

Brunswick Community College
Alan Holden Public Safety Center
SCO Project Number 22-25751-02A

Addendum 1

December 4, 2024

To: All Plan Holders

From: Doug Sherwood, AIA



General Items

1. The Form of Proposal has been revised to include Add Alternate G-10 (Building Generator). Bidders are to use this form when submitting their bids.

Specification Items

1. Section 01 2300 Alternates
 - a. 1.03 Schedule of Alternates, J has been included to describe Alternate No. G-10.
2. Section 26 3213 Engine Generators has been added.
3. Section 26 3600 Transfer Switches has been added.

Drawing Items

1. C0 Existing Conditions: existing spot elevations and contour labels are now shown.
2. A4.3 Enlarged Equipment Screen Plans, Sections, and Details: Generator enclosure has been increased in width, depth, and height.
3. SBD-01: Structural detail for the generator slab.

Clarifications

1. Two geotechnical reports are included in the construction documents. Bidders shall familiarize themselves with these reports as they will be relied on during construction. Remediation of poor soils in locations identified by the reports will not be considered unforeseen conditions and will not be reason for additional cost.
2. Add Alternate G-4: GC to determine the pump size, depth, and capacity of the existing well shown to tie into. This well was installed for irrigation purposes by the College and is anticipated to be appropriate for its intended use. Base Bid seeding as required by Civil Drawings.
3. Specification Section 06 4100 Architectural Casework: Decorative laminate finish colors and finishes will be selected from the manufacturer's full line.
4. Window shades – Light filtering fabric is to be provided at all exterior windows except that Rooms 306, 307, 308 shall be blackout. Blackout fabric shall also be provided at HM3, HM4, HM5, HM6. See A6.1 and A6.2.
5. BDA Surveys and system installation are included in the base bid.

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6. LV Cabling and Fire Alarm System are by the GC and included in the base bid.
7. Security camera infrastructure including Cat 6 cable are by the GC and included in the base bid.
8. Security card readers, door contacts, strikes, keypads and motion detector devices are by the Owner or Owner's vendor. The infrastructure to accommodate installation of those items are by the GC and included in the base bid.
9. Data and telephone communications cables and outlets are by the GC and included in the base bid.
10. Natural Gas will be brought to the building by the natural gas utility, Piedmont. Piedmont will also provide the gas meter and building regulator. Division 22 work begins immediately downstream of the building regulator, see Drawing P1.1. The contractor who is awarded the project will need to work directly with Piedmont to coordinate with other construction activities occurring on site.

Approved Substitutions

The following have been reviewed and accepted:

1. Specification Section 07 4213 Metal Wall Panels
 - Construction Metal Products (www.cmpmetalsystems.com)
2. Specification Section 10 5129 Phenolic Lockers
 - Lockers Manufacturing (www.lockersmfg.com)

End of Addendum 1

FORM OF PROPOSAL

Project: Brunswick Community College Alan Holden Public Safety Center

Contract: Single Prime

Institution: The Trustees of Brunswick Community College Bidder: _____

SCO-ID #: 22-25751-02A

Date: _____

The undersigned, as bidder, hereby declares that the only person or persons interested in this proposal as principal or principals is or are named herein and that no other person than herein mentioned has any interest in this proposal or in the contract to be entered into; that this proposal is made without connection with any other person, company or parties making a bid or proposal; and that it is in all respects fair and in good faith without collusion or fraud. The bidder further declares that he has examined the site of the work and the contract documents relative thereto, and has read all special provisions furnished prior to the opening of bids; that he has satisfied himself relative to the work to be performed. The bidder further declares that he and his subcontractors have fully complied with NCGS 64, Article 2 in regards to E-Verification as required by Section 2.(c) of Session Law 2013-418, codified as N.C. Gen. Stat. § 143-129(j).

The Bidder proposes and agrees if this proposal is accepted to contract with the

The Trustees of Brunswick Community College

in the form of contract specified below, to furnish all necessary materials, equipment, machinery, tools, apparatus, means of transportation and labor necessary to complete the construction of

Brunswick Community College Alan Holden Public Safety Center

in full in complete accordance with the plans, specifications and contract documents, to the full and entire satisfaction of the State of North Carolina, and the

Brunswick Community College and Sawyer Sherwood & Associate, P.C.

with a definite understanding that no money will be allowed for extra work except as set forth in the General Conditions and the contract documents, for the sum of:

SINGLE PRIME CONTRACT:

Base Bid:

_____ Dollars(\$)

General Subcontractor:

_____ Lic _____

Plumbing Subcontractor:

_____ Lic _____

Mechanical Subcontractor:

_____ Lic _____

Electrical Subcontractor:

_____ Lic _____

GS143-128(d) requires all single prime bidders to identify their subcontractors for the above subdivisions of work. A contractor whose bid is accepted shall not substitute any person as subcontractor in the place of the subcontractor listed in the original bid, except (i) if the listed subcontractor's bid is later determined by the contractor to be non-responsible or non-responsive or the listed subcontractor refuses to enter into a contract for the complete performance of the bid work, or (ii) with the approval of the awarding authority for good cause shown by the contractor.

ALTERNATES:

Should any of the alternates as described in the contract documents be accepted, the amount written below shall be the amount to be "added to" the base bid.)

GENERAL CONTRACT:

Alternate No. G-1 (*Preferred Hardware*)

1. Base Bid Item: Any manufacturer listed in Specifications 08 7100.

2. Alternate Item: Cobin Russwin (locksets), Norton (closeers), Dorma (locks).

(Add) _____ Dollars(\$)

Alternate No. G-2 (*HVAC DDC*)

(Add) _____ Dollars(\$)

Alternate No. G-3 (*Drive*)

(Add) _____ Dollars(\$)

Alternate No. G-4 (*Sod & Irrigation*)

(Add) _____ Dollars(\$)

Alternate No. G-5 (*Wood Storage Shelving*)

(Add) _____ Dollars(\$)

Alternate No. G-6 (*Suspended Wood Ceiling*)

(Add) _____ Dollars(\$)

Alternate No. G-7 (*Interior Aluminum Frames and Lites*)

(Add) _____ Dollars(\$)

Alternate No. G-8 (*Fluid Applied Flooring in Apparatus Bay and Supporting Spaces*)

(Add) _____ Dollars(\$)

Alternate No. G-9 (*Stainless Steel Wall Base*)

(Add) _____ Dollars(\$)

Alternate No. G-10 (*Building Generator*)

(Add) _____ Dollars(\$)

MINORITY BUSINESS PARTICIPATION REQUIREMENTS

Provide with the bid - Under GS 143-128.2(c) the undersigned bidder shall identify **on its bid** (Identification of Minority Business Participation Form) the minority businesses that it will use on the project with the total dollar value of the bids that will be performed by the minority businesses. **Also** list the good faith efforts (Affidavit **A**) made to solicit minority participation in the bid effort.

NOTE: A contractor that performs all of the work with its **own workforce** may submit an Affidavit (**B**) to that effect in lieu of Affidavit (**A**) required above. The MB Participation Form must still be submitted even if there is zero participation.

After the bid opening - The Owner will consider all bids and alternates and determine the lowest responsible, responsive bidder. Upon notification of being the apparent low bidder, the bidder shall then file within 72 hours of the notification of being the apparent lowest bidder, the following:

An Affidavit (**C**) that includes a description of the portion of work to be executed by minority businesses, expressed as a percentage of the total contract price, which is equal to or more than the 10% goal established. This affidavit shall give rise to the presumption that the bidder has made the required good faith effort and Affidavit **D** is not necessary;

*** OR ***

If **less than the 10% goal**, Affidavit (**D**) of its good faith effort to meet the goal shall be provided. The document must include evidence of all good faith efforts that were implemented, including any advertisements, solicitations and other specific actions demonstrating recruitment and selection of minority businesses for participation in the contract.

Note: Bidders must always submit **with their bid** the Identification of Minority Business Participation Form listing all MB contractors, **vendors and suppliers** that will be used. If there is no MB participation, then enter none or zero on the form. Affidavit A **or** Affidavit B, as applicable, also must be submitted with the bid. Failure to file a required affidavit or documentation with the bid or after being notified apparent low bidder is grounds for rejection of the bid.

Proposal Signature Page

The undersigned further agrees that in the case of failure on his part to execute the said contract and the bonds within ten (10) consecutive calendar days after being given written notice of the award of contract, the certified check, cash or bid bond accompanying this bid shall be paid into the funds of the owner's account set aside for the project, as liquidated damages for such failure; otherwise the certified check, cash or bid bond accompanying this proposal shall be returned to the undersigned.

Respectfully submitted this day of _____

(Name of firm or corporation making bid)

WITNESS:

(Proprietorship or Partnership)

By: _____
Signature

Name: _____
Print or type

Title _____
(Owner/Partner/Pres./V.Pres)

Address _____

ATTEST:

By: _____

Title: _____
(Corp. Sec. or Asst. Sec. only)

License No. _____

Federal I.D. No. _____

Email Address: _____

(CORPORATE SEAL)

Addendum received and used in computing bid:

Addendum No. 1 _____ Addendum No. 3 _____ Addendum No. 5 _____ Addendum No. 6 _____

Addendum No. 2 _____ Addendum No. 4 _____ Addendum No. 6 _____ Addendum No. 7 _____

**SECTION 01 2300
ALTERNATES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Description of Alternates.
- B. Procedures for pricing Alternates.
- C. Documentation of changes to Contract Price and Contract Time.

1.02 ACCEPTANCE OF ALTERNATES

- A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.
- B. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

1.03 SCHEDULE OF ALTERNATES

- A. Alternate No. G-1 - Preferred Hardware:
 - 1. Base Bid Item: Any manufacturer listed in Specifications 08 7100.
 - 2. Alternate Item: Cobin Russwin (locks), Norton (closeers), Dorma (locks).
- B. Alternate No. G-2 - DDC:
 - 1. Base Bid Item: Per Specification, "Controls shall be DDC BACnet BAS connected to and fully incorporated into Brunswick Community College's existing BACnet Alerton central system including all necessary integration, updating of system's graphics pages, software, etc... as necessary".
 - 2. Alternate Item: For proprietary system, provide cost to add to the Base Bid for new DDC BAS control system to be DDC BACnet Alerton installed by Hoffman Building Technologies connecting to the new building's Ethernet and connecting to the existing Allerton controls on the Campus' on site computer in the Maintenance Office, including all necessary integration, updating of system's graphics pages, software, etc.... as necessary.
- C. Alternate No. G-3 - Drive:
 - 1. Base Bid Item: Single drive from College Road leading to parking lot and apparatus bay. Drive from apparatus bay to College Road. As shown on Civil Drawings.
 - 2. Alternate Item: Secondary drive from College Road leading to parking lot. All site work including stormwater drainage and site lighting coordination is to be included. As called out on Civil Drawings.
- CI. Alternate No. G-4 - Sod and Irrigation:
 - 1. Base Bid Item: All landscaping and seeding as called for on Civil Drawings.
 - 2. Alternate Item: Sod and irrigation in areas identified on Civil Drawings.
- CII. Alternate No. G-5 - Wood Storage Shelving:
 - 1. Base Bid Item: None.
 - 2. Alternate Item: Section 10 6000 and as identified on Architectural Drawing.
- CIII. Alternate No. G-6 - Suspended Wood Ceiling:
 - 1. Base Bid Item: Section 09 5100 Acoustical Ceilings and Drawing number A1.2 including all mechanical, electrical, and fire protection.
 - 2. Alternate Item: Section 09 5426 Suspended Wood Ceilings and Drawing number A1.2 including all mechanical, electrical, and fire protection.
- CIV. No. G-7 - Interior Aluminum Frames and Lites:
 - 1. Base Bid Item: Section 08 1213 Hollow Metal Frames and Drawing number A1.0, A1.1, A6.0, A6.1 & A6.2 including Painting.
 - 2. Alternate Item: Section 08 1116 Aluminum Doors & Frames and Drawing number A1.0, A1.1, A6.0, A6.1 & A6.2 including all door frames in metal stud and gypsum wall board

walls. Door frames in concrete masonry walls remain hollow metal.

- H. Alternate No. G-8 - Fluid Applied Flooring in Apparatus Bay and Supporting Spaces:
 - 1. Base Bid Item: Section 03 3351 Concrete Floor Finishes and Drawing number A7.5.
 - 2. Alternate Alternate Item: Section 09 6700 Fluid Applied Flooring 09 6700 Fluid Applied Flooring and Drawing numbers A6.0 & A7.5.
- I. Alternate No. G-9 - Stainless Steel Wall Base:
 - 1. Base Bid Item: Section 09 6500 Resilient Flooring09 6500 09 6500 Resilient Flooring09 6500 and Drawing numbers A6.0 & A7.0.
 - 2. Alternate Item: Drawing detail 8-A7.5 including Lobby 100, V-1, V-2, H-2, H-3, H-4, H-5 & H-6.
- J. Alternate No. G-10 - Building Generator:
 - 1. Base Bid Item: Drawing E1.2 Provide (2) spare 1" conduits for future block heater, battery charger, and start/stop circuitry.
 - 2. Alternate Item: Section 26 3213 Engine Generators and Section 26 3600 Transfer Switches, and Drawing numbers A1.1, A4.3, E1.2 and E7.1 Provide generator, transfer switch, concrete slab for generator, and screen wall for generator.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

**SECTION 26 3213
ENGINE GENERATORS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes packaged engine-generator sets for optional standby power supply. Include the following features:
 - 1. Diesel engine.
 - 2. Unit-mounted cooling system.
 - 3. Unit-mounted control and monitoring.
 - 4. Performance requirements for sensitive loads.
 - 5. Fuel system.
 - 6. Outdoor enclosure.
- B. Related Requirements:
 - 1. Section "Transfer Switches" for transfer switches including sensors and relays to initiate automatic-starting and -stopping signals for engine-generator sets.

1.3 DEFINITIONS

- A. AHJ: Authority Having Jurisdiction.
- B. ECM: Engine Control Module.
- C. Optional Standby Power Supply: NEC 702, Optional Standby Systems.
- D. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.

1.4 SUBMITTALS

- A. PDF files of submittal data shall be provided. Two sets of Closeout Submittals are acceptable.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product, standard accessories, and optional accessories.
 - 1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
 - 2. Include motor starting performance curve(s) indicating voltage drop for motor starting conditions.
 - 3. Include thermal damage curve for generator.
 - 4. Include time-current characteristic curves for generator protective devices.
 - 5. Include fuel consumption in gallons per hour at 0.8 power factor at 0.5, 0.75 and 1.0 times generator capacity.
 - 6. Include generator efficiency at 0.8 power factor at 0.5, 0.75 and 1.0 times generator capacity.
 - 7. Include air flow requirements for cooling and combustion air in cfm at 0.8 power factor and rated load. Testing shall be performed per ISO3046 standards. Provide drawings showing requirements and limitations for location of air intake and exhausts.
 - 8. Include generator characteristics, including, but not limited to kw rating, efficiency, reactances, and short-circuit current capability.
 - 9. Color chart for enclosure finish selection by the Architect.
- B. Shop Drawings:

1. Include plans and elevations for engine-generator set, subbase fuel tank, enclosure, and other components specified and/or provided. Indicate recommended equipment pad dimensions. Indicate access requirements affected by height of subbase fuel tank.
2. Include details of equipment assemblies. Indicate dimensions, weights, center of gravity of full assembly, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Identify fluid drain ports and clearance requirements for proper fluid drain.
4. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include base weights.
5. Include diagrams for power, signal, and control wiring. Complete schematic, wiring, and interconnection diagrams showing terminal markings for EPS equipment, automatic transfer switch, and functional relationship between all electrical components.

1.6 INFORMATIONAL SUBMITTALS

- A. Specification Compliance Markup: Submit a mark-up copy of this specification with notations and explanations comprehensively showing all deviations and / or exceptions to these Specifications.
- B. Qualification Data: For supplier / installer.
 1. Statement from supplier / installer detailing local service capability, factory-trained service personnel, and details of service response required in accordance with this specification. Reference section 1.9A.31.9A.3 for service response guarantee.
- C. Source quality-control reports, including, but not limited to the following:
 1. Report of exhaust emissions showing compliance with applicable regulations.
- D. Field quality-control reports.
- E. Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

- A. Initial Manual Submittal for Review: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Owner and/or Engineer will comment on whether scope and content of manual are acceptable.
 1. Correct or revise each manual to comply with Owner and/or Engineer comments. Submit copies of each corrected manual as the Final Manual Submittal.
- B. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training.
 1. Format: Submit operations and maintenance manuals in the following formats.
 - a. PDF electronic file. Submit electronic file via email and USB drive.
 - b. Two paper copies in heavy-duty, three-ring, loose-leaf binders. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves.
- C. Operation and Maintenance Data: For packaged engine generators to include in emergency, operation, and maintenance manuals. Data shall be provided and identified that is specific to the site where equipment is installed.
 1. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
 2. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
 - a. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents.
 - b. Product information.
 - c. Maintenance procedures.
 - d. Maintenance and service schedules.

- e. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- f. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- g. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- h. Warranties: Include copies of warranties and lists of circumstances and conditions that would affect validity of warranties. Include procedures to follow and required notifications for warranty claims.
- 3. Operation Manuals: Assemble a complete set of operation data indicating operation of each system, subsystem, and piece of equipment not part of a system.
 - a. System, subsystem, and equipment descriptions.
 - b. Operating procedures.
 - c. Wiring diagrams.
 - d. Control diagrams.
 - e. Piped system diagrams.
- 4. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
- 5. Additionally, include the following:
 - a. List of tools and replacement items recommended to be stored at Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.
 - b. Operating instructions laminated and mounted adjacent to generator location.
 - c. Training plan.
 - d. Software for unit controller with diagnostic, troubleshooting, and maintenance functionality.

1.8 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Fuses: One for every 10 of each type and rating but no fewer than one of each.
 - 2. Indicator Lamps: Two for every six of each type used, but no fewer than two of each.
 - 3. Filters: One set each of lubricating oil, fuel, and combustion-air filters.
 - 4. Paint: Two spray cans of each color.
 - 5. Keys: Four keys for enclosure access doors.
 - 6. Special Tools: Tools unique to the product for standard maintenance, listed by part number in operations and maintenance manual.

1.9 QUALITY ASSURANCE

- A. Supplier / Installer Qualifications:
 - 1. Manufacturer and factory authorized representative who is trained and approved by manufacturer.
 - 2. Maintain, within 125 miles or two hours of Bolivia, North Carolina; a factory certified service center capable of providing training, parts, and emergency maintenance repairs.
 - 3. Response for emergency repairs shall be guaranteed to be eight hours or less upon receipt of service call notification.
 - 4. Manufacturer's authorized representative shall employ factory-trained and certified service personnel and shall carry single-source responsibility for warranty, parts, and service.

1.10 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period at no additional cost to the Owner.
 - 1. Warranty Period: 2 years or 2000 hours, whichever occurs first, from date of Final Acceptance of the generator set installation.

1.11 SERVICE CONTRACT

- A. Manufacturer's service representative shall provide a service contract at no additional cost to the Owner for a period of 2 years from date of start-up and Substantial Completion of the generator set installation.
- B. At the Owner's option, the service agreement shall be renewable on a year-to-year basis, thereafter, with costs being paid by the Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Caterpillar.
 - 2. Cummins.
 - 3. MTU.
- B. Source Limitations: Obtain packaged generator sets and auxiliary components through one source from a single manufacturer. Generator set shall be standard offering from manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. NFPA Compliance:
 - 1. Comply with NFPA 30.
 - 2. Comply with NFPA 37.
 - 3. Comply with NFPA 70.
- B. UL Compliance: Comply with UL 2200/CSA.
- C. Engine Exhaust Emissions: Comply with EPA Tier 3 requirements and applicable state and local government requirements.
- D. Noise Emission:
 - 1. At a minimum, sound level measured at a distance of 23 feet from the unit after installation is complete shall be 80 dBA or less.
- E. Environmental Conditions: Engine-generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:
 - 1. Ambient Temperature: Minus 15 to plus 50 deg C.
 - 2. Altitude: Sea level to 100 feet.

2.3 ASSEMBLY DESCRIPTION

- A. Factory-assembled and -tested, water-cooled engine, with brushless generator and accessories.
- B. Governor: Adjustable isochronous, with speed sensing.
- C. Mounting Frame: Structural steel framework to maintain alignment of mounted components without depending on concrete foundation. Provide lifting attachments sized and spaced to prevent deflection of base during lifting and moving.
 - 1. Rigging Diagram: Inscribed on metal plate permanently attached to mounting frame to indicate location and lifting capacity of each lifting attachment and generator-set center of gravity.
- D. Capacities and Characteristics:

1. Power Output Ratings: Nominal ratings as indicated on the drawings at 0.8 power factor excluding power required for the continued and repeated operation of the unit and auxiliaries.
 2. Output Connections: As indicated on the drawings.
 3. Voltage: As indicated on the drawings.
 4. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of component. Nameplate shall be in accordance with NFPA70.
- E. Generator-Set Performance:
1. Oversizing alternator compared with the rated power output of the engine is permissible to meet specified performance.
 - a. Nameplate Data for Oversized Generator: Show ratings required by the Contract Documents rather than ratings that would normally be applied to generator size installed.
 2. Steady-State Voltage Operational Bandwidth: 2 percent of rated output voltage from no load to full load.
 3. Transient Voltage Performance:
 - a. Not more than 20 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within 3 seconds.
 - b. Not more than 25 percent dip under worst case motor starting conditions. See Informational Submittals, Voltage Drop Calculations for specific step loading criteria.
 4. Steady-State Frequency Operational Bandwidth: Plus or minus 0.25 percent of rated frequency from no load to full load.
 5. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
 6. Transient Frequency Performance: Less than 5 percent variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within 5 seconds.
 7. Sustained Short-Circuit Current: For a three-phase, bolted short circuit at system output terminals, system shall supply a minimum of 250 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to winding insulation or other generator system components.
 8. Block Load Performance: per NFPA110, the unit shall be able to fully recover from a 100% block load.
 9. Excitation System: Performance shall be unaffected by 10% total voltage distortion (THD) caused by nonlinear load.
 - a. Provide permanent magnet excitation (PMG) for power source to voltage regulator.
 10. Start Time: Comply with NFPA 110, Type 10, system requirements.

2.4 ENGINE

- A. Fuel: Diesel Fuel oil, Grade DF-2.
- B. Engine Rating: Prime mover shall have adequate horsepower to meet the specified kW at the specified site altitude and temperatures. Products that de-rate below specified kW for temperature or altitude shall not be accepted.
- C. Rated Engine Speed: 1800 rpm.
- D. Cylinders: For units 300 kW and larger, cylinders shall be cast iron, sleeved.
- E. Lubrication System: The following items shall be mounted on engine or skid:
 1. Positive displacement, full pressure lubrication oil pump.

2. Filter and Strainer: Per manufacturer recommendations.
 3. Dipstick to check oil level.
 4. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.
- F. Jacket Coolant Heater:
1. Electric-immersion type, factory installed in coolant jacket system. Comply with NFPA 110 requirements for Level 1 equipment for heater capacity. Heater(s) shall be 3rd party listed.
 2. 1500-watts, 120 volt minimum. Provide higher capacity heater as required based on manufacturer requirements for engine size.
 3. Thermostatically controlled to maintain engine coolant at not less than 90 deg F in 32 deg F ambient.
 4. Shut-off valve to simplify replacement of the heater.
- G. Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine-generator-set mounting frame and integral engine-driven coolant pump.
1. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.
 2. Cooling System Sizing: Sized to adequately cool the generator set, including aftercooler, without de-rate to an ambient temperature of 122 deg F (50 deg C) for diesel. Maximum external restriction shall be no greater than 0.5 inch of water column.
 3. Size of Radiator: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.
 4. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
 5. Blower fan, water pump, thermostat, and radiator duct flange shall properly cool the engines in 105 deg F ambient with up to 0.5 inches H₂O static pressure on the fan. Radiator shall include a duct flange adapter for connection to the discharge air vent.
 6. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, ultraviolet-, and abrasion-resistant fabric.
 - a. Rating: 50-psig maximum working pressure with coolant at 180 deg F (82 deg C), and non-collapsible under vacuum.
 - b. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.
- H. Air-Intake Filter: Heavy-duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.
- I. Starting System: 12 or 24-V electric, with negative ground.
1. Components: Sized so they are not damaged during a full engine-cranking cycle with ambient temperature at maximum specified in "Performance Requirements" Article.
 2. Cranking / Starting Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.
 - a. Speed sensing and a second independent starter motor disengagement systems shall protect against starter engagement with a moving flywheel.
 3. Cranking Cycle: As required by NFPA 110 for system level specified.
 - a. Cranking cycle with 15 second ON and OFF cranking periods.
 - b. Overcrank protection designed to open the cranking circuit after 75 seconds if the engine fails to start.
 - c. The starting system shall be designed for restarting in the event of a false engine start, by permitting the engine to completely stop and then re-engage the starter.
 4. The starting system shall be designed for restarting in the event of a false engine start, by permitting the engine to completely stop and then re-engage the starter.

5. Battery: Lead acid, certified to meet NFPA 110, with capacity within ambient temperature range specified in "Performance Requirements" Article to provide specified cranking cycle at least three times without recharging.
6. Battery Cable: Size as recommended by engine manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.
7. Battery Stand: Factory-fabricated, two-tier metal with acid-resistant finish designed to hold the quantity of battery cells required and to maintain the arrangement to minimize lengths of battery interconnections.
8. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and continuous rating adequate for batteries provided, 35-A minimum.
9. Battery Charger: Current-limiting, automatic-equalizing and float-charging type designed for lead-acid batteries. Unit shall comply with and be listed to UL 1236 and include the following features:
 - a. Operation: Equalizing-charging rate of 10 A shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
 - b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 40 deg C to 60 deg C to prevent overcharging at high temperatures and undercharging at low temperatures.
 - c. Automatic Voltage Regulation: Maintain +/- 1% constant output voltage regardless of input voltage variations up to plus or minus 10 percent.
 - d. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates. Fuse protection. Reverse polarity and transient protected.
 - e. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
 - f. Enclosure and Mounting: NEMA 250, Type 1, wall-mounted cabinet with adequate vibration isolation if mounted within the generator set.

2.5 DIESEL FUEL-OIL SYSTEM

- A. Comply with NFPA 30.
- B. Flexible fuel lines rated 300 deg F and 100 psi ending in pipe thread.
- C. Main Fuel Pump: Mounted on engine to provide primary fuel flow under starting and load conditions. Engine-driven or electric fuel transfer pump capable of lifting fuel 4.7 feet minimum.
- D. Fuel Filtering: Primary fuel filter to remove water and contaminants larger than 10 micron. Secondary filter to remove contaminants larger than 2 micron.
- E. Relief-Bypass Valve: Automatically regulates pressure in fuel line and returns excess fuel to source.
- F. Subbase-Mounted, Double-Wall, Fuel-Oil Tank: Factory installed and piped, complying with UL 142 fuel-oil tank. Features include the following:
 1. Fuel-Tank Capacity: Fuel for 48 hours' continuous operation at 100 percent rated power output. Tanks larger than the minimum capacity specified are acceptable.
 2. Tank level indicator gauge.
 3. Low Fuel Sensing Switch: shall be provided, in accordance with NFPA110, to indicate when less than the minimum fuel necessary for full load running, as required by the specified EPSS class.
 4. Leak detection in interstitial space.
 5. Vandal-resistant fill cap.

6. Spill containment box for filling location.
7. Normal vent shall extend to 12' above grade. Adequately brace extended vent so that attachment of the vent to the tank is not the sole means of support.
8. Containment Provisions: Comply with requirements of authorities having jurisdiction.
9. Tank shall be production tested to 2 psi.
10. Tank shall be equipped with overfill protection, fuel line check valve, fuel level gauge, low fuel level alarm contact, low fuel level shutdown contact, and fittings for fuel supply, return, fill and vent.
11. The tank shall feature all welded construction and have the structural integrity to support the genset, accessories, and the weather-protective enclosure.

2.6 CONTROL AND MONITORING

- A. Automatic Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of generator set. When mode-selector switch is switched to the on position, generator set starts. The off position of same switch initiates generator-set shutdown with a programmed 5-minute cooldown period. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. Activation of a remote emergency-stop switch also shuts down generator set. When mode-selector switch is in the OFF position, the engine shall not start even though the remote start contacts close. This position shall also provide for immediate shutdown in case of an emergency. Reset of any fault shall also be accomplished by putting the switch to the OFF position.
- B. Provide minimum run time control set for 15 minutes with override only by switching the model-selector switch to Off or by operation of a remote emergency-stop switch. Provide engine cooldown timer, factory set at 5 minutes, to permit unloaded running of the standby set after transfer of the load to normal.
- C. Comply with UL 508A.
- D. Configuration: Operating and safety indications, protective devices, basic system controls, and engine gages shall be grouped in a common control and monitoring panel mounted on the generator set. Mounting method shall isolate the control panel from generator-set vibration. Panel shall be powered from the engine-generator set battery.
 1. Engine and generator control wiring shall be multi-stranded annealed copper conductors encased by cross-linked polyethylene insulation resistant to heat, abrasion, oil, water, diesel fuel, and antifreeze. Wiring shall be suitable for continuous use at 250 deg F (121 deg C) with insulation not brittle at minus 60 deg F (minus 51 deg C). Cables shall be enclosed in nylon flexible conduit, which is slotted to allow easy access and moisture to escape.
 - a. Engines that are equipped with an electronic engine control module (ECM) shall monitor and control engine functionality and seamlessly integrate with the generator set controller through digital communications. ECM monitored parameters shall be integrated into the genset controllers NFPA 110 alarm and warning requirements.
 2. Construction: All circuitry within the control panel shall be individually environmentally sealed to prevent corrosion. Encapsulated circuit boards with surface mounted components and sealed, automotive-style connectors for sensors and circuit board connectors.
- E. Indicating Devices: As required by NFPA 110 for Level 1 system. All ECM fault codes shall be displayed at the generator set controller in standard language; fault code numbers are not acceptable. Utilizing a digital display, including the following:
 1. AC voltage: True three-phase sensing.

2. AC current.
 3. Frequency.
 4. EPS supplying load indicator.
 5. DC voltage (alternator battery charging).
 6. Engine-coolant temperature.
 7. Engine lubricating-oil pressure.
 8. Running-time meter.
 9. Current and Potential Transformers: Instrument accuracy class.
- F. Protective Devices and Controls in Local Control Panel: Shutdown devices and common visual alarm indication as required by NFPA 110 for Level 1 system, including the following:
1. Start-stop switch.
 2. Overcrank shutdown device.
 3. Overspeed shutdown device.
 4. Coolant high-temperature shutdown device.
 5. Coolant low-level shutdown device.
 6. Low lube oil pressure shutdown device.
 7. Overcrank alarm.
 8. Overspeed alarm.
 9. Coolant high-temperature alarm.
 10. Coolant low-temperature alarm.
 11. Coolant low-level alarm.
 12. Low lube oil pressure alarm.
 13. Lamp test.
 14. Contacts for local and remote common alarm.
 15. Coolant high-temperature prealarm.
 16. Generator-voltage; digitally adjustable via controller, password protected.
 17. Fuel tank low-level alarm.
 18. Run-Off-Auto switch.
 19. Control switch not in automatic position alarm.
 20. Low cranking voltage alarm.
 21. Battery-charger malfunction alarm.
 22. Battery low-voltage alarm.
 23. Battery high-voltage alarm.
- G. Remote Emergency Shutdown: Provide remote emergency stop switch on external wall of equipment enclosure at a height suitable for installed location.
- H. Supporting Items: Include sensors, transducers, terminals, relays, and other devices and include wiring required to support specified items. Locate sensors and other supporting items on engine or generator, unless otherwise indicated.
- I. Data Connection: Provide an RS-485 ModBus port.
- J. The control system shall provide pre-wired customer use dry contact outputs (4 minimum). Customer I/O shall be software configurable providing full access to all alarm, event, data logging, and shutdown functionality. For the initial installation, configure:
1. One relay output shall be configured for a summary indication of pre-alarm / alarm / shutdown conditions.
 2. One relay output shall be configured for RUN indication of the generator.
- K. Programmable Cycle Timer: To start and run the generator for a predetermined time. The timer shall use 14 user-programmable sequences that are repeated in a 7-day cycle. Each sequence shall have the following programmable set points:
1. Day of the week.
 2. Time of the day start.
 3. Duration of cycle.

4. Option to exercise at reduced speed for quiet test mode.

2.7 GENERATOR OVERCURRENT AND FAULT PROTECTION

- A. Overcurrent protective devices for the entire EPSS shall be coordinated to optimize selective tripping when a short circuit occurs. Coordination of protective devices shall consider both utility and EPSS as the voltage source.
 1. Overcurrent protective devices for the EPSS shall be accessible only to authorized personnel.
- B. Generator Circuit Breaker: Molded-case, thermal-magnetic type; 100 percent rated; complying with UL 489.
 1. Tripping Characteristic: Designed specifically for generator protection.
 2. Trip Rating: Matched to generator output rating.
 3. Trip Settings:
 - a. Selected to coordinate with generator thermal damage curve.
 - b. Selected to coordinate with magnetic only, motor circuit protector breaker at a fire pump controller, as applicable.
 - c. The instantaneous trip setting shall not exceed the calculated short circuit fault current available from the generator.
 4. Shunt Trip: Connected to trip breaker when generator set is shut down by other protective devices.

2.8 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

- A. Comply with NEMA MG 1 and UL2200, sized for 248 deg F (120 deg C) temperature rise above ambient at rated load.
- B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.
- C. Electrical Insulation: Class H, vacuum impregnated with epoxy varnish in accordance with MILSPEC 1-24092 for improved fungus and salt spray resistance.
- D. Stator-Winding Leads: Brought out to terminal box to permit future reconnection for other voltages if required. Provide twelve lead alternator.
- E. Range: Provide broad range of output voltage by adjusting the excitation level.
- F. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rated speed, and heat during operation at 110 percent of rated capacity.
- G. Enclosure: Drip-proof.
- H. Instrument Transformers: Mounted within generator enclosure.
- I. Voltage Regulator: Solid-state type on a sealed circuit board, separate from exciter, providing performance as specified and as required by NFPA 110. Must be 3-phase sensing.
 1. Voltage Adjustment on Control and Monitoring Panel: Provide plus or minus 10 percent adjustment of output-voltage operating band.
 2. Provide anti-hunt provision to stabilize voltage.
 3. Isolated to prevent tracking when connected to SCR loads.
- J. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.
- K. Subtransient Reactance: 12 percent, maximum for sites with motor load supplied from VFDs or solid state soft starters.
- L. Excitation: Permanent magnet (PMG) type providing 300 percent current output for up to 10 seconds to a downstream breaker for selective coordination and improved motor starting.

2.9 OUTDOOR GENERATOR-SET ENCLOSURE

- A. Description: Vandal-resistant, sound-attenuating, weatherproof housing, wind resistant up to 150 mph. Roof shall be peaked or sloped for water runoff. Access doors shall be positioned to provide adequate access to components requiring maintenance. Instruments and controls shall be mounted within enclosure.
1. Structural Design and Anchorage: Comply with North Carolina Building Code for wind loads up to 150 mph. Enclosure shall be mounted to the subbase fuel tank.
 2. Aluminum alloy, 0.063" thick minimum (14 gauge equivalent).
 3. Enclosure exterior shall be primed and finish coated with powder baked paint finish as selected by the Architect.
 4. Hinged Doors:
 - a. Provide a minimum of two doors per side for operator and service access. A rear door or removable access panel shall provide access to generator end of unit.
 - b. Door Panels: With integral stiffeners, and capable of being removed by one person without tools. In lieu of being removed, hardware that retains doors in fully open position are acceptable.
 - c. Slip-pin hinges and latches stainless steel with nylon spacers.
 - d. Gasketed for weather and rodent protection.
 - e. Handles to have padlocking provisions.
 - f. Door locks, hardware, and fasteners shall be stainless steel. Locks shall be keyed alike.
 5. Silencer:
 - a. Located within enclosure.
 - b. Super-critical type, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements. At a minimum, sound level measured at a distance of 23 feet from exhaust discharge after installation is complete shall be 75 dBA or less. Reference section 2.2D for coordination required to determine if more restrictive noise emissions are necessary. Reference 2.2.D for sound emission requirements.
 - c. Coated to be temperature and rust resistant.
 - d. Integral condensate drain.
 - e. Gas proof, stainless steel, flexible exhaust bellows with threaded NPT or flanged connections.
 - f. All exhaust piping shall be wrapped for personnel protection and to eliminate excessive heat build-up during generator operation.
 6. Assembly Hardware (Nuts and Bolts): Use stainless steel hardware and nylon washers to prevent paint deterioration.
- B. Sound Attenuation: Factory or third party enclosure, designed to meet the following design criteria:
1. Sound attenuated enclosure designed to match the criteria for the silencer. Reference section 2.2.D. Enclosure shall have intake and discharge hoods, as needed, to reduce the mechanical and exhaust noise to an acceptable level.
 2. Sound attenuation materials shall be securely supported, attached, and mechanically held in place; preferably with aluminum perforated metal sheeting.
- C. Engine Cooling Airflow through Enclosure: Maintain temperature rise of system components within required limits when unit operates at 110 percent of rated load for 2 hours with ambient temperature at top of range specified in system service conditions.
1. Louvers: Fixed-engine, cooling-air inlet and discharge. Storm-proof and drainable louvers to prevent entry of rain and snow. Screened openings to prevent rodent entry.
- D. Convenience Outlets: Factory wired, GFCI. Arrange for external electrical connection.

2.10 VIBRATION ISOLATION DEVICES

- A. Elastomeric Isolator Pads: Oil- and water-resistant elastomer or natural rubber, arranged in single or multiple layers, molded with a nonslip pattern and galvanized-steel baseplates of sufficient stiffness for uniform loading over pad area, and factory cut to sizes that match requirements of supported equipment.

2.11 SOURCE QUALITY CONTROL

- A. Prototype Testing: Factory test engine-generator set using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.
 - 1. Tests: Comply with NFPA 110, Level 1 Energy Converters and with IEEE 115.
 - 2. Additionally, test and document the following:
 - a. Maximum power (kW).
 - b. Maximum motor starting (kVA) at 35% instantaneous voltage dip.
 - c. Alternator temperature rise by embedded thermocouple and by resistance method per NEMA MG1 -22.40.
 - d. Governor speed regulation under steady-state and transient conditions.
 - e. Voltage regulation and generator transient response.
 - f. Fuel consumption at 1/4, 1/2, 3/4, and full load.
 - g. Harmonic analysis, voltage waveform deviation, and telephone influence factor.
 - h. Three-phase short circuit tests.
 - i. Alternator cooling air flow.
 - j. Torsional analysis testing to verify that the generator set is free of harmful torsional stresses.
 - k. Endurance testing.
- B. Project-Specific Equipment Tests: Before shipment, factory test engine-generator set and other system components and accessories manufactured specifically for this Project. Perform tests at rated load and power factor. Include the following tests:
 - 1. Test components and accessories furnished with installed unit that are not identical to those on tested prototype to demonstrate compatibility and reliability.
 - 2. Test generator, exciter, and voltage regulator as a unit.
 - 3. Full load run.
 - 4. Maximum power.
 - 5. Voltage regulation.
 - 6. Transient and steady-state governing.
 - 7. Single-step load pickup.
 - 8. Safety shutdown.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine-generator performance.
- B. Examine roughing-in for piping systems and electrical connections. Verify actual locations of connections before packaged engine-generator installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 DELIVERY

- A. Generator equipment shall be shipped to the site as a "single-source" item for which responsibility for overall installation, maintenance, spare parts, and service is through the local factory representative.

- B. Delivery of the generator shall include off-loading and setting the generator in place on a concrete slab. Installation shall include mounting of all accessories specified elsewhere in this specification along with external power and control connections of the unit.

3.3 INSTALLATION

- A. Comply with packaged engine-generator manufacturers' written installation and alignment instructions and with NFPA 110.
- B. Equipment Mounting:
 - 1. Install packaged engine generators on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified and/or as detailed in the drawings.
 - 2. Coordinate size and location of concrete bases for packaged engine generators. Cast anchor-bolt inserts into bases.
- C. Install packaged engine-generator to provide access, without removing connections or accessories, for periodic maintenance.
- D. Install engine-generator in enclosure with elastomeric isolator pads on concrete base. Secure set as required by the manufacturer.
- E. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.
- F. Provide fuel as required for startup, testing, and demonstration.

3.4 CONNECTIONS

- A. Connect fuel, cooling-system, and exhaust-system piping adjacent to packaged engine-generator to allow service and maintenance.
- B. Connect engine exhaust pipe to engine with flexible connector.
- C. Ground equipment according to Section "Grounding and Bonding."
- D. Connect wiring according to Section "Conductors and Cable." Provide a minimum of one 90 degree bend in flexible conduit routed to the generator set from a stationary element.

3.5 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- B. Tests and Inspections:
 - 1. NFPA 30 Fuel Tank Tightness Testing:
 - a. After installation on site and before being placed into service, the fuel tank and connections shall be tested in accordance with NFPA 30 requirements.
 - b. Notify the Design Team and local AHJ and Fire Marshal two weeks prior to scheduled test date to allow observation of the testing.
 - c. Obtain written acceptance of testing from the local AHJ and Fire Marshal.
 - d. Submit two copies of local AHJ and Fire Marshal written acceptance of testing.
 - 2. Perform tests recommended by manufacturer and each visual and mechanical inspection and electrical and mechanical test listed in the first two subparagraphs as specified in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - a. Visual and Mechanical Inspection
 - 1) Compare equipment nameplate data with drawings and specifications.
 - 2) Inspect physical and mechanical condition.
 - 3) Inspect anchorage, alignment, and grounding.
 - 4) Verify the unit is clean.
 - 5) Provide fluids and check levels of fuel, lubricating oil, and antifreeze for conformity to the manufacturer's recommendations, under the environmental conditions present and expected.

- 6) Accessories that normally function while each set is standing by shall be checked prior to cranking the engines. These shall include: block heaters, battery chargers, etc.
- b. Electrical and Mechanical Tests
 - 1) Test protective relay devices per manufacturer recommendations.
 - 2) Verify phase rotation, phasing, and synchronized operation as required by the application.
 - 3) Start-up test mode to check for exhaust leaks, path of exhaust gases outside buildings, cooling air flow, movement during starting and stopping, vibration during running, normal and emergency line-to-line voltage, and phase rotation.
 - 4) Functionally test engine shutdown for low oil pressure, overtemperature, overspeed, and other protection features as applicable.
 - 5) Conduct performance test in accordance with NFPA 110.
 - 6) Verify correct functioning of the governor and regulator.
 - 7) Four hour load bank test with an external load bank as follows: 1 hour @ 50% load, 3 hours @ 100% load. Monitor and record the following data in 15 minute intervals: engine coolant temperature, oil pressure, battery charge level, generator output voltage, amperes, and frequency.
3. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions. Record individual cell voltages.
 - a. Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions. Check electrolyte level and specific gravity under both conditions.
 - b. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery.
 - c. Verify acceptance of charge for each element of the battery after discharge.
 - d. Verify that measurements are within manufacturer's specifications.
4. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.
5. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine-generator system before and during system operation. Check for air, exhaust, and fluid leaks. Repair leaks and retest until no leaks exist.
6. Voltage and Frequency Transient Stability Tests:
 - a. Use data capture from manufacturer control panel and software for measurements.
 - b. Measure voltage and frequency transients for 50 and 100 percent step-load increases and decreases, and verify that performance is as specified.
 - c. Measure voltage and frequency transients for actual site loads, similar to the steps indicated for voltage drop calculation requirements.
- C. Coordinate tests with tests for transfer switches and run them concurrently. Perform automatic start-up by means of simulated power outage to test remote-automatic starting, transfer of the load, and automatic shutdown.
- D. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation for generator and associated equipment.
- E. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- F. Remove and replace malfunctioning units and retest as specified.
- G. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.

- H. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests.

3.6 MAINTENANCE SERVICE

- A. After the seven four hour load bank test has been completed:
 - 1. Change the lubrication oil, lubrication oil filters, and fuel filters.
 - 2. Fill fuel tank.
- B. Under the service contract, provide full service and maintenance by certified employees of manufacturer's designated service organization.
 - 1. Quarterly: Include inspection, testing, exercising, and adjustments to check for proper starting, load transfer, and running under load. Include routine preventive maintenance as recommended by manufacturer and adjusting as required for proper operation.
 - 2. Yearly: Along with quarterly activities, include a load bank test for a minimum of 3 hours at 100% load.
 - 3. Provide parts and supplies same as those used in the manufacture and installation of original equipment.
 - 4. Include certification in the Owner's maintenance log of repairs made and proper functioning of all engine and auxiliary systems.

3.7 TRAINING

- A. The equipment supplier shall provide training for the facility operating personnel covering operation, maintenance, and repair of the equipment provided. The training program shall be not less than 4 hours in duration and the class size shall be limited to 5 persons. Training date shall be coordinated with the facility owner. Time permitting, training will be tentatively scheduled after start-up.

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SECTION 26 3600
TRANSFER SWITCHES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes transfer switches rated 600 V and less, including the following:
 - 1. Automatic transfer switches (ATS), closed transition type.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, weights, operating characteristics, furnished specialties, and accessories.
- B. Shop Drawings:
 - 1. Dimensioned plans, elevations, sections, and details showing minimum clearances, conductor entry provisions, gutter space, installed features and devices, and material lists for each switch specified.
 - 2. Wiring diagrams.
- C. Field quality-control test reports.
- D. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals. In addition to items specified elsewhere for operation and maintenance Data, include the following:
 - 1. Features and operating sequences, both automatic and manual.
 - 2. List of all factory settings of relays; provide relay-setting and calibration instructions, including software, where applicable.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Maintain a service center capable of providing training, parts, and emergency maintenance repairs within a response period of less than four hours from time of notification.
- B. Source Limitations: Obtain automatic transfer switches through one source from a single manufacturer.
- C. Comply with NEMA ICS 1.
- D. Comply with NFPA 70.
- E. Comply with NFPA 110.
- F. Comply with UL 1008 unless requirements of these Specifications are stricter.

1.5 COORDINATION

- A. Coordinate size and location of concrete bases, if necessary. Cast anchor-bolt inserts into bases.

1.6 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of transfer switch or transfer switch components that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years from date of Final Acceptance.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Contactor Transfer Switches:
 - a. Emerson; ASCO Power Technologies, LP.
 - b. ABB / GE / Zenith Controls.
 - c. Russelectric, Inc.

2.2 GENERAL TRANSFER-SWITCH PRODUCT REQUIREMENTS

- A. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including tungsten filament lamp loads not exceeding 30 percent of switch ampere rating, unless otherwise indicated.
- B. Tested Fault-Current Closing and Withstand Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.
 1. Rating: 18,000 AIC.
- C. Solid-State Controls: Repetitive accuracy of all settings shall be plus or minus 2 percent or better over an operating temperature range of minus 20 to plus 70 deg C.
- D. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.41. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.
- E. Electrical Operation: Accomplish by a nonfused, momentarily energized solenoid or electric-motor-operated mechanism, mechanically and electrically interlocked in both directions.
- F. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.
 1. Switch Action: Double throw; mechanically held in both directions.
 2. Contacts: Silver composition or silver alloy for load-current switching. Conventional automatic transfer-switch units, rated 225 A and higher, shall have separate arcing contacts.
- G. Neutral Switching. Where four-pole switches are indicated for 3-phase distribution systems and three-pole switches are indicated for single phase distribution system, provide neutral pole switched simultaneously with phase poles.
- H. Factory Wiring: Train and bundle factory wiring and label, consistent with Shop Drawings, either by color-code or by numbered or lettered wire and cable tape markers at terminations. Color-coding and wire and cable tape markers are specified in Section "Electrical Identification."
 1. Designated Terminals: Pressure type, suitable for types and sizes of field wiring indicated.
 2. Power-Terminal Arrangement and Field-Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated.
 3. Control Wiring: Equipped with lugs suitable for connection to terminal strips.
- I. Enclosures: General-purpose NEMA 250, Type 1, complying with NEMA ICS 6 and UL 508, unless otherwise indicated.

2.3 AUTOMATIC TRANSFER SWITCHES

- A. Comply with Level 2 equipment according to NFPA 110.
- B. Switching Arrangement: Double-throw type, incapable of pauses or intermediate position stops during normal functioning, unless otherwise indicated.
- C. Manual Switch Operation: Under load, with door closed and with either or both sources energized. Transfer time is same as for electrical operation. Control circuit automatically disconnects from electrical operator during manual operation.
- D. Signal-Before-Transfer Contacts: A set of normally open/normally closed dry contacts operates in advance of retransfer to normal source. Interval is adjustable from 1 to 30 seconds.
- E. Automatic Closed-Transition Transfer Switches: Include the following functions and characteristics:

1. Fully automatic make-before-break operation.
 2. Load transfer without interruption, through momentary interconnection of both power sources not exceeding 100 ms.
 3. Initiation of No-Interruption Transfer: Controlled by in-phase monitor and sensors confirming both sources are present and acceptable.
 - a. Initiation occurs without active control of generator.
 - b. Controls ensure that closed-transition load transfer closure occurs only when the 2 sources are within plus or minus 5 electrical degrees maximum, and plus or minus 5 percent maximum voltage difference.
 4. Failure of power source serving load initiates automatic break-before-make transfer.
 5. Comply with utility company interconnection requirements:
 - a. Include synchronization check function (25 relay).
 - b. Include a separate timer that initiates separation of the backup supply source from the utility if the paralleling time exceeds 100 ms.
- F. Automatic Transfer-Switch Features:
1. Undervoltage Sensing for Each Phase of Normal Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage is adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.
 2. Adjustable Time Delay: For override of normal-source voltage sensing to delay transfer and engine start signals. Adjustable from zero to six seconds, and factory set for one second.
 3. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.
 4. Time Delay for Retransfer to Normal Source: Adjustable from 0 to 30 minutes, and factory set for 10 minutes to automatically defeat delay on loss of voltage or sustained undervoltage of backup source, provided normal supply has been restored.
 5. Test Switch: Simulate normal-source failure.
 6. Switch-Position Pilot Lights: Indicate source to which load is connected.
 7. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and backup source sensing circuits.
 - a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
 - b. Backup Power Supervision: Red light with nameplate engraved "Emergency Source Available."
 8. Unassigned Auxiliary Contacts: Two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.
 9. Transfer Override Switch: Overrides automatic retransfer control so automatic transfer switch will remain connected to backup power source regardless of condition of normal source. Pilot light indicates override status.
 10. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 32-V dc minimum.
 11. Engine Shutdown Contacts: Time delay adjustable from zero to five minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.
 12. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods are adjustable from 10 to 30 minutes. Factory settings are for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:

- a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
- b. Push-button programming control with digital display of settings.
- c. Integral battery operation of time switch when normal control power is not available.

2.4 SOURCE QUALITY CONTROL

- A. Factory test and inspect components, assembled switches, and associated equipment. Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Floor-Mounting Switch: Anchor to floor by bolting, if configure for floor mounting.
 - 1. Concrete Bases: 4 inches high, reinforced, with chamfered edges. Extend base no more than 4 inches in all directions beyond the maximum dimensions of switch, unless otherwise indicated or unless required for seismic support.
- B. Identify components according to Section "Electrical Identification."
- C. Set field-adjustable intervals and delays, relays, and engine exerciser clock.
- D. Label transfer switch with short circuit current rating information as required by NEC 702.5.

3.2 CONNECTIONS

- A. Wiring to Remote Components: Match type and number of cables and conductors to control and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner, if necessary to accommodate required wiring.
- B. Ground equipment according to Section "Grounding and Bonding".
- C. Connect wiring according to Section "Conductors and Cables".

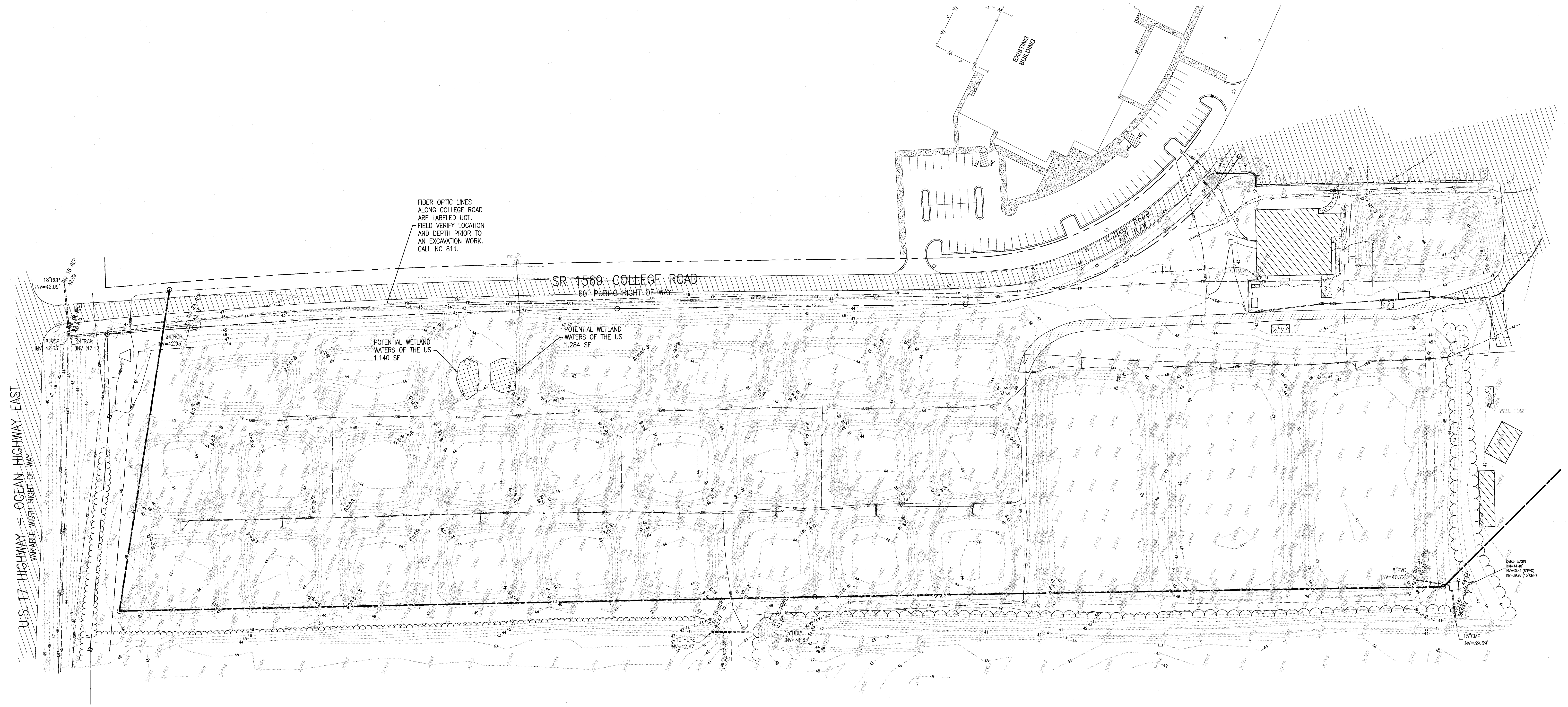
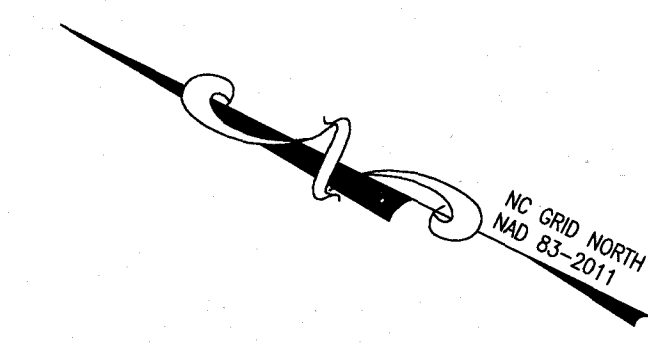
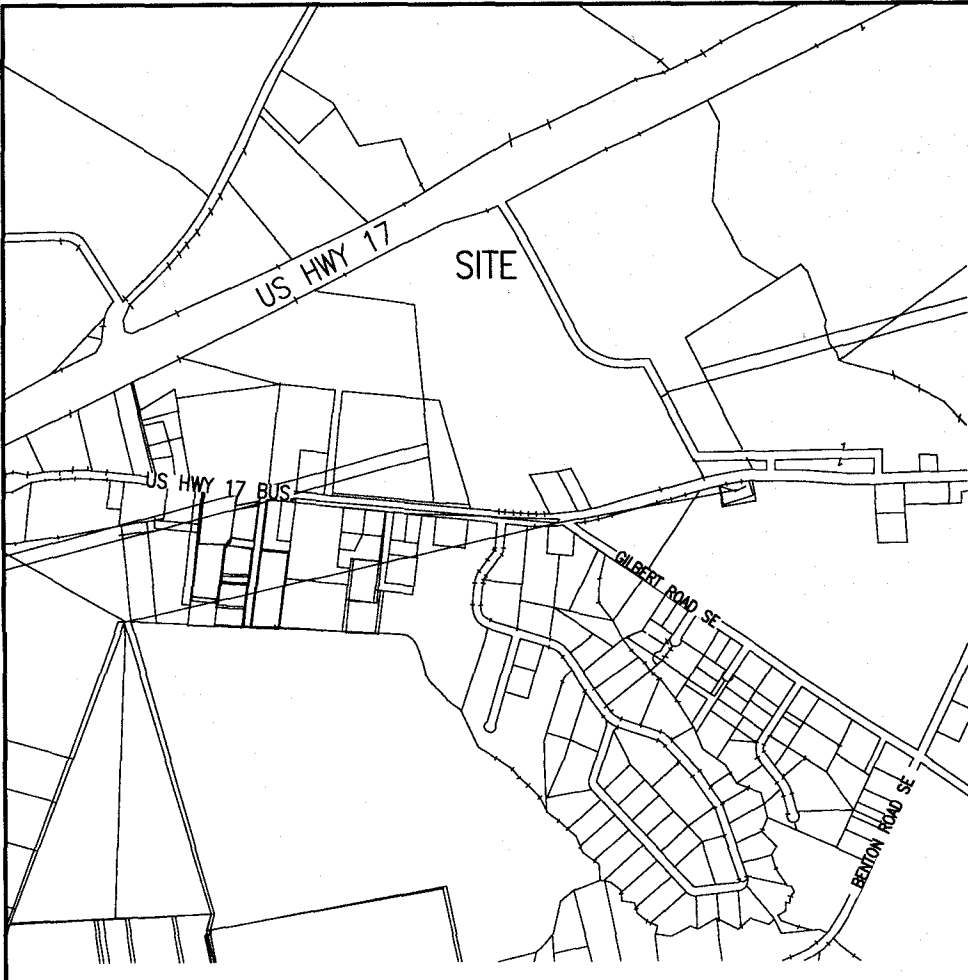
3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.
- B. Perform tests and inspections and prepare test reports.
 - 1. After installing equipment and after electrical circuitry has been energized, test for compliance with requirements.
 - 2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 3. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.
 - a. Check for electrical continuity of circuits and for short circuits.
 - b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
 - c. Verify that manual transfer warnings are properly placed.
 - d. Perform manual transfer operation.
 - 4. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times.
 - a. Simulate power failures of normal source to automatic transfer switches and of backup source with normal source available.
 - b. Simulate loss of phase-to-ground voltage for each phase of normal source.

- c. Verify time-delay settings.
 - d. Verify pickup and dropout voltages by data readout or inspection of control settings.
 - e. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.
 - 5. Ground-Fault Tests: Coordinate with testing of ground-fault protective devices for power delivery from both sources.
 - a. Verify grounding connections and locations and ratings of sensors.
 - C. Coordinate tests with tests of generator and run them concurrently.
 - D. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.
 - E. Remove and replace malfunctioning units and retest as specified above.
- 3.4 DEMONSTRATION**
- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain transfer switches and related equipment as specified below.
 - B. Coordinate this training with that for generator equipment.

END OF SECTION

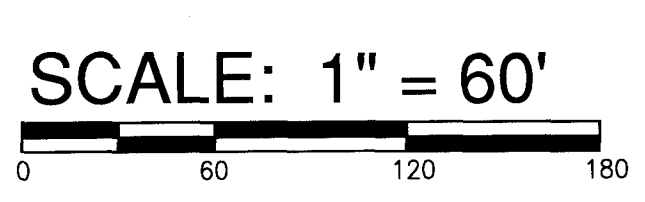
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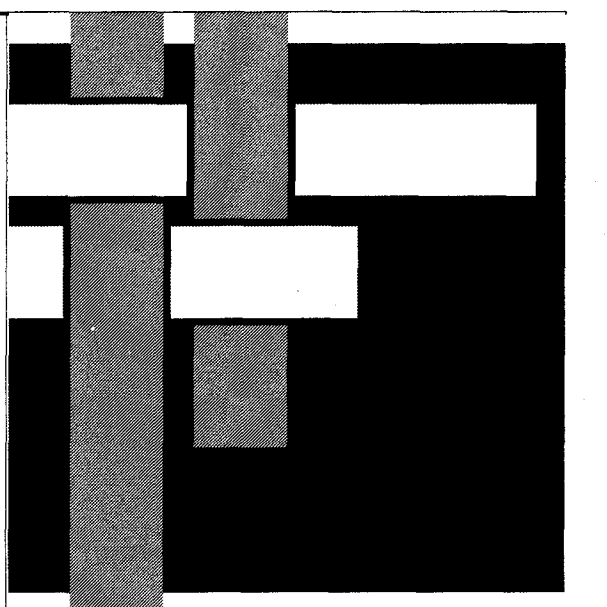
LEGEND		
LABEL	SYM.	DESCRIPTION
IRS	○	1/2" REBAR SET
CMF	■	CONC. MON. FOUND.
PFE	●	FINISHED FLOOR ELEV.
CATV	⊗	CABLE TV PEDESTAL
TPED	⊕	TELEPHONE PEDESTAL
FOP	⬮	FIBER OPTIC POST
FIB	⬮	FIBER OPTIC BOX
PP	○	POWER POLE
EB	⊗	ELECTRIC BOX
SMW	○	SEWER MANHOLE
SCD	○	SEWER CLEANOUT
RPZ	⊗	REDUCED PRESSURE ZONE
FI	⬮	FIRE HYDRANT
WM	■	WATER METER
GS	⊗	SPOT ELEVATION
GUT	⬮	GUT WIRE
CB	⬮	CATCH BASIN
INV.	⬮	INVERT OF PIPE
OHE	⬮	OVERHEAD ELECTRIC
LSA	⬮	LANDSCAPED AREA
R/W	⬮	RIGHT OF WAY

LINE LEGEND:	
—F—	SANITARY SEWER FORCE MAIN
—E—	UNDERGROUND ELECTRIC LINE
—U—	UNDERGROUND UTILITY UNKNOWN
—F—	UNDERGROUND FIBER OPTIC
—T—	UNDERGROUND TELEPHONE/CABLE/INTERNET
—W—	UNDERGROUND WATER LINE

UTILITY LOCATION STATEMENT
SUBSURFACE UTILITIES SHOWN HEREON ARE BASED AND LOCATED AS MARKED BY EGS SOUTHEAST, L.P., COASTAL GEOMATICS, LLC AND ITS EMPLOYEES. MAKE NO GUARANTEE OR REPRESENTATION THAT THE UNDERGROUND UTILITIES SHOWN COMPRISE ALL OF SUCH UTILITIES IN THE AREA, EITHER IN SERVICE OR ABANDONED, AND DOES NOT CERTIFY THAT THE UNDERGROUND UTILITIES SHOWN ARE IN THE EXACT LOCATION AS SHOWN. HEREON, UTILITY LINES ARE SHOWN AS ACCURATELY AS POSSIBLE FROM INFORMATION AVAILABLE AT THE TIME OF THIS SURVEY. THE OWNER/CONTRACTOR IS RESPONSIBLE FOR NOTIFYING NC 811 FOR UTILITY LOCATION PRIOR TO ANY EXCAVATION ON THIS SITE.



- GENERAL NOTES:
- ADJOINING DEED REFERENCES BASED ON CURRENT INFORMATION FOUND IN THE BRUNSWICK COUNTY TAX OFFICE.
 - ACCORDING TO CURRENT FEMA FLOOD MAP # 3720213000K, THE TRACT APPEARS TO BE LOCATED IN THE FOLLOWING ZONE X, AREA OF MINIMAL FLOODING.
 - THIS PROPERTY IS SUBJECT TO ANY AND ALL EASEMENTS, COVENANTS, RESTRICTIONS, RIGHT-OF-WAYS OF RECORD, GOVERNMENTAL ORDINANCES AND/OR REQUIREMENTS WHICH MAY LIMIT THE USE OF THIS PROPERTY.
 - ALL BEARINGS ARE BASED ON NC GRID NORTH (NAD83-NRIS 2011); ALL DISTANCES ARE HORIZONTAL GROUND DISTANCES. COMBINED GRID FACTOR = 1.00009878.
 - CURRENT ZONING: BRUNSWICK COUNTY: CLD.
 - ELEVATIONS WERE OBTAINED BY NORTH CAROLINA REAL TIME NETWORK AND ARE BASED ON N.A.V.D. 88 DATUM.
 - CONTOURS SHOWN AT ONE FOOT INTERVALS.
 - THE SURVEY AREA SHOWN IS A PORTION OF TAX PARCEL 1533000105.



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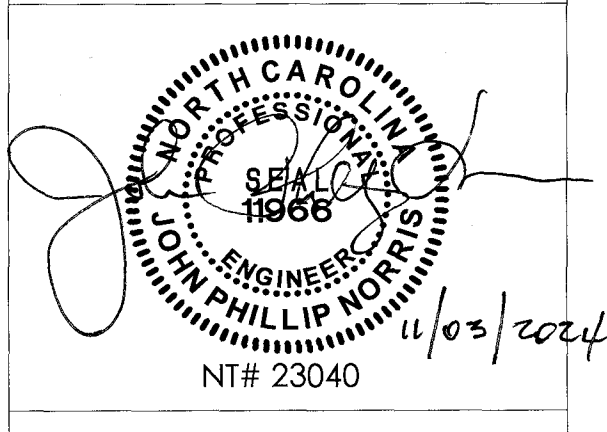
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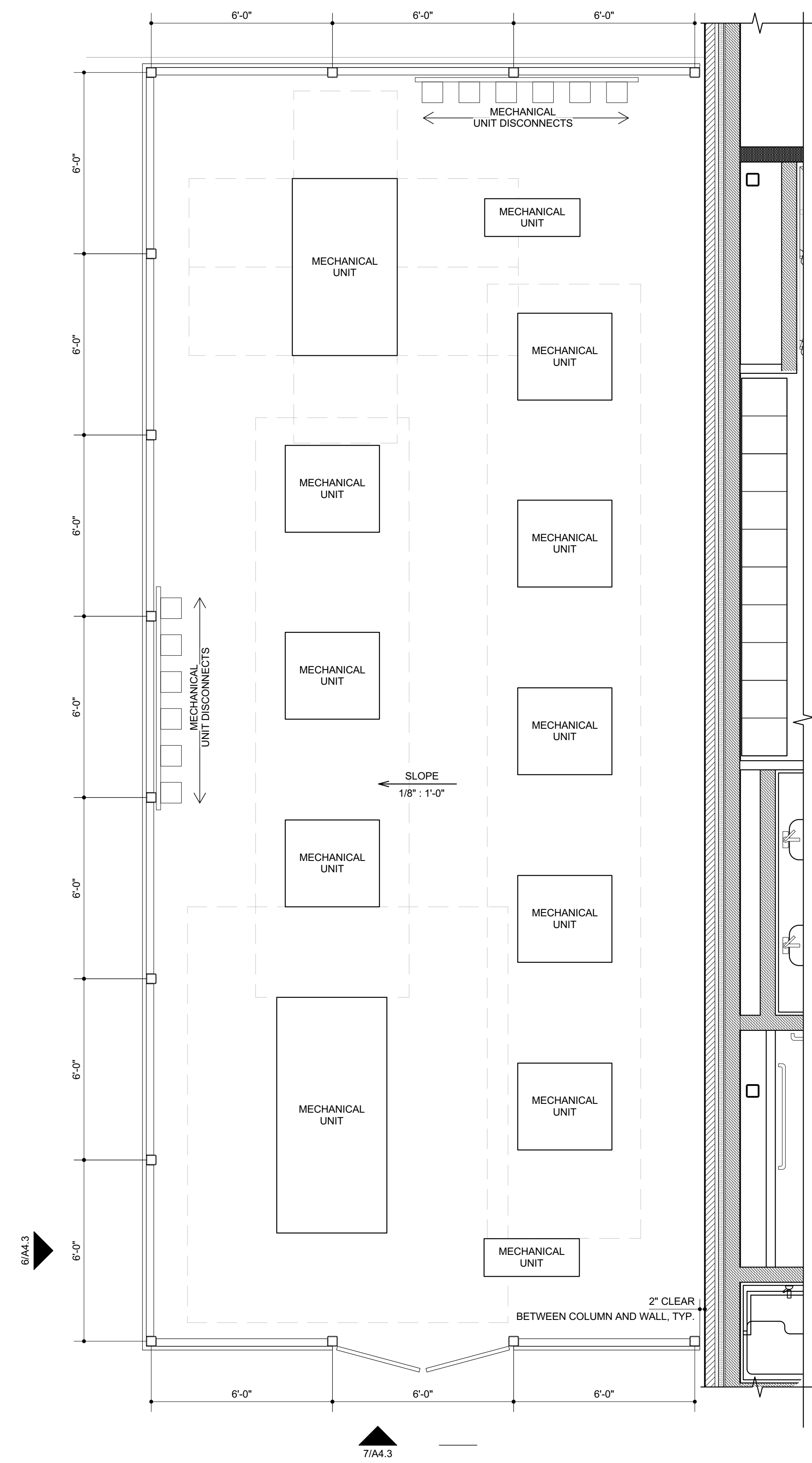
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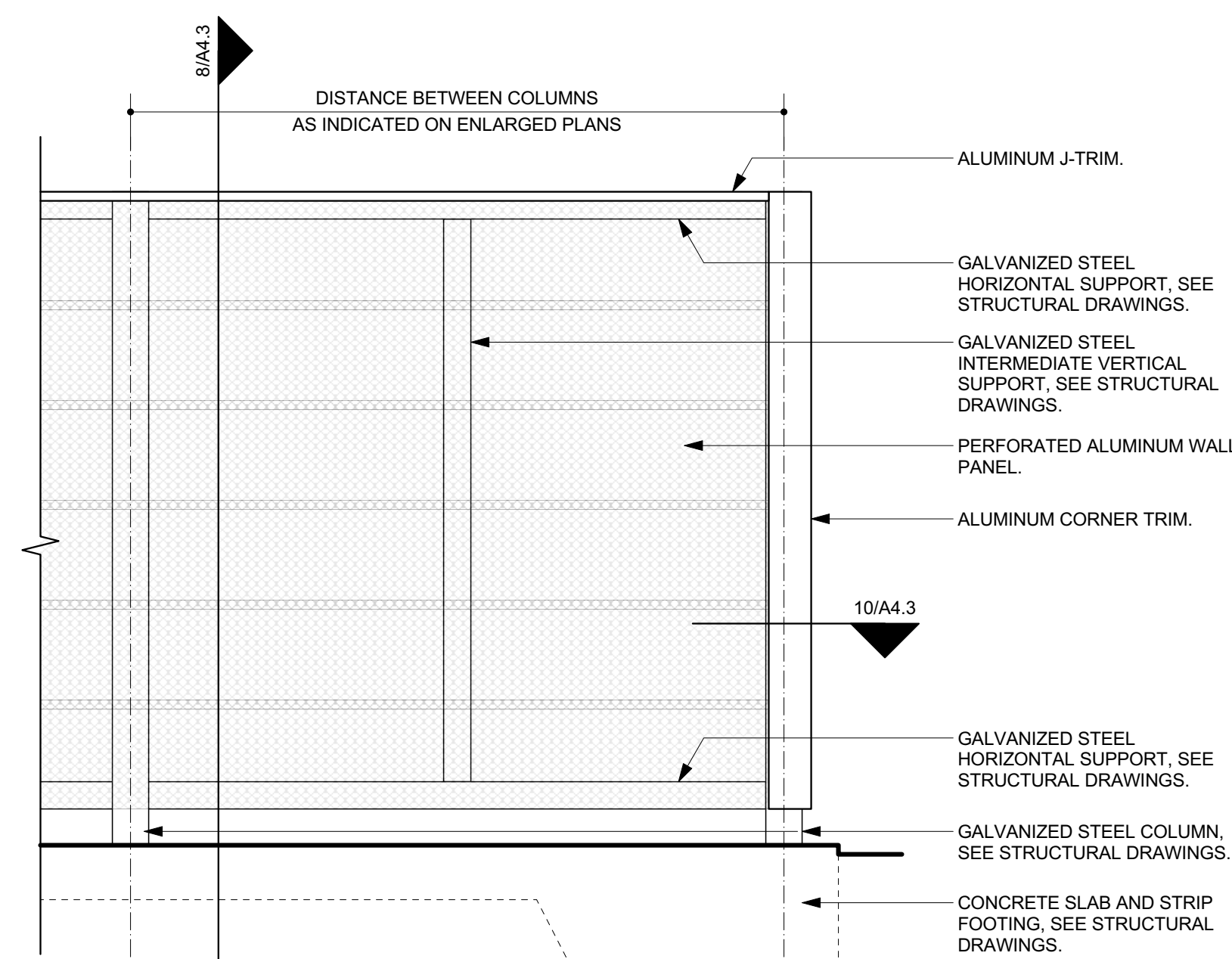
EXISTING
CONDITIONS

Rev.	Date	Notes
ADD 1	12/03/24	TURNED ON EX SPOT ELEVATIONS AND CONTOUR LABELS

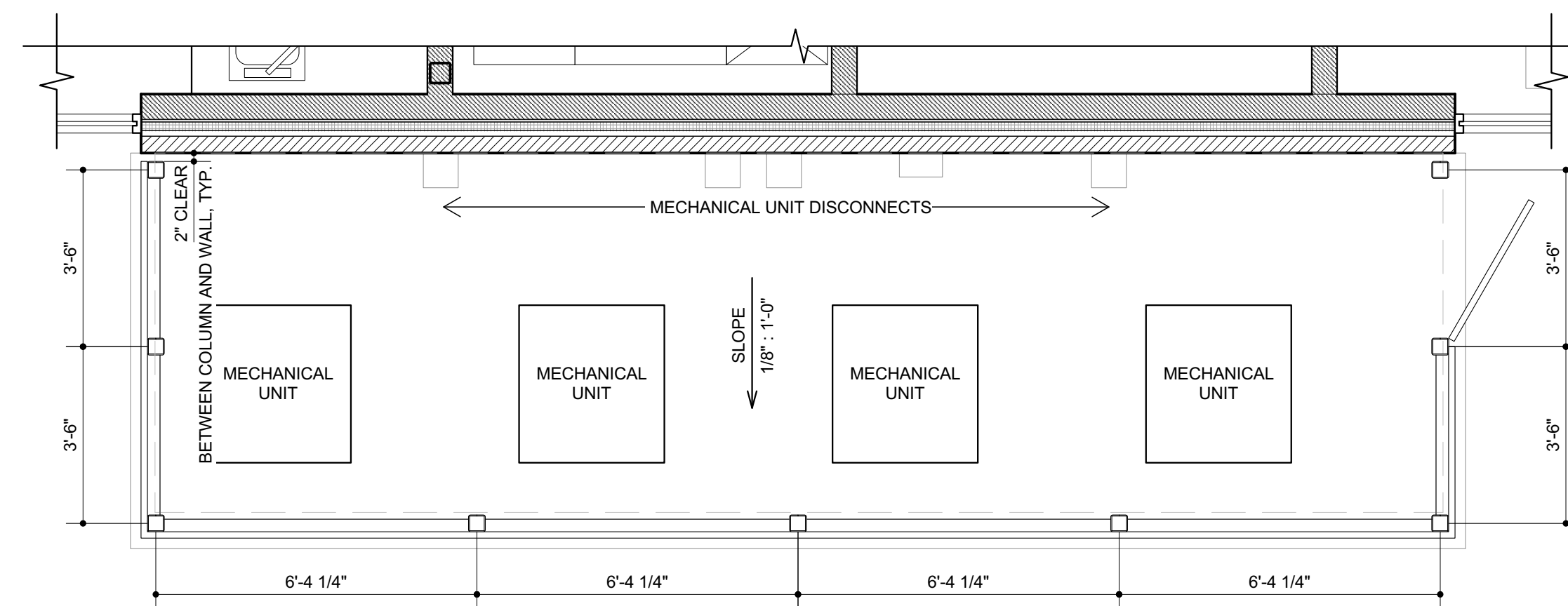
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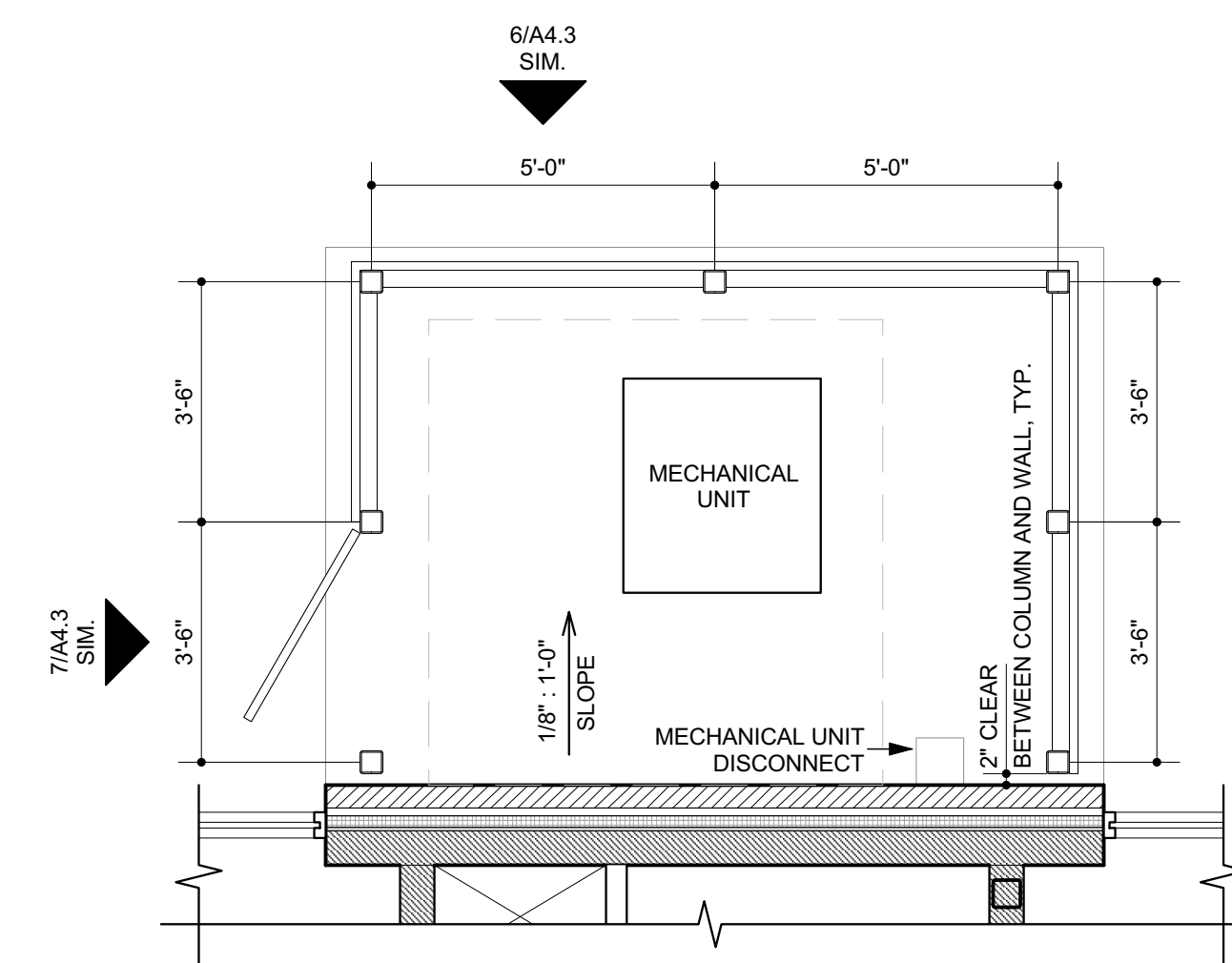
1 Mechanical Yard Enlarged Plan
A4.3 Scale: 3/8" = 1'-0"



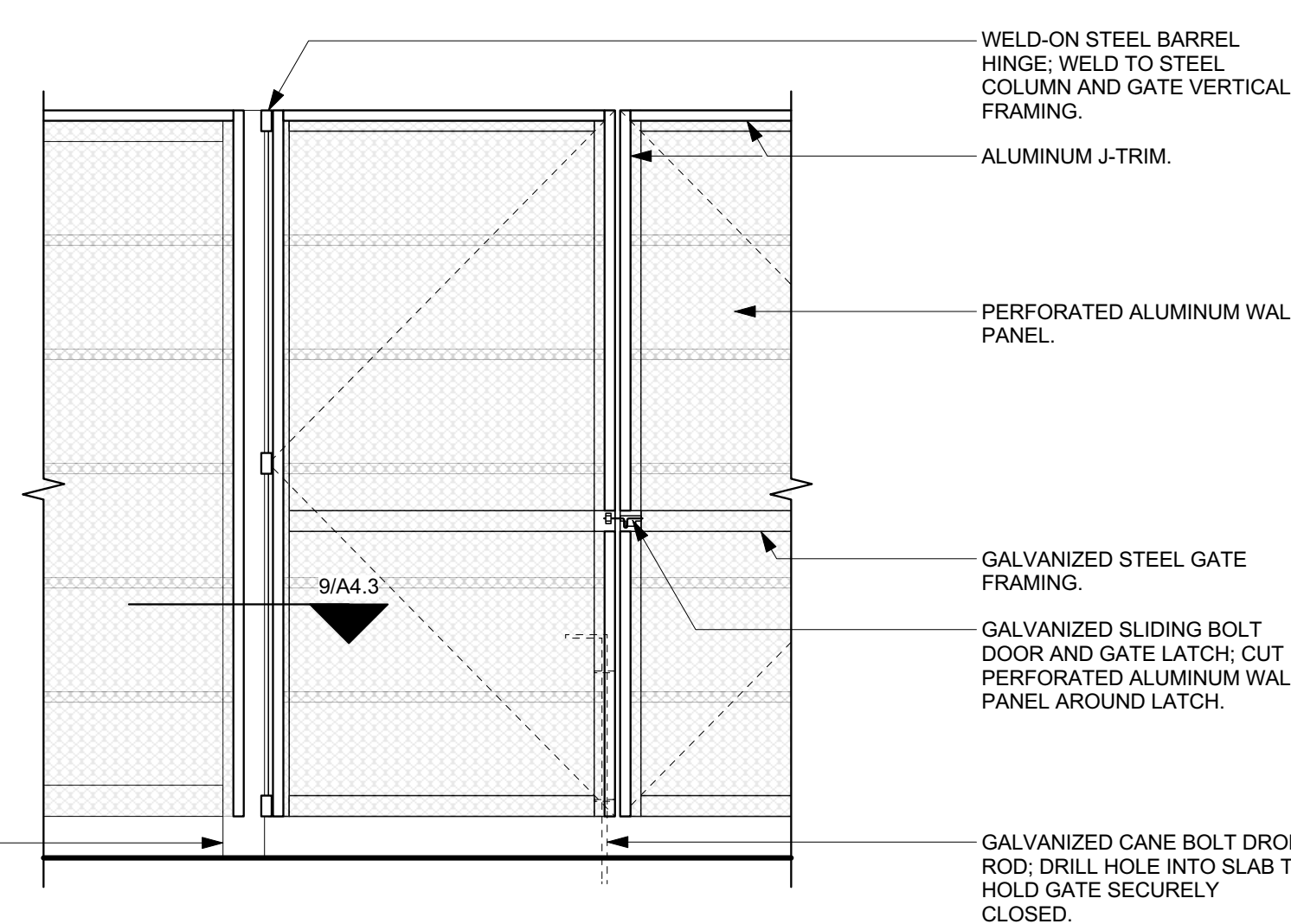
6 Equipment Screen Elevation
A4.3 Scale: 3/4" = 1'-0"



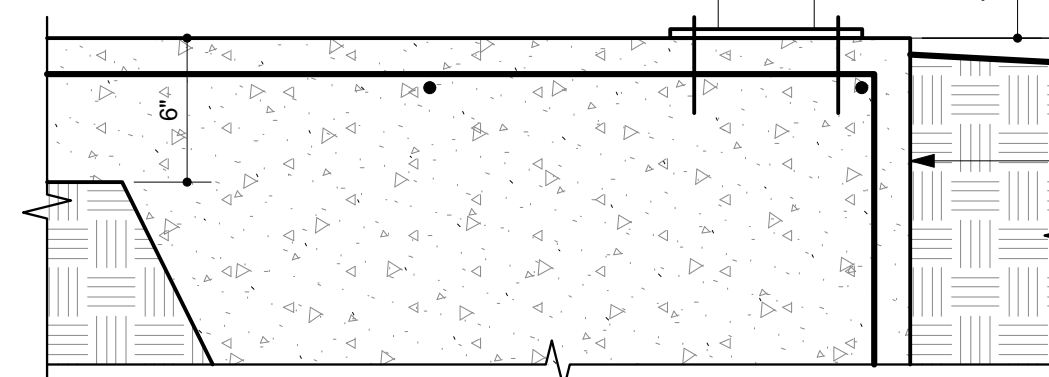
2 Equipment Screen Enlarged Plan
A4.3 Scale: 3/8" = 1'-0"



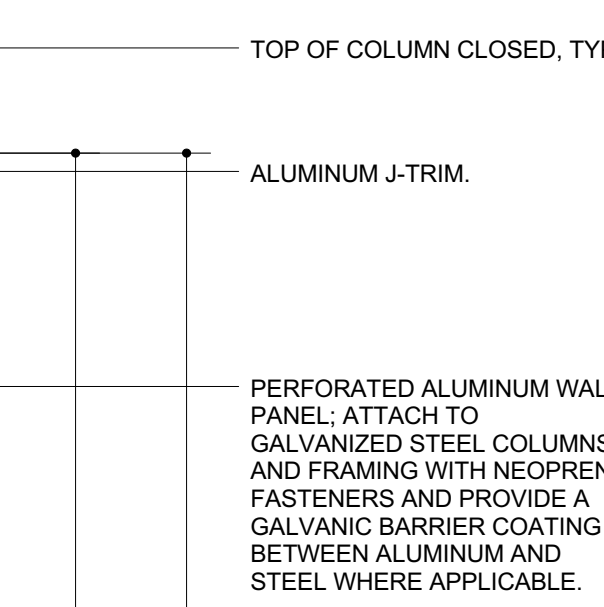
4 Equipment Screen Enlarged Plan
A4.3 Scale: 3/8" = 1'-0"



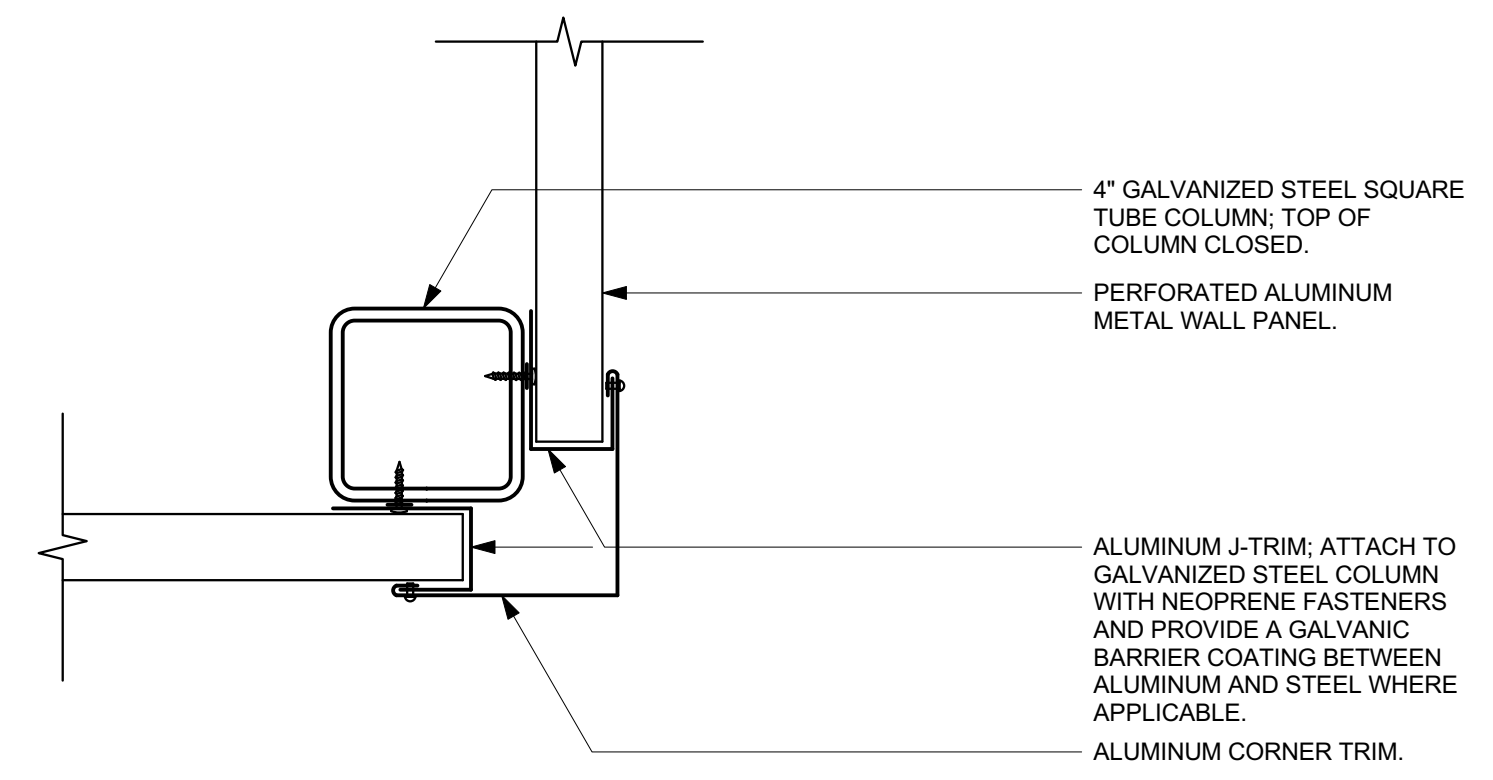
7 Equipment Screen Gate Elevation
A4.3 Scale: 3/4" = 1'-0"



8 Typical Equipment Screen Section
A4.3 Scale: 1 1/2" = 1'-0"



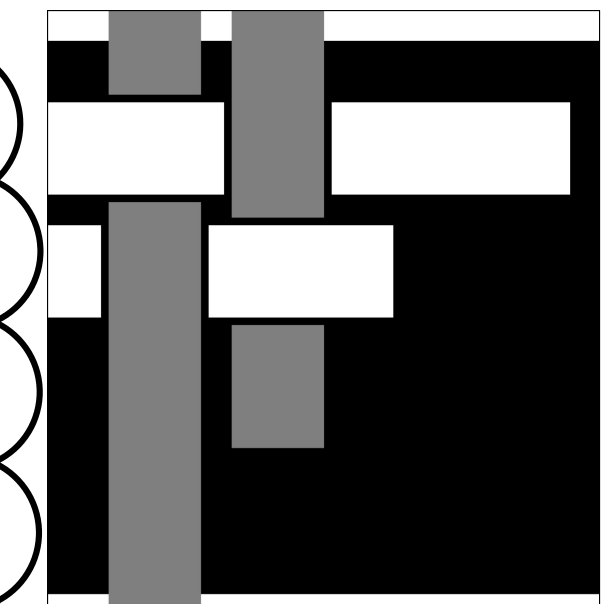
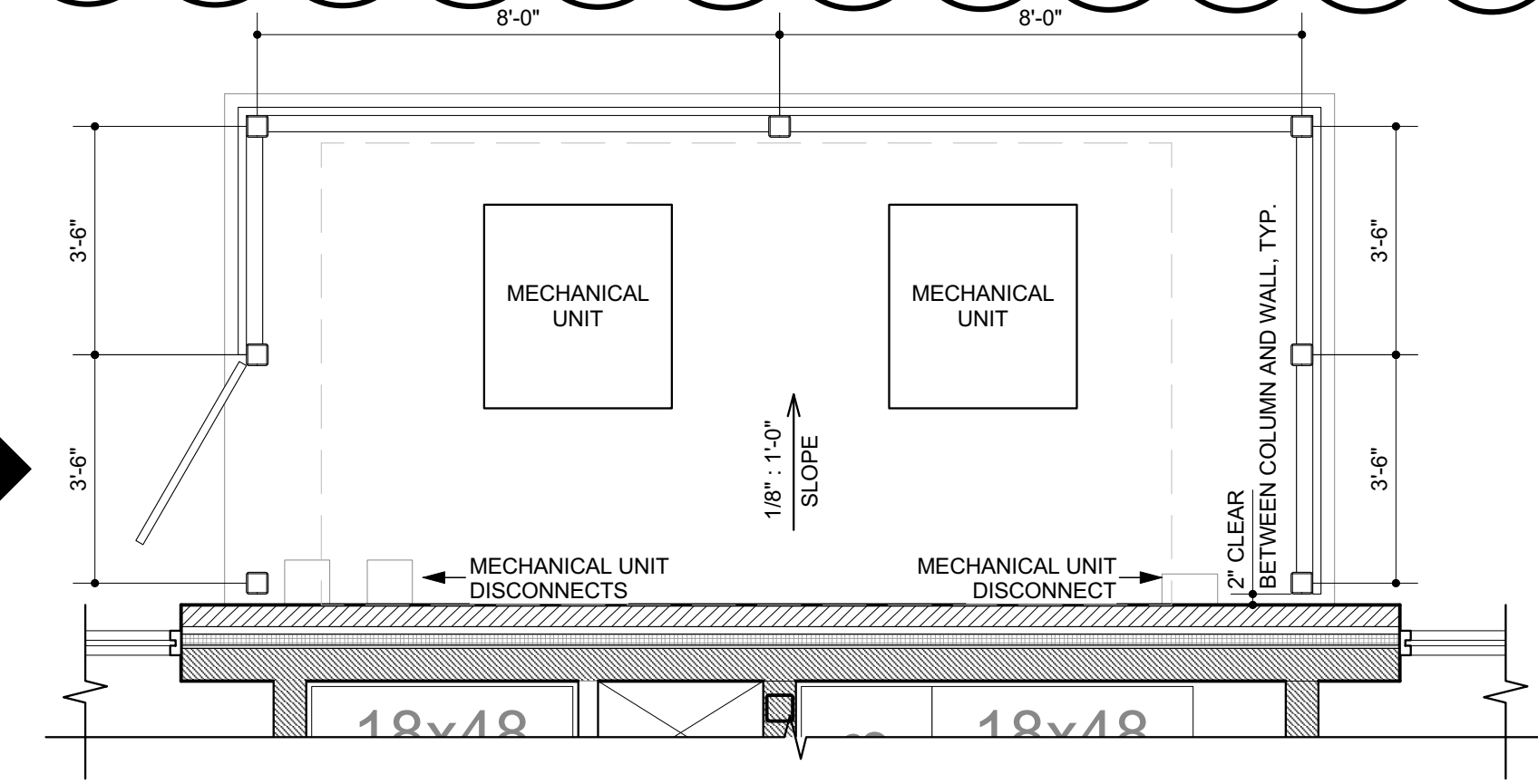
9 Equipment Screen Gate Hinge Detail
A4.3 Scale: 3" = 1'-0"



10 Equipment Screen Corner Detail
A4.3 Scale: 3" = 1'-0"

ALTERNATE 6-10:
BACKUP GENERATOR
INCLUDING SLAB AND
SCREEN WALL.

3 Generator Yard Enlarged Plan
A4.3 Scale: 3/8" = 1'-0"



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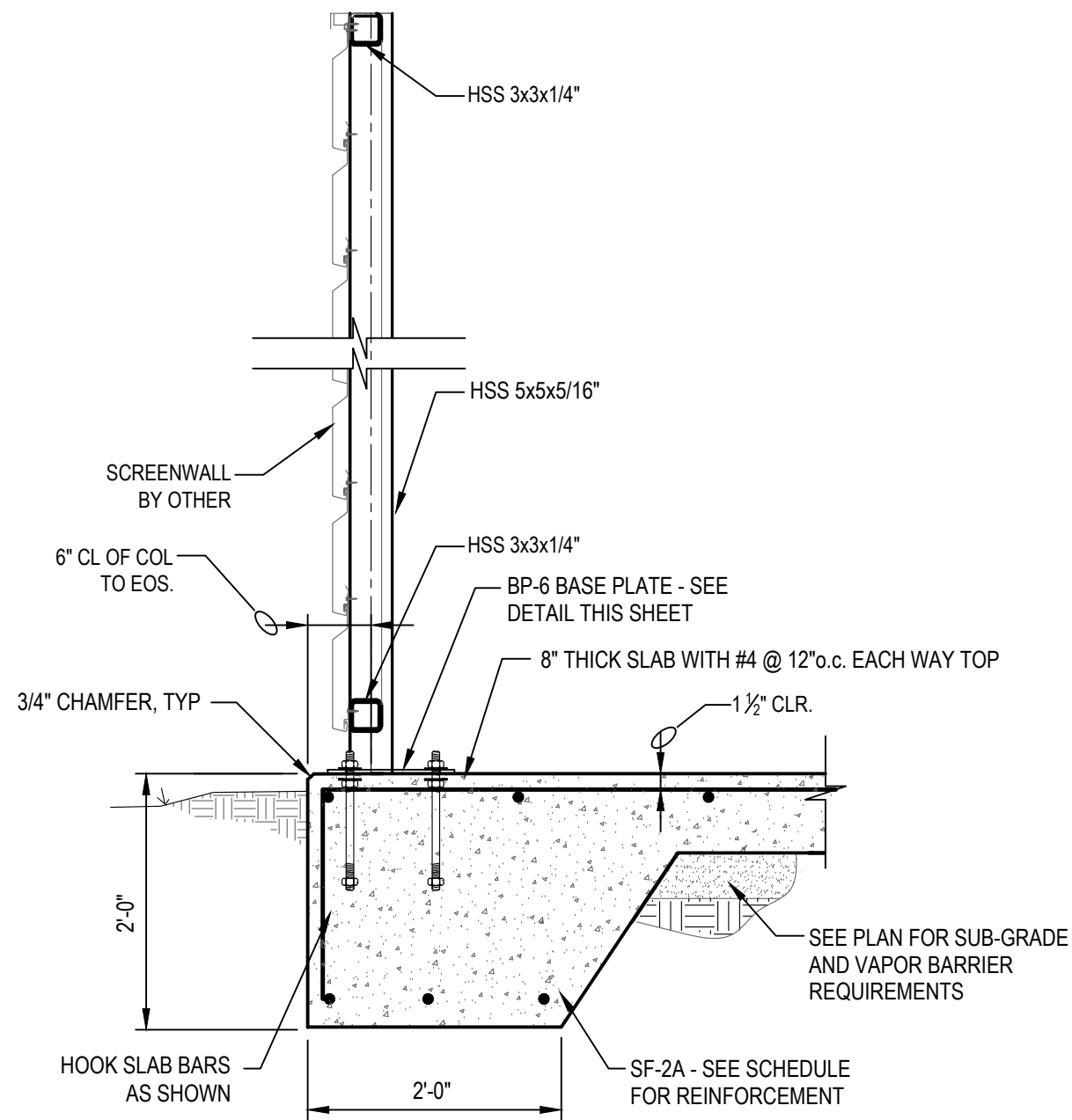
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Enlarged Equipment
Screen Plans, Sections,
and Details

Rev.	Date	Notes
Addendum #1	12/03/24	Generator pad and screening sizes have been increased.

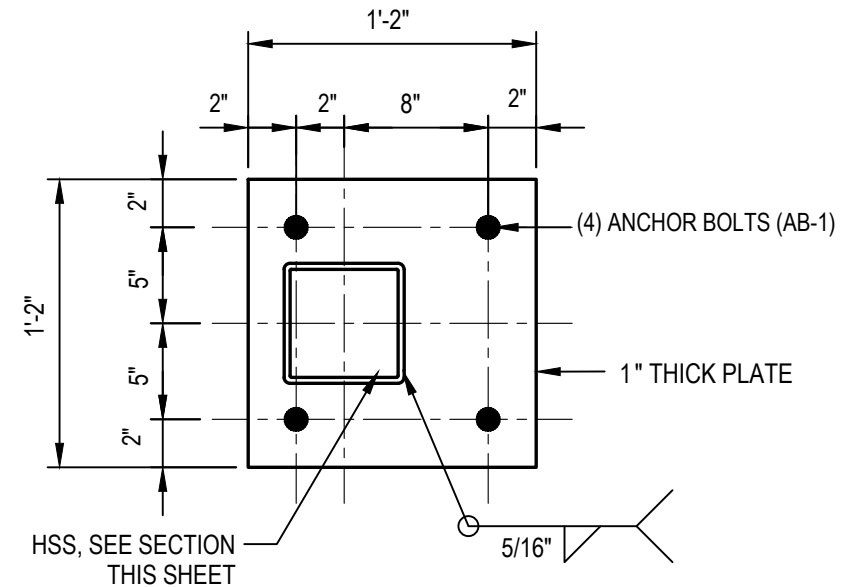
A4.3



COORDINATE EXTENTS OF PAD
WITH ARCHITECTURAL DRAWINGS

SECTION AT GENERATOR PAD

SCALE: 3/4" = 1'-0"



DETAIL 'BP-6"

SCALE: 1 1/2" = 1'-0"

(HSS BASEPLATE AT GENERATOR SCREEN WALL)