loss factor (LLF)
4. IES Light Measurement LM-79: Electrical and Photometric Measurements of Solid State Lighting Products.
5. IES LM-80: Measuring Lumen Maintenance of LED Light Sources
6. IES Technical Memorandum TM-21 Projecting Long Term Lumen Maintenance of LED Light Sources
7. Minimum lifespan (LED Component and driver)
8. Minimum color rendering index (CRI)
9. Color Temperature
10. LEDs from the same batch
11. Inrush current
12. Surge protection
13. Radio frequency interference (RFI), total harmonic distortion (THD), power factor
14. Warranty and availability of replacement parts

Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers

2.8 LIGHTING FIXTURE SUPPORT COMPONENTS

- A. Comply with Section 26 05 29 "Hangers and Supports" 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 fixture.
- C. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.
- D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage
- E. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage
- F. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
- G. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Lighting fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.
- B. Comply with NFPA 70 for minimum fixture supports.
- C. Suspended Lighting Fixture Support:

1. Pendants and Rods: Where longer than 48 inches brace to limit swinging.
2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.

- D. Air-Handling Lighting Fixtures: Install with dampers closed and ready for adjustment.
- E. Adjust aimable lighting fixtures to provide required light intensities.
- F. Adjust luminaires that require field adjustment or aiming
- G. Connect wiring according to Section 26 05 19 " Electrical Power Conductors."

3.2 FIELD QUALITY CONTROL

- A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.
- B. 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.

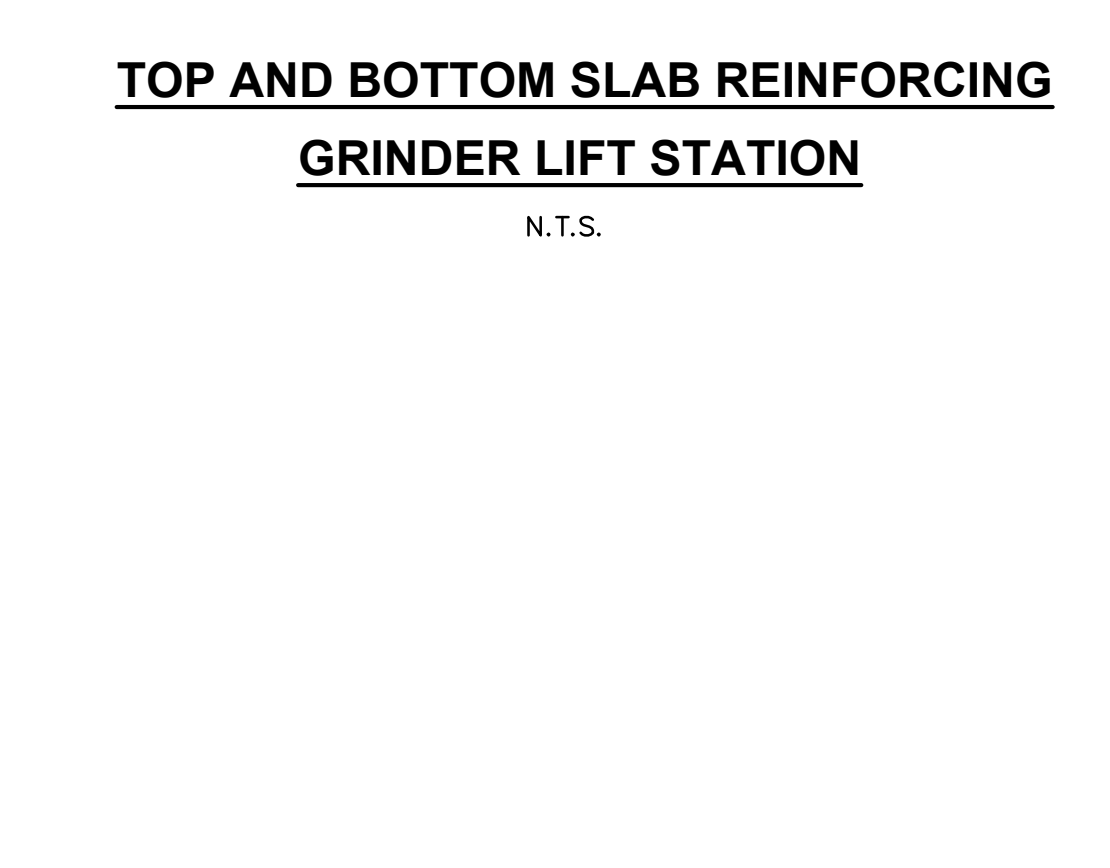
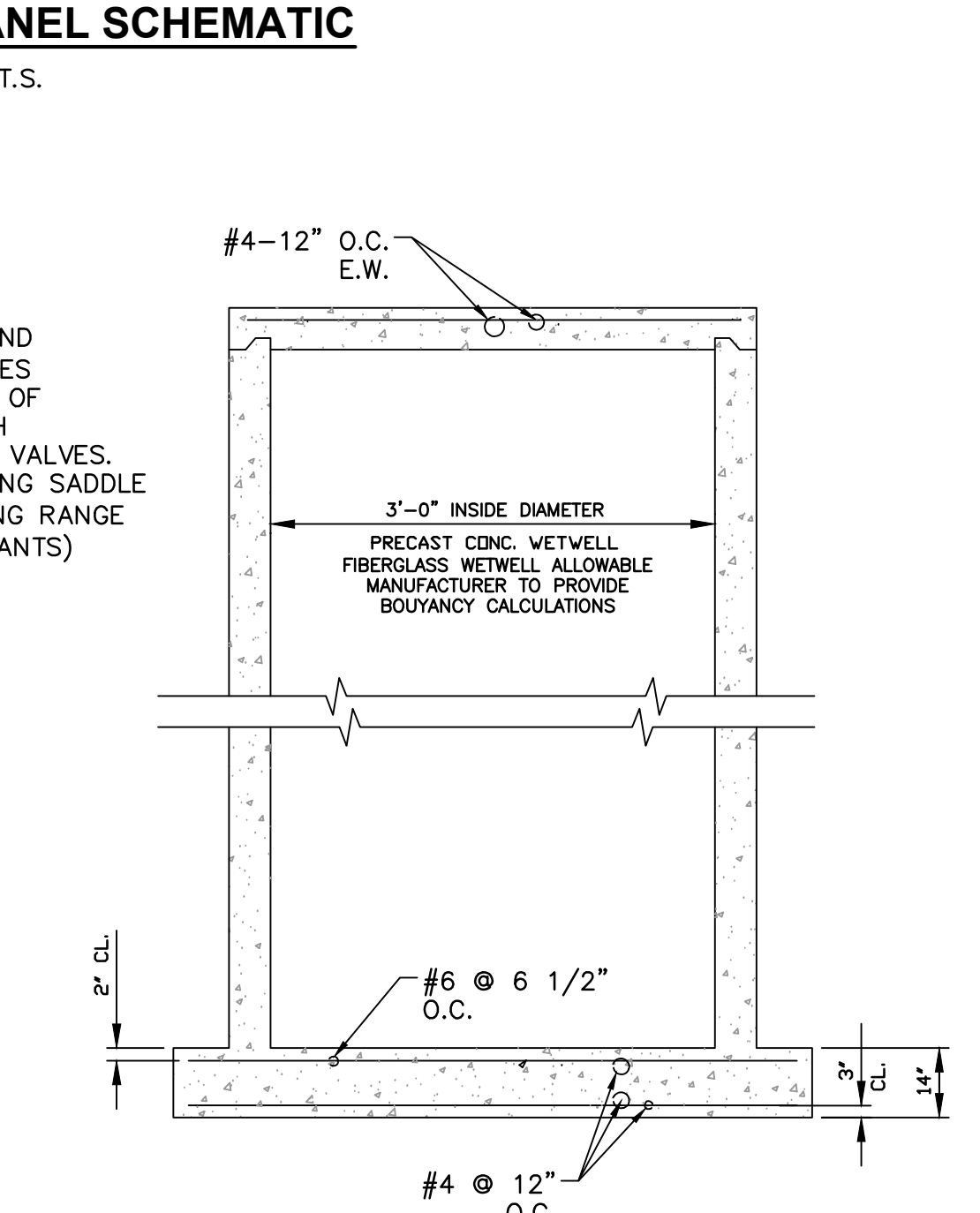
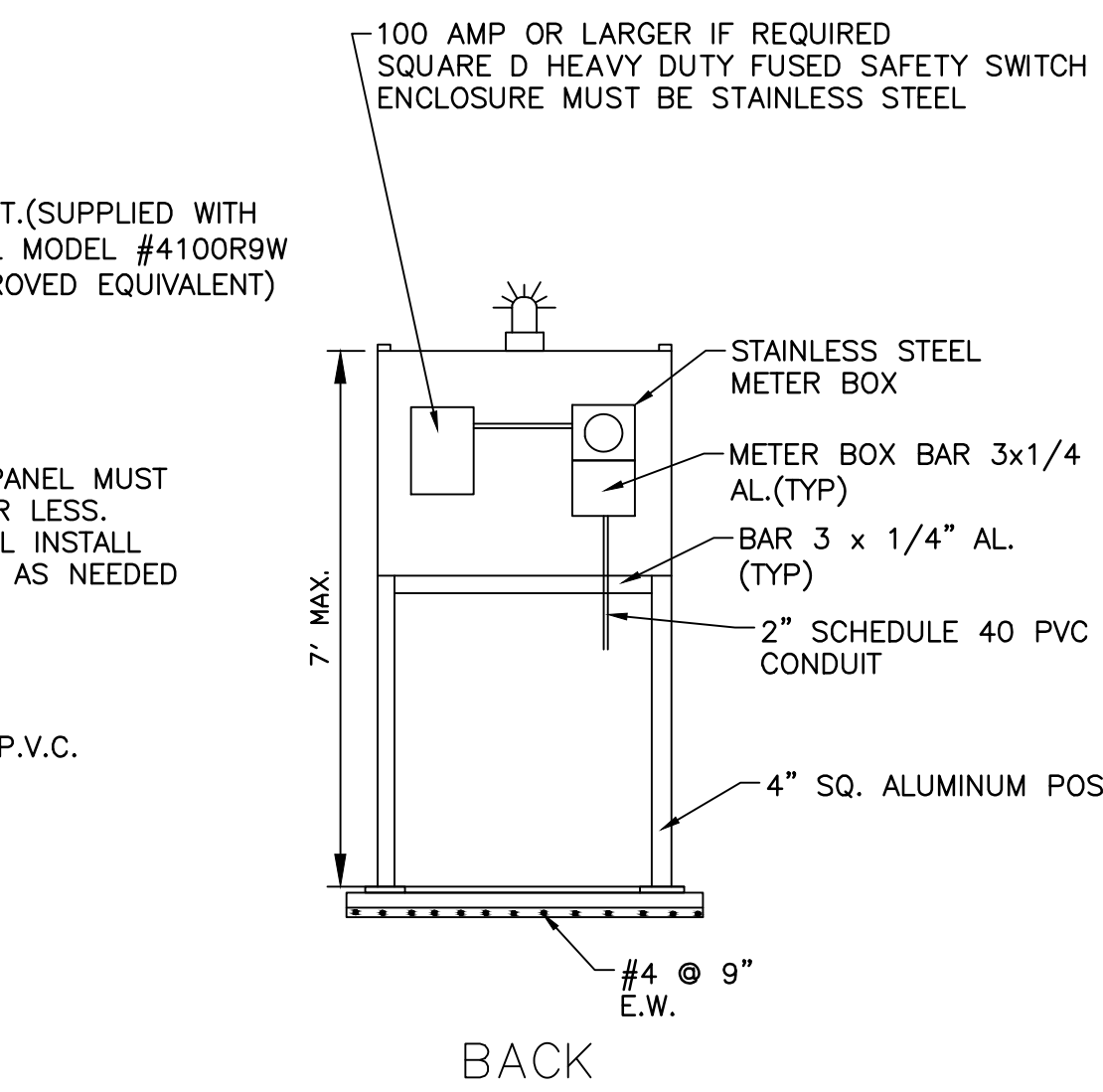
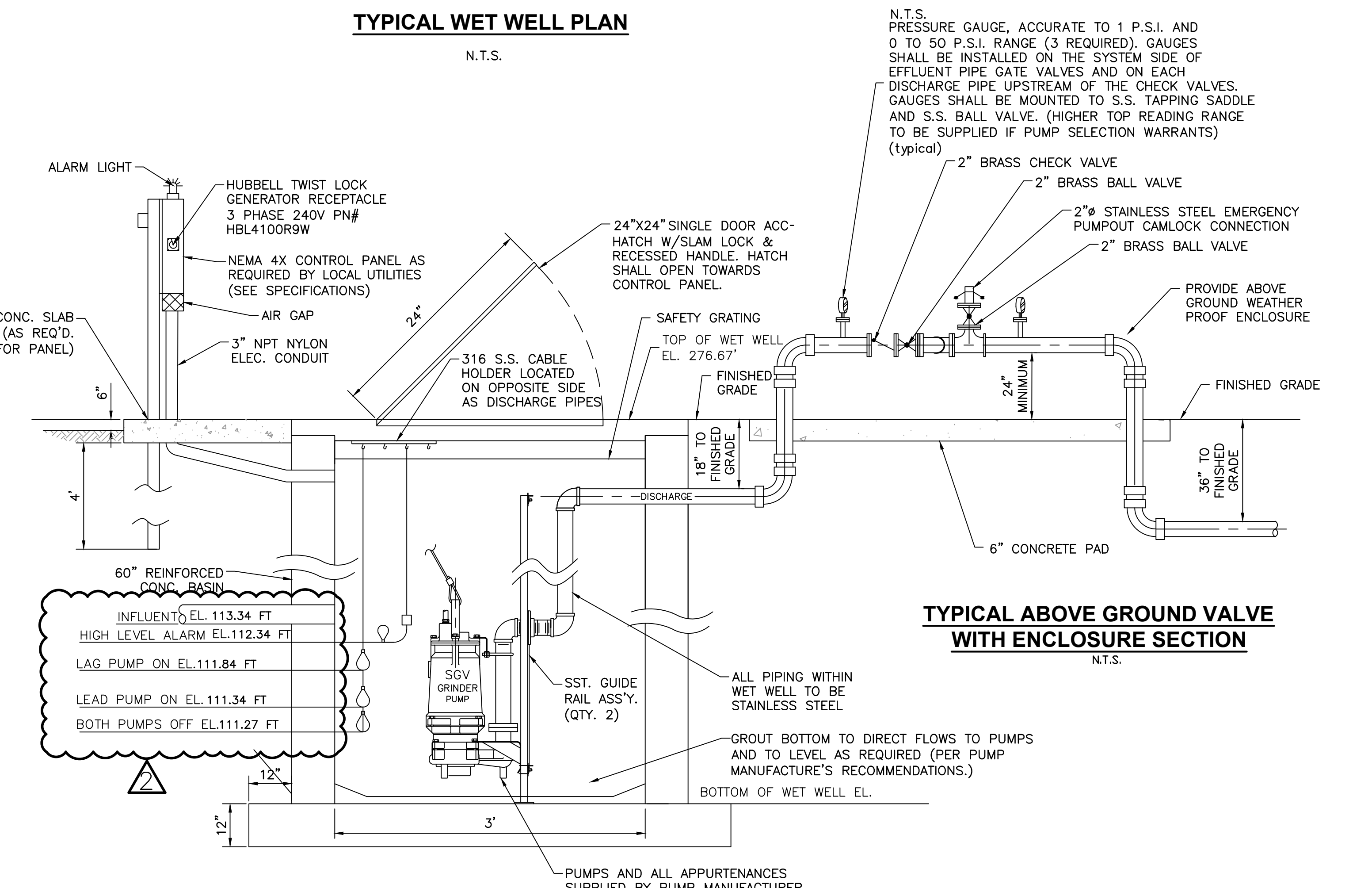
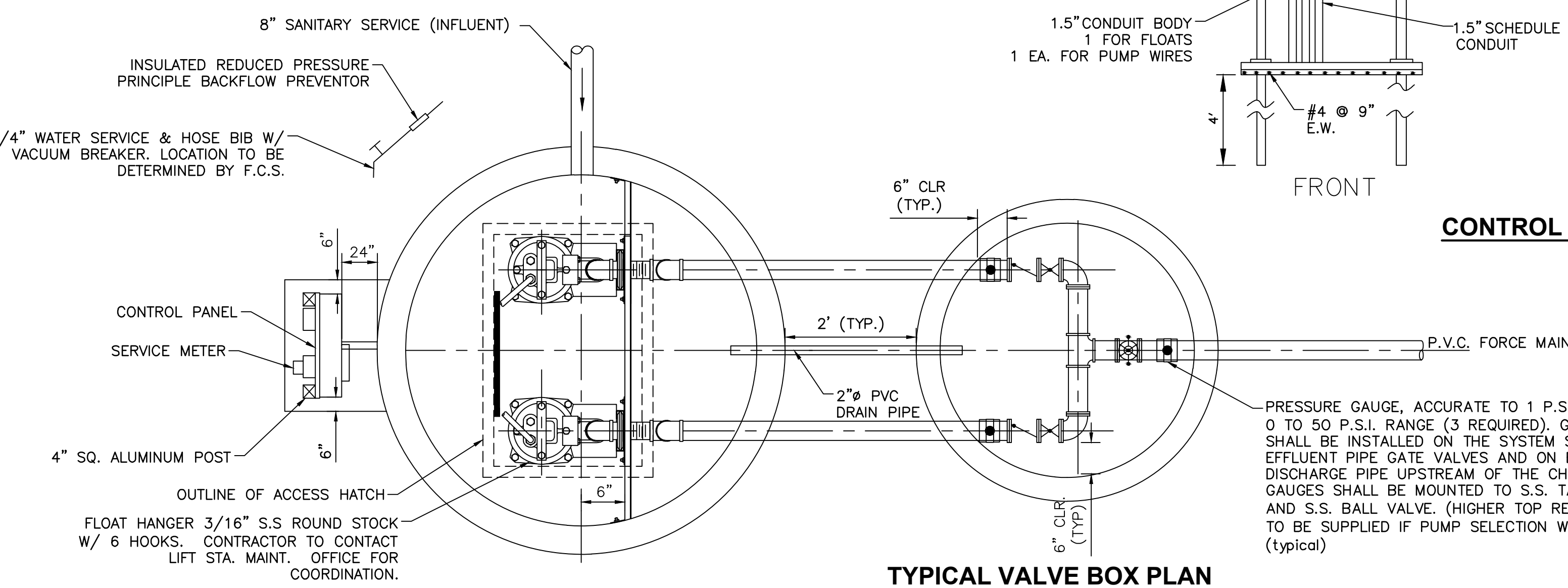
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PUMPING STATION DATA	
Designation	
Pump model	BARNES SGV3032L
Impeller	4.5 IN
voltage(1 PHASE)	120 Volt
h.p.	2
r.p.m.	3450 R.P.M
Influent Size	4.00 IN
Force main	1.50 IN

PUMP STATION NOTE:

- PUMP SHALL BE FLYGHT, KSB, ZOELLER, HYDRASERVICE, OR GRUMPHOS. PUMP STATION DATA ABOVE PROVIDED FOR PERFORMANCE CRITERIA ONLY.



- GENERAL NOTES:**
- WET WELL AND VALVE VAULT SHALL BE COATED WITH KOP-COAL TAR EPOXY 300-M INSIDE AND OUT. (TWO COATS, 9MILS EACH)
 - BASE AND FIRST RISER UNIT TO BE CAT MONOLITHIC.
 - VALVE VAULT SHALL BE SIZED TO PERMIT EASY REMOVAL OF CHECK VALVE.
 - ALL LOCATIONS WHERE PIPES ENTER OR LEAVE THE WET WELL OR VALVE VAULT SHALL BE MADE WATERTIGHT WITH WALL SLEEVE OR NON-SHRINK.
 - THERE SHALL BE NO VALVES OR ELECTRICAL JUNCTION BOXES IN WET WELL.
 - WET WELL AND VALVE VAULT COVERS SHALL BE ALUMINUM WITH 316 S.S. HARDWARE SIZE AS REQUIRED BY PUMP MANUFACTURE AND APPROVED BY FLORIDA COMMUNITY SERVICES.
 - FLEXIBLE COUPLING IF USED SHALL BE SLEEVE TYPE.
 - ALL HARDWARE IN WET WELL AND VALVE BOX TO BE STAINLESS STEEL.
 - ALL ENCLOSURES SHALL BE NEMA 3R OR BETTER EXCEPT CONTROL PANEL WHICH SHALL BE NEMA 4X.
 - THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING AND MEETING THE REQUIREMENTS OF REGIONAL UTILITIES STANDARD DETAILS AND SPECIFICATIONS LATEST EDITION.
 - ANY LOCATION WHERE PRESSURE PIPELINES CURVATURE EXCEEDS MANUFACTURES' SPECIFICATIONS; APPROPRIATE MECHANICAL JOINT FITTINGS SHALL BE USED.
 - ALL 2-INCH VALVE SHALL BE BALL TYPE- 2 - INCH GATE VALVE SHALL NOT BE USED.
 - ALL TIE IN TO EXISTING PRESSURIZED PIPELINES SHALL BE BY TAPPING SLEEVE (3 INCH TAP AND LARGER) (OR TAPPING SADDLE, 2 INCH TAP AND SMALLER) AND VALVE W/VALVE BOX.
 - DEVELOPERS OF PRIVATE PROJECTS SHALL PROVIDE ALL WETLANDS PERMITS NECESSARY FOR UTILITY CONSTRUCTIONS.
 - GRINDER LIFT STATION SHALL BE EQUIPPED WITH 3 HOOKS FOR THE STATION, ONE 5 HOOK FOR THE FLOATS, AND 2 SINGLE OR 2 HOOKS FOR PUMP CABLES.
 - ALL FLOAT CONDUITS SHALL INCLUDE SWEEPS, NOT 90° ANGLES.
 - LIFT STATION AND BYPASS PUMP SHALL BE FENCED AND ROCKED INSIDE THE FENCE.
 - ALL VALVES SHALL BE AMERICAN DARLING OR MTH.

- STRUCTURAL AND OTHER NOTES:**
- CONCRETE: DESIGN PER CURRENT EDITION OF A.C.I (318-83). CONCRETE STRENGTH @ 28 DAYS IS: $F_c' = 3500$ PSI
CONCRETE MIX SHOULD NOT CONTAIN MORE THAN 5 GALLONS OF WATER PER SACK OF CEMENT. AGGREGATES SHOULD HAE LOW ABSORPTION AND SHOULD BE CLEAN, SOUND AND WELL GRADED FORM FINE TO COARSE. SAND MUST HAVE 10 TO 20 PERCENT OF PARTICLES PASSING A 50 MESH SIEVE. COASTE AGGREGATE MUST BE GRADED FROM 1/4" UP TO A MAXIMUM OF 2", KEEPING THE CONCRETE CURED FOR ATLEAST 7 DAYS IS ADVISABLE. REINFORCING ASTM A-615, GRADE 60.
 - CLEAR COVER FOR BASE SLAB - 3" FOR BOTTOM BARS AND - 2" FOR TOP BARS.
 - CLEAR COVER FOR TOP SLAB - 2" FOR TOP & BOTTOM BARS.
 - CLEAN SAND BACKFILL WITH A FRICTION FACTOR OF 30% ROUND AND WEIGHING 120 PCF TO 130 PCF IS ASSUMED. THE DESIGN IS BASED ON A SUBMERGED CONDITION.
 - ALL REINFORCING SHALL BE SECURELY HELD IN POSITION WITH STANDARD ACCESSORIES DURING THE PLACING OF CONCRETE.
 - SPLICES IN REINFORCEMENT AR ENOT PERMITTED
 - IF FOTTING ELEVATIONS SHOWN OCCUR IN A DISTURBED, UNSTABLE OR UNSUITABLE SOIL, THE ENGINEER SHALL BE NOTIFIED.
 - MAXIMUM DESIGN SOIL PRESSURE ASSUMED = 2000 PSF.
 - ALL GRAVITY SEWER AND SEWER SERVICES SHALL HAVE CONCRETE ENCASEMENT WHERE COVER IS LESS THAN 30 INCHES UNDER PAVEMENT OR LESS THAN 18 INCHES IN GREEN AREAS.
 - AT ALL HIGH POINTS CREATED DURING FORCE MAIN CONSTRUCTION, AIR RELEASE VALVES SHALL BE CONSTRUCTED.
 - EXTERNAL DROP TYPE MANHOLES ARE REQUIRED WHERE MANHOLE INVERT ELEVATIONS VARY BY OVER TWO FEET.
 - MANHOLE TOPS IN GREEN AREAS SHALL BE ELEVATED TO PROHIBIT STORMWATER ENTRY.
 - SEWER SERVICES SHALL BE CONSTRUCTED AT THE LOWER SIDE OF LOTS AS MAY BE APPLICABLE.

AVCON, INC.
ENGINEERS & PLANNERS
320 BAYSHORE DRIVE, SUITE A
NICEVILLE, FL 32578-2425
OFFICE: (850) 678-0050
CORPORATE CERTIFICATE OF AUTHORIZATION NUMBER: 8057
www.avconinc.com

TRANSFORMING TODAY'S IDEAS INTO TOMORROW'S REALITY

IMAB	JUN	BY
ADDENDUM #1		
ADDENDUM #3		
11/17/24	11/17/24	NO. DATE
		REVISION

T-HANGAR DEVELOPMENT
PREPARED FOR
CALHOUN COUNTY AIRPORT

DESIGNED BY: J.R.C.
DRAWN BY: M.A.B.
CHECKED BY: J.R.C.
APPROVED BY: V.C.L.
PROJECT NO: 2022.241.01
DATE: NOVEMBER 2024

SHEET C-15

LEGEND NOTE: THESE ARE STANDARD SYMBOLS AND ALL MAY NOT APPEAR IN THIS PROJECT DRAWING SET. REFER TO ELECTRICAL GENERAL NOTES FOR ABBREVIATION LIST AND SPECIFICATIONS FOR MOUNTING HEIGHTS

ELECTRICAL SYMBOL LEGEND

POWER DISTRIBUTION EQUIPMENT

- MAIN SERVICE DISTRIBUTION SWITCHGEAR, SEE RISER DIAGRAM AND PANEL SCHEDULE FOR DETAILS
- MAIN / BRANCH DISTRIBUTION PANELBOARD, SEE RISER DIAGRAM AND PANEL SCHEDULE FOR DETAILS
- 480Y/277V, 3, 4W BRANCH PANELBOARD, SEE RISER DIAGRAM AND PANEL SCHEDULE FOR DETAILS
- 208Y/120V, 3, 4W BRANCH PANELBOARD, SEE RISER DIAGRAM AND PANEL SCHEDULE FOR DETAILS
- 240/120V, 3, 3W BRANCH PANELBOARD, SEE RISER DIAGRAM AND PANEL SCHEDULE FOR DETAILS
- ATS - AUTOMATIC TRANSFER SWITCH, SEE RISER DIAGRAM AND PANEL SCHEDULE FOR DETAILS
- MBS - MAINTENANCE BY-PASS SWITCH, SEE RISER DIAGRAM AND PANEL SCHEDULE FOR DETAILS
- DRY-TYPE TRANSFORMER MOUNTED TO 4" CONCRETE HOUSEKEEPING PAD UNLESS OTHERWISE NOTED, SEE RISER DIAGRAM AND PANEL SCHEDULE FOR DETAILS
- UTILITY METER BASE, SEE RISER DIAGRAM FOR DETAILS
- EMERGENCY SHUNT TRIP, MOUNTED 84" AFF FOR OUTDOOR USE AND 48" AFF FOR INDOOR USE UNLESS OTHERWISE NOTED, SEE RISER DIAGRAM FOR DETAILS
- SURGE PROTECTION DEVICE, SEE RISER DIAGRAM FOR LOCATIONS AND SEE SPECIFICATIONS FOR DETAIL INFORMATION
- TRAFFIC RATED PRE-FORMED MAN HOLE OR APPROVED EQUAL
- 24"x24" ELECTRICAL PULL BOX OR APPROVED EQUAL, UNLESS OTHERWISE NOTED
- 12"x12" ELECTRICAL HAND-HOLE OR APPROVED EQUAL, UNLESS OTHERWISE NOTED
- ELECTRICAL WIRE WAY, CONTRACTOR TO SIZE ACCORDING TO NEC CODE, UNLESS OTHERWISE NOTED. SEE ELECTRICAL SPECIFICATIONS FOR DETAIL INFORMATION AND TYPE
- MSGB - MAIN SERVICE ELECTRICAL GROUND BAR
- INSTANTANEOUS WATER HEATER, ELECTRIC OR GAS

MECH. POWER EQUIPMENT

- ELECTRIC PUMP MOTOR, ID MARK WILL CORRESPOND WITH PLUMBING SCHEDULE FOR SIZE AND ELECTRICAL DATA
- ELECTRIC HVAC MOTOR, ID MARK WILL CORRESPOND WITH MECHANICAL SCHEDULE FOR SIZE AND ELECTRICAL DATA
- INSTANTANEOUS ELECTRIC WATER HEATER, SEE PLUMBING SCHEDULE FOR SIZE AND ELECTRICAL DATA
- ELECTRIC HOT WATER HEATER, SEE PLUMBING SCHEDULE FOR SIZE AND ELECTRICAL DATA
- RE-CIRCULATION PUMP, SEE PLUMBING SCHEDULE FOR SIZE AND ELECTRICAL DATA
- 24V ELECTRIC AUTOMATIC FLUSH VALVE AND MINI TRANSFORMER, SEE PLUMBING SCHEDULE FOR SIZE AND ELECTRICAL DATA
- 24V ELECTRIC AUTOMATIC SINK VALVE AND MINI TRANSFORMER, SEE PLUMBING SCHEDULE FOR SIZE AND ELECTRICAL DATA

CONDUIT AND WIRE

- ABOVE GROUND RIGID METAL CONDUIT UNLESS NOTED OTHERWISE
- BURIED ELEC SCHD 40 PVC CONDUIT, UNLESS NOTED OTHERWISE
- ELECTRICAL CONDUCTOR HOME RUN. STANDARD CONDUCTOR SIZE IS 20A, 75° RATED, #12AWG THHN WIRE UNLESS OTHERWISE NOTED. SEE RISER DIAGRAM AND FEEDER SCHEDULES FOR CONDUCTOR SIZE, NUMBER OF CONDUCTORS, GROUND WIRE SIZE, CONDUIT SIZE AND VOLTAGE DROP.
- ABOVE GROUND CONDUCTOR OR GROUND CABLE, UNLESS OTHERWISE NOTED
- BELOW GROUND CONDUCTOR OR GROUND CABLE, UNLESS OTHERWISE NOTED
- GROUND CONNECTION OR GROUND CONNECTOR
- BURIED FIBER OPTIC CABLE, UNLESS NOTED OTHERWISE
- CAT 6 8 STRAND CAT 6 WIRE, UNLESS NOTED OTHERWISE

POWER EQUIPMENT

- FLOOR / WALL MOUNTED JUNCTION BOX, STANDARD SIZE 4"x4" METAL BOX UNLESS NOTED OTHERWISE
- CEILING MOUNTED JUNCTION BOX, STANDARD SIZE 4"x4" METAL BOX UNLESS NOTED OTHERWISE
- POKE THROUGH JUNCTION BOX, STANDARD SIZE 4" ROUND METAL BOX UNLESS NOTED OTHERWISE
- DUPLEX RECEPTACLE, STANDARD MOUNTING HEIGHT 18" AFF, UNLESS OTHERWISE NOTED
 - GFI - GROUND FAULT CIRCUIT INTERRUPTER
 - IG - ISOLATED GROUND FAULT RECEPTACLE
 - C - OUTLET CONTROLLED VIA LIGHTING CONTROL PER 2019 FLORIDA ENERGY CODE
 - A - ARC FAULT CIRCUIT INTERRUPTER
 - WP - GROUND FAULT CIRCUIT INTERRUPTER IN WEATHERPROOF BOX w/ COVER
 - REF - DEDICATED REFRIGERATOR RECEPTACLE
 - MW - DEDICATED MICROWAVE GFI RECEPTACLE
 - EWC - DEDICATED ELECTRIC WATER COOLER GFI RECEPTACLE, SEE PLUMBING PLANS FOR LOCATION
 - DC - DUST COVER
- GFI DUPLEX RECEPTACLE MOUNTED AT COUNTERTOP HEIGHT 42" AFF, UNLESS OTHERWISE NOTED
 - IG - ISOLATED GROUND FAULT RECEPTACLE
 - C - OUTLET CONTROLLED VIA LIGHTING CONTROL PER 2019 FLORIDA ENERGY CODE
 - A - ARC FAULT CIRCUIT INTERRUPTER
 - MW - DEDICATED MICROWAVE RECEPTACLE
- QUADRIPEX RECEPTACLE, STANDARD MOUNTING HEIGHT 18" AFF, UNLESS OTHERWISE NOTED
 - GFI - GROUND FAULT CIRCUIT INTERRUPTER
 - IG - ISOLATED GROUND FAULT RECEPTACLE
 - EWC - DEDICATED ELECTRIC WATER COOLER GFI RECEPTACLE, SEE PLUMBING PLANS FOR LOCATION
- DUPLEX RECEPTACLE FLUSH MOUNTED IN FLOOR, METAL BOX w/ COVER UNLESS OTHERWISE NOTED
- 208V / 230V 2 POLE DEDICATED DRYER SIMPLEX OUTLET MOUNTED AT 48", UNLESS OTHERWISE NOTED
- 480V, 3 PHASE, 4 WIRE DEDICATED SPECIALTY OUTLET MOUNTED AT 48", UNLESS OTHERWISE NOTED
- ELECTRIC MOTOR, * DENOTES TYPE OF MOTOR
 - G - GENERATOR MOTOR
 - E - ELEVATOR MOTOR
 - M - GENERAL ELECTRIC MOTOR
- 20A MOTOR RATED TOGGLE SAFETY SWITCH OR APPROVED EQUAL, UNLESS OTHERWISE NOTED
- NON FUSED HEAVY DUTY SAFETY SWITCH (SIZE AND NO. OF POLES ARE INDICATED)
 - SAFETY SWITCH ENCLOSURE NEMA RATING
 - NF (NON FUSED)
 - SAFETY SWITCH SIZE / NUMBER OF POLES
- FUSED HEAVY DUTY SAFETY SWITCH (SIZE, NO. OF POLES AND FUSE SIZE ARE INDICATED)
 - SAFETY SWITCH ENCLOSURE NEMA RATING
 - NF (NON FUSED)
 - SAFETY SWITCH SIZE / NUMBER OF POLES
- COMBINATION MAGNETIC STARTER / FUSED HEAVY DUTY SAFETY SWITCH
 - SAFETY SWITCH ENCLOSURE NEMA RATING
 - NF (NON FUSED)
 - NEMA STARTER SIZE
 - SAFETY SWITCH SIZE / NUMBER OF POLES
- COMBINATION MAGNETIC STARTER / ENCLOSED CIRCUIT BREAKER
 - SAFETY SWITCH ENCLOSURE NEMA RATING
 - CIRCUIT BREAKER SIZE
 - NEMA STARTER SIZE
- ENCLOSED CIRCUIT BREAKER
 - CIRCUIT BREAKER SIZE
 - CIRCUIT BREAKER ENCLOSURE NEMA RATING
- VFD (VARIABLE FREQUENCY DRIVE) STARTER / DISCONNECT, SEE MECHANICAL SCHEDULE FOR MOTOR SIZE AND ELECTRICAL DATA
 - UNIT MOTOR SIZE, SEE MECHANICAL SCHEDULE FOR MOTOR SIZE
 - VFD ENCLOSURE NEMA RATING

LIGHTING EQUIPMENT

- LED EXIT LIGHT, SINGLE FACE, ARROWS SHOWN ON FLOOR PLAN FOR DIRECTION OF EXIT. SEE LIGHTING FIXTURE SCHEDULE FOR MANUFACTURER, ELECTRICAL DATA AND MOUNTING TYPE
- LED EXIT LIGHT, DUAL FACE, ARROWS SHOWN ON FLOOR PLAN FOR DIRECTION OF EXIT. SEE LIGHTING FIXTURE SCHEDULE FOR MANUFACTURER, ELECTRICAL DATA AND MOUNTING TYPE
- INDUSTRIAL 1x4 LED FIXTURE w/ DEFLECTOR. SEE LIGHTING FIXTURE SCHEDULE FOR MANUFACTURER, ELECTRICAL DATA AND MOUNTING TYPE
- INDUSTRIAL 1x4 LED STRIP LIGHT. SEE LIGHTING FIXTURE SCHEDULE FOR MANUFACTURER, ELECTRICAL DATA AND MOUNTING TYPE
- VAPOR TIGHT 1x4 LED LIGHT. SEE LIGHTING FIXTURE SCHEDULE FOR MANUFACTURER, ELECTRICAL DATA AND MOUNTING TYPE
- LED WALL MOUNT FIXTURE. SEE LIGHTING FIXTURE SCHEDULE FOR MANUFACTURER, ELECTRICAL DATA AND MOUNTING TYPE
- LED POLE MOUNT SITE FIXTURE. SEE LIGHTING FIXTURE SCHEDULE FOR MANUFACTURER, ELECTRICAL DATA AND MOUNTING TYPE
- SURFACE MOUNT ROUND LIGHT. SEE LIGHTING FIXTURE SCHEDULE FOR MANUFACTURER, ELECTRICAL DATA AND MOUNTING TYPE
- SURFACE MOUNT SQUARE LIGHT. SEE LIGHTING FIXTURE SCHEDULE FOR MANUFACTURER, ELECTRICAL DATA AND MOUNTING TYPE
- RECESSED ROUND CAN LIGHT. SEE LIGHTING FIXTURE SCHEDULE FOR MANUFACTURER, ELECTRICAL DATA AND MOUNTING TYPE
- RECESSED SQUARE CAN LIGHT. SEE LIGHTING FIXTURE SCHEDULE FOR MANUFACTURER, ELECTRICAL DATA AND MOUNTING TYPE

LIGHTING CONTROLS

- SINGLE POLE DIGITAL SWITCH, UNLESS OTHERWISE NOTED
 - 1 - SINGLE BUTTON DIGITAL SWITCH
 - 2 - 2 BUTTON DIGITAL SWITCH
 - 3 - 3 BUTTON DIGITAL SWITCH
 - 4 - 4 BUTTON DIGITAL SWITCH
 - 5 - 5 BUTTON DIGITAL SWITCH
 - 6 - 6 BUTTON DIGITAL SWITCH
 - KS - KEY OPERATED SWITCH
 - 0 - DIGITAL SWITCH / OCCUPANCY SENSOR COMBINATION
 - T - DIGITAL TIMER SWITCH w/ OVERRIDE
 - 3W - 3 WAY TOGGLE SWITCH
 - WP - TOGGLE SWITCH IN WEATHERPROOF BOX w/ COVER
- LIGHTING RELAY CONTACT PANEL
- EXTERIOR PHOTO-ELECTRIC CELL FOR RELAY PANEL
- ASTRONOMICAL TIME CLOCK
- VACANCY SENSOR DUAL TECHNOLOGY, 2000 SQ. FEET, CEILING MOUNTED
- VACANCY SENSOR DUAL TECHNOLOGY, WALL MOUNTED

LIGHTING FIXTURE SCHEDULE

SYMBOL	FIXTURE ID	DESCRIPTION	LOAD	VOLTAGE
	WL	HE WILLIAMS 80-4-L63-8-40. 4' LINEAR LED FIXTURE	41.6 VA	120V
	EX	COOPER INDUSTRIES APCH7RRG-H EXIT LIGHT/EM LIGHT WITH 90 MINUTE BATTERY BACK UP. UL 924 LISTED	1.3 VA	120V
	DL	HE WILLIAMS 6" ROUND DOWN LIGHT 6DR-TL-L30-835-DIM-UNIV-OW	26.9 VA	120V
	FL	HE WILLIAMS FLOODLIGHT VF2-L57-730-HF-MTG-CLR-OPT-DIM-UNV	53.0 VA	120V

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ELECTRICALSYMBOL
 LEGEND AND
 LUMINAIRE SCHEDULE
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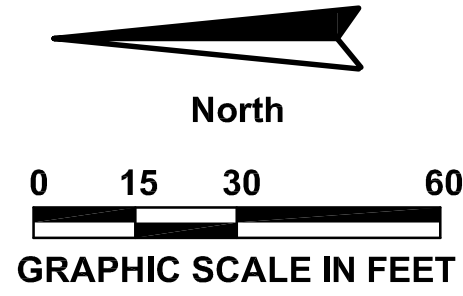
T-HANGAR
 DEVELOPMENT
 PREPARED FOR
 CALHOUN COUNTY
 AIRPORT

DESIGNED BY: PJP
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 APPROVED BY: CCG
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SHEET
E002

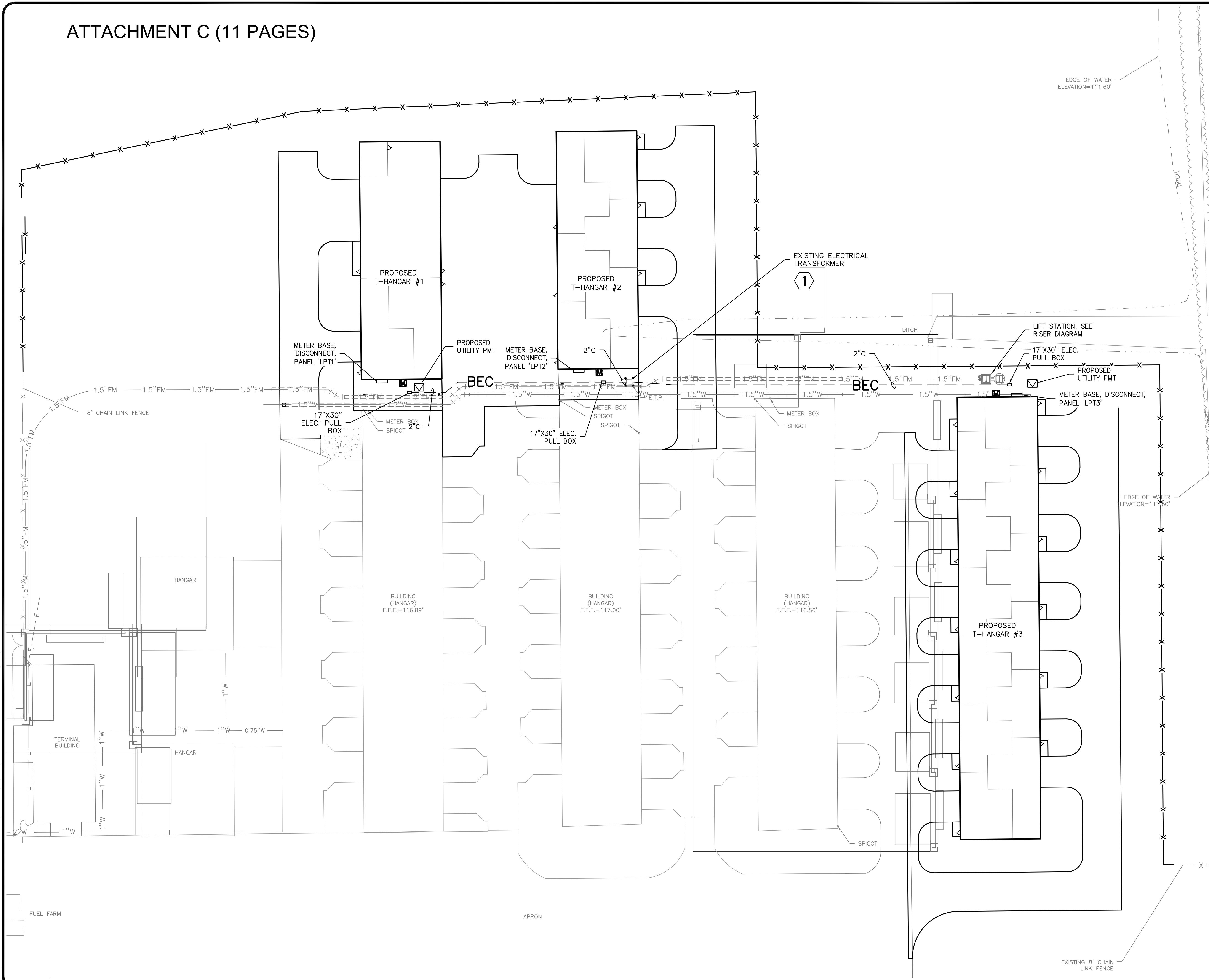
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ATTACHMENT C (11 PAGES)



HEX NOTES:

1. LOCATION OF EXISTING UTILITY TRANSFORMER, ROUTE SERVICE CONDUCTOR CONDUIT FROM EACH HANGAR SERVICE DISCONNECT TO THE EXISTING TRANSFORMER LOCATION. REFER TO ONE-LINE DIAGRAM FOR CONDUCTOR SIZING.



CALL 2 WORKING DAYS BEFORE YOU DIG **811**
 IT'S THE LAW! DIAL 811 Know what's below. Call before you dig.
 SUNSHINE STATE ONE CALL OF FLORIDA, INC.

LEGEND

	EXISTING PAVEMENT
	PROPOSED PAVEMENT
	EXISTING FENCE
	PROPOSED FENCE
	PROPOSED ASPHALT PAVEMENT

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ELECTRICAL SITE PLAN
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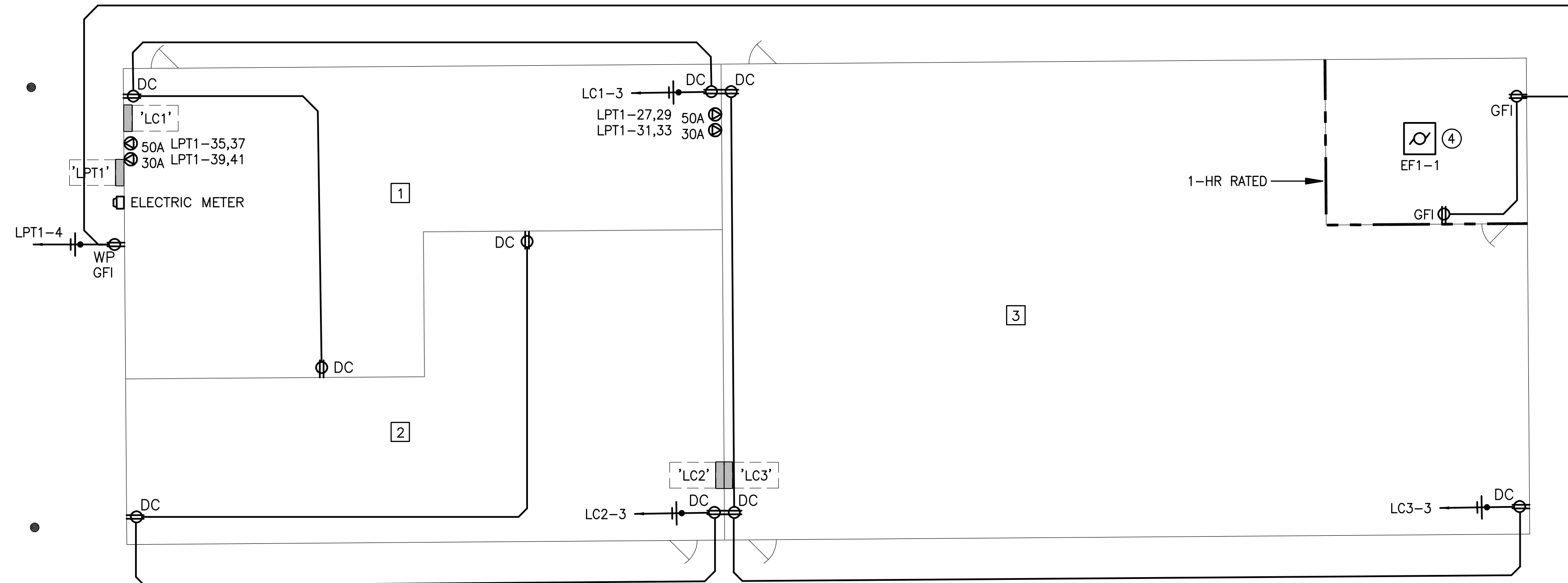
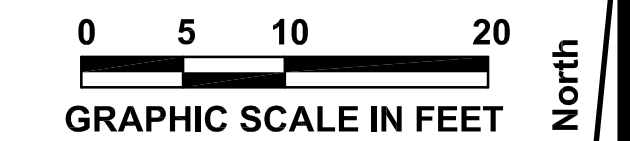
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SHEET E101

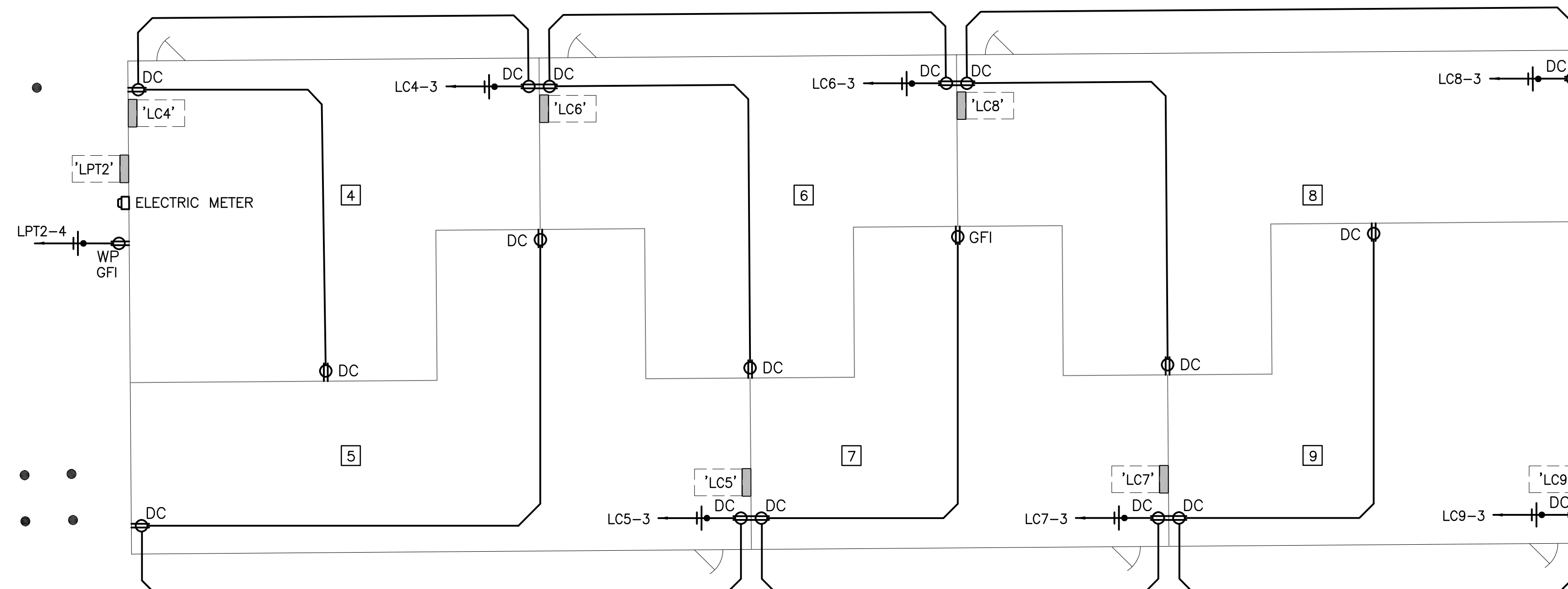
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T-HANGAR POWER FLOOR PLAN - BUILDING #1 ①②③

SCALE: 1" = 10'-0"



T-HANGAR POWER FLOOR PLAN - BUILDING #2 ①②③

SCALE: 1" = 10'-0"

ELECTRICAL NOTES:

1. ALL RECEPTACLES TO BE MOUNTED MINIMUM 36" ABOVE FINISHED FLOOR UNLESS OTHERWISE NOTED. LOCATE RECEPTACLES OUT OF EXCLUSION ZONE. REFER TO SHEET E701.
2. ALL CONDUIT TO BE ROUTED OVERHEAD TO KEEP OUT OF EXCLUSION ZONE. PROVIDE CONDUIT SUPPORTS AS REQUIRED.
3. ALL RECEPTACLES IN HANGAR SHALL BE MOUNTED TO HANGAR WALL IN DUST PROOF BOX WITH COVER.
4. SEE DETAIL ON SHEET E701 FOR DETAIL TO INTERLOCK EXHAUST FAN AND LIGHT SWITCH.

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T-HANGAR
BUILDINGS 1 AND 2
POWER PLAN
RELEASE FOR BID

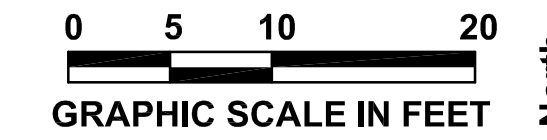
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SHEET
E201

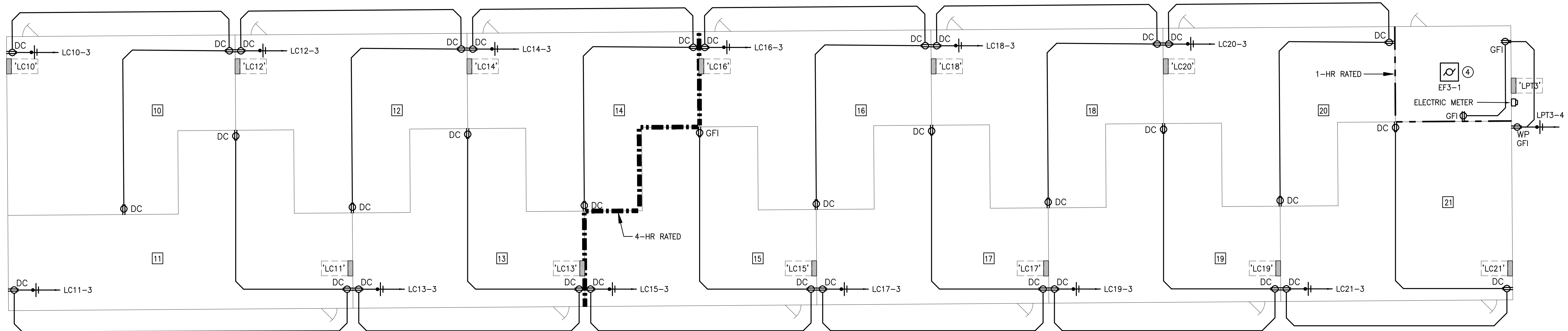
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ELECTRICAL NOTES:

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2. ALL CONDUIT TO BE ROUTED OVERHEAD TO KEEP OUT OF EXCLUSION ZONE. PROVIDE CONDUIT SUPPORTS AS REQUIRED.
3. ALL RECEPTACLES IN HANGAR SHALL BE MOUNTED TO HANGAR WALL IN DUST PROOF BOX WITH COVER.
4. SEE DETAIL 2 ON SHEET E701 FOR DETAIL TO INTERLOCK EXHAUST FAN AND LIGHT SWITCH.



T-HANGAR POWER FLOOR PLAN - BUILDING #3 ①②③

SCALE: 1" = 10'-0"

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**T-HANGAR BUILDING 3
 POWER PLAN**
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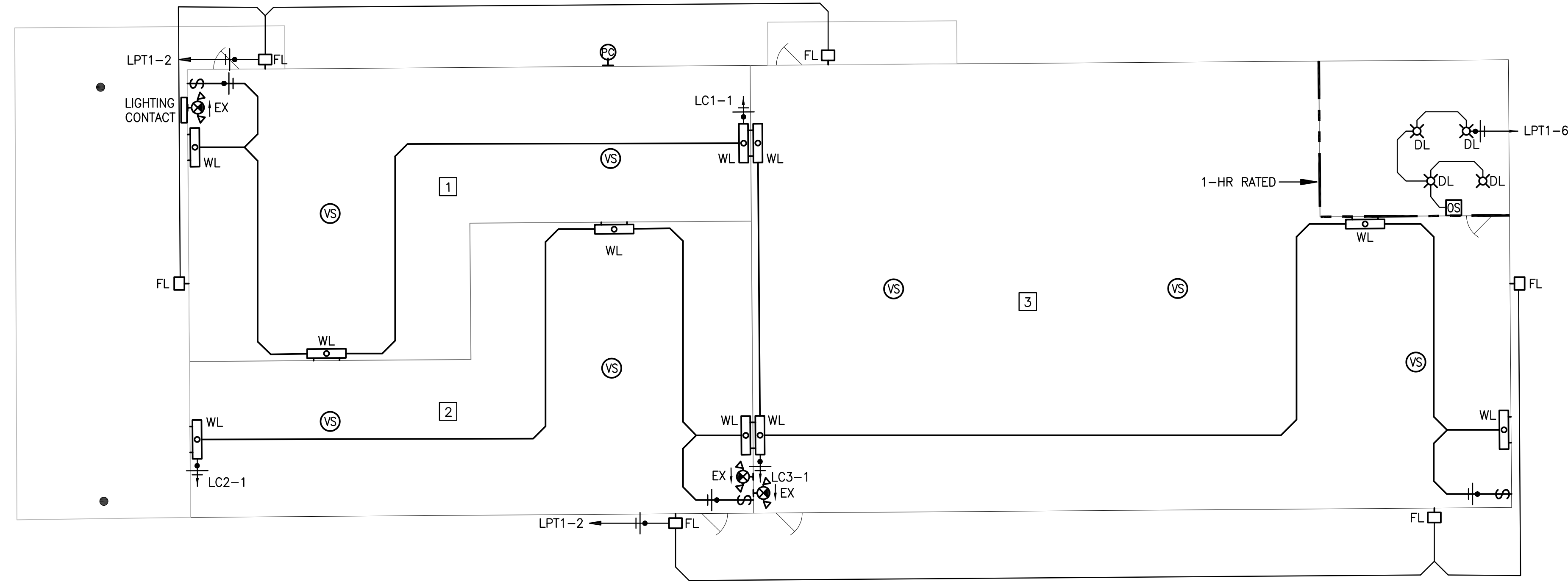
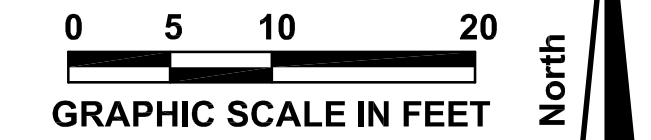
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**CALHOUN COUNTY
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**SHEET
 E202**

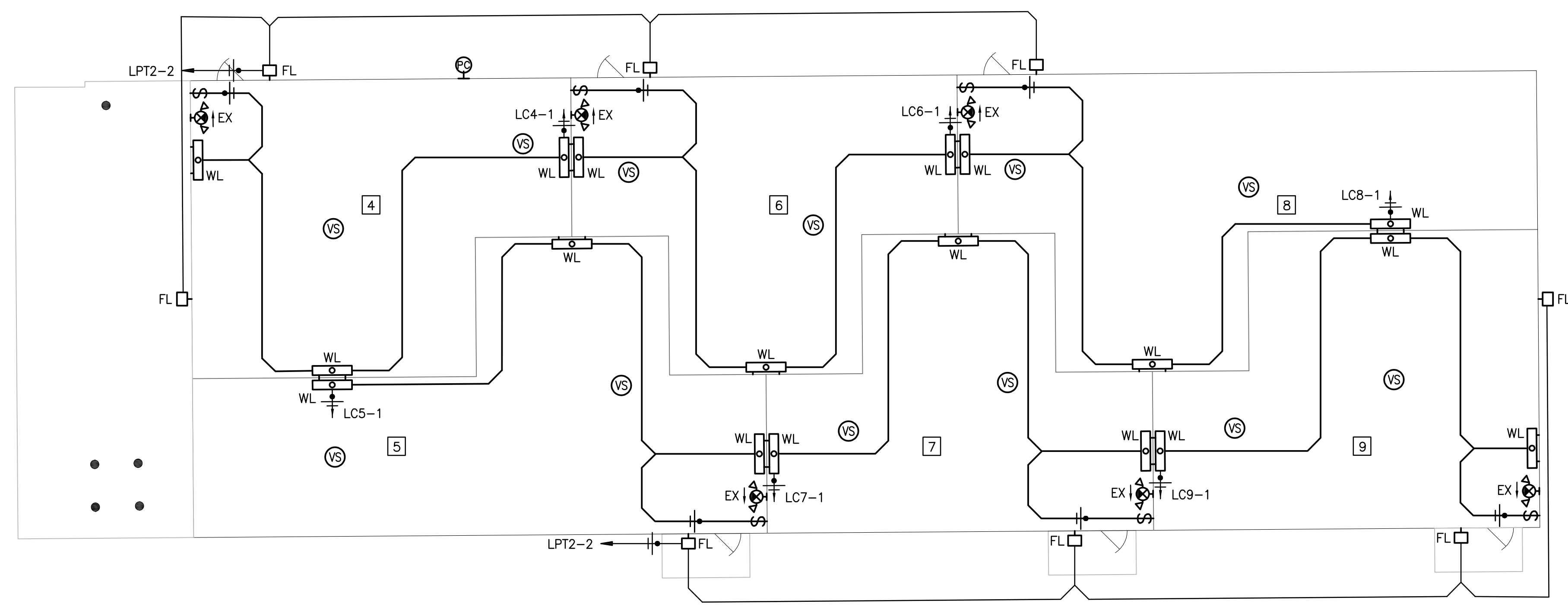
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T-HANGAR LIGHTING FLOOR PLAN - BUILDING #1

SCALE: 1" = 10'-0"



T-HANGAR LIGHTING FLOOR PLAN - BUILDING #2

SCALE: 1" = 10'-0"

NOTES

1. LIGHTING CONTACTOR PANEL TO BE LOCATED ON WEST WALL OF HANGAR FOR CONTROL OF EXTERIOR LIGHTING CIRCUITS.
2. PROVIDE LIGHT SWITCH WITH INTEGRAL OCCUPANCY SENSOR IN EACH T-HANGAR AND RESTROOM. SWITCH SHALL OVERRIDE OCCUPANCY SENSOR INPUT.
3. PROVIDE EXIT SIGNS WITH INTEGRAL BATTERY-BACKED "GOOSE EYE" EGRESS LIGHTING AT DOOR. CONNECT EXIT SIGNS TO LOCAL LIGHTING CIRCUIT, UN-SWITCHED.

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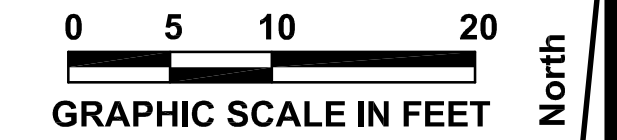
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T-HANGAR BUILDINGS 1 AND 2 LIGHTING PLAN
RELEASE FOR BID

T-HANGAR DEVELOPMENT
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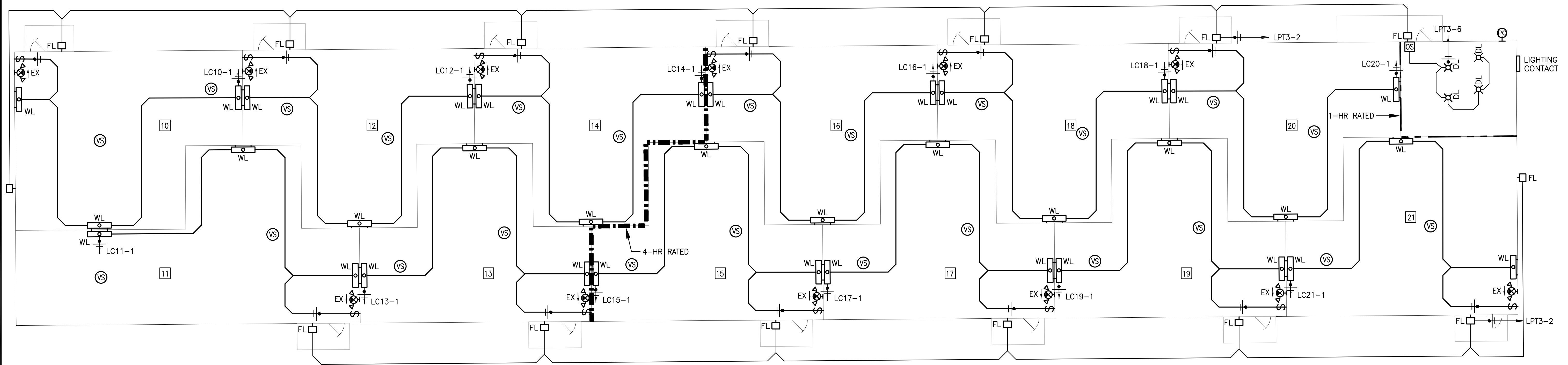
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Charles C. Gableman P.E. 51936



NOTES

1. LIGHTING CONTACTOR PANEL TO BE LOCATED ON EAST WALL OF HANGAR FOR CONTROL OF EXTERIOR LIGHTING CIRCUITS.
2. PROVIDE LIGHT SWITCH WITH INTEGRAL OCCUPANCY SENSOR IN EACH T-HANGAR AND RESTROOM. SWITCH SHALL OVERRIDE OCCUPANCY SENSOR INPUT.
3. PROVIDE EXIT SIGNS WITH INTEGRAL BATTERY-BACKED "GOOSE EYE" EGRESS LIGHTING AT DOOR.



T-HANGAR LIGHTING FLOOR PLAN - BUILDING #3

SCALE: 1" = 10'-0"

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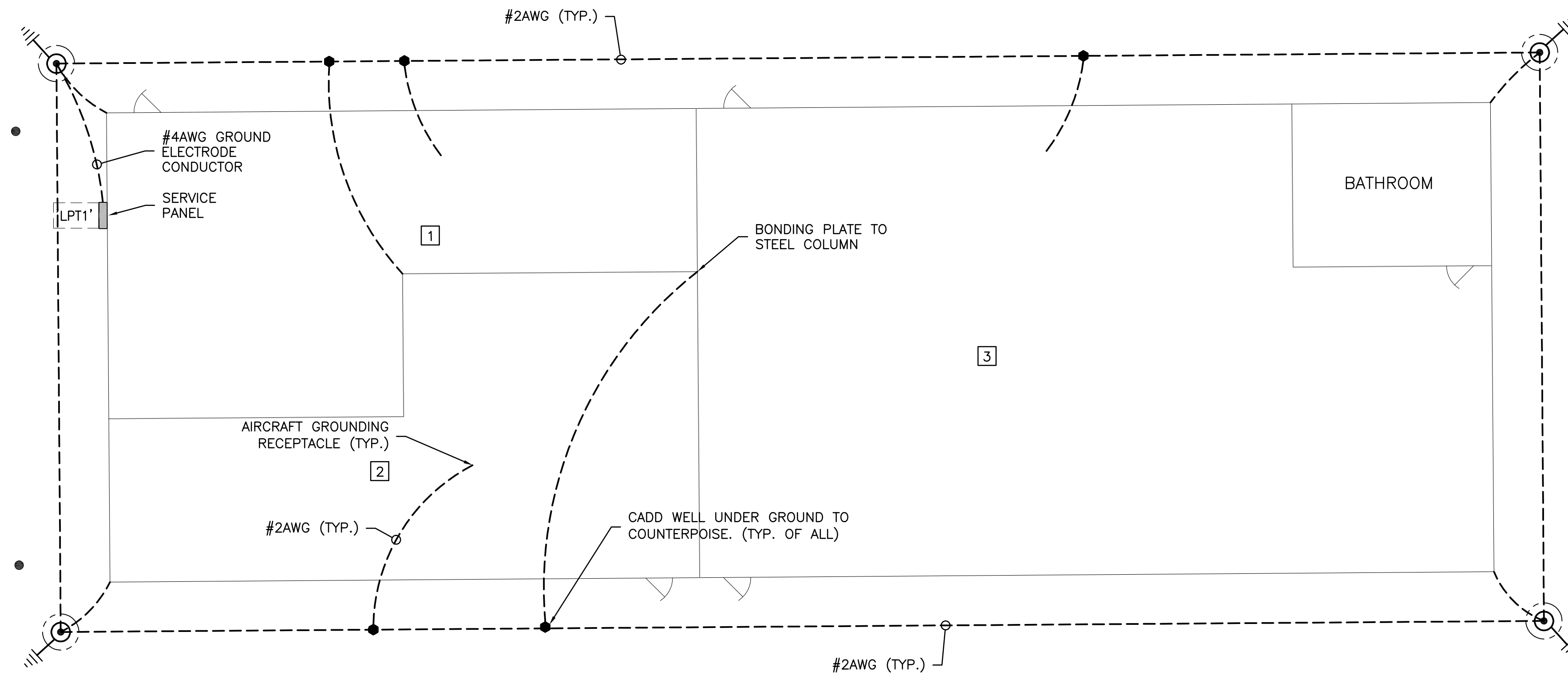
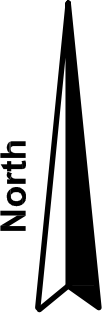
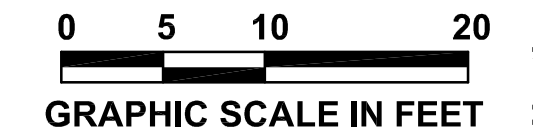
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**T-HANGAR BUILDING 3
 LIGHTING PLAN**
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**T-HANGAR
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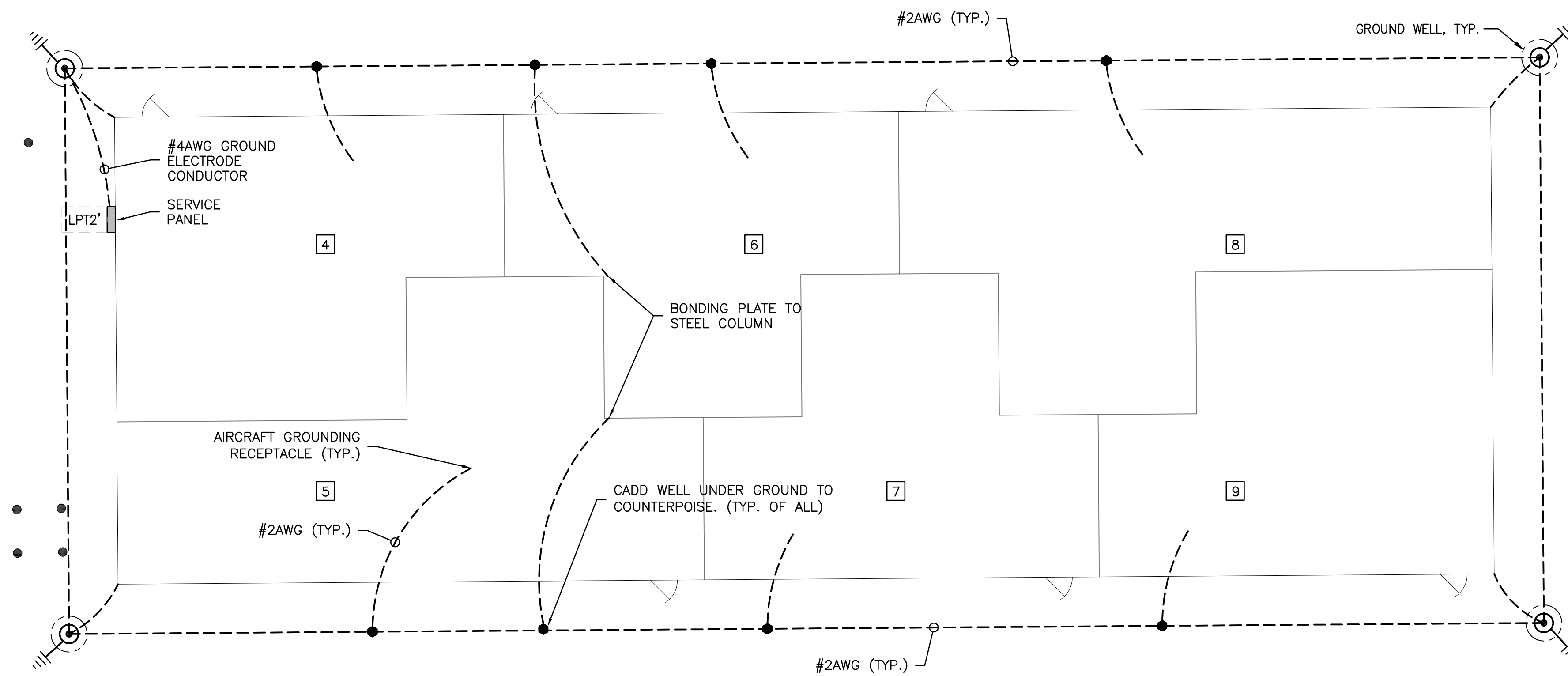
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 DRAWN BY: PJP
 CHECKED BY: CCG
 APPROVED BY: CCG
 PROJECT NO: 2022.241.01
 DATE: NOVEMBER 2024

JOHNSON, LEVINSON
 RAGAN, DAVILA, INC.
 CONSULTING ENGINEERS
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 West Palm Beach, Florida 33401
 (561) 689-2353 • (561) 689-2352 fax
 www.jlrd.com
 Certification Number 6059
 Charles C. Gableman P.E. 51936



T-HANGAR GROUNDING PLAN - BUILDING #1

SCALE: 1" = 10'-0"



T-HANGAR GROUNDING PLAN - BUILDING #2

SCALE: 1" = 10'-0"

GROUNDING GENERAL NOTES

1. SEE SHEET E701 FOR AIRCRAFT GROUNDING CONNECTION DETAIL. LOCATE AT DIMENSIONS SHOWN.
2. BURY COUNTERPOISE 3' OUTSIDE BUILDING ENVELOPE.
3. LOCATE AIRCRAFT GROUNDING LUGS AT DIMENSIONS SHOWN. REFER TO SHEET A102 FOR AIRCRAFT LAYOUTS. LUGS TO BE LOCATED OFF CENTER FOR CONNECTIONS AIRCRAFT.

G:\124228 CALHOUN COUNTY - 3 T-HANGER\DESIGN\CAD\2224101_ELEC_GROUND.DWG 11/21/2024 7:25 AM

AVCON, INC.
 ENGINEERS & PLANNERS
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 NICHOLSVILLE, KY 40356-2423
 OFFICE (606) 678-0606
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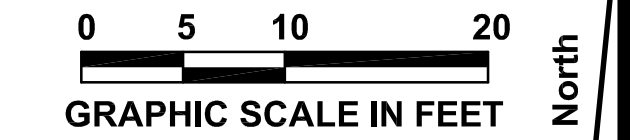
T-HANGAR BUILDINGS 1 AND 2 GROUNDING PLAN
 RELEASE FOR BID

T-HANGAR DEVELOPMENT
 PREPARED FOR
CALHOUN COUNTY AIRPORT

DESIGNED BY: PJP
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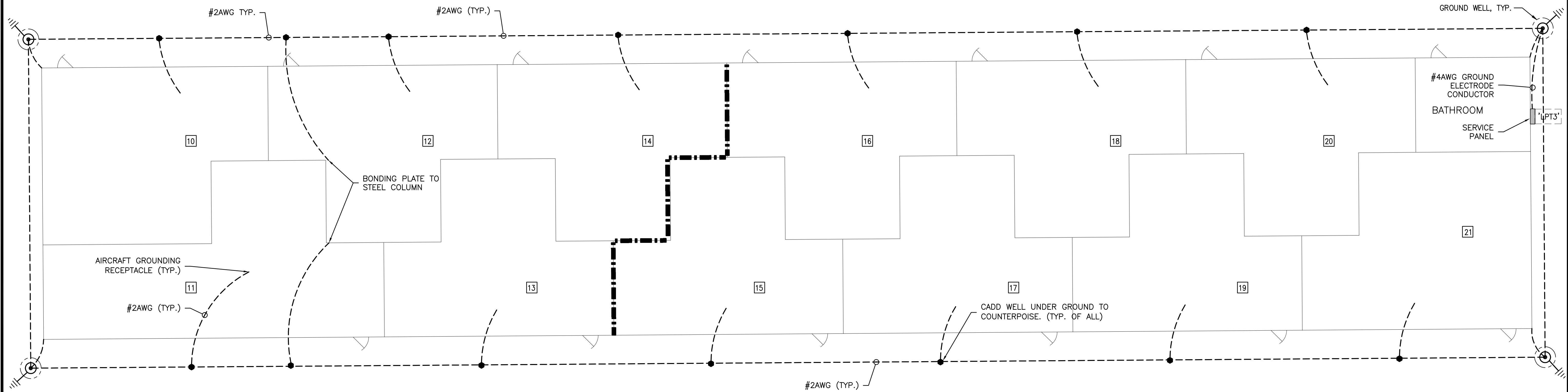
SHEET E401

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GROUNDING GENERAL NOTES

1. SEE SHEET E701 FOR AIRCRAFT GROUNDING CONNECTION DETAIL. LOCATE AT DIMENSIONS SHOWN.
2. BURY COUNTERPOISE 3' OUTSIDE BUILDING ENVELOPE.
3. LOCATE AIRCRAFT GROUNDING LUGS AT DIMENSIONS SHOWN. REFER TO SHEET A102 FOR AIRCRAFT LAYOUTS. LUGS TO BE LOCATED OFF CENTER FOR CONNECTIONS AIRCRAFT.



T-HANGAR GROUNDING PLAN - BUILDING #3

SCALE: 1" = 10'-0"

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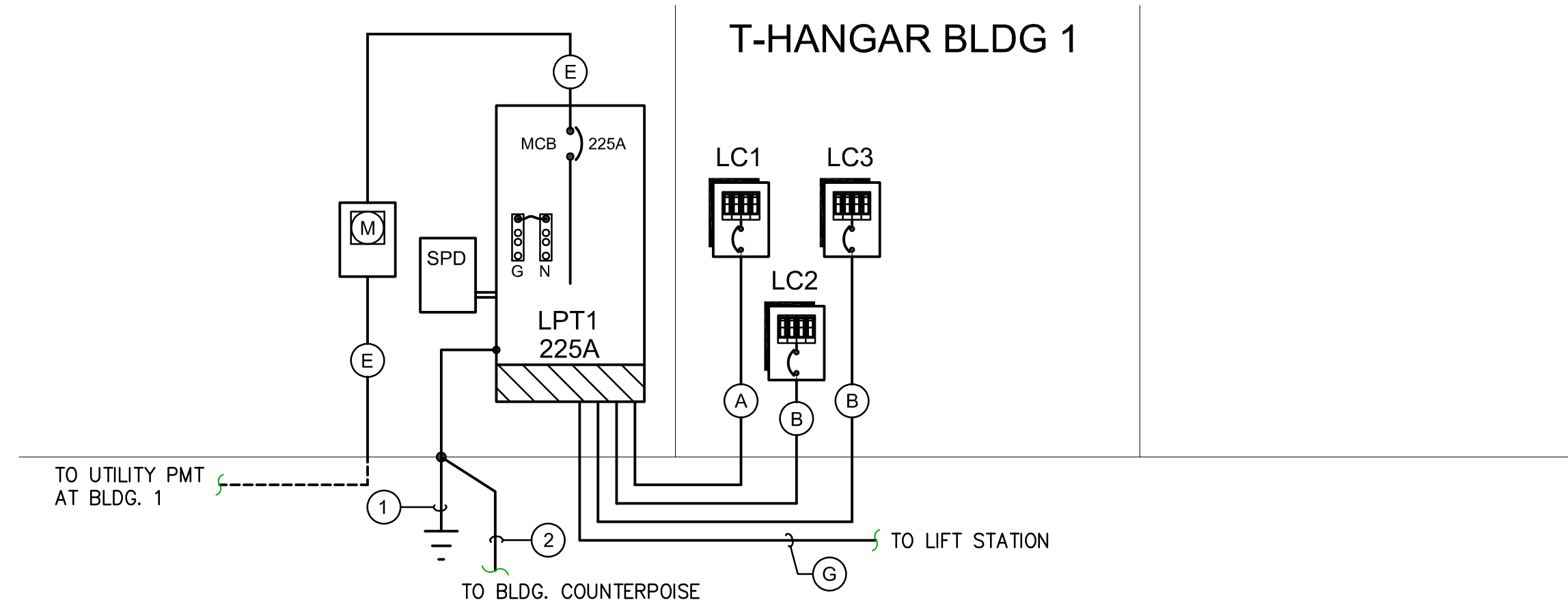
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**T-HANGAR BUILDING 3
 GROUNDING PLAN**
 RELEASE FOR BID

**T-HANGAR
 DEVELOPMENT**
 PREPARED FOR
**CALHOUN COUNTY
 AIRPORT**

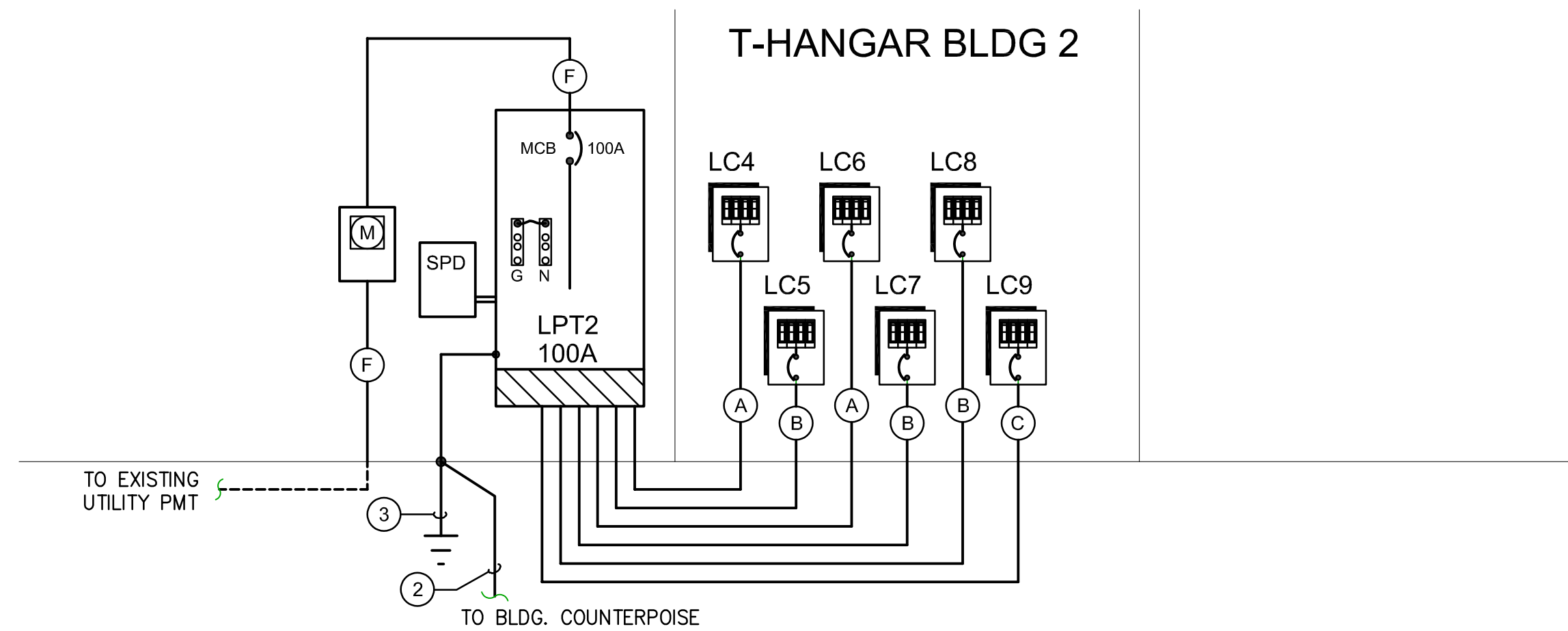
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 DATE: NOVEMBER 2024

**SHEET
 E402**



POWER RISER DIAGRAM - BUILDING #1

SCALE: NONE



POWER RISER DIAGRAM - BUILDING #2

SCALE: NONE

RISER DIAGRAM NOTES:

- ① 1#2G TO GROUND ROD
- ② 1#4G TO COUNTERPOISE
- ③ 1#8G TO GROUND ROD

FEEDER SCHEDULE							
KEY NOTE	PANEL/DEVICE NAME	VOLTAGE	FRAME SIZE	MAIN TYPE	MAIN SIZE	WIRE SIZE	CONDUIT
A	LOAD CENTERS	208V, 1Φ	30A	MCB	30A	3#10, 1#10G	3/4"
B	LOAD CENTERS	208V, 1Φ	30A	MCB	30A	3#8, 1#8G	3/4"
C	LOAD CENTERS	208V, 1Φ	30A	MCB	30A	3#6, 1#6G	3/4"
D	LOAD CENTER	208V, 1Φ	30A	MCB	30A	3#4, 1#8G	1"
E	LPT1	208Y/120V, 3Φ	225A	MCB	225A	4#4/0, 1#4G	2-1/2"
F	LPT2	208Y/120V, 3Φ	100A	MCB	100A	4#3, 1#8G	1-1/4"
G	LIFT STATION	208Y/120V, 3Φ	100A	DISCONNECT	100A	4#3, 1#8G	1-1/4"

LOCATION: HANGER #1 - EXTERIOR													PANELBOARD SCHEDULE						PANEL 'LPT1'		
BUS KVA		LOAD		POLES	TRIP	CIRC.	BUS			CIRC.	TRIP	POLES	LOAD		BUS KVA						
A	B	C					A	B	C				A	B	C	A	B	C			
0.3			LOAD CENTER 'LC1'	2	30	1	●			2	20	1	EXTERIOR LIGHTING VIA CT			0.3					
	0.5			-	-	3				4	20	1	RECEPTACLES				0.2				
		0.3	LOAD CENTER 'LC2'	2	30	5	●			6	20	1	RESTRM. LIGHTING AND EXH. FAN					0.2			
0.5				-	-	7				8	20	1	SPARE								
		0.3	LOAD CENTER 'LC3'	2	30	9	●			10	20	1	SPARE								
		0.5		-	-	11				12	20	1	SPARE								
-	-	-	SPARE	2	30	13				14	-	-	SPACE								
-	-	-	SPARE	-	-	15				16	-	-	SPACE								
-	-	-	SPARE	-	-	17				18	-	-	SPACE								
-	-	-	SPARE	-	-	19				20	-	-	SPACE								
-	-	-	SPARE	-	-	21				22	-	-	SPACE								
-	-	-	SPARE	-	-	23				24	-	-	SPACE								
-	-	-	SPARE	-	-	25				26	-	-	SPACE								
	3.1		EAST SPECIAL RECEPT - HANGER 1	2	50	27	●			28	-	-	SPACE								
		3.1		-	-	29				30	-	-	SPACE								
2.1			EAST SPECIAL RECEPT - HANGER 1	2	30	31	●			32	-	-	SPACE								
	2.1			-	-	33				34	100	3	LIFT STATION - (2) 2.0HP			2.2		2.2			
		3.1	WEST SPECIAL RECEPT - HANGER 1	2	50	35	●			36	-	-	SPACE								
3.1				-	-	37				38	-	-	SPACE								
	2.1		WEST SPECIAL RECEPT - HANGER 1	2	30	39	●			40	30	3	SPD								
		2.1		-	-	41				42	-	-	SPACE								

RATED VOLTAGE: 120/208V 3 PHASE, 4 WIRE
 FEED IS TO BE (●)BOTTOM: ()TOP FROM: 'UTIL. PMT'
 RATING IS TO BE ()100 (●)225 ()400 AMPS
 GROUND BAR IS REQUIRED NEMA 3R
 (●)MAIN BREAKER 225 AMPS () MAIN LUGS ONLY
 NEUTRAL BUS IS TO BE (●)FULL ()DOUBLE SIZE
 BRANCH POLES=()12 ()24 ()30 (●)42
 HINGED DOOR WITH KEYED LATCH (●)IS ()IS NOT REQUIRED
 PANELBOARD IS TO BE ()FUSED (●)BOLT IN CIRCUIT BREAKER TYPE
 HARD WIRED SURGE PROTECTION (●)IS ()IS NOT REQUIRED
 ALL BREAKERS MUST BE RATED TO INTERRUPT A SHORT CIRCUIT CURRENT I_{sc} = 22,000 AMPS, SYM RMS
 CONNECTED LOAD: 30.5 KVA
 $I = \frac{30,500VA}{208 \times \sqrt{3}} = 85A$

LOCATION: HANGER #2 - EXTERIOR													PANELBOARD SCHEDULE						PANEL 'LPT2'		
BUS KVA		LOAD		POLES	TRIP	CIRC.	BUS			CIRC.	TRIP	POLES	LOAD		BUS KVA						
A	B	C					A	B	C				A	B	C	A	B	C			
0.3			LOAD CENTER 'LC4'	2	30	1	●			2	20	1	EXTERIOR LIGHTING VIA CT			0.3					
	0.5			-	-	3				4	20	1	RECEPTACLES				0.2				
		0.3	LOAD CENTER 'LC5'	2	30	5	●			6	20	1	SPARE								
0.5				-	-	7				8	20	1	SPARE								
		0.3	LOAD CENTER 'LC6'	2	30	9	●			10	20	1	SPARE								
		0.5		-	-	11				12	20	1	SPARE								
0.3			LOAD CENTER 'LC7'	2	30	13	●			14	-	-	SPACE								
	0.5			-	-	15				16	-	-	SPACE								
		0.3	LOAD CENTER 'LC8'	2	30	17	●			18	-	-	SPACE								
		0.5		-	-	19				20	-	-	SPACE								
	0.3		LOAD CENTER 'LC9'	2	30	21	●			22	-	-	SPACE								
		0.5		-	-	23				24	-	-	SPACE								
-	-	-	SPARE	2	30	25				26	-	-	SPACE								
-	-	-	SPACE	-	-	27				28	30	3	SPD								
-	-	-	SPACE	-	-	29				30	-	-	SPACE								

RATED VOLTAGE: 120/208V 3 PHASE, 4 WIRE
 FEED IS TO BE (●)BOTTOM: ()TOP FROM: 'EXIST. UTIL. PMT'
 RATING IS TO BE (●)100 ()225 ()400 AMPS
 GROUND BAR IS REQUIRED NEMA 3R
 (●)MAIN BREAKER 100 AMPS () MAIN LUGS ONLY
 NEUTRAL BUS IS TO BE (●)FULL ()DOUBLE SIZE
 BRANCH POLES=()12 ()24 (●)30 ()42
 HINGED DOOR WITH KEYED LATCH (●)IS ()IS NOT REQUIRED
 PANELBOARD IS TO BE ()FUSED (●)BOLT IN CIRCUIT BREAKER TYPE
 HARD WIRED SURGE PROTECTION (●)IS ()IS NOT REQUIRED
 ALL BREAKERS MUST BE RATED TO INTERRUPT A SHORT CIRCUIT CURRENT I_{sc} = 22,000 AMPS, SYM RMS
 CONNECTED LOAD: 5.3 KVA
 $I = \frac{5,300VA}{208 \times \sqrt{3}} = 15A$

TYPICAL OF 21

LOCATION: INDIVIDUAL HANGAR													PANELBOARD SCHEDULE						PANEL 'LCXX'		
BUS KVA		LOAD		POLES	TRIP	CIRC.	BUS			CIRC.	TRIP	POLES	LOAD		BUS KVA						
A	B	C					A	B	C				A	B	C	A	B	C			
0.2			LIGHTING	1	20	1	●			2	20	1	EXIT SIGN			0.1					
	.54		RECEPTACLES	1	20	3				4	20	1	SPARE								
-	-	-	SPARE	1	20	5				6	20	1	SPARE								
-	-	-	SPACE	-	-	7				8	-	-	SPACE								
-	-	-	SPACE	-	-	9				10	-	-	SPACE								
-	-	-	SPACE	-	-	11				12	-	-	SPACE								

RATED VOLTAGE: 120/240V 1 PHASE, 3 WIRE
 FEED IS TO BE ()BOTTOM: (●)TOP FROM: 'LPTX'
 RATING IS TO BE (●)60 ()100 ()225 AMPS
 GROUND BAR (●)IS ()IS NOT REQUIRED
 (●)MAIN BREAKER 30 AMPS () MAIN LUGS ONLY
 NEUTRAL BUS IS TO BE (●)FULL ()DOUBLE SIZE
 BRANCH POLES=(●)12 ()20 ()30 ()42
 KEYED DOOR LATCH (●)IS ()IS NOT REQUIRED
 PANELBOARD IS TO BE ()FUSED (●)BOLT IN CIRCUIT BREAKER TYPE
 HINGED DOOR IS REQUIRED
 ALL BREAKERS MUST BE RATED TO INTERRUPT A SHORT CIRCUIT CURRENT I_{sc} = 10,000 AMPS, SYM RMS
 CONNECTED LOAD: 0.8 KVA
 $I = \frac{840VA}{208V} = 4A$

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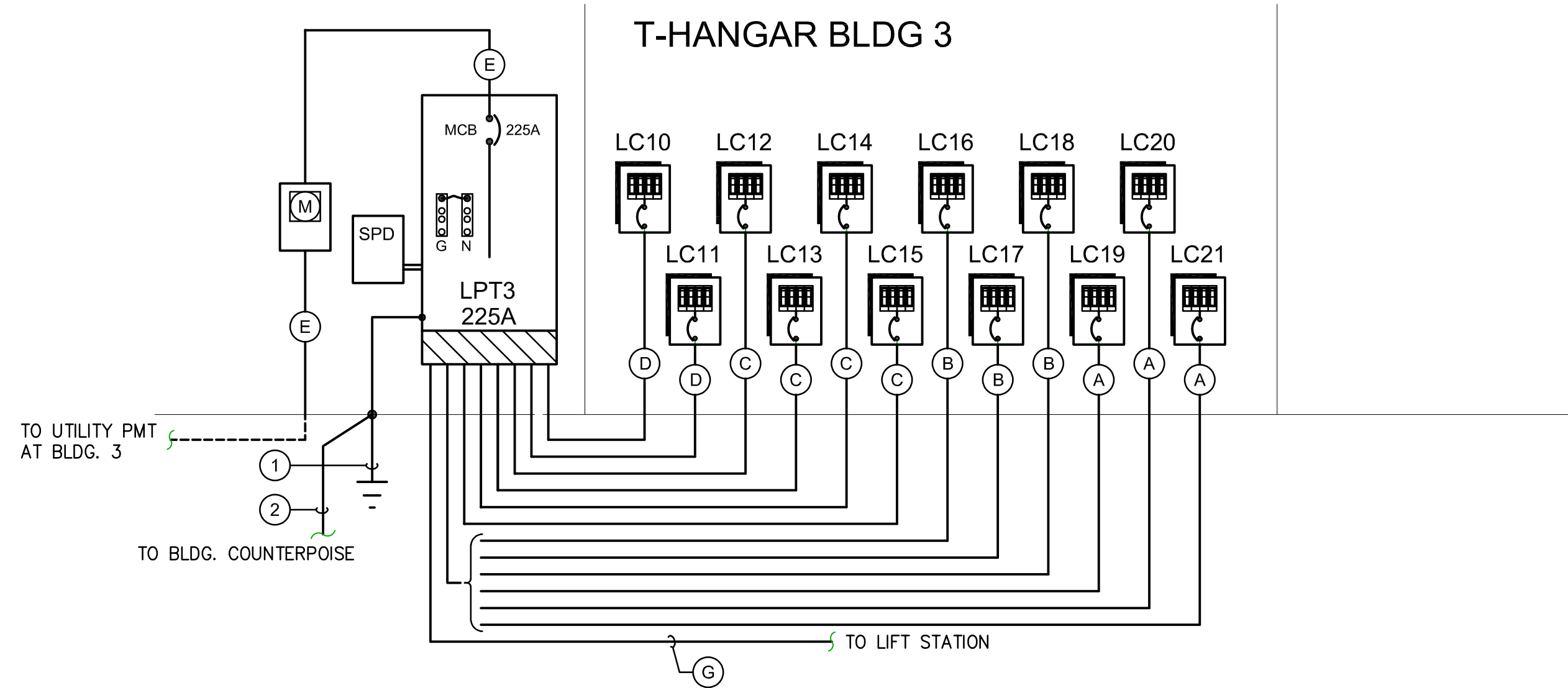
ONE-LINE DIAGRAM AND PANEL SCHEDULES (SHEET 1 OF 2)
 RELEASE FOR BID

T-HANGAR DEVELOPMENT
 PREPARED FOR
CALHOUN COUNTY AIRPORT

DESIGNED BY: PJP
 DRAWN BY: PJP
 CHECKED BY: CCG
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SHEET E501

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 Certification Number 6059
 Charles C. Gableman P.E. 51936



POWER RISER DIAGRAM - BUILDING #3

SCALE: NONE

RISER DIAGRAM NOTES:

- ① 1#2G TO GROUND ROD
- ② 1#4G TO COUNTERPOISE
- ③ 1#8G TO GROUND ROD

FEEDER SCHEDULE

KEY NOTE	PANEL/DEVICE NAME	VOLTAGE	FRAME SIZE	MAIN TYPE	MAIN SIZE	WIRE SIZE	CONDUIT
A	LOAD CENTERS	208V, 1Φ	30A	MCB	30A	3#10, 1#10G	3/4"
B	LOAD CENTERS	208V, 1Φ	30A	MCB	30A	3#8, 1#8G	3/4"
C	LOAD CENTERS	208V, 1Φ	30A	MCB	30A	3#6, 1#6G	3/4"
D	LOAD CENTER	208V, 1Φ	30A	MCB	30A	3#4, 1#8G	1"
E	LPT1	208Y/120V, 3Φ	225A	MCB	225A	4#4/0, 1#4G	2-1/2"
F	LPT2	208Y/120V, 3Φ	100A	MCB	100A	4#3, 1#8G	1-1/4"
G	LIFT STATION	208Y/120V, 3Φ	100A	DISCONNECT	100A	4#3, 1#8G	1-1/4"

LOCATION: HANGER #3 - EXTERIOR										PANELBOARD SCHEDULE										PANEL 'LPT3'		
BUS KVA			LOAD	POLES	TRIP	CIRC.	BUS			CIRC.	TRIP	POLES	LOAD	BUS KVA								
A	B	C					A	B	C					A	B	C						
0.3	0.5		LOAD CENTER 'LC10'	2	30	1	1	2	20	1	EXTERIOR LIGHTING VIA CT	0.4										
		0.3	LOAD CENTER 'LC11'	2	30	5	4	20	1	RECEPTACLES		0.2										
						7	6	20	1	RESTRM. LIGHTING AND EXH. FAN			0.2									
0.5	0.3		LOAD CENTER 'LC12'	2	30	9	8	20	1	SPARE												
		0.5				11	10	20	1	SPARE												
0.3	0.5		LOAD CENTER 'LC13'	2	30	13	12	20	1	SPARE												
						15	14	-	-	SPACE												
		0.3	LOAD CENTER 'LC14'	2	30	17	16	-	-	SPACE												
						19	18	-	-	SPACE												
0.5	0.3		LOAD CENTER 'LC15'	2	30	21	20	-	-		2.2											
		0.5				23	22	100	3	LIFT STATION - (2) 2.0HP		2.2										
0.3	0.5		LOAD CENTER 'LC16'	2	30	25	24	-	-					2.2								
						27	26	30	2	SPARE												
		0.3	LOAD CENTER 'LC17'	2	30	29	28	-	-													
0.5	0.3		LOAD CENTER 'LC18'	2	30	33	30	30	2	LOAD CENTER 'LC20'		0.5		0.3								
		0.5				31	32	-	-													
0.3	0.5		LOAD CENTER 'LC19'	2	30	37	34	30	2	LOAD CENTER 'LC21'				0.5								
						35	36	-	-													
0.3	0.5		LOAD CENTER 'LC19'	2	30	37	38	-	-													
						39	40	30	3	SPD												
		-	SPACE	-	-	41	42	-	-													

RATED VOLTAGE: 120/208V 3 PHASE, 4 WIRE FEED IS TO BE (●)BOTTOM: ()TOP FROM: 'UTIL. PMT'

RATING IS TO BE ()100 (●)225 ()400 AMPS GROUND BAR IS REQUIRED NEMA 3R

(●)MAIN BREAKER 225 AMPS () MAIN LUGS ONLY NEUTRAL BUS IS TO BE (●)FULL ()DOUBLE SIZE

BRANCH POLES=()12 ()24 ()30 (●)42 HINGED DOOR WITH KEYED LATCH (●)IS ()IS NOT REQUIRED

PANELBOARD IS TO BE ()FUSED (●)BOLT IN CIRCUIT BREAKER TYPE HARD WIRED SURGE PROTECTION (●)IS ()IS NOT REQUIRED

ALL BREAKERS MUST BE RATED TO INTERRUPT A SHORT CIRCUIT CURRENT I_{sc} = 22,000 AMPS, SYM RMS CONNECTED LOAD: 16.8 KVA

$$I = \frac{16,800VA}{208 \times \sqrt{3}} = 47A$$

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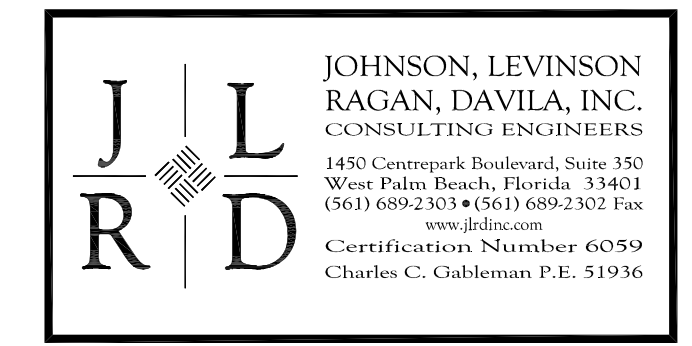


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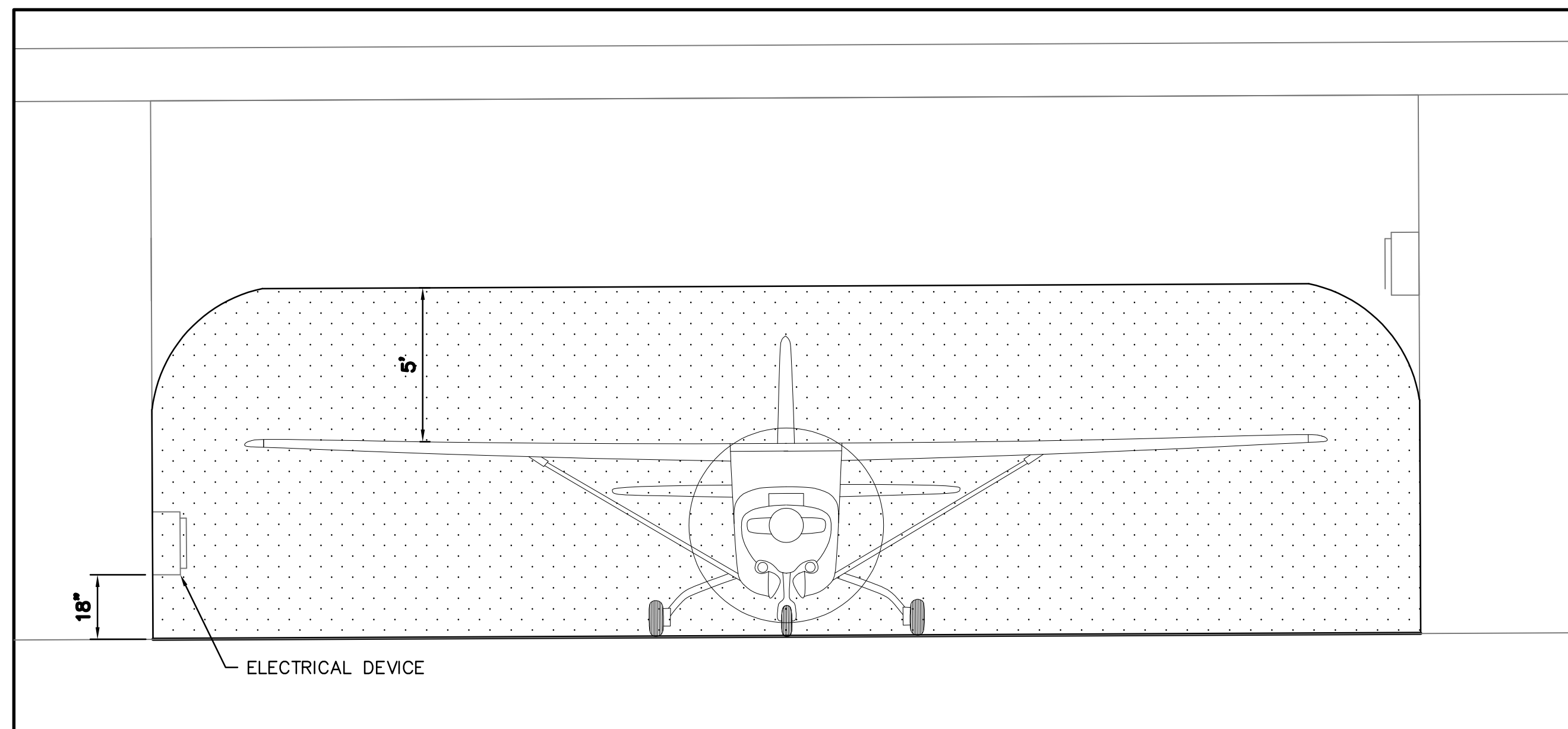
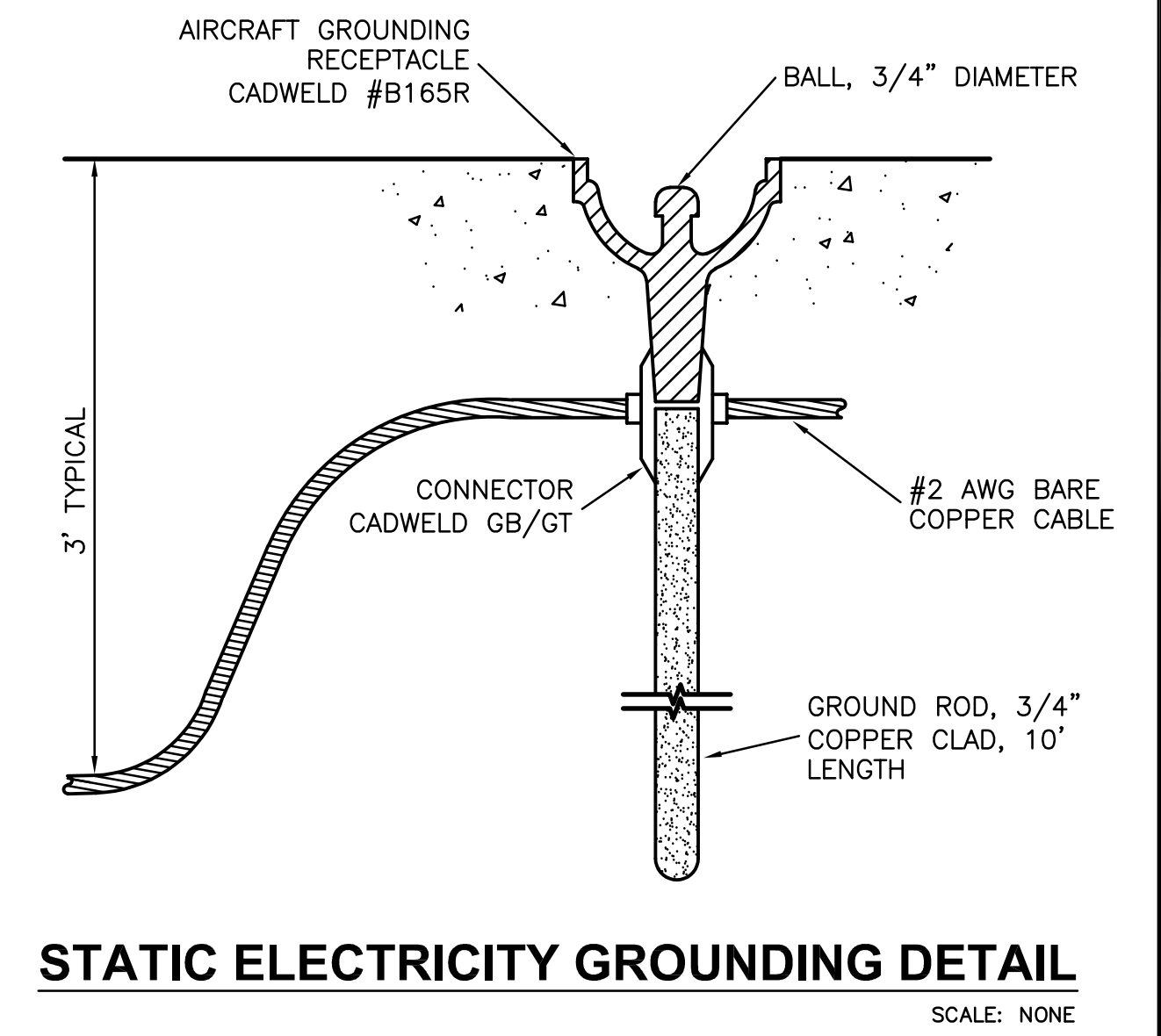
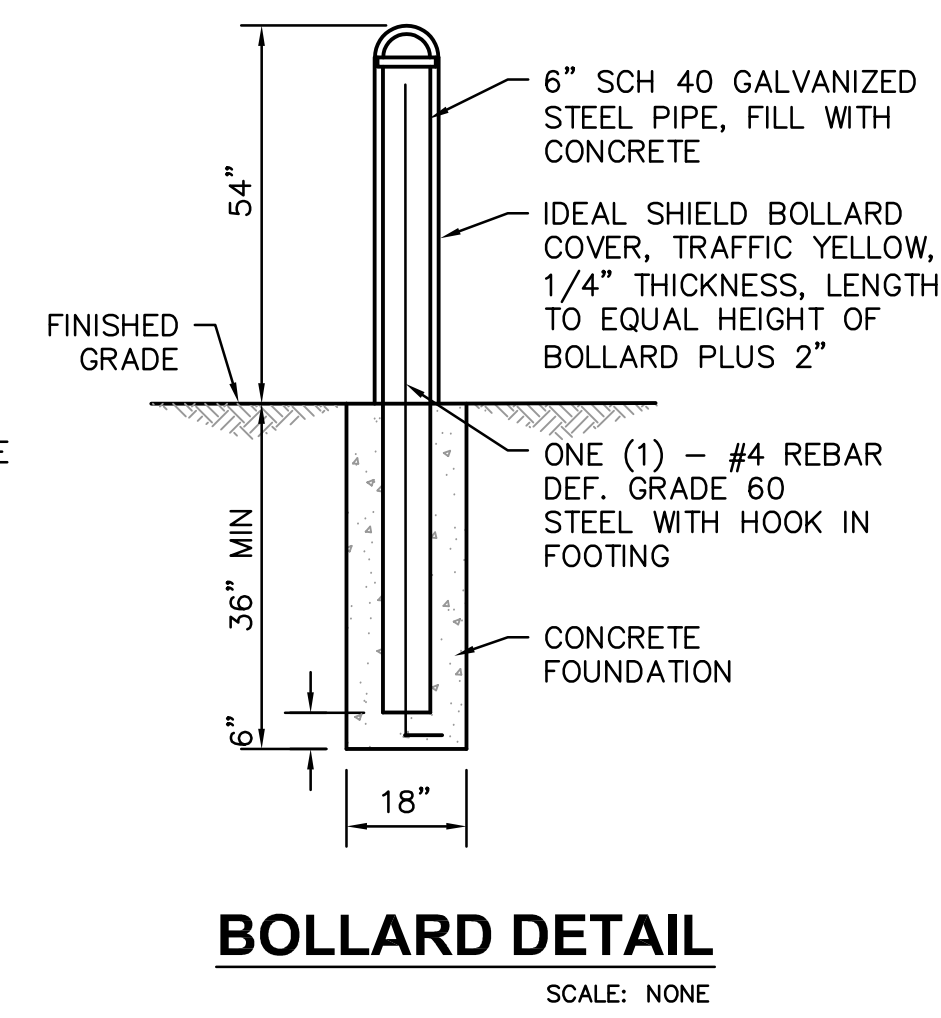
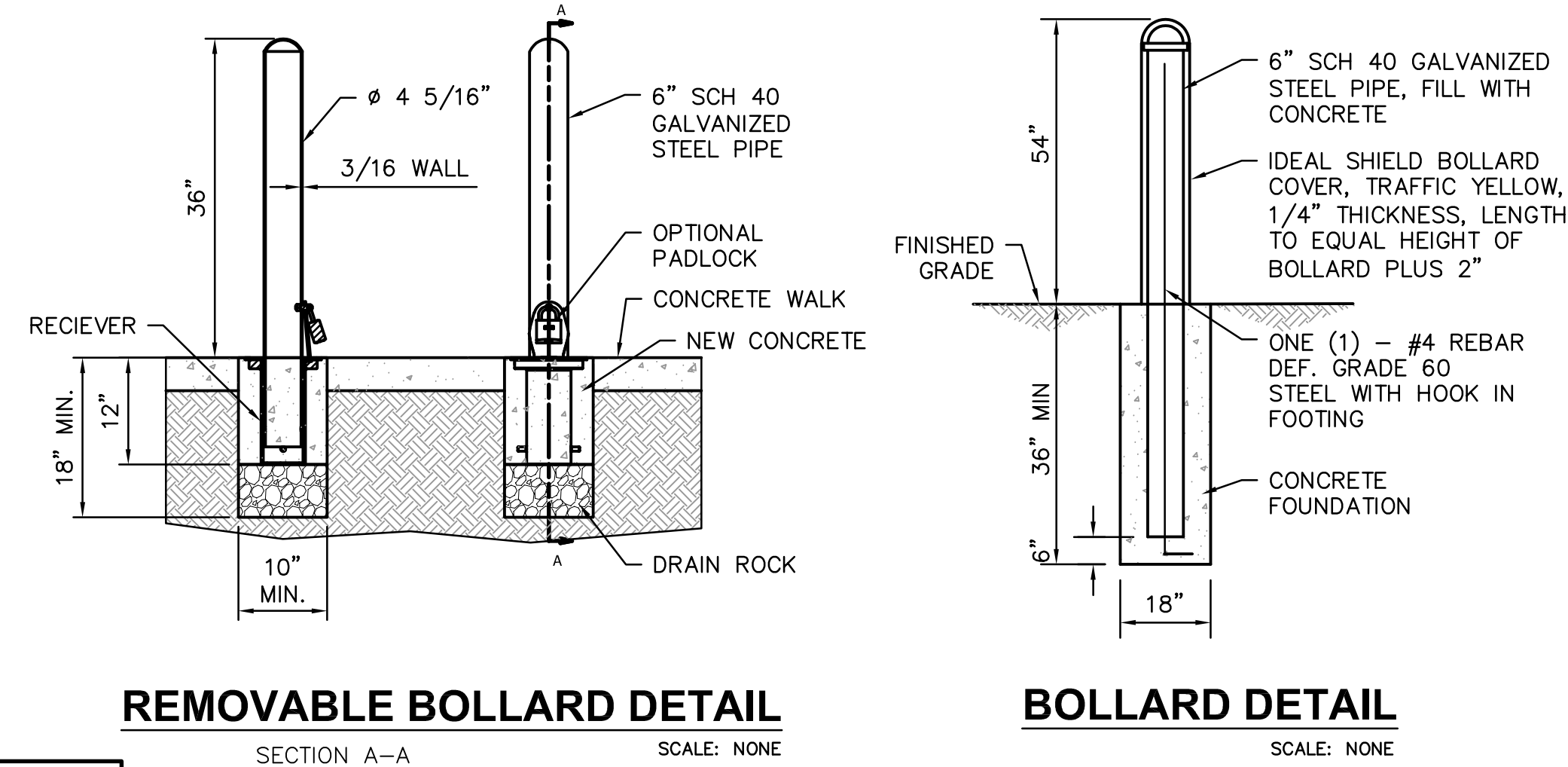
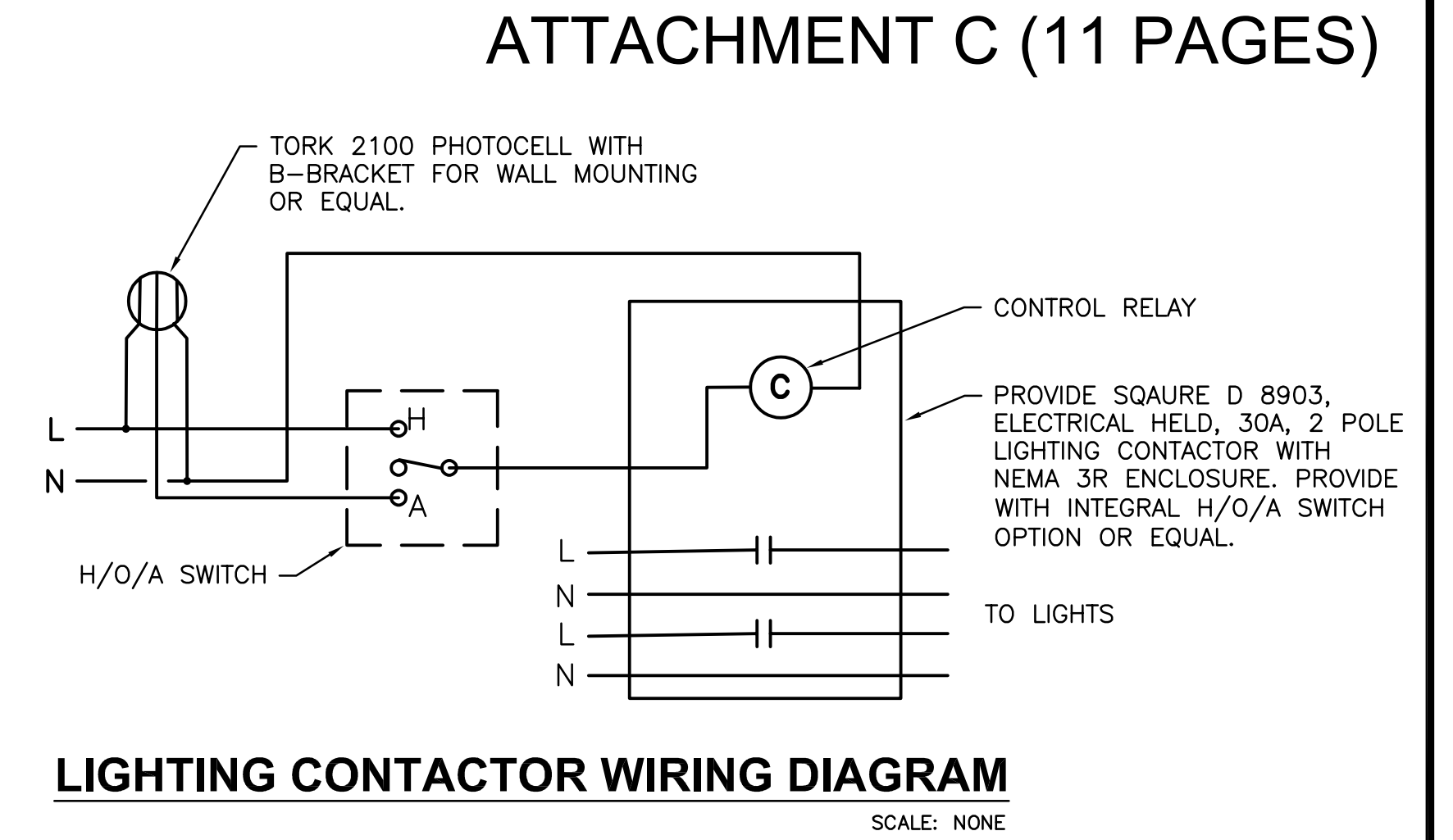
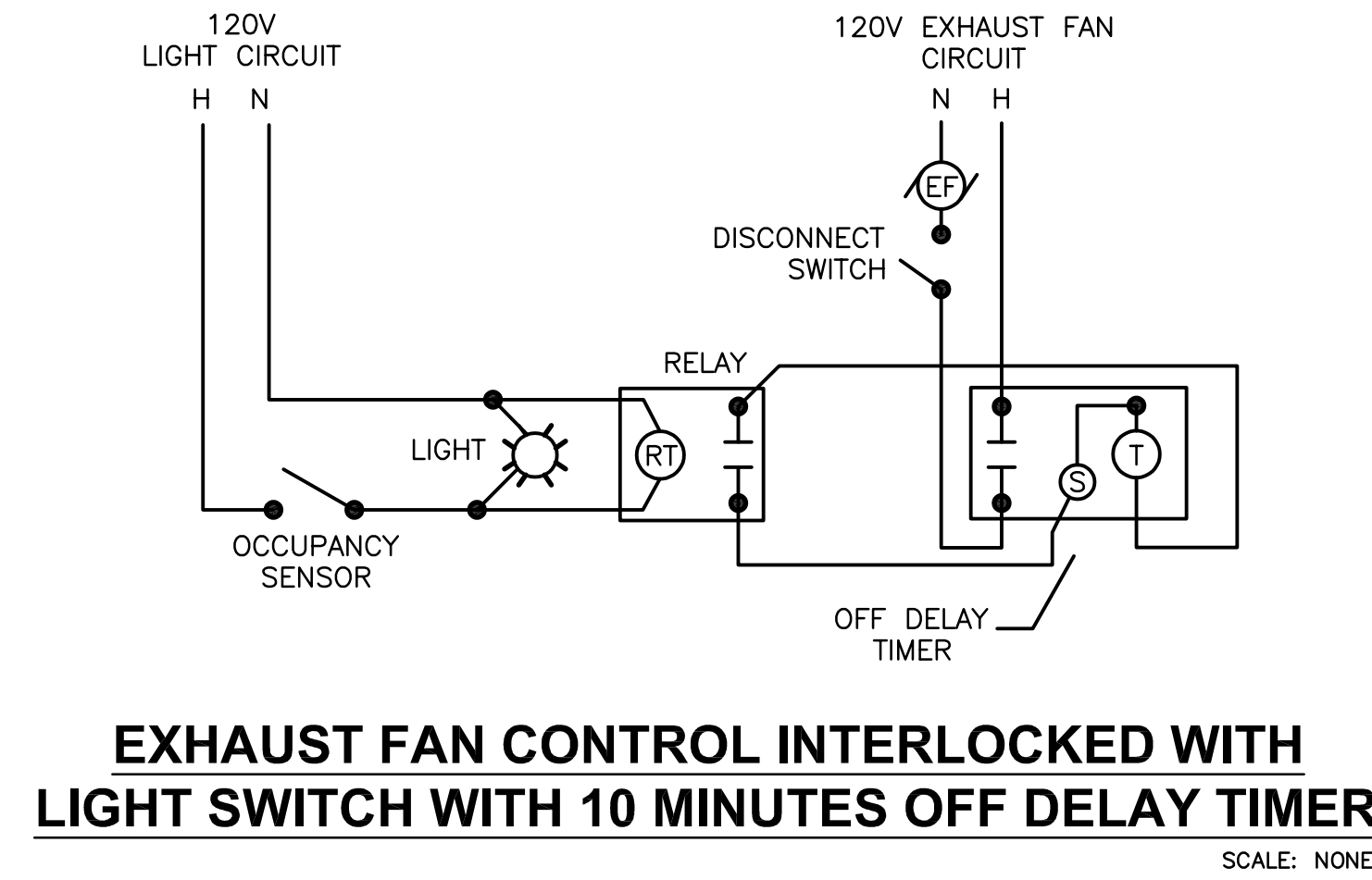
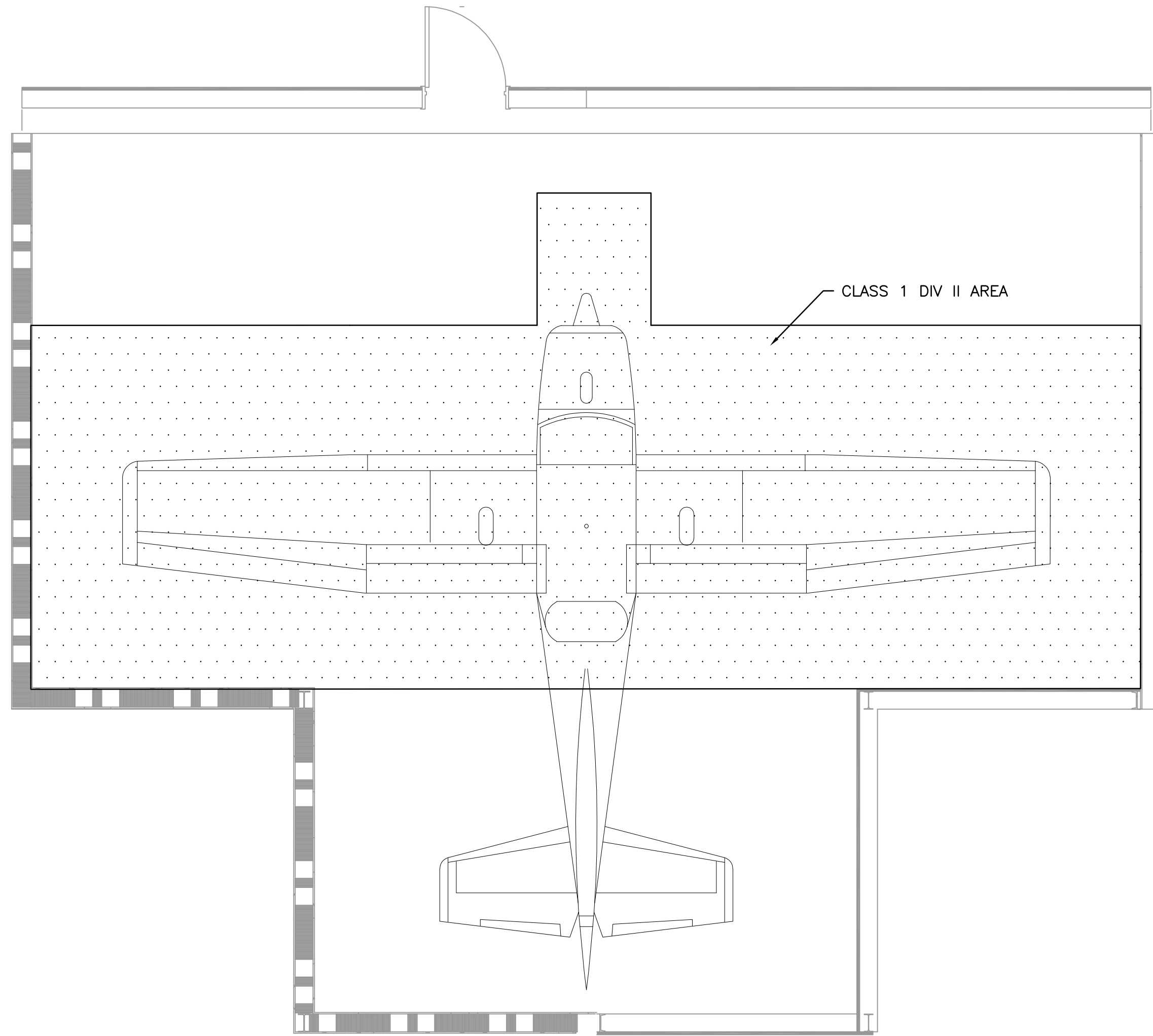
ONE-LINE DIAGRAM AND PANEL SCHEDULES (SHEET 2 OF 2)
RELEASE FOR BID

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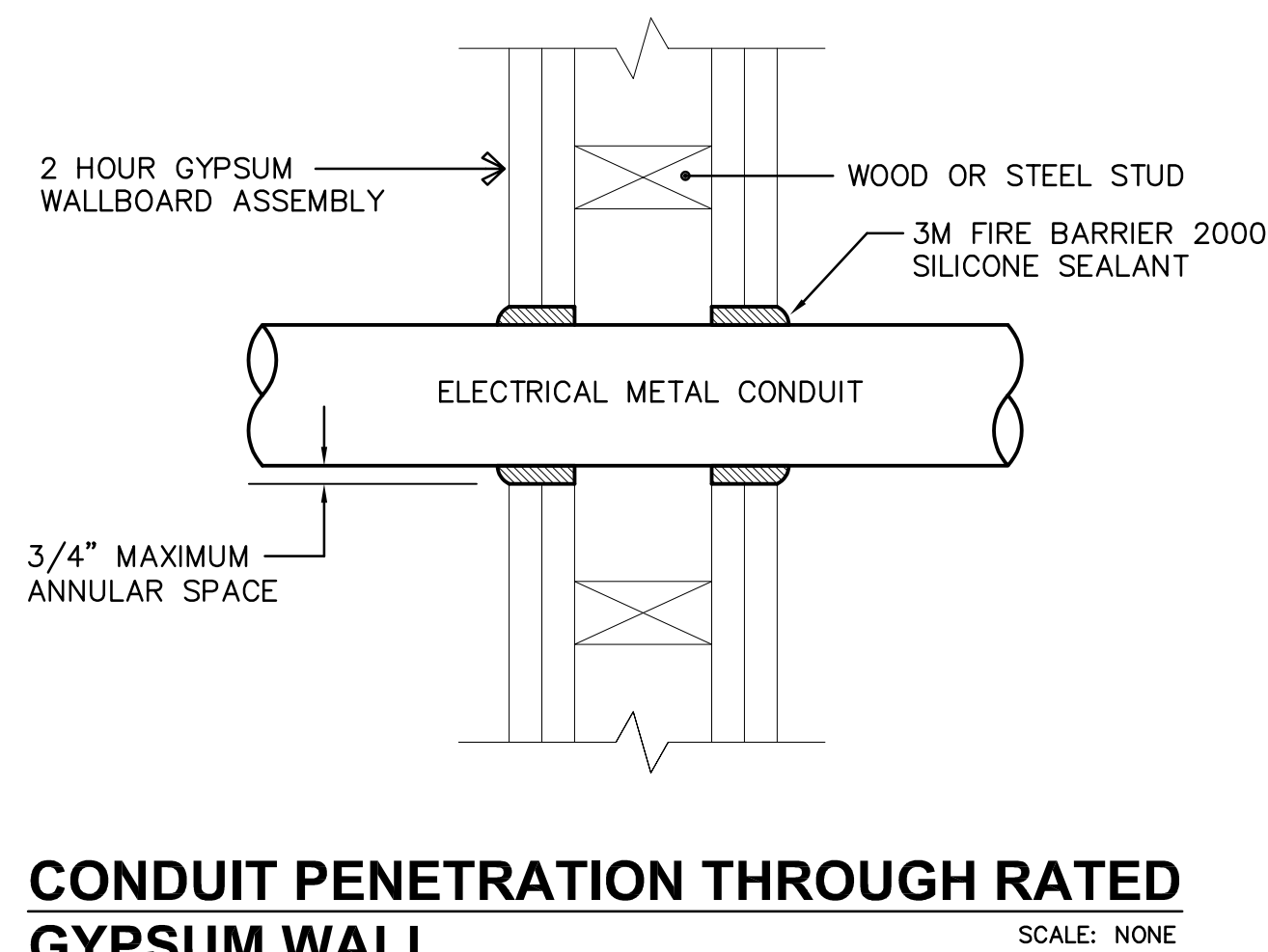
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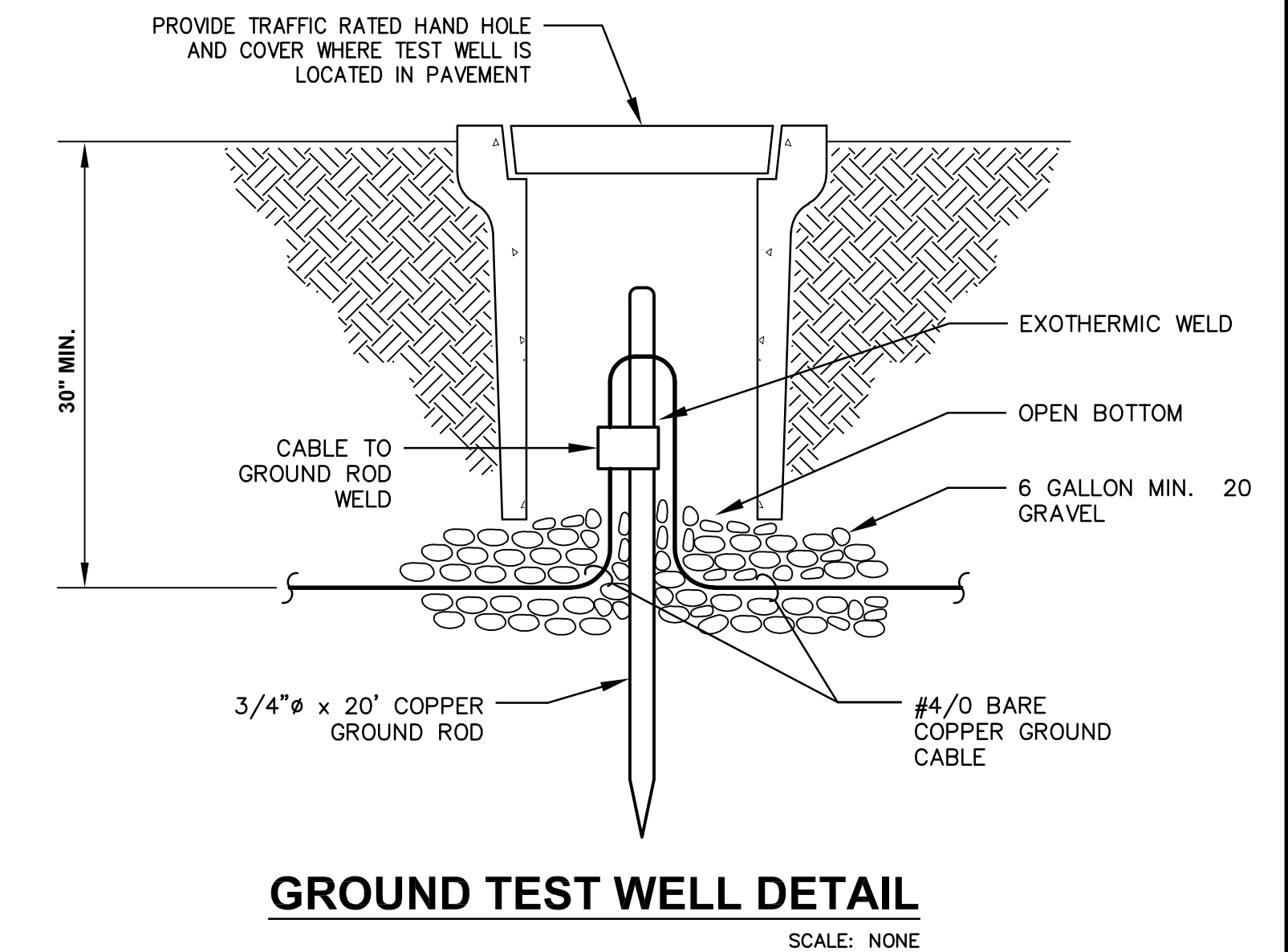
SHEET E502



TYPICAL HANGAR EXCLUSION ZONES
SCALE: NONE



- CONDUIT PENETRATION NOTES (GYPSUM):**
(UL #W-L-1010)
1. MAXIMUM 3/4" ANNULAR SPACE.
 2. INSTALL 3M FIRE BARRIER 2000 SILICONE SEALANT TO COMPLETELY FILL THE ANNULAR SPACE BETWEEN THE PIPE AND THE WALL ASSEMBLY. FILL TO THE FULL THICKNESS OF THE GYPSUM WALL (MINIMUM 1-1/4 INCH SEALANT THICKNESS) PLUS AN ADDITIONAL 1/4 INCH CROWN AROUND THE PERIMETER OF THE CONDUIT.
 3. 2-HOUR RATING SHOWN, PROVIDE 4-HOUR WHERE REQUIRED, SEE 'C' SERIES SHEETS FOR ASSEMBLY.



GENERAL NOTES

1. HANGARS ARE DESIGNED FOR AIRCRAFT DESIGN GROUP I
2. ALL AREAS BELOW 18" ABOVE FINISHED FLOOR ARE CONSIDERED A CLASS 1 DIV. 2 AREA. MOUNT ALL ELECTRICAL DEVICES ABOVE THIS HEIGHT IN ACCORDANCE WITH NEC ARTICLE 513.
3. ALL AREAS WITHIN 5' HORIZONTAL OF THE FUELED WINGS IS CLASS 1 DIV 2 AREA. LOCATE RECEPTACLES OUT OF THIS AREA.
4. ALL CONDUIT TO BE ROUTED OVERHEAD TO AVOID CROSSING THE CLASSIFIED AREA BOUNDARY. CONTRACTOR SHALL REQUEST PERMISSION STUB UP ELECTRICAL CONDUIT INTO HANGAR AS THIS WILL REQUIRE CONDUIT SEAL OFFS.

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MISCELLANEOUS
DETAILS

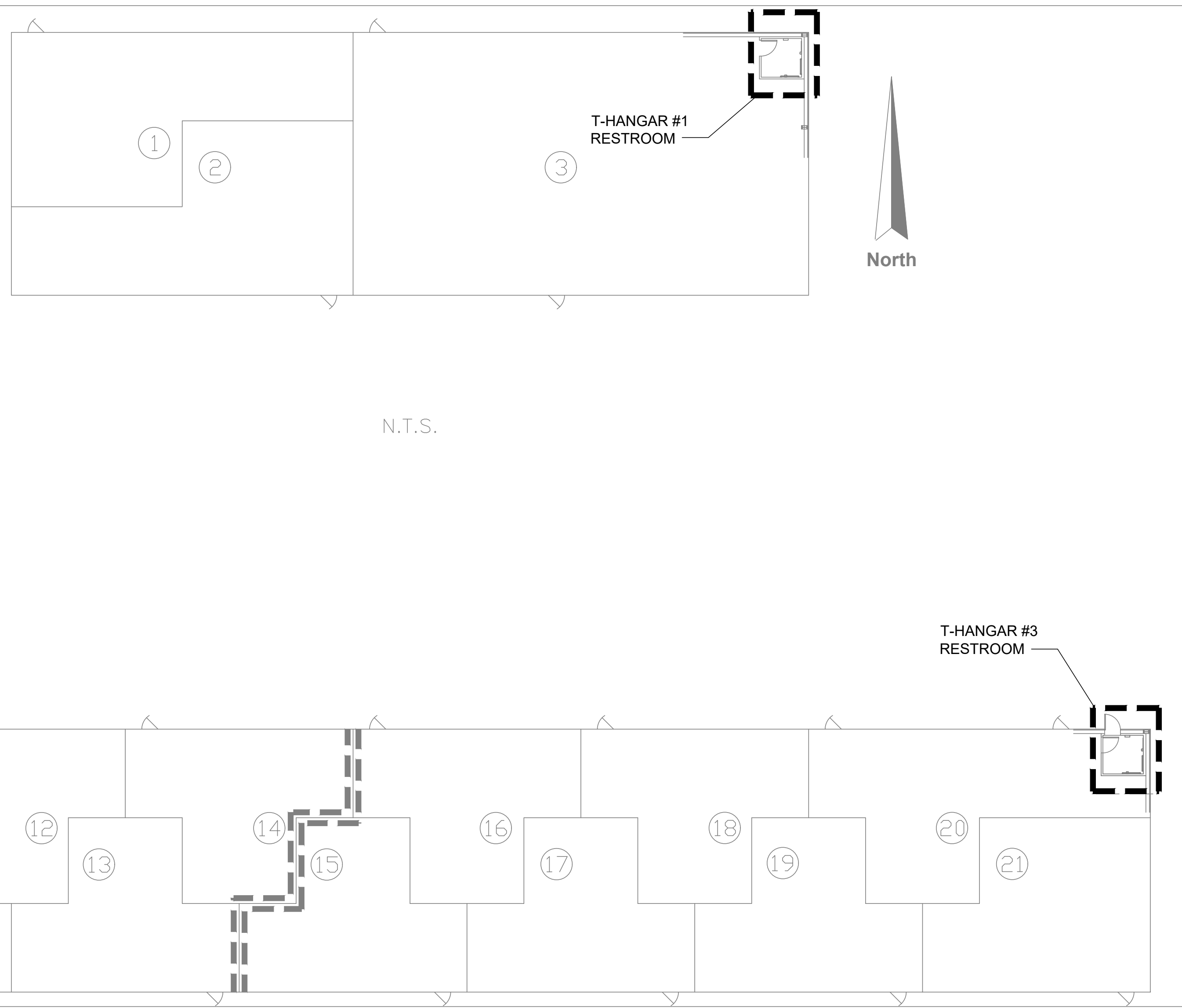
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T-HANGAR
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Charles C. Clabeman P.E. 51936

SHEET
E701



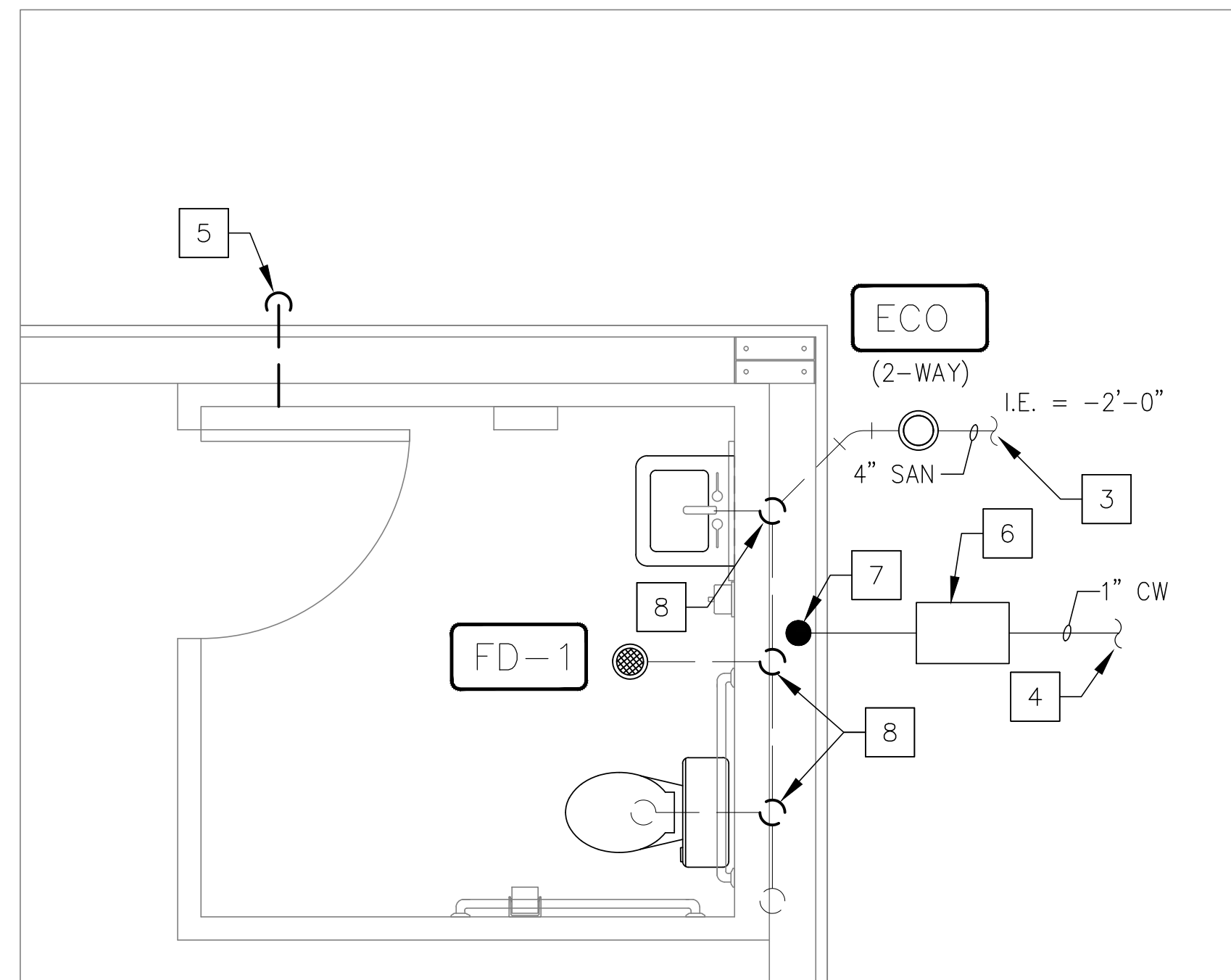
MECHANICAL & PLUMBING GENERAL NOTES

- A. THE CONTRACTOR AND SUBCONTRACTOR SHALL VISIT THE FACILITY AND THOROUGHLY FAMILIARIZE THEMSELVES WITH THE EXISTING CONDITIONS. NO CLAIMS FOR ADDITIONAL WORK DUE TO OBSERVABLE CONDITIONS WILL BE CONSIDERED.
- B. REPORT ANY ALTERATION TO AND/OR DEVIATIONS FROM THE DRAWING AS REQUIRED BY THE REGULATORY AUTHORITIES TO THE ARCHITECT/ENGINEER AND SECURE HIS/HER APPROVAL BEFORE STARTING ALTERATIONS.
- C. PROVIDE EQUIPMENT CLEARANCES IN ACCORDANCE WITH THE MANUFACTURER'S INSTALLATION INSTRUCTIONS AND IN ACCORDANCE WITH APPLICABLE CODES.
- D. ALL WORK AND EQUIPMENT SHALL MEET THE REQUIREMENTS OF THE MOST RECENTLY REVISED VERSION OF ALL APPLICABLE LAWS, RULES, REGULATION AND ORDINANCES OF FEDERAL, STATE AND LOCAL AUTHORITIES, WHETHER INDICATED ON THE DRAWINGS OR NOT.
- E. PROVIDE FIRE STOPPING AT PENETRATIONS OF RATED ASSEMBLIES (SLAB AND RATED WALLS).
- F. PIPE ROUTING SHOWN IS SCHEMATIC AND IS INTENDED TO INDICATE GENERAL ROUTING. PLUMBING CONTRACTOR SHALL PROVIDE ANY ADDITIONAL OFFSETS AND FITTING REQUIRED FOR PROPER INSTALLATION AND TO MAINTAIN CLEARANCES AS ENCOUNTERED IN THE FIELD.
- G. PLUMBING PIPING INVERTS ARE REFERENCED TO FINISHED FLOOR ELEVATION 0'0".

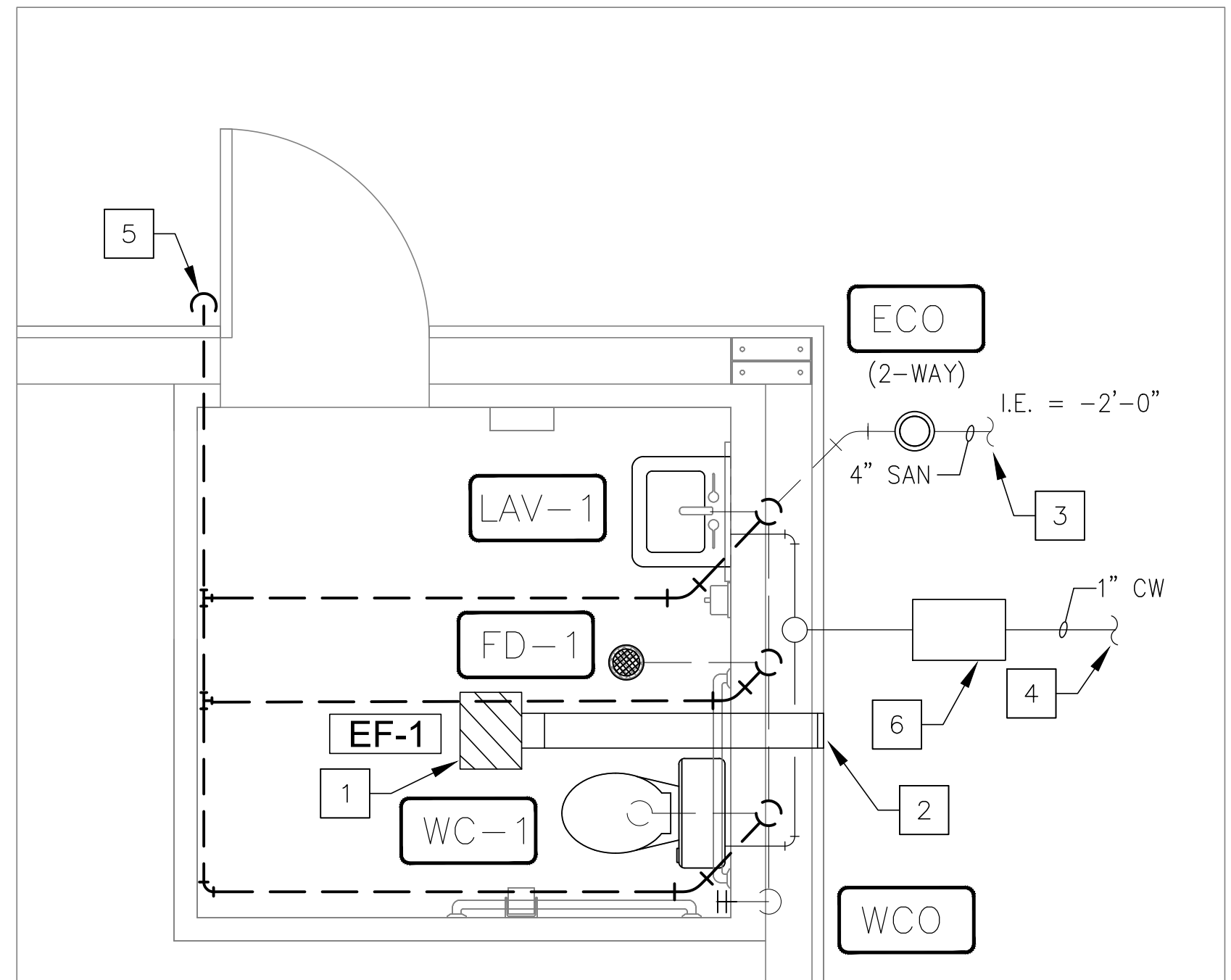
MECHANICAL & PLUMBING KEY NOTES

- 1 PROVIDE CEILING CABINET EXHAUST FAN. REFER TO FAN SCHEDULE ON SHEET MP601 AND DETAIL 01/MP501.
- 2 PROVIDE WALL VENT CAP WITH A 6" DIAMETER INLET. PRODUCT SHALL BE RDP HOODED WALL VENT WITH SPRING LOADED DAMPER AND SCREEN, OR APPROVED EQUAL.
- 3 SANITARY POINT OF CONNECTION TO SITE CIVIL, REFERENCE CIVIL DRAWINGS FOR CONTINUATION.
- 4 DOMESTIC POINT OF CONNECTION TO SITE CIVIL, REFERENCE CIVIL DRAWINGS FOR CONTINUATION.
- 5 PROVIDE NEW VENT THROUGH SIDE WALL. TURN DOWN AT BUILDING EXTERIOR AND PROVIDE BIRD SCREEN AT OPENING. VENT OPENING SHALL TERMINATE 10' AFF. REFERENCE SANITARY RISER FOR VENT SIZING.
- 6 PROVIDE SHUT-OFF VALVE INSIDE VALVE BOX FOR DOMESTIC COLD WATER. REFER TO DETAIL 04/MP501.
- 7 CAP DOMESTIC COLD WATER PIPING IN RISER.
- 8 SANITARY VENT STUBBED UP AND CAPPED.

1 T-HANGARS #1 & #3 - OVERALL PLAN
MP101 SCALE: N.T.S.



2 T-HANGAR #1 FLOOR PLAN - MECHANICAL & PLUMBING
MP101 SCALE: 1/2" = 1'-0"



3 T-HANGAR #3 FLOOR PLAN - MECHANICAL & PLUMBING
MP101 SCALE: 1/2" = 1'-0"

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AUTHORIZATION NUMBER: 9057
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TRANSFORMING TODAY'S IDEAS
INTO TOMORROW'S REALITY

NO.	DATE	REVISION	BY

RELEASE FOR BID

T-HANGAR
DEVELOPMENT
PREPARED FOR
CALHOUN COUNTY
AIRPORT

DESIGNED BY: A.S.
DRAWN BY: A.S.
CHECKED BY: Z.B.P.
APPROVED BY: Z.B.P.
PROJECT NO: 2022.241.01
DATE: NOVEMBER 2024

SHEET
MP101

PLUMBING SPECIFICATIONS

1. WORK INCLUDED

- A. WORK WILL INCLUDE, BUT NOT BE LIMITED TO THE FOLLOWING SYSTEMS COMPLETE WITH ALL REQUIRED ACCESSORIES.
- SYSTEM OF SANITARY SOIL, WASTE, AND VENT PIPING.
 - SYSTEM OF DOMESTIC HOT AND COLD WATER PIPING.
 - PLUMBING FIXTURES, EQUIPMENT, ACCESSORIES, TRIM AS SPECIFIED HEREIN.
 - WATER SERVICE TO EACH FIXTURE REQUIRING SUCH SERVICE.
 - SANITARY BUILDING DRAINS AND FIXTURE BRANCHES FROM EACH FIXTURE REQUIRING SUCH SERVICE.
 - PIPING INCIDENTAL TO HEATING AND AIR CONDITIONING WORK TO THE EXTENT HEREIN SPECIFIED.

2. LAWS AND CODES

- A. THE CONTRACTOR SHALL INSTALL ALL WORK IN STRICT COMPLIANCE WITH ALL APPLICABLE CODES AND BE INCLUSIVE OF ALL STATE AND LOCAL CODES. ALL PROVISIONS OF THIS SECTION APPLY TO ALL PLUMBING WORK.
- B. THE CONTRACTOR SHALL OBTAIN AND PAY FOR ALL PERMITS, FEES, AND CHARGES REQUIRED INCIDENTAL TO THE WORK INVOLVED THAT MAY BE NECESSARY FOR FULLY COMPLETING THE WORK.
- C. THE CONTRACTOR SHALL MAKE ALL NECESSARY TESTS REQUIRED BY LOCAL AUTHORITIES, LEGAL REGULATIONS, AND RETURN TO THE ENGINEER ANY CERTIFICATE OF APPROVAL ISSUED FOR ALL PLUMBING WORK SIGNED BY THE INSPECTING ADMINISTRATIVE AUTHORITY IN CHARGE OF EACH PARTICULAR PART OF THE WORK.

3. QUALIFICATIONS:

- A. THE CONTRACTOR SHALL BE A LICENSED PLUMBER CERTIFIED BY THE STATE.

4. GUARANTEE AND SERVICE:

- A. THE CONTRACTOR SHALL GUARANTEE ALL PIPING, EQUIPMENT, FIXTURES, AND RELATED MATERIALS FOR A PERIOD OF ONE (1) YEAR FROM DATE OF ACCEPTANCE AGAINST DEFECTS DUE TO FAULTY WORKMANSHIP OR MATERIALS. SUCH DEFECTS WILL BE CORRECTED PROMPTLY AFTER NOTIFICATIONS BY THE ENGINEER AND AT THE CONTRACTOR'S EXPENSE WITH NO COST TO THE OWNER.
- B. THE CONTRACTOR SHALL ALSO FURNISH WITHOUT CHARGE, ANY REASONABLE SERVICE IN MAKING MINOR ADJUSTMENTS TO FIXTURES AND EQUIPMENT FOR THE SAME PERIOD, BUT THIS SERVICE WILL NOT INCLUDE THE REPLACEMENT OF PARTS DAMAGED BY MALICIOUSNESS OR VANDALISM AFTER ACCEPTANCE BY THE OWNER OR CLEARING OF OBSTRUCTION FROM SEWERS CAUSED BY OTHER THAN DEFECTS IN THE LINE.
- C. THE CONTRACTOR SHALL PUT ALL ITEMS INSTALLED UNDER THIS DIVISION INTO OPERATION AND WILL INSTRUCT THE OWNER'S MAINTENANCE PERSONNEL IN ALL POINTS REQUIRING SERVICE AND MAINTENANCE.

5. SHOCK ARRESTORS:

- A. INSTALL WATER HAMMER SHOCK ARRESTORS AS SHOWN ON PLANS. ARRESTORS SHALL BE FACTORY-FABRICATED. INSTALL ARRESTORS AND SIZE PER PLUMBING AND DRAINAGE INSTITUTE STANDARD P.D.I. WH-201. ACCEPTED MANUFACTURERS - SIOUX CHIEF, JOSAM, JAY R. SMITH, WATTS (NO. 15 SERIES), WADE. AIR CHAMBERS ARE NOT ACCEPTABLE.

6. VALVES:

- A. FURNISH VALVES DESIGNED FOR 200-POUND WOG. VALVES SHALL BE OF SAME MANUFACTURER. VALVES SHALL BE THREADED AND SHALL HAVE BRONZE BODY. SOLDER FITTINGS MAY BE USED AS ALTERNATIVE.
- B. PRODUCT DATA TO BE SUBMITTED SHALL BE PUBLISHED BY THE MANUFACTURERS AND SHALL CONTAIN COMPLETE AND DETAILED ENGINEERING AND DIMENSIONAL INFORMATION. THE CONTRACTOR SHALL SUBMIT PRODUCT DATA AS DESCRIBED BELOW.
- C. PRODUCT DATA SUBMITTED SHALL CONTAIN ONLY INFORMATION RELEVANT TO THE PARTICULAR EQUIPMENT OR MATERIAL TO BE FURNISHED. THE CONTRACTOR SHALL NOT SUBMIT CATALOGS WHICH DESCRIBE SEVERAL DIFFERENT ITEMS IN ADDITION TO THOSE ITEMS TO BE USED, UNLESS ALL IRRELEVANT INFORMATION IS CLEARLY MARKED. PRODUCT DATA FROM EACH MANUFACTURER SHALL BE IDENTIFIED AND SUBMITTED SEPARATELY. SUBMIT SHOP DRAWINGS IN BOUND FORM. LOOSE SHEETS ARE NOT ACCEPTABLE.
- D. THE CONTRACTOR SHALL PROVIDE OPERATING INSTRUCTION AND MAINTENANCE DATA BOOKS FOR ALL EQUIPMENT AND MATERIALS FURNISHED. MAINTENANCE INSTRUCTION MANUALS SHALL INCLUDE COMPLETE OILING, CLEANING, AND SERVICING DATA COMPILED IN CLEARLY AND EASILY UNDERSTANDABLE FORM. LISTS OF REPLACEMENT PARTS, MOTOR RATINGS, AND ACTUAL LOADS. INCLUDE THE FOLLOWING WHERE APPLICABLE:
- IDENTIFY NAME AND MARK NUMBER.
 - LOCATIONS (WHERE SEVERAL SIMILAR ITEMS ARE USED, PROVIDE A LIST).
 - COMPLETE NAMEPLATE DATA.
 - PARTS LIST.
 - PERFORMANCE CURVES AND DATA.
- E. SUBMIT SHOP DRAWINGS FOR REVIEW PRIOR TO COMMENCING ANY WORK. SHOP DRAWINGS SHALL INCLUDE COMPLETE DATA AND APPLICABLE PROCEDURES FOR THE FOLLOWING EQUIPMENT AND MATERIAL (WHERE APPLICABLE):
- ALL VALVES.
 - ALL INSULATION MATERIALS.
 - ALL PLUMBING FIXTURES AND TRIMS.
 - PIPING MATERIALS
 - PLUMBING EQUIPMENT

- F. SHOP DRAWINGS SHALL BE DONE IN AN EASILY LEGIBLE SCALE AND SHALL CONTAIN SUFFICIENT PLANS, ELEVATIONS, SECTIONS, AND SCHEMATICS TO CLEARLY DESCRIBE THE APPARATUS. ALL SHEET METAL, PIPING, AND SIMILAR SHOP DRAWINGS SHALL BE DRAWN TO AT LEAST 1/4" = 1'-0" SCALE. SHOP DRAWINGS THAT DO NOT COMPLY WITH THESE REQUIREMENTS WILL BE RETURNED FOR RESUBMITTAL.

7. PLUMBING PIPE INSULATION

- A. ALL ABOVE GROUND DOMESTIC WATER PIPING SHALL BE INSULATED WITH MIN. 1" THICK RIGID FIBERGLASS INSULATION. MAXIMUM K FACTOR SHALL BE 0.27 AT 70F. PROVIDE FACTORY ATTACHED WHITE VAPOR BARRIER JACKET.
- B. PROVIDE ALUMINUM JACKET OVER ALL INSULATION EXPOSED OUTSIDE BUILDING. JACKET FOR PIPING SHALL BE .016" THICK TYPE 3105 ALUMINUM WITH FACTORY APPLIED ONE MIL POLYKRAFT MOISTURE BARRIER, SIMILAR TO CHILLERS "STRAP ON" OR APPROVED. FITTING COVERS SHALL BE FACTORY MADE 0.024" TYPE 1100 ALUMINUM TO MATCH PIPE COVERING. FITTING COVERS SHALL BE MANUFACTURED TO ASTM C-450 STANDARDS. CHILLERS ELL-JACS OR APPROVED.
- C. PROVIDE FLEXIBLE CLOSED CELL INSULATION WITH 0.28L FACTOR AT 75F MEAN TEMPERATURE DIFFERENCE FOR LAVATORY DRAINS.

8. DOMESTIC WATER PIPING

- A. INTERIOR PIPING
- COPPER WATER TUBE, TYPE L RIGID, WITH SOLDER TYPE WROUGHT COPPER FITTINGS, MADE UP WITH 95-5 SOLDER.
- B. EXTERIOR PIPING
- COPPER WATER TUBE, TYPE K RIGID, WITH SOLDER TYPE WROUGHT COPPER FITTINGS, MADE UP WITH 95-5 SOLDER.
- C. PROVIDE VALVE IN BRANCH LINES TO EACH PIECE OF WATER CONSUMING EQUIPMENT OR FIXTURE. STOP VALVES SATISFY THIS REQUIREMENT.
- D. STOPS AND SUPPLIES: STOPS SHALL BE 3/8" OR 1/2" ALL BRASS CHROME PLATE SIMILAR TO MCGUIRE #216SLK. PIPE EXTENDING FROM WALL TO STOP SHALL BE CHROME PLATED WITH CHROME PLATED ESCUTCHEON AT WALL. PIPE EXTENDING FROM STOP TO FIXTURE CONNECTION SHALL BE CHROME PLATED WITH METAL NOSE PIECE (RUBBER NOSE PIECE OR CONE IS NOT ACCEPTABLE). WHEN INSTALLED IN PUBLIC AREAS PROVIDE LOOSE KEY OPERATOR WITH KEY.
- E. CLEANING WATER PIPING: CLEAN ALL WATER PIPING. INCLUDE SURGE TANKS, STORAGE VESSELS, AND ALL COMPONENTS AND DEVICES IN THE PIPING SYSTEM. FLUSH THOROUGHLY, STERILIZE WITH CHLORINE SOLUTION FOR MINIMUM 24 HOURS, THEN FLUSH CLEAN. STRENGTH OF CHLORINE SOLUTION AND METHODS MUST COMPLY WITH CITY CODE AND HEALTH AUTHORITIES. AT COMPLETION, THERE MUST BE NO DISCERNIBLE ODOR. POST WARNINGS UNTIL STERILIZATION IS COMPLETE.
- F. CPVC PIPING MAYBE USED AS ALTERNATE MATERIAL FOR INTERIOR DOMESTIC WATER PIPING. CPVC PIPING SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. CPVC PIPE AND FITTINGS SHALL CONFORM TO ASTM D 2846.

9. DRAINAGE, WASTE, AND VENT PIPING:

- A. ALL DWV PIPING ABOVE SLAB WITHIN CHASES AND BELOW SLAB SHALL BE SCHEDULE 40 PVC WITH SOLVENT WELDED JOINTS. ANY SANITARY PIPING IN RETURN AIR PLENUM SHALL BE CAST IRON.
- B. SANITARY DRAIN CONNECTIONS BETWEEN TAILPIECE OF FIXTURES AND EQUIPMENT AND SANITARY WASTE LINE SHALL BE DWV COPPER OR BRASS PIPE. WHERE EXPOSED TO VIEW, INCLUDING UNDER COUNTERS AND IN CABINETS, CONNECTIONS SHALL BE CHROME PLATED, PLASTIC IS NOT ACCEPTABLE. RESTRAIN EACH END OF ALL CAST IRON FITTING AND PIPE JOINTS AT EACH CHANGE OF DIRECTION, INCLUDING THE BASE OF EACH OFFSET FORM THE VERTICAL TO HORIZONTAL. RESTRAIN WITH GRINNELL NO. 594 AND 595 OR COMPARABLE MODEL SOCKET CLAMPS AND WASHERS. PROVIDE THREADED STEEL RODS BETWEEN CLAMPS AND SECURE WITH LOCKING NUTS. SECURE THE HORIZONTAL PORTION OF THE BASE FITTING (ELBOW) AT EACH OFFSET FROM VERTICAL TO HORIZONTAL OF EACH RISER, TO THE STRUCTURE USING A PIPE HANGER OR WELDED STEEL HANGER STRUCTURE.
- C. ALL EQUIPMENT SHALL BE FURNISHED BY MANUFACTURER SPECIFIED OR BY OWNER APPROVED EQUAL.

10. CLEANOUTS:

- A. INSTALL CLEANOUTS AT EACH CHANGE OF DIRECTION, AT THE FOOT OF EACH RISER AND AT LOCATIONS SHOWN FOR SANITARY AND STORM SYSTEMS ON THE PLANS. CLEANOUTS SHALL BE A MAXIMUM OF 75' APART.

11. ACCESS PANELS

- A. REQUIRED: PROVIDE ACCESS PANELS OF SIZE AND LOCATION TO PROVIDE ACCESS FOR OPERATION AND SERVICE TO ALL CONCEALED VALVES AND EQUIPMENT. OBTAIN ARCHITECT'S APPROVAL OF LOCATIONS AND TYPE BEFORE ORDERING.
- B. SIZE: MINIMUM 12" X 12", LARGER WHERE REQUIRED FOR ADEQUATE SERVICE ACCESS.
- C. TYPE: BEST SUITED FOR SURFACE MATERIALS IN WHICH INSTALLED, COMPLETE WITH ANCHOR STRAPS, CONCEALED HINGES, CYLINDER LOCK, DUSTTIGHT DOOR, ALL DOORS KEYS ALIKE, STAINLESS STEEL.
- D. MANUFACTURERS: MILCOR, MIAMI-CAREY, ZURN, TITUS, WADE.

12. PIPE SUPPORTS

- A. GENERAL: PROVIDE SUPPORTS OF ADEQUATE STRENGTH FOR ALL PIPING. PIPING CONNECTED TO A PIECE OF EQUIPMENT SHALL HAVE A SUPPORT LOCATED NEAR ENOUGH TO THE EQUIPMENT THAT THERE WILL BE NO PIPE WEIGHT SUPPORTED BY THE EQUIPMENT. IN NO CASE SHALL THE NEAREST SUPPORT BE MORE THAN TWO FEET HORIZONTALLY FROM THE CONNECTION POINT. SUPPORTS SHALL BE ARRANGED SUCH THAT NO STRAIN IS PLACED ON THE EQUIPMENT. HANGERS AND SUPPORTS USED IN FIRE PROTECTION SYSTEMS SHALL BE SAME AS THOSE BELOW AND SHALL BE U.L. LISTED.
- B. APPROVAL: OBTAIN STRUCTURAL ENGINEER APPROVAL OF PIPE SUPPORT POINTS AND RESULTING LOAD BEFORE INSTALLATION.
- C. HORIZONTAL PIPING:

- TUBING 1" AND SMALLER SHALL BE SUPPORTED EVERY 3'. TUBING 1-1/4" OR LARGER SHALL BE SUPPORTED EVERY 4' IN ACCORDANCE WITH THE FLORIDA BUILDING CODE.
- SUPPORT SPACING: PROVIDE SUPPORT SPACING AS REQUIRED BY CODE. THE MAXIMUM DISTANCES BETWEEN SUPPORTS SHALL NOT EXCEED CODE REQUIREMENTS. SUPPORT SPACING CLOSER THAN THAT REQUIRED BY CODE SHALL BE PROVIDED WHERE RECOMMENDED BY PIPE AND FITTINGS MANUFACTURER AND WHERE CONDITIONS AND LOADING REQUIRE CLOSER SPACING.
- SUPPORT FROM ABOVE: ALL PIPING NEAR THE STRUCTURE ABOVE, WHERE IT HAS ADEQUATE STRENGTH TO PROVIDE SAFE SUPPORT. USE A METHOD SUITABLE FOR TYPE OF CONSTRUCTION AND OF SUFFICIENT STRENGTH. USE STEEL HANGER RODS, DIAMETER AS REQUIRED TO SAFELY SUPPORT LOADS. DO NOT USE PERFORATED STRAP OR WIRE. USE GRINNELL OR APPROVED EQUAL INSERTS OR DRILLED INSERTS FOR CONCRETE CONSTRUCTION. USE GRINNELL OR APPROVED EQUAL BEAM CLAMPS FOR STEEL STRUCTURE. USE GRINNELL OR APPROVED EQUAL SIDE BEAM BRACKET WITH THRU-BOLT AND MINIMUM 3" X 3" X 3/16" STEEL PLATE FOR WOOD CONSTRUCTION.
- HANGERS: MANUFACTURED BY GRINNELL, ELCEN, MICHIGAN, OR APPROVED.
 - SINGLE RUNS OF PIPE: SPLIT RING WITH TURN BUCKLE ADJUSTER OR ADJUSTABLE CLEVIS AS APPROPRIATE, FOR VERTICAL ALIGNMENT. TWO HOLE PIPE STRAPS SHALL NOT BE USED.
 - MULTIPLE RUNS: TRAPEZE HANGERS.
- SUPPORT MATERIAL FINISH: FOR DRY AREAS, BLACK STEEL. FOR MOIST OR WET AREAS, GALVANIZED OR CADMIUM PLATED STEEL. WHERE THE PIPE SUPPORTED IS UNINSULATED BLACK STEEL WHICH WILL BE PAINTED, SUPPORT MAY BE SAME.
- PIPE SADDLES: FORMED GALVANIZED SHEETS AT EACH SUPPORT POINT FOR INSULATED PIPE, SHAPED TO FIT PIPE, AND COVERING BOTTOM HALF OF PIPE. LENGTH AT SADDLE SHALL BE NOT LESS THAN TWICE THE INSULATION OUTSIDE DIAMETER.
- VERTICAL RISER: GRINNELL FIGURE 261, OR APPROVED EQUAL, CLAMP RESTING ON SUITABLE STRUCTURAL MEMBER. LOCATE AT EACH FLOOR UNLESS OTHERWISE INDICATED OR REQUIRED BY CODE.

13. TESTING:

- A. BALANCE ALL WATER SYSTEMS TO PROVIDE PROPER AMOUNTS OF WATER TO ALL EQUIPMENT AND FIXTURES WHICH REQUIRE WATER.
- B. AT TIME OF JOB COMPLETION:
- PROVIDE SUCH TOOLS, EQUIPMENT, AND PERSONNEL AS REQUIRED TO CONDUCT TESTS AND DEMONSTRATE THE ACCEPTABILITY OF THE VARIOUS PLUMBING SYSTEMS.
 - HAVE THE AUTHORIZED REPRESENTATIVES OF THE VARIOUS MANUFACTURERS AVAILABLE IF REQUESTED.

14. FOUNDATIONS AND EQUIPMENT SUPPORTS:

- A. GENERAL: PROVIDE ALL FOUNDATIONS, SUPPORTS, AND VIBRATION ISOLATION FOR EQUIPMENT.
- B. CONCRETE HOUSEKEEPING PADS: TO BE PROVIDED UNDER DIVISION 3. PADS SHALL BE REINFORCED, HAVE CHAMFERED EDGES AND 4" PAD HEIGHTS.

15. COORDINATION OF WORK WITH OTHER TRADES

- A. THE CONTRACTOR SHALL LAYOUT AND PROCEED WITH THIS WORK SO THAT THIS WORK WILL BE EXECUTED IN HARMONY WITH ALL OTHER CONTRACTS PERTAINING TO THIS PROJECT.
- B. ALL ELECTRICAL POWER WIRING REQUIRED FOR INSTALLATION OF EQUIPMENT UNDER THIS SECTION IS SPECIFIED UNDER ELECTRICAL DIVISION. PLUMBING CONTRACTOR SHALL FURNISH AND INSTALL ALL CONTROLS, AND CONTROL WIRING AS SPECIFIED OR REQUIRED TO PROPERLY COMPLETE THE INSTALLATION. CONTROL CONDUIT IS SPECIFIED UNDER ELECTRICAL DIVISION TO THE EXTENT SHOWN ON ELECTRICAL DRAWINGS. ALL OTHER CONTROL CONDUIT SHALL BE PROVIDED UNDER THIS SECTION OF WORK. ALL ELECTRICAL WORK PERFORMED UNDER THIS SECTION SHALL MEET REQUIREMENTS SET FORTH IN THE ELECTRICAL DIVISION.
- C. PIPE SLEEVES: FIT ALL PIPES PASSING THROUGH JOB CAST CONCRETE CONSTRUCTION WITH SLEEVES. SLEEVES SHALL BE CUT FLUSH WITH EACH SURFACE, 1/2" LARGER IN DIAMETER THAN THE PASSING PIPE OR COVER, BUILT-IN AS WORK PROGRESSES. SLEEVES THROUGH JOISTS AND BEAMS SHALL BE OF GALVANIZED STEEL PIPE, OTHER SLEEVES SHALL BE OF 16 GAUGE GALVANIZED IRON. MAKE SPACE BETWEEN FLOOR SLEEVES AND PASSING PIPES WATERTIGHT BY CAULKING WITH FIREPROOF PACKING AND PLASTIC WATERPROOF CAULKING COMPOUND.

16. FIXTURE SUPPORTS AND CONNECTIONS

- A. GENERAL: ALL FIXTURES INCLUDING LAVATORIES, WATER CLOSETS, ETC. MUST BE SECURELY FASTENED TO THE WALLS OR FLOOR.
- B. WALL MOUNTED FIXTURES: SUPPORT ALL WALL MOUNTED FIXTURES WITH 3/16" THICK X 3-1/2" HIGH PLATES FULL LENGTH OF FIXTURE, MOUNTED BEHIND WALL WHERE FIXTURES ARE BACK TO BACK ON A SOLID WALL. MOUNT WITH BOLTS FROM FIXTURE HANGER TO FIXTURE HANGER. DO NOT USE TOGGLE BOLTS OR EXPANSION BOLTS EXCEPT AS NOTED. WHERE FIXTURES ARE MOUNTED ON SOLID WALLS FINISHED BOTH SIDES, INSTALL FIXTURE WITH PLATED TOGGLE BOLTS. WHERE FIXTURES ARE MOUNTED ON WELDED STUDS, EMPLOY 3/16" STEEL HANGER PLATES PLACED ON WALL BEFORE LATHING. PLATES SHALL BE 16" X 8" MINIMUM SIZE, AND SHALL HAVE WELDED-ON BOLT STUDS. WHERE FIXTURES ARE MOUNTED ON WOOD OR LIGHT GAUGE STEEL STUDS, EMPLOY PRESSURE TREATED BLOCKING OF 2 X 10 NOMINAL SIZE WELL SECURED INTO STUD LINE WITH NON-CORROSSIVE FASTENERS, FIT BEHIND STUD FLANGES, USING ESPECIALLY PLACED STUDS AS REQUIRED.
- C. FLOOR CONNECTIONS: PROVIDED FLOOR FLANGES, SCREWED OR CAULKED TO DRAINAGE PIPE BOLT THE CONNECTION AND MAKE TIGHT TO FIXTURE WITH SETTING RING OR POLYETHYLENE GASKET FLANGE.
- D. WASTE ARMS TO FIXTURES: AS SPECIFIED HEREIN, WHERE COPPER OR BRASS PIPE IS SPECIFIED, ALL JOINTS DOWNSTREAM FROM TAP SHALL HAVE SOLDERED JOINTS.

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TRANSFORMING TODAY'S IDEAS
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NO.	DATE	REVISION	BY
1	11/26/24	ADD/REMOVE NO. 3	

RELEASE FOR BID

T-HANGAR
DEVELOPMENT
PREPARED FOR
CALHOUN COUNTY
AIRPORT

DESIGNED BY: A.S.
DRAWN BY: A.S.
CHECKED BY: Z.B.P.
APPROVED BY: Z.B.P.
PROJECT NO: 2022.241.01
DATE: NOVEMBER 2024

SHEET
MP003

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FAN SCHEDULE

PLAN MARK	LOCATION	SERVES	TYPE	CFM	R.P.M.	S.P. IN. WG.	DRIVE	MOTOR DATA				BHP	UNIT WGT. (LBS)	DIMENSIONS (WxLxH)(IN.)	NOTES
								H.P.	R.P.M.	VOLTS	PH.				
EF-1	RESTROOM	RESTROOM	CEILING	50	750	0.2	DIRECT	0.01	850	115	1	-	12	15X13X9	

NOTES:

- FAN WHEEL AND HOUSING SHALL BE ALUMINUM CONSTRUCTION.
- PROVIDE ECM MOTOR FOR MANUAL SPEED CONTROL WITH POTENTIOMETER DIAL FOR ALL SINGLE SPEED FAN MOTORS.
- PROVIDE NEMA-1 DISCONNECT SWITCH.
- PROVIDE GRAVITY BACKDRAFT DAMPER.
- EXHAUST FANS SHALL BE GREENHECK MODEL NUMBER SP-A70 OR APPROVED EQUAL.
- FANS SHALL BE DIRECT DRIVE WITH ECM MOTOR.
- EF-1 SHALL BE INTERLOCKED WITH RESTROOM LIGHT SWITCH.

PLUMBING FIXTURE SCHEDULE

FIXTURE TAG	DESCRIPTION	REMARKS	WASTE	VENT	CW	HW	MANUFACTURER	MODEL
ECO	EXTERNAL CLEANOUT	EPOXY COATED CAST IRON CLEANOUT WITH 5" ROUND ADJUSTABLE HEAVY DUTY DUCTILE IRON TOP, REMOVABLE GASKETED BRASS CLEANOUT PLUG.	4"	-	-	-	WATTS	CO-200P-RX4
FD-1	FLOOR DRAIN	EPOXY COATED CAST IRON DRAIN, 5" ROUND HEEL-PROOF NICKEL BRONZE STRAINER, REVERSIBLE CLAMPING COLLAR. PROVIDE WITH DEEP SEAL TRAP, AND TRAP GUARD.	3"	2"	-	-	WATTS	FD-100-A
LAV-1 (ADA)	LAVATORY (ADA)	BARRIER FREE - ADA HEIGHT WALL HUNG LAV. PROVIDE STRAINER, TRAPS, STOPS, AND FLOOR MOUNTED CARRIER. 4" CENTER-SET MANUAL FAUCET, SINGLE CONTROL LEVER, 0.5 GPM AERATOR.	2"	2"	1/2"	-	AMERICAN STANDARD AMERICAN STANDARD	0356.421 7052107.002
PDI	WATER HAMMER ARRESTOR	TYPE L COPPER BODY, POLYPROPYLENE PISTON	-	-	VARIES	-	SIoux CHIEF	HYDRA-RESTER
WC-1 (ADA)	WATER CLOSET (ADA)	ENLOGATED VITEROUS CHINA, FLOOR MOUNTED, ADA HEIGHT, FLUSH TANK, MANUAL, 1.28 GPF. PROVIDE OPEN FRONT SEAT & MOUNTING HARDWARE, MOUNTING RING, BOLTS, AND STOP. BARRIER FREE.	4"	2"	1/2"	-	SLOAN SLOAN	WETS-4029.4210 G2 8111
WCO	WALL CLEANOUT	THREADED BRASS CLEANOUT PLUG, STAINLESS STEEL ACCESS COVER, VANDAL PROOF SCREW	4"	-	-	-	WATTS	CO-590-RD

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TRANSFORMING TODAY'S IDEAS
 INTO TOMORROW'S REALITY

NO.	DATE	REVISION	BY
1	11/20/24	ADDRESS NO. 3	

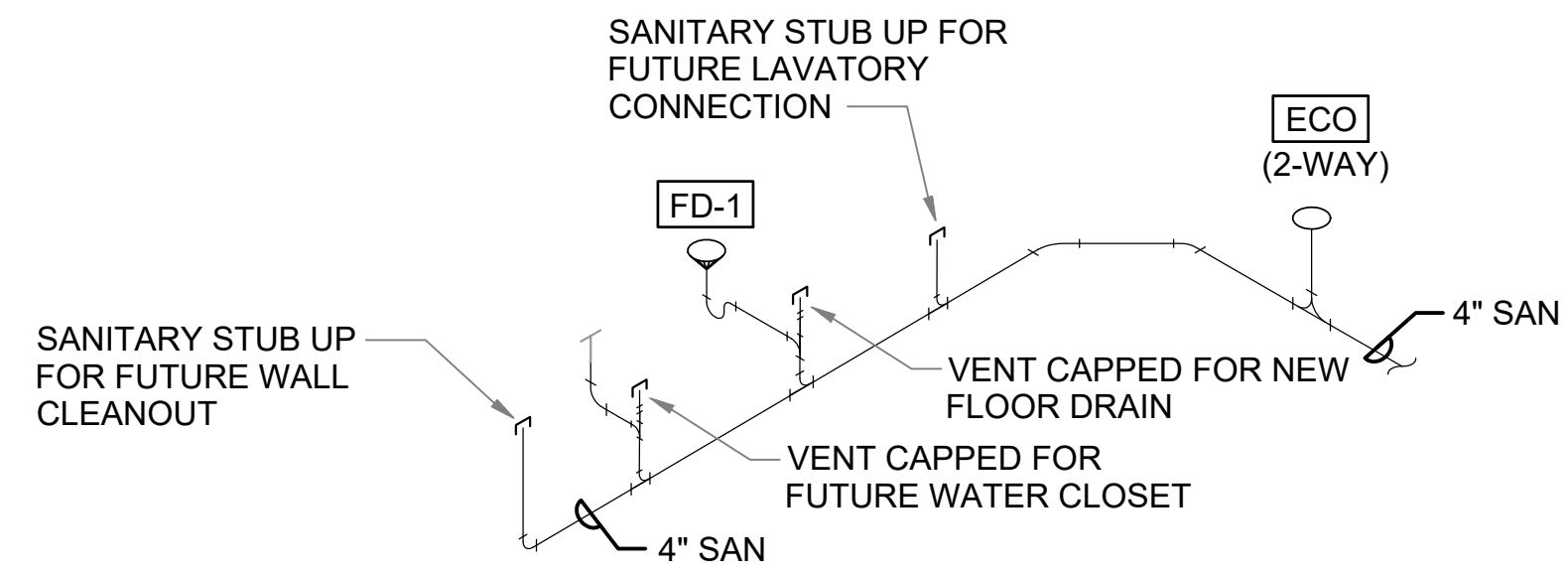
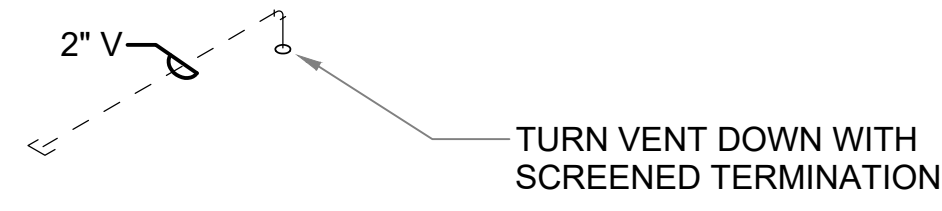
RELEASE FOR BID

T-HANGAR
 DEVELOPMENT
 PREPARED FOR
 CALHOUN COUNTY
 AIRPORT

DESIGNED BY: A.S.
 DRAWN BY: A.S.
 CHECKED BY: Z.B.P.
 APPROVED BY: Z.B.P.
 PROJECT NO: 2022.241.01
 DATE: NOVEMBER 2024

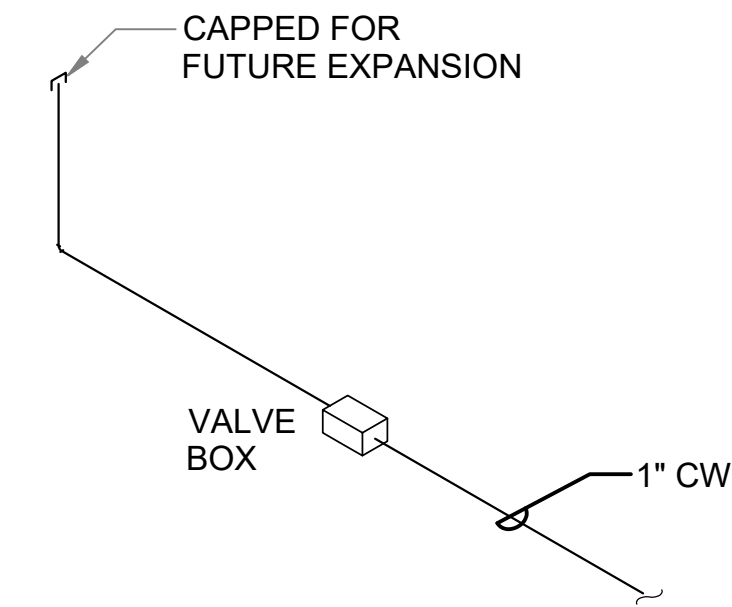
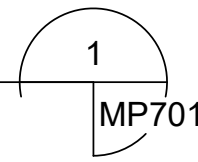
SHEET
 MP601

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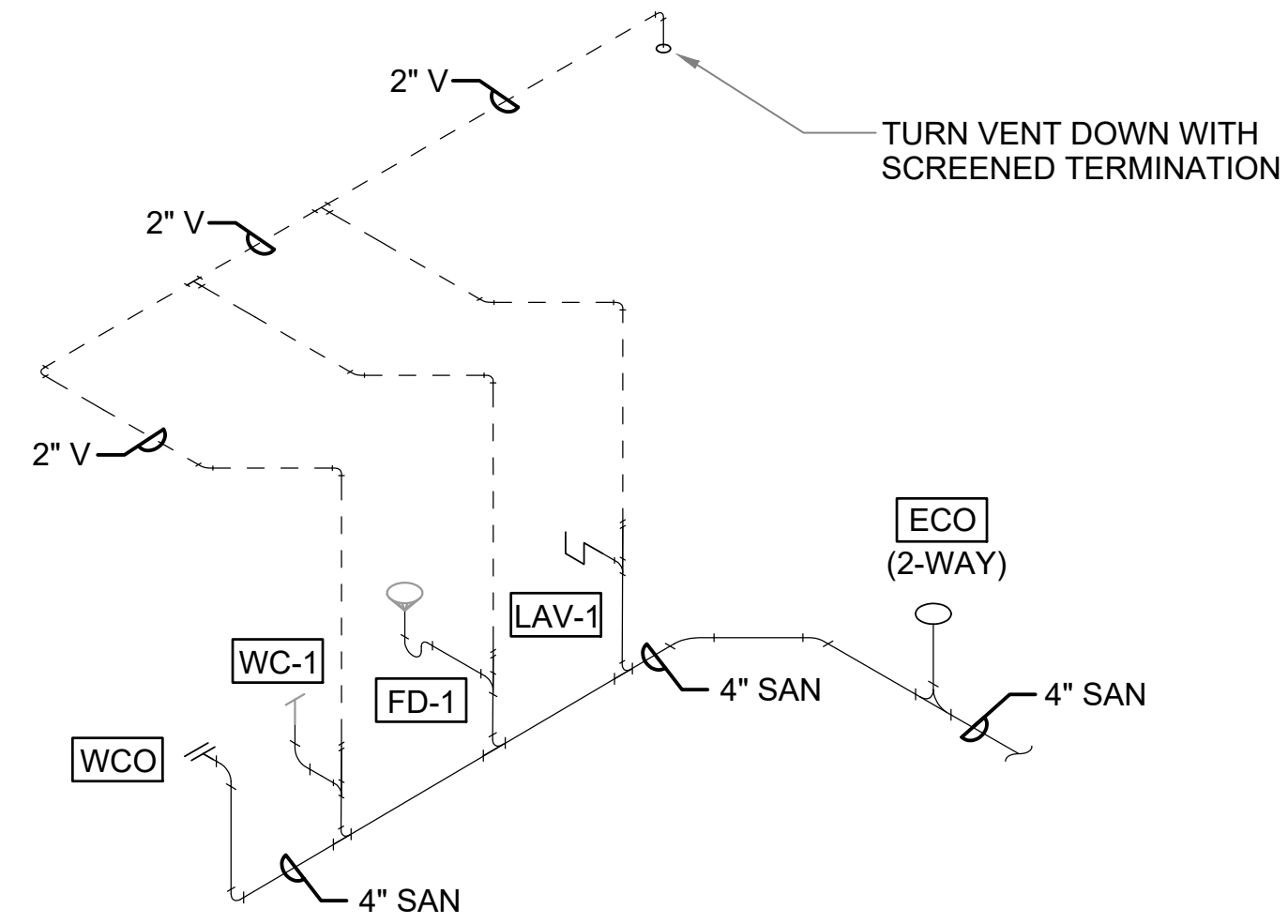
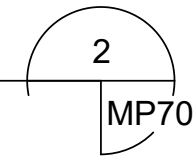
T-HANGAR #1 - SANITARY RISER DIAGRAM

SCALE: NOT TO SCALE



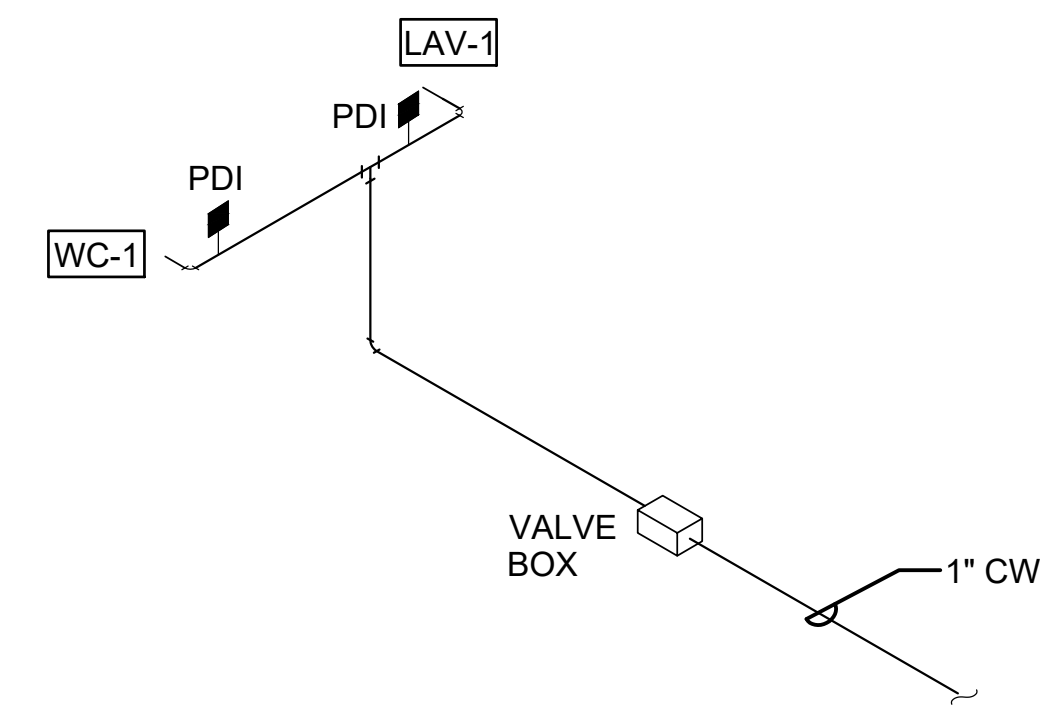
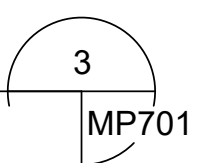
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SCALE: NOT TO SCALE



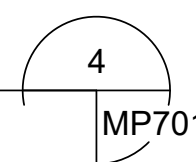
T-HANGAR #3 - SANITARY RISER DIAGRAM

SCALE: NOT TO SCALE



T-HANGAR #3 - DOMESTIC RISER DIAGRAM

SCALE: NOT TO SCALE



K:\MEP_REFERENCE_FILES\CALHOUN_T-HANGAR - TEMP\REFERENCES\MP701 - PLUMBING RISER DIAGRAMS.DWG 11/18/2024 3:30 PM

NO.	DATE	REVISION	BY
1	11/20/24	ADDITIONAL NO. 3	

RELEASE FOR BID

T-HANGAR DEVELOPMENT PREPARED FOR CALHOUN COUNTY AIRPORT

DESIGNED BY: A.S.
 DRAWN BY: A.S.
 CHECKED BY: Z.B.P.
 APPROVED BY: Z.B.P.
 PROJECT NO: 2022.241.01
 DATE: NOVEMBER 2024

SHEET MP701

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