



To: All Plan Holders of Record

From: CT Consultants, Inc.
For the Owner

Re: *Addendum No. 1*
Constance Avenue Lift Station Improvements
Village of Hiram

Date: February 23, 2024

This Addendum forms a part of the contract documents and modifies the original bidding documents dated February 2024 and all previous addenda, if any. Acknowledge receipt of this addendum in the space provided in the bid forms. Failure to do so may subject the bidder to disqualification.

QUESTIONS AND ANSWERS

Q1. After visiting the site, seems like the two trees may have to be removed in order to excavate for the new Grinder Vault and Bypass Vault. Is this acceptable?

A1. The preference is not to remove any trees, or if a tree has to be removed, removing it prior to March 30 or after October 1. There are no restrictions for removing trees, but tree removal shall be limited.

Q2. Are existing Bollards to be reused? Are we adding Bollards. Is there a detail for installation of Bollards?

A2. Refer to the enclosed bollard plan.

Q3. Where is the nearest upstream MH for bypass.

A3. The nearest upstream manhole is east of the intersection of Constance Avenue and Winrock Drive across from 11900 Winrock Drive. There is also an 8-inch lateral from 6969 Constance Avenue.

Q4. On Sheet 11, coded note #7, "Extend Existing Electrical Equipment" is there any information what the existing materials is, rebar size, tube size, ss or galvanized?

A4. Per note #7, extensions shall match the existing panel system. Post shall be 4"x4"x1/4" galvanized steel with welded caps. An aluminum plate shall be provided between post. Rubber pads shall be provided between dissimilar materials. Rebar shall be #5 rebar, 4 bars minimum. Concrete cylinder for additional post shall be 24" diameter, 6 ft in depth, with 1" height of concrete exposed, sloped away from the post.

Q5. Is there a specification for the Generator?

A5. See enclosed.

Q6. Is there an estimated Flow Rate for the Lift Station? Need the information for bypass equipment.

A6. The existing pump station is rated for a flow rate of 60 gpm.

BID DOCUMENTS

1. Add the enclosed bollard plan.

SPECIFICATIONS

1. Add the enclosed Specification 099700 – Special Coatings
2. Add the enclosed Specification 263213.14 – Diesel Engine Generator
3. Add the enclosed Specification 263600 – Automatic Transfer Switch

EF/RS:rs/br

Enclosures

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SECTION 099770 - SPECIAL COATINGS

PART 1 – GENERAL

1.1 SUMMARY

- A. Work covered by this Section includes the furnishing and application of paints, stains, primers, varnishes and other finish, decorative and protective coatings.
- B. Shop priming and factory prefinishing are required on some, but not necessarily all, of the items described in other sections.
- C. Extent of work:
 - 1. All new process equipment and process piping.
 - 2. All building and room surfaces as indicated on the plans or as scheduled.
 - 3. All conduits, ducts, drains, etc of other trades unless such product is deemed having an acceptable factory pre-finish, under the following conditions:
 - a. When specifically called out as requiring special coating protection.

1.2 DEFINITIONS

- A. Special coating systems are defined as those types of materials and methods of application requiring more than normal skills and techniques for mixing, handling and application, as specified in the "Painting" section.
 - 1. The term "special coating systems" as used in this section includes applied materials used in prime, intermediate and finish coats.
 - 2. The word "paint", as applied in this and or other Sections shall apply to all special coatings required herein for the protection of materials from corrosive environment, weathering processes, or for aesthetic or other reasons.
 - 3. The term "exposed surfaces" is defined to include areas visible when permanent or built-in fixtures, convector covers, covers for finned tube radiation, grilles, and similar components are in place in areas to be coated. Extend special coatings in these areas as required to maintain the coating system integrity and provide desired protection.

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's technical information including basic materials analysis and application instructions for each coating material specified.
 - 1. List each material and cross-reference to the specific coating and finish system and application. Identify each material by the manufacturer's catalog number and general classification.
 - 2. In the event that the submittal requests a substitution then the following ASTM test results from an independent testing laboratory for the referenced products

shall be included:

ASTM B 117 Salt Fog
ASTM D 3359 (Method A and B) Adhesion Test
ASTM G8, Method A Cathodic Disbondment
ASTM D 4541 (Elcometer)
ASTM D 4060 Taber Abrasion
ASTM D 522 (Conical Mandrel)
ASTM D 3363 Pencil Hardness
ASTM D 2794 Impact
ASTM G 53 QUV Exposure
ASTM D 2240 Durometer, Shore D
ASTM D 870 Immersion (Potable Water)
ASTM E 96 Moisture Vapor Transmission
ASTM D 2370 Tensile Strength and Elongation
ASTM D 638 Tear Strength

- B. Manufacturer's representative color and texture sample cards shall be submitted to the Engineer at least 30 days prior to paint application. Contractor shall coordinate work so as to allow sufficient time for paint to be delivered to the job site.

1.4 QUALITY ASSURANCE

- A. **Single Source Responsibility:** Provide primers and other undercoat material produced by the same manufacturer as the finish coats. Use only thinners recommended by the manufacturer, and only within recommended limits.
- B. **Coordination of Work:** Review other sections of these specifications in which other coatings are to be provided to ensure compatibility of the total coatings systems for various substrates.
 - 1. Upon request, furnish information on the characteristics of pre-primed materials, to ensure that provisions for specified finish coats can be appropriately applied.
 - 2. Notify the Engineer of any anticipated problems involved in using the coatings systems as specified.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the job site in the manufacturer's original, new, unopened packages and containers bearing manufacturer's name and label and the following information:
 - 1. Name or title of material.
 - 2. Federal Specification number, if applicable.
 - 3. Manufacturer's stock number and date of manufacture.
 - 4. Manufacturer's name.
 - 5. Contents by volume, for major pigment and vehicle constituents.
 - 6. Thinning instructions.
 - 7. Application instructions.
 - 8. Color name and number.

9. Handling instructions and precautions.
 - B. Store materials not in actual use in tightly covered containers at a minimum ambient temperature of 45 deg. F (7 deg. C) in a well ventilated area. Maintain containers used in storage of coatings in a clean condition, free of foreign materials and residue.
 1. Protect from freezing where necessary. Keep storage area neat and orderly. Remove oily rags and waste daily. Take all necessary precautionary measures to ensure that workmen and work areas are adequately protected from fire hazards and health hazards resulting from handling, mixing and application of stains.
 - C. No material shall be applied unless the containers are opened in the presence of the Owner's Representative.

1.6 PROJECT CONDITIONS

- A. Apply coatings only when the temperature of surfaces to be coated and surrounding air temperatures are above 45 deg. F (7 deg. C), unless otherwise permitted by manufacturer's printed instructions.
- B. Do not apply coatings in snow, rain, fog or mist, or when the relative humidity exceeds 85%, or to damp or wet surfaces unless otherwise permitted by manufacturer's printed instructions. Allow wet surfaces to dry thoroughly and attain the temperature and conditions specified before proceeding with or continuing with the coating operation.
 1. Work may continue during inclement weather only if areas and surfaces to be coated are enclosed and the temperature within the area can be maintained within limits specified by the manufacturer during application and drying periods.
- C. Report to responsible person such as safety personnel, General Trades Superintendent, etc., any condition which may pose a threat to the health and welfare of employees.
- D. Keep working area clean and safe.
- E. Obey all job site rules and regulations.
- F. Surfaces not to be painted; unless specifically stated otherwise:
 1. Face brick
 2. Pre-finished wall panels, partitions and ceiling tile
 3. Items with acceptable factory-applied final finish
 4. Concealed ducts, pipes and conduit.
 5. Glass, Aluminum, Copper, Bronze, Stainless Steel
- G. All exposed piping, equipment, and control building concrete walls and ceiling shall be coated as required in Section 2.2.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products of one of the following:
 - 1. Tnemec Company, Inc., North Kansas City, Missouri
 - 2. Carboline Company, At. Louis, Missouri
 - 3. Sherwin Williams Company, Cleveland, Ohio
- B. Material Quality: Provide the best quality grade of the various types of coatings as regularly manufactured by acceptable coating manufacturers. Materials not displaying manufacturer's identification as a standard, best-grade product will not be acceptable.
- C. Proprietary names to designate colors or materials are not intended to imply that products of named manufacturers are required to the exclusion of equivalent products of other manufacturers.
- D. Request for substitution shall include manufacturer's literature for each product giving the name, product number, generic type, descriptive information, solids by volume, recommended dry film thickness and certified test reports showing results to equal the performance criteria of the products listed herein.

2.2 COATING SYSTEMS

A. Ferrous Metal:

1. Submerged, Non-Potable

Surface Preparation: SSPC-SP10 Near White Blast

First Coat: Tnemec Series N69 Hi-Build Epoxoline II @ 3.0-5.0 mils dry

Carboline Carboguard 890 @ 3.0 - 5.0 DFT

Sherwin Williams Dura-Plate 235 at 3.0-5.0 mils DFT

Second Coat: Tnemec Series N69 Hi-Build Epoxoline II @ 6.0-8.0 mils dry

Carboline Carboguard 890 @ 4.0 - 6.0 DFT

Sherwin Williams Dura-Plate 235 at 5.0-8.0 mils DFT

NOTE: If shop primed, field surface preparation for weld seams and abraded areas is SSPC-SP-10 and spot prime with Series 161 @ 3-5 mils dry or Carboline Carboguard 890 @ 3.0 - 5.0 DFT or Sherwin Williams Dura-Plate 235 @3.0-5.0 mils DFT.

2. Non-Submerged, Interior Exposure

Surface Preparation: SSPC-SP6 Commercial Blast

First Coat: Tnemec Series N69 Hi-Build Epoxoline II @ 3.0-5.0 mils dry

Carboline Carboguard 60 @ 3.0 - 5.0 DFT

Sherwin Williams Macropoxy 646 at 3.0-5.0 mils DFT

Second Coat: Tnemec Series N69 Hi-Build Epoxoline II @ 4.0-6.0 mils dry

Carboline Carboguard 60 @ 4.0 - 6.0 DFT

Sherwin Williams Macropoxy 646 at 4.0-6.0 mils DFT

NOTE: If shop primed, field surface preparation for weld seams and abraded areas is SSPC-SP-10 and spot prime with Series N69 @ 3-5 mils dry or Carboline Carboguard 60 @ 3.0 - 5.0 DFT or Sherwin Williams Macropoxy 646 at 3.0-5.0 mils DFT.

3. Non-Submerged, Exterior Exposure

Surface Preparation: SSPC-SP6 Commercial Blast

First Coat: Tnemec Series N69 Hi-Build Epoxoline II @ 3.0-5.0 mils dry

Carboline Carboguard 60 @ 3.0 - 5.0 DFT
Sherwin Williams Macropoxy 646 at 3.0-5.0 mils DFT

Second Coat: Tnemec Series 1075 Endura-Shield II @ 2.0-4.0 mils dry
Carboline Carbothane 133 LH @ 3.0 - 5.0 DFT
Sherwin Williams Acrolon 218 HS or Hi-Solids Polyurethane at 3.0-5.0 mils DFT

NOTE: If shop primed, field surface preparation for weld seams and abraded areas is SSPC-SP-6 and spot prime with Series N69 @ 3-5 mils dry or Carboline Carboguard 60 @ 3.0 - 5.0 DFT or Sherwin Williams Macropoxy 646 at 3.0-5.0 mils DFT.

4. Galvanized Steel (including Bar Joist and Galvanized Steel)

Surface Preparation: SSPC-SPI Solvent Clean on galvanized surfaces.

SSPC-SP7 Brush-Off blast to lightly profile surface.

First Coat: N69 Hi-Build Epoxoline II @ 2.0-4.0 mils dry

Carboline Carboguard 888 @ 3.0 - 4.0 DFT
Sherwin Williams Macropoxy 646 at 3.0-4.0 mils DFT

B. Non-Ferrous Metals:

1. Interior Exposure

Surface Preparation: SSPC-SP1 Solvent Clean and Scarify per SSPC-SP 3

First Coat: Tnemec Series N69 Hi-Build Epoxoline II @ 2.0-3.0 mils dry

Carboline Carboguard 60 @ 3.0 - 5.0 DFT
Sherwin Williams Macropoxy 646 at 3.0-5.0 mils DFT

Second Coat: Tnemec Series N69 Hi-Build Epoxoline II @ 3.0-5.0 mils dry

Carboline Carboguard 60 @ 3.0 - 5.0 DFT
Sherwin Williams Macropoxy 646 at 3.0-5.0 mils DFT

2. Exterior Exposure

Surface Preparation: SSPC-SP1 Solvent Clean and Scarify per SSPC-SP 3

First Coat: Tnemec Series N69 Hi-Build Epoxoline II @ 2.0-3.0 mils dry
Carboline Carboguard 60 @ 3.0 - 5.0 DFT
Sherwin Williams Macropoxy 646 at 3.0-5.0 mils DFT

Second Coat: Tnemec Series 1075 Endura-Shield @ 2.0-4.0 mils dry
Carboline Carbothane 133 LH @ 3.0 - 5.0 DFT
Sherwin Williams Acrolon 218 HS or Hi-Solids

2.3 COLOR CODING AND PROCESS SYSTEM IDENTIFICATION

- A. The following color coding is suggested for **wastewater** transport and treatment systems. Color coding for processing piping, equipment and appurtenances is a suggested system unless otherwise specified or requested by Owner. Final coding to be determined in the field:
1. Equipment - light gray with O.S.H.A. orange coupling guards and O.S.H.A. yellow belt guards.
 2. Pipe Supports - hangers to be same color as piping applied, floor post to be same as adjacent wall color, and fabricated racks to be manufacturer's standard protective finish or paint same as adjacent wall color if not having a suitable protective finish.
 3. Process piping-exposed interior or exterior:
 - a. Submerged Pipe or Supports - Black
 - b. Intermittently Submerged Metals - Black (unless piping as defined otherwise)
 - c. Raw wastewater - Medium Grey*
- *These colors are recommended as standard by WEF.
- C. Miscellaneous, non-process related items such as electrical conduit, duct work, roof drains, etc. are to be properly prepped and finished to match adjacent wall or ceiling color.
1. In situations where two colors do not have sufficient contrast to easily differentiate between them, a six (6) inch band of contrasting color shall be on one of the pipes at approximately thirty (30) inch intervals.

3.2 SURFACE PREPARATION

A. General:

1. Dislodge dirt, rust, plaster nibs, mortar spatter and other dry material by scraping or brushing. Remove dust and loose material by brushing, sweeping, vacuuming or blowing with high-pressure air.
2. Remove oil, wax and grease by scraping off heavy deposits and cleaning with mineral spirits or a hot trisodium phosphate solution followed by a water rinse.
3. Verify that surfaces to be coated are dry, clean and free of dust, dirt, oil, wax grease or other contaminants.

B. Non-Ferrous Metal:

1. SSPC-SPI solvent cleaning to remove all contaminants.

C. Ferrous Metal:

1. Enclosed: Remove loose rust, mill scale and other foreign matter by hand (SSPC-

- SP2) or power tool (SSPC-SP3) cleaning and apply specified coating before rusting occurs.
2. Non-Submerged, Architecturally Exposed: Society of Protective Coatings, SSPC-SP6 Commercial Blast.
3. Submerged Steel: Society of Protective Coatings, SSPC-SP10 Near White Blast.

D. Galvanized Metal:

1. Remove contaminants and protective mill coating by SSPC-SP1 Solvent Cleaning or steam cleaning. All surfaces shall be prepared by light brush blasting to achieve a minimum 1.0 mil abrasive blast profile.

PART 3 - EXECUTION

3.1 PRE-WORK INSPECTION

- A. Examine surfaces to be coated and report conditions that would adversely affect appearance or performance of coating systems and which cannot be put into an acceptable condition by preparatory work specified in Paragraph 3.2.
- B. Do not proceed with surface preparation and application until surface is acceptable or authorization to proceed is given by the Owner's representative.

3.2 SURFACE PREPARATION

A. General:

1. Dislodge dirt, rust, plaster nibs, mortar spatter and other dry material by scraping or brushing. Remove dust and loose material by brushing, sweeping, vacuuming or blowing with high-pressure air.
2. Remove oil, wax and grease by scraping off heavy deposits and cleaning with mineral spirits or a hot trisodium phosphate solution followed by a water rinse.
3. Verify that surfaces to be coated are dry, clean and free of dust, dirt, oil, wax grease or other contaminants.

B. Non-Ferrous Metal:

1. SSPC-SPI solvent cleaning to remove all contaminants.

C. Ferrous Metal:

1. Enclosed: Remove loose rust, mill scale and other foreign matter by hand (SSPC-SP2) or power tool (SSPC-SP3) cleaning and apply specified coating before rusting occurs.
2. Non-Submerged, Architecturally Exposed: Society of Protective Coatings, SSPC-SP6 Commercial Blast.
3. Submerged Steel: Society of Protective Coatings, SSPC-SP10 Near White Blast.

D. Galvanized Metal:

1. Remove contaminants and protective mill coating by SSPC-SP1 Solvent Cleaning or steam cleaning. All surfaces shall be prepared by light brush blasting to achieve a minimum 1.0 mil abrasive blast profile

3.3 APPLICATION

A. General: Apply special coatings by brush, roller, spray, squeegee, or other applicators in accordance with the manufacturer's directions. Brushes best suited for the type of material being applied. Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.

1. Coating colors, surfaces treatments and finishes are indicated in the "Schedules" of the contract documents.
2. Provide finish coats that are compatible with the primers used.
3. The number of coats and coating film thickness required is the same regardless of the application method. Do not apply succeeding coats until the previous coat has cured as recommended by the coating manufacturer. Sand between coating applications where sanding is required to produce an even smooth surface in accordance with the coating manufacturer's directions.
4. Coat surfaces behind movable equipment and furniture the same as similar exposed surfaces.
5. Coat the back sides of access panels, removable or hinged covers, and similar hinged items, to match exposed surfaces.

B. Minimum Coating Thickness: Apply each material at not thinner than the manufacturer's recommended spreading rate. Provide a total dry film thickness of the entire coating system as recommended by the manufacturer.

C. Prime Coats: Before the application of finish coats, apply a prime coat, as recommended by the coating manufacturer, to material that is required to be painted or finished, and which has not been prime coated by others.

1. Recoat primed and sealed substrates where there is evidence of suction spots or unsealed areas in the first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.

D. Brush Application: Brush-out and work brush coats into surfaces in an even film. Eliminate cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Neatly draw glass lines and color breaks.

1. Apply primers and first coats by brush unless the manufacturer's instructions permit use of mechanical applicators.

E. Mechanical Applications: Use mechanical methods for coating application when permitted by the coating manufacturer's recommendations, governing ordinances, and trade union regulations.

1. Wherever spray application is used, apply each coat to provide the equivalent

hiding of brush-applied coats. Do not double-back with spray equipment building-up film thickness of 2 coats in one pass, unless recommended by the coating manufacturer.

- F. Completed Work: Match approved samples for color, texture and coverage. Remove, refinish or recoat work not in compliance with specified requirements.
- G. Spray application will not be permitted for the Primary Clarifier Painting bid item.

3.4 INSPECTION

- A. Request acceptance of each coat before applying succeeding coats.
- B. The Contractor shall furnish the Engineer a suitable thickness detector of a type recommended by the paint manufacturer.
- C. Any field painting found to be defective shall be removed and the surfaces repainted as the Engineer may direct at no additional cost to the Owner.
- D. Before final approval of the work, all damaged surfaces of paint (field or factory applied) shall be cleaned and repainted or touched up as directed.

3.5 FIELD QUALITY CONTROL

- A. The Owner reserves the right to invoke the following material testing procedure at any time, and at any number of times during the period when coating operations are being conducted.
 - 1. The Owner will engage the services of an independent testing laboratory to sample the coating being used. Samples of material delivered to project site will be taken, identified and sealed, and certified in the presence of the Contractor.
 - 2. The testing laboratory will perform appropriate tests for any or all of the following characteristics as required by the Owner:
 - a. Quantitative materials analysis.
 - b. Absorption.
 - c. Accelerated weathering.

3.6 CLEANING

- A. Clean-Up: At the end of each work day during progress of work, remove rubbish, empty cans, rags and other discarded materials from the site.
 - 1. Upon completion of the work, clean window glass and other spattered surfaces. Remove spattered coatings by washing, scraping or other proper methods, using care not to scratch or otherwise damage adjacent finished surfaces.

3.7 PROTECTION

- A. Protect work of other trades, whether to be coated or not, against damage from coating operations. Correct damage by cleaning, repairing or replacing, and recoating as acceptable to the Engineer. Leave the work in an undamaged condition.
- B. Provide "Wet Paint" signs as required to protect newly-coated finishes. Remove temporary protective wrappings provided by others for protection of their work, after completion of coating operations.
 - 1. At completion of the work of other trades, touch-up and restore damaged or defaced coated surfaces.

END OF SECTION

SECTION 263213.14 - DIESEL ENGINE GENERATORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes packaged engine generators used to supply non-emergency power, with the following features:
 - 1. Diesel engine.
 - 2. Diesel fuel-oil system.
 - 3. Control and monitoring.
 - 4. Generator overcurrent and fault protection.
 - 5. Generator, exciter, and voltage regulator.
 - 6. Load banks.
 - 7. Outdoor engine generator enclosure.
 - 8. Remote radiator motors.
 - 9. Vibration isolation devices.
 - 10. Finishes.

1.2 DEFINITIONS

- A. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.

1.3 SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
 - 2. Include thermal damage curve for generator.
 - 3. Include time-current characteristic curves for generator protective device.
 - 4. Include fuel consumption in gallons per hour at 0.8 power factor at 0.5, 0.75, and 1.0 times generator capacity.
 - 5. Include generator efficiency at 0.8 power factor at 0.5, 0.75, and 1.0 times generator capacity.
 - 6. Include airflow requirements for cooling and combustion air in cubic feet per minute at 0.8 power factor, with air-supply temperature of 95, 80, 70, and 50 deg F. Provide Drawings indicating requirements and limitations for location of air intake and exhausts.

7. Include generator characteristics, including, but not limited to, kilowatt rating, efficiency, reactances, and short-circuit current capability.

B. Shop Drawings:

1. Include plans and elevations for engine generator and other components specified. Indicate access requirements affected by height of subbase fuel tank.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Identify fluid drain ports and clearance requirements for proper fluid drain.
4. Design calculations for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
5. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include base weights.
6. Include diagrams for power, signal, and control wiring. Complete schematic, wiring, and interconnection diagrams showing terminal markings for engine generators and functional relationship between all electrical components.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.
- B. Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For packaged engine generators to include in emergency, operation, and maintenance manuals.
 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - a. List of tools and replacement items recommended to be stored at Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.
 - b. Operating instructions laminated and mounted adjacent to generator location.
 - c. Training plan.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: One for every 10 of each type and rating, but no fewer than one of each.
2. Indicator Lamps: Two for every six of each type used, but no fewer than two of each.
3. Filters: One set each of lubricating oil, fuel, and combustion-air filters.
4. Tools: Each tool listed by part number in operations and maintenance manual.

1.7 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 1 year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Kohler Company
- B. Cummins Engine Company
- C. Caterpillar
- D. Or Approved Equal
- E. Source Limitations: Obtain packaged engine generators and auxiliary components from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. B11 Compliance: Comply with B11.19.
- B. NFPA Compliance:
 1. Comply with NFPA 37.
 2. Comply with NFPA 70.
- C. UL Compliance: Comply with UL 2200.
- D. Engine Exhaust Emissions: Comply with EPA Tier 3 requirements and applicable state and local government requirements.

- E. Noise Emission: A maximum noise level of 82 dBA log average at 23 feet 100 percent load and including engine, engine exhaust, engine cooling-air intake and discharge, and other components of installation.
- F. Environmental Conditions: Engine generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:
 - 1. Ambient Temperature: 5 to 104 deg F.
 - 2. Relative Humidity: Zero to 95 percent.
 - 3. Altitude: Sea level to 640 feet.

2.3 ENGINE GENERATOR ASSEMBLY DESCRIPTION

- A. Factory-assembled and -tested, water-cooled engine, with brushless generator and accessories.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- C. Power Rating: Prime.
- D. Overload Capacity: 110 percent of service load for 1 hour in 12 consecutive hours.
- E. Power Factor: 0.8, lagging.
- F. Frequency: 60 Hz.
- G. Voltage: 120/240 -V ac.
- H. Phase: Three-phase, four wire.
- I. Governor: Adjustable isochronous, with speed sensing.
- J. 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.
- K. Capacities and Characteristics:
 - 1. Power Output Ratings: Nominal ratings as indicated at 0.8 power factor excluding power required for the continued and repeated operation of the unit and auxiliaries.
 - 2. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of component.
- L. Engine Generator Performance:

1. Steady-State Voltage Operational Bandwidth: 0.5 percent of rated output voltage from no load to full load.
2. Transient Voltage Performance: Not more than 20 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within three seconds.
3. Steady-State Frequency Operational Bandwidth: 0.25 percent of rated frequency from no load to full load.
4. Transient Frequency Performance: Less than 10 percent variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within six seconds.
5. Output Waveform: At no load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3 percent for single harmonics. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.
6. Sustained Short-Circuit Current: For a three-phase, bolted short circuit at system output terminals, system shall supply a minimum of 250 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to generator system components.
7. Start Time:
 - a. Comply with NFPA 110, Type 10 system requirements.

M. Engine Generator Performance for Sensitive Loads:

1. Oversizing generator 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: 0.5 percent of rated output voltage from no load to full load.
3. Transient Voltage Performance: Not more than 15 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within 4 second.
4. Steady-State Frequency Operational Bandwidth: Plus or minus 0.25 percent of rated frequency from no load to full load.
5. Transient Frequency Performance: Less than 7 percent variation for 50 percent step-load increase or decrease. Frequency to recover and remain within the steady-state operating band within three seconds.
6. Output Waveform: At no load, harmonic content measured line to line and line to neutral may not exceed 5 percent total or 3 percent for a single harmonic. Telephone influence factor, determined in accordance with NEMA MG 1, may not exceed 50.
7. Sustained Short-Circuit Current: For a three-phase, bolted short circuit at system output terminals, system to supply a minimum of 300 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. Excitation System: Performance to be unaffected by voltage distortion caused by nonlinear load.
9. Start Time:
 - a. Comply with NFPA 110, Type 10 system requirements.

2.4 DIESEL ENGINE

- A. Fuel: ASTM D975, diesel fuel oil, Grade 2-D S15.
- B. Rated Engine Speed: 1800 rpm.
- C. Lubrication System: Engine or skid-mounted.
 1. Filter and Strainer: Rated to remove 90 percent of particles 5 micrometers and smaller while passing full flow.
 2. Thermostatic Control Valve: Control flow in system to maintain optimum oil temperature. Unit shall be capable of full flow and is designed to be fail-safe.
 3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.
- D. Jacket Coolant Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with UL 499.
- E. 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. Size of Radiator: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.
 3. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.
 4. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
 5. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, UV-, and abrasion-resistant fabric.
 - a. Rating: 50-psig maximum working pressure with coolant at 180 deg F, and noncollapsible under vacuum.

- F. Cooling System: Closed loop, liquid cooled, with remote radiator and integral engine driven coolant pump.
1. Configuration: Vertical air discharge.
 2. Radiator Core Tubes: Nonferrous-metal construction other than aluminum.
 3. Size of Radiator: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.
 4. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.
 5. Fan: Driven by totally enclosed electric motor with sealed bearings.
 6. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.
 7. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
- G. Muffler/Silencer: Critical type, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.
1. Minimum sound attenuation of 25 dB at 500 Hz.
- H. Air-Intake Filter: Heavy-duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.
- I. Starting System: 12-V electric, with negative ground.
1. Components: Sized so they are not damaged during a full engine-cranking cycle with ambient temperature at maximum specified in "Performance Requirements" Article.
 2. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.
 3. Cranking Cycle: 60 seconds.
 4. Battery: Lead acid, with capacity within ambient temperature range specified in "Performance Requirements" Article to provide specified cranking cycle at least three times without recharging.
 5. Battery Cable: Size as recommended by engine manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.
 6. Battery Heater: Thermostatically controlled heater to be arranged to maintain battery above 50 deg F (10 deg C) regardless of external ambient temperature within range specified in "Performance Requirements" Article. Include accessories required to support and fasten batteries in place. Provide ventilation to exhaust battery gases.
 7. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35-A minimum continuous rating.

8. Battery Charger: Current-limiting, automatic-equalizing, and float-charging type designed for lead-acid batteries. Unit shall comply with UL 1236 and include the following features:
 - a. Automatic three-stage charge cycle for up to three independent batteries simultaneously per charger.
 - b. Output Voltage Regulation: Charger regulates output to within plus or minus 0.5 percent of manufacturer-provided voltage settings despite variations of input voltage, input frequency, and output current.
 - c. Battery Thermal Compensation: Battery temperature compensation with adjustable slope, factory set at minus 0.18 percent per degree C, and equipped for sensing battery temperature. Include battery temperature sensor mounted on battery negative terminal.
 - d. AC Input: Charger operates from any 45- to 65-Hz ac source with voltage ranging from 105- to 264-V rms.
9. LED Lamp Indicators: Current limit, AC ON, and charger fail.
10. Charger Fail Alarm Contact: Voltage-free (dry type) form "C" output.
11. Filtered output for type VRLA AGM batteries.
12. Charger Enclosure: NEMA 250, Type 1 (IP20), wall mounted and rated for generator duty with charger enclosure vibration resistance.

2.5 DIESEL FUEL-OIL SYSTEM

- A. Comply with NFPA 30.
- B. Piping: Fuel-oil piping shall be Schedule 40 black steel. Cast iron, aluminum, copper, and galvanized steel shall not be used in the fuel-oil system.
- C. Main Fuel Pump: Mounted on engine to provide primary fuel flow under starting and load conditions.
- D. Fuel Filtering: Remove water and contaminants larger than 1 micron.
- E. Relief-Bypass Valve: Automatically regulates pressure in fuel line and returns excess fuel to source.
- A. Subbase-Mounted, Double-Wall, Fuel-Oil Tank: Complying with UL 142 and including the following features:
 1. Steel Channel Support System: Reinforced steel box channel for generator support. Full height gussets at either end of channel and at generator mounting locations.
 2. Fuel Level Gauge: Direct-reading, UL-listed, magnetic fuel level gauge with a hermetically sealed, vacuum-tested dial.
 3. Low-Fuel Alarm Contact: Float-type switch for remote or local annunciation of a low-fuel-level condition.

4. Fill Tube: 2-inch (25-mm) NPT opening with lockable cap.
 5. Leak detection in interstitial space.
 6. Vandal-resistant fill cap.
 7. Fill-pipe spill containment, minimum capacity 5 gal. (19 L).
 8. Emergency inner- and outer-tank UL-listed relief vents sized in accordance with American Petroleum Institute Standard No 2000 with an opening pressure of 0.5 psig (3.5 kPa) and full opening pressure of 2.5 psig (17 kPa).
 9. Containment Provisions: Comply with requirements of authorities having jurisdiction.
- B. Day Tank: Comply with UL 142, freestanding, factory-fabricated fuel tank assembly, with integral, float-controlled transfer pump and the following features:
1. Containment: Integral rupture basin with a capacity of 150 percent of nominal capacity of day tank.
 - a. Leak Detector: Locate in rupture basin and connect to provide audible and visual alarm in the event of day-tank leak.
 2. Tank Capacity: As recommended by engine manufacturer for an uninterrupted period of 48 hours' operation at 100 percent of rated power output of engine generator system without being refilled.
 3. Pump Capacity: Exceeds maximum flow of fuel drawn by engine-mounted fuel supply pump at 110 percent of rated capacity, including fuel returned from engine.
 4. Low-Level Alarm Sensor: Liquid-level device operates alarm contacts at 25 percent of normal fuel level.
 5. Piping Connections: Factory-installed fuel supply and return lines from tank to engine; local fuel fill, vent line, overflow line; and tank drain line with shutoff valve.
- C. Subbase-Mounted, Double-Wall, Fuel-Oil Tank: Factory installed and piped, complying with UL 142 fuel-oil tank. Features include the following:
1. Tank level indicator.
 2. Fuel-Tank Capacity: Minimum 133 percent of total fuel required for planned operation plus fuel for periodic maintenance operations between fuel refills with a minimum tank capacity of 133 gallons.
 3. Leak detection in interstitial space.
 4. Vandal-resistant fill cap.
 5. Containment Provisions: Comply with requirements of authorities having jurisdiction.

2.6 CONTROL AND MONITORING

- A. Automatic Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in

one or more separate automatic transfer switches initiate starting and stopping of engine generator. When mode-selector switch is switched to the on position, engine generator starts. The off position of same switch initiates engine generator shutdown. When engine generator is running, specified system or equipment failures or derangements automatically shut down engine generator and initiate alarms.

- B. Manual Starting System Sequence of Operation: Switching on-off switch on the generator control panel to the on position starts engine generator. The off position of same switch initiates engine generator shutdown. When engine generator is running, specified system or equipment failures or derangements automatically shut down engine generator and initiate alarms.
- C. Comply with UL 508A.
- D. Configuration: Operating and safety indications, protective devices, basic system controls, and engine gauges will be grouped in a common control and monitoring panel mounted on the engine generator. The mounting method will isolate the control panel from generator-set vibration. Panel will be powered from the engine generator battery.
- E. Control and Monitoring Panel:
 - 1. Digital engine generator controller with integrated alphanumeric display, providing two lines of data. The display has back lighting for ease of operator use in high- and low-light conditions. Capable of local and remote control, monitoring, and programming.
 - 2. Operating Temperature: Minus 40 to plus 158 deg F.
 - 3. Maximum Operating Humidity: 95 percent noncondensing.
 - 4. Corrosion Resistant: Tested in accordance with ASTM B117 (salt spray test).
 - 5. Controller Features:
 - a. Mode Selector: Allowing selection of one of the following modes:
 - 1) Off/Reset: Prohibits the generator from starting and resets shutdowns. In this mode, the controller does not respond to remote start and stop commands.
 - 2) Manual: Allows user to locally start and stop to operate the generator. In this mode, the controller does not respond to remote start and stop commands.
 - 3) Auto: Allows generator to start and stop based on remote commands. In this mode, the generator does not respond to manual start and stop commands.
 - b. Emergency Stop Switch: Latch-type remote stop switch, red in color with mushroom-type head. Depressing the stop button will immediately stop the generator set and lock out any automatic remote starting.
 - c. Audible Alarm: Horn sounds for specific warning and shutdown conditions.

- d. Alarm Silence/Lamp Test Pushbutton: Silences audible alarm when depressed. All controller-indicating lights are simultaneously illuminated while actuated.
 - e. Fault Light: LED indicating abnormal conditions:
 - 1) Yellow: Active warning condition or mode selector switch not in automatic.
 - 2) Red: Active shutdown condition.
 - f. Engine Control Features:
 - 1) Programmable engine start delay.
 - 2) Programmable engine cool-down delay.
 - 3) Programmable warm-up delay based on time or engine temperature.
 - 4) Programmable idle speed.
 - 5) Programmable cyclic cranking with adjustable on time, off time, and number of cycles.
 - g. Event Logging:
 - 1) Maintain record of a minimum of 1,000 events with date and time locally for warning and shutdown faults.
6. Monitoring Instruments: Accessible through the digital engine generator controller and viewable during operation.
- a. Engine-coolant temperature.
 - b. Battery voltage.
 - c. Running-time meter.
 - d. Engine speed.
 - e. Oil pressure.
 - f. Fuel level (with optional sensor)
 - g. Fuel pressure.
 - h. AC output voltage for each phase, 0.5 percent accuracy.
 - i. AC output current for each phase, 0.5 percent accuracy.
 - j. AC frequency meter, 0.5 percent accuracy.
 - k. kW total and per phase, 1.0 percent accuracy.
 - l. kVARS total and per phase, 1.0 percent accuracy.
 - m. kVA total and per phase, 1.0 percent accuracy.
 - n. kW hours.
7. Service Data: Stored in the controller and available for display.
- a. Generator model number and serial number.
 - b. Controller serial number and firmware version.
8. Operational Records: Stored in controller beginning at system startup.

- a. Total run-time hours.
 - b. Total loaded hours.
 - c. Total kW hours.
 - d. Controller run-time hours.
 - e. Number of starts.
9. Controls and Protective Devices: Controls, shutdown devices, and common visual alarm indication, including the following:
- a. Mode selector switch not in automatic position.
 - b. Overcrank shutdown.
 - c. Low lubricating-oil pressure warning.
 - d. Low lubricating-oil pressure shutdown.
 - e. Low coolant temperature warning.
 - f. High engine temperature warning.
 - g. High engine temperature shutdown.
 - h. Overspeed shutdown.
 - i. Low fuel pressure shutdown.
 - j. Low fuel main tank.
 - 1) Low-fuel-level alarm to be initiated when the level falls below that required for operation for duration.
 - 2) Critically low-fuel-level warning.
 - k. Coolant high-temperature warning.
 - l. Coolant high-temperature shutdown.
 - m. Battery high-voltage warning.
 - n. Battery-charger malfunction warning.
 - o. Battery low-voltage warning.
 - p. Remote manual stop shutdown.
 - q. Local manual stop shutdown.
 - r. Alternator protection shutdown.
 - s. Overcurrent warning.
 - t. Overcurrent shutdown.
 - u. Under frequency warning.
 - v. Under frequency shutdown.
 - w. Over frequency warning.
 - x. Over frequency shutdown.
 - y. Over power warning.
 - z. Over power shutdown.
 - aa. Under voltage warning.
 - bb. Under voltage shutdown.
 - cc. Over voltage warning.
 - dd. Over voltage shutdown.
 - ee. User-defined input warning.
 - ff. User-defined input shutdown.

- gg. No oil pressure signal shutdown.
- hh. No speed sensor signal shutdown.
- ii. Fail-to-start shutdown.

F. Connection to Datalink:

- 1. Provide connections for datalink transmission of indications to remote data terminals via ModBus RTU.

G. Supporting Items: Sensors, transducers, terminals, relays, and other devices located on engine or generator unless otherwise indicated.

H. Remote Emergency-Stop Switch: Wall mounted unless otherwise indicated. Push button must be permanently labeled and protected from accidental operation.

I. Remote Alarm Annunciator: LED indicator light labeled with proper alarm conditions will identify each alarm event, and a common audible signal will sound for each alarm condition in accordance with NFPA 110. The silencing switch in face of panel will silence signal without altering visual indication. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset. Controls to include "Lamp Test" momentary switch wired to illuminate all LED indicator lights regardless of alarm state while switch is on. Cabinet and faceplate are surface- or flush-mounting type to suit mounting conditions indicated.

J. Start Signal Wiring Integrity Monitor: UL-listed modular system to monitor condition of generator remote start circuit(s), annunciate faults, and start generator in accordance with NFPA 70, Article 700.10(D)(4).

- 1. Output Contacts: Two form "C" contacts, one for engine start and one for start circuit alarm.

2.7 GENERATOR OVERCURRENT AND FAULT PROTECTION

A. Overcurrent protective devices shall be coordinated to optimize selective tripping when a short circuit occurs.

- 1. Overcurrent protective devices for the entire EPSS to be coordinated to optimize selective tripping when a short circuit occurs. Coordination of protective devices considers both utility and EPSS as the voltage source.
- 2. Overcurrent protective devices for the EPSS to be accessible only to authorized personnel.

B. Generator Overcurrent Protective Device:

- 1. Molded-case circuit breaker, thermal-magnetic type; 100 percent rated; complying with UL 489:

- a. Tripping Characteristic: Designed specifically for generator protection.
- b. Trip Rating: Matched to generator output rating.
- c. Mounting: Adjacent to, or integrated with, control and monitoring panel.

2.8 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

- A. Comply with NEMA MG 1.
- B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.
- C. Electrical Insulation: Class H.
- D. Stator-Winding Leads: Brought out to terminal box to permit future reconnection for other voltages if required.
- E. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation.
- F. Enclosure: Dripproof.
- G. Voltage Regulator: Microprocessor-based, high-speed digital voltage regulator, separate from exciter, with three-phase, true RMS sensing, providing performance as specified and as required by NFPA 110.
 - 1. Maintain steady-state voltage within 0.50 percent from no load to full load.
 - 2. Adjusting Feature on Control and Monitoring Panel: Provide plus or minus 10 percent adjustment of output-voltage operating band.
- H. Strip Heater: Thermostatically controlled unit arranged to maintain stator windings above dew point.
- I. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.
- J. Subtransient Reactance: 16 percent, maximum.

2.9 LOAD BANK

- A. Permanent, outdoor, weatherproof, remote-controlled, forced-air-cooled, resistive unit capable of providing a balanced three-phase, delta-connected load to engine generator at 100 percent rated-system capacity, at 80 percent power factor, lagging. Unit may contain separate resistive and reactive load banks controlled by a common control panel. Unit to be capable of selective control of load in 25 percent steps and with minimum step changes of approximately 5 and 10 percent available.
- B. Regulatory Requirements:

1. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
- C. General Characteristics:
1. Reference Standards: UL CCN NMTR and UL 508.
- D. Resistive Load Elements: Corrosion-resistant chromium alloy with ceramic and stainless-steel supports. Elements to be double insulated and designed for repetitive on-off cycling. Elements to be mounted in removable aluminized-steel heater cases. Galvanized steel is prohibited. The element's maximum resistance to be between 100 and 105 percent of rated resistance.
- E. Reactive Load Elements: Epoxy-encapsulated reactor coils.
- F. Load-Bank Heat Dissipation: Integral fan with totally enclosed motor provides uniform cooling airflow through load elements. Airflow and coil operating current to be such that, at maximum load, with ambient temperature at the upper end of specified range, load-bank elements operate at not more than 50 percent of maximum continuous temperature rating of resistance elements.
- G. Load-Element Switching: Remote-controlled contactors switch groups of load elements. Contactor coils are rated 120 V. Contactors to be located in a separate NEMA 250, Type 3R enclosure within load-bank enclosure, accessible from exterior through hinged doors with tumbler locks.
- H. Contactor Enclosures: Heated by thermostatically controlled strip heaters to prevent condensation.
- I. Load-Bank Enclosures: NEMA 250, Type 3R, aluminized steel complying with NEMA ICS 6. Louvers at cooling-air intake and discharge openings prevent entry of rain and snow. Openings for airflow to be screened with 1/2-inch- (13-mm-) square, galvanized-steel mesh. Reactive load bank includes automatic shutters at air intake and discharge. Components other than resistive elements to receive exterior epoxy coating with compatible primer.
- J. Protective Devices: Power input circuits to load banks to be fused, and fuses selected to coordinate with generator circuit breaker. Fuse blocks to be located in contactor enclosure. Cooling airflow and overtemperature sensors automatically shut down and lock out load bank until manually reset. Safety interlocks on access panels and doors disconnect load power, control, and heater circuits. Fan motor to be separately protected by overload and short-circuit devices. Short-circuit devices to be noninterchangeable fuses with 200,000-A interrupting capacity.
- K. Load-Bank Remote-Control Panel: Separate from load bank in NEMA 250, Type 1 enclosure with a control power switch and pilot light, and switches controlling groups of load elements.

2.10 OUTDOOR ENGINE GENERATOR ENCLOSURE

A. Description:

1. Vandal-resistant, sound-attenuating, weatherproof aluminum enclosure with 0.080-inch thick walls; wind resistant. Multiple panels to be lockable and provide adequate access to components requiring maintenance, minimum two doors per side. Access to controller and main line circuit breaker in accordance with NFPA 70. Panels to be removable by one person without tools. Instruments and controls be mounted within enclosure.

B. Source Limitations: Obtain enclosure from engine-driven generator manufacturer.

C. Structural Design and Anchorage: Comply with ASCE/SEI 7 for wind loads up to 186 mph (299 kph).

D. Minimum Snow Load Rating: 70 psf (33.5 kPa).

E. Access doors and panels rubber sealed to prevent water intrusion and minimize noise.

F. Hinged Doors: Lockable; keyed alike with recessed locks.

G. Insulation Flammability Classification: UL 94 HF1.

H. Muffler Location: Complete exhaust system located within enclosure.

I. Engine-Cooling Airflow through Enclosure: Maintain temperature rise of system components within required limits.

J. Stainless steel latches, hinges, and hardware on external panels of enclosure.

2.11 VIBRATION ISOLATION DEVICES

A. Elastomeric Vibration Isolators: Oil- and water-resistant elastomer neoprene or natural rubber, molded with a nonslip pattern and baseplates of sufficient stiffness for uniform loading over pad area, and factory cut to sizes that match requirements of supported equipment. Compliant with ISO 8528-9.

B. Vibration isolation devices may not be used to accommodate misalignments or to make bends.

2.12 FINISHES

A. Indoor and Outdoor Enclosures and Components: Heavy-duty, high-durability, fade-, scratch- and corrosion-resistant finish achieved through a multi-stage finishing process from the genset manufacturer including:

1. Pre-cleaning: Enclosure components cleaned with a two-stage alkaline cleaning process to remove grease, grit, and grime from parts then subjected to a Zirconium-based conversion coating process to prepare the metal for electrocoat (e-coat) adhesion.
 2. Primer: All enclosure parts to receive 100 percent epoxy primer electrocoat (e-coat) with high-edge protection.
 3. Finish Coating: Powder-baked paint for superior finish, durability, and appearance.
 4. Minimum Enclosure Corrosion Resistance: 3000 hours salt spray test in accordance with ASTM B117.
 5. Powder coat for fading and abrasion resistance.
- B. Subbase Tank: Polyurea-texturized rubber coating for corrosion protection and adequate surface grip from the genset manufacturer.

2.13 SOURCE QUALITY CONTROL

- A. Prototype Testing: Factory test engine generator using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.
1. Tests: Comply with IEEE 115
- B. Project-Specific Equipment Tests: Before shipment, factory test engine generator 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 generator, exciter, and voltage regulator as a unit.
 2. Load Test: 25, 50, 75 and 100 percent rated load.
 3. Single-step load pickup.
 4. Safety shutdown.
 5. Overcrank.
 6. Locked rotor.
 7. Mechanical Readings: Oil pressure, ambient temperature, and coolant temperature.
 8. Report factory test results within 10 days of completion of test.

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 PREPARATION

- A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:
 - 1. Notify Engineer no fewer than working days in advance of proposed interruption of electrical service.
 - 2. Do not proceed with interruption of electrical service without Engineer's written permission.

3.3 INSTALLATION

- A. Comply with NECA 1 and NECA 404.
- B. Comply with packaged engine generator manufacturers' written installation and alignment instructions.
- C. Equipment Mounting:
 - 1. Install packaged engine generators on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Section 030000 – Concrete Work."
 - 2. Coordinate size and location of concrete bases for packaged engine generators. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.
 - 3. Install engine generator with a skin-tight enclosure.
- D. Install packaged engine generator to provide access, without removing connections or accessories, for periodic maintenance.
- E. Exhaust System: Install Schedule 40 black steel piping with welded joints and connect to engine muffler. Piping sized in accordance with allowable back pressure for the engine and indicated on mechanical plans.
- F. Drain Piping: Install condensate drain piping to muffler drain outlet full size of drain connection with a shutoff valve, stainless-steel flexible connector, and Schedule 40 black steel pipe with welded joints.
- G. Fuel Piping:

1. Copper and galvanized steel shall not be used in the fuel-oil piping system.
- H. Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.

3.4 CONNECTIONS

- A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping and specialties.
- B. Connect fuel, cooling-system, and exhaust-system piping adjacent to packaged engine generator to allow space for service and maintenance.
- C. Connect cooling-system water piping to engine generator with flexible connectors.
- D. Connect engine exhaust pipe to engine with flexible connector.
- E. Ground equipment in accordance with NFPA 70.
- F. Connect fuel piping to engines with a gate valve and union and flexible connector.
- G. Connect wiring according to drawings and NFPA 70. Provide a minimum of one 90-degree bend in flexible conduit routed to the engine generator from a stationary element.
- H. Balance single-phase loads to obtain a maximum of 10 percent unbalance between any two phases.

3.5 IDENTIFICATION

- A. Install a sign indicating the generator neutral is bonded to the main service neutral at the main service location.

3.6 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- B. Tests and Inspections:
1. Perform tests recommended by manufacturer and each visual and mechanical inspection and electrical and mechanical test listed in first two subparagraphs below, as specified in NETA ATS. Certify compliance with test parameters.

- a. Visual and Mechanical Inspection:
 - 1) Compare equipment nameplate data with Drawings and the Specifications.
 - 2) Inspect physical and mechanical condition.
 - 3) Inspect anchorage, alignment, and grounding.
 - 4) Verify that the unit is clean.
 - b. Electrical and Mechanical Tests:
 - 1) Verify phase rotation, phasing, and synchronized operation as required by the application.
 - 2) Functionally test engine shutdown for low oil pressure, overtemperature, overspeed, and other protection features as applicable.
 2. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here, including, but not limited to, single-step full-load pickup test.
 3. Battery Tests: Equalize charging of battery cells in accordance with manufacturer's written instructions. Record individual cell voltages.
 - a. Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions. Check electrolyte level and specific gravity under both conditions.
 - b. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery.
 - c. Verify acceptance of charge for each element of the battery after discharge.
 - d. Verify that measurements are within manufacturer's specifications.
 4. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.
 5. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine generator system before and during system operation. Check for air, exhaust, and fluid leaks.
 6. Voltage and Frequency Transient Stability Tests: Use recording oscilloscope to measure voltage and frequency transients for 50 and 100 percent step-load increases and decreases, and verify that performance is as specified.
 7. Harmonic-Content Tests: Measure harmonic content of output voltage at 25 and 100 percent of rated linear load. Verify that harmonic content is within specified limits.
 8. Noise Level Tests: Measure A-weighted level of noise emanating from engine generator installation, including engine exhaust and cooling-air intake and discharge, at four locations 23 feet from edge of the generator enclosure, and compare measured levels with required values.
- C. Coordinate tests with tests for transfer switches and run them concurrently.

- D. Test instruments shall have been calibrated within the past 12 months, traceable to NIST Calibration Services, and adequate for making positive observation of test results. Make calibration records available for examination on request.
- E. Leak Test: After installation, charge exhaust, coolant, and fuel systems and test for leaks. Repair leaks and retest until no leaks exist.
- F. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation for generator and associated equipment.
- G. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- H. Remove and replace malfunctioning units and retest as specified above.
- I. Retest: Correct deficiencies identified by tests and observations, and retest until specified requirements are met.
- J. 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.
- K. Infrared Scanning: After Substantial Completion, but not more than 60 days after final acceptance, perform an infrared scan of each power wiring termination and each bus connection while running with maximum load. Remove all access panels so terminations and connections are accessible to portable scanner.
 - 1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan 11 months after date of Substantial Completion.
 - 2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 - 3. Record of Infrared Scanning: Prepare a certified report that identifies terminations and connections checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generators.

END OF SECTION 263213.14

SECTION 263600 - ENCLOSED TRANSFER SWITCHES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Automatic transfer switches.

1.2 REFERENCES

- A. NFPA 70 - National Electrical Code.
- B. NEMA ICS 1 - General Standards for Industrial Control and Systems.
- C. NEMA ICS 2 - Standards for Industrial Control Devices, Controllers, and Assemblies.
- D. NEMA ICS 6 - Enclosures for Industrial Controls and Systems.
- E. UL 1008 - Standard for Transfer Switch Equipment

1.3 SUBMITTALS

- A. Submit under provisions of Division 1.
- B. Product Data: Provide catalog sheets showing voltage, switch size, ratings and size of switching and overcurrent protective devices, operating logic, short circuit ratings, dimensions, and enclosure details.
- C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.2 OPERATION AND MAINTENANCE DATA

- A. Operation Data: Include instructions for operating equipment. Include instructions for operating equipment under emergency conditions when engine generator is running.
- B. Maintenance Data: Include routine preventative maintenance and lubrication schedule. List special tools, maintenance materials, and replacement parts.

1.3 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience, and with service facilities within 100 miles of Project.

- B. Supplier: Authorized distributor of specified manufacturer with minimum three years documented experience. NOTE: Switches for the project shall be supplied by the same manufacturer as the generator.

1.4 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Furnish products listed and classified by UL as suitable for purpose specified and indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Division 1.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to internal components, enclosure and finish.

1.6 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on shop drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Kohler
- B. Cummins
- C. Or Approved Equal

2.2 AUTOMATIC TRANSFER SWITCH

- A. Description: NEMA ICS 2, automatic transfer switch.
- B. Configuration: Electrically operated, mechanically held transfer switch.

2.3 RATINGS

- A. Voltage: 480 volts, three phase, four wire, 60 Hz.
- B. Switched Poles: 3; with solid neutral.

- C. Load Inrush Rating: Combination.
- D. Continuous Rating: 200A.
- E. Withstand Current Rating: 22 kA rms symmetrical amperes minimum.

2.4 PRODUCT OPTIONS AND FEATURES

A. Summary of Options:

Microprocessor logic,
 Adjustable time Delay Normal to Emergency
 Adjustable time Delay Engine Start Adj. .5-15 secs.
 Adjustable time Delay Emergency to Normal
 Adjustable time Delay Engine Cooloff
 Emer. Source Sensing:
 Test pushbutton
 Electrical Operator Isolation Switch
 Single Phase Under Volt/Under Freq.
 Indication / Pilot Light: Normal Position
 Indication / Pilot Light: Emergency Position
 Indication / Pilot Light: Normal Tripped
 Indication / Pilot Light: Emergency Tripped
 Aux. Contacts: Norm Source Avail. 4NO/4NC
 Aux. Contacts: Emer Source Avail. 4NO/4NC
 Normal and Emergency Over current protection
 Auto. Plant Exer.: Selectable Load/No Load w/Failsafe

- B. Test Switch: Mount in cover of enclosure to simulate failure of normal source.
- C. Return to Normal Switch: Mount in cover of enclosure to initiate manual transfer from alternate to normal source.
- D. Transfer Switch Auxiliary Contacts: 2 normally open; 2 normally closed.
- E. Normal Source Monitor: Monitor each line of normal source voltage and frequency; initiate transfer when voltage drops below 85 percent or frequency varies more than 3 percent from rated nominal value.
- F. Alternate Source Monitor: Monitor alternate source voltage and frequency; inhibit transfer when voltage is below 85 percent or frequency varies more than 3 percent from rated nominal value.
- G. Open transition transfer.

2.5 AUTOMATIC SEQUENCE OF OPERATION

- A. Initiate Time Delay to Start Alternate Source Engine Generator: Upon initiation by

normal source monitor.

- B. Time Delay To Start Alternate Source Engine Generator: 0 to 15 seconds, adjustable.
- C. Initiate Transfer Load to Alternate Source: Upon initiation by normal source monitor and permission by alternate source monitor.
- D. Time Delay Before Transfer to Alternate Power Source: 0 to 3 minutes, adjustable.
- E. Initiate Retransfer Load to Normal Source: Upon permission by normal source monitor.
- F. Time Delay Before Transfer to Normal Power: 0 to 30 minutes, adjustable; bypass time delay in event of alternate source failure.
- G. Time Delay Before Engine Shut Down: 0 to 30 minutes, adjustable, of unloaded operation.
- H. Engine Exerciser: Start engine every 7 days; run for 30 minutes before shutting down. Bypass exerciser control if normal source fails during exercising period.
- I. Alternate System Exerciser: Transfer load to alternate source during engine exercising period.

2.6 ENCLOSURE

- A. Enclosure: NEMA Type 4X – outdoor unit.
- B. Finish: Painted Steel for NEMA 4X.
- C. Surface Mounted

PART 3 - EXECUTION

3.1 INSTALLATION

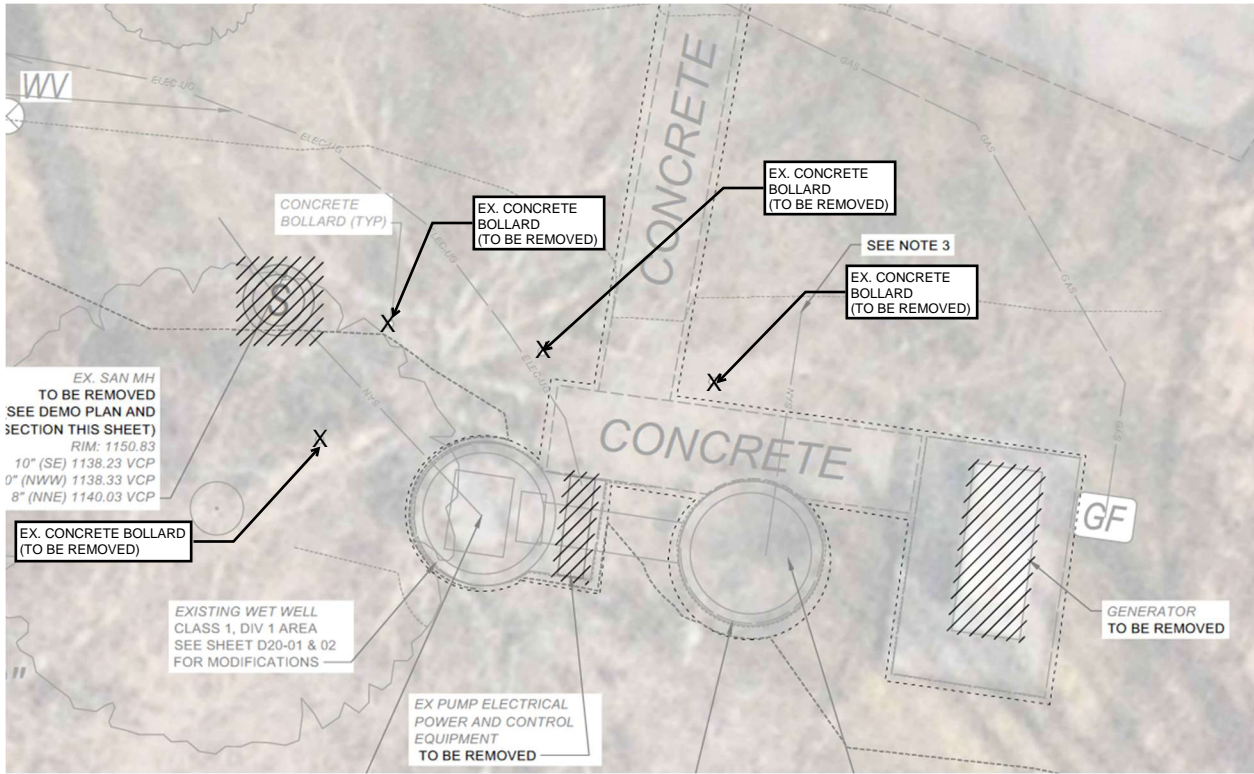
- A. Install transfer switches in accordance with manufacturer's instructions.
- B. Provide engraved plastic nameplate.
- C. Include startup by authorized technician and coordinate with generator manufacturer.

3.2 WARRANTY- Provide 5-year comprehensive warranty with parts, labor and travel

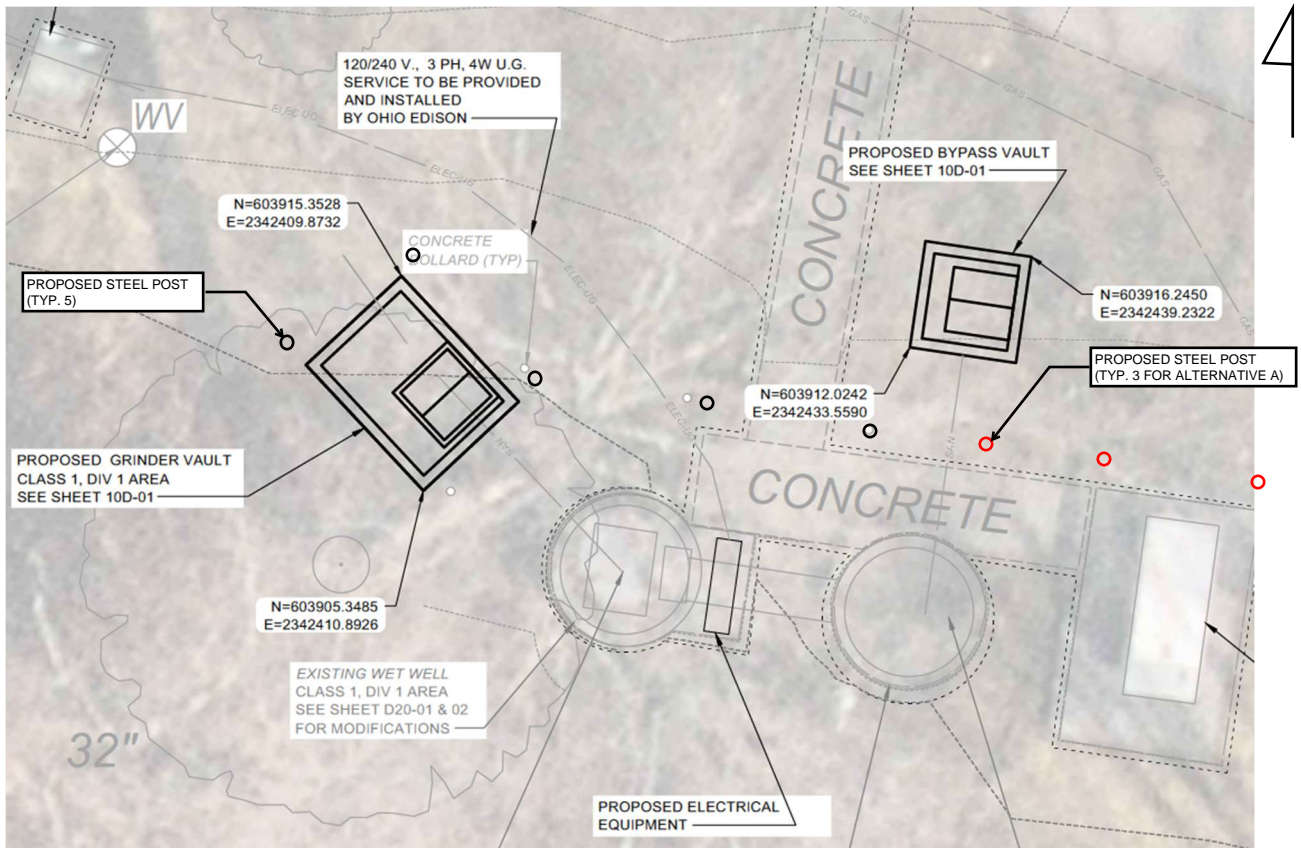
3.3 DEMONSTRATION

- A. Provide systems demonstration under provisions of Division 1.
- B. Demonstrate operation of transfer switches in normal and emergency modes.

END OF SECTION 263600

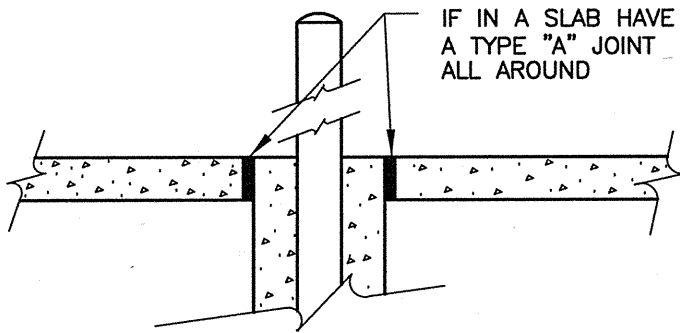
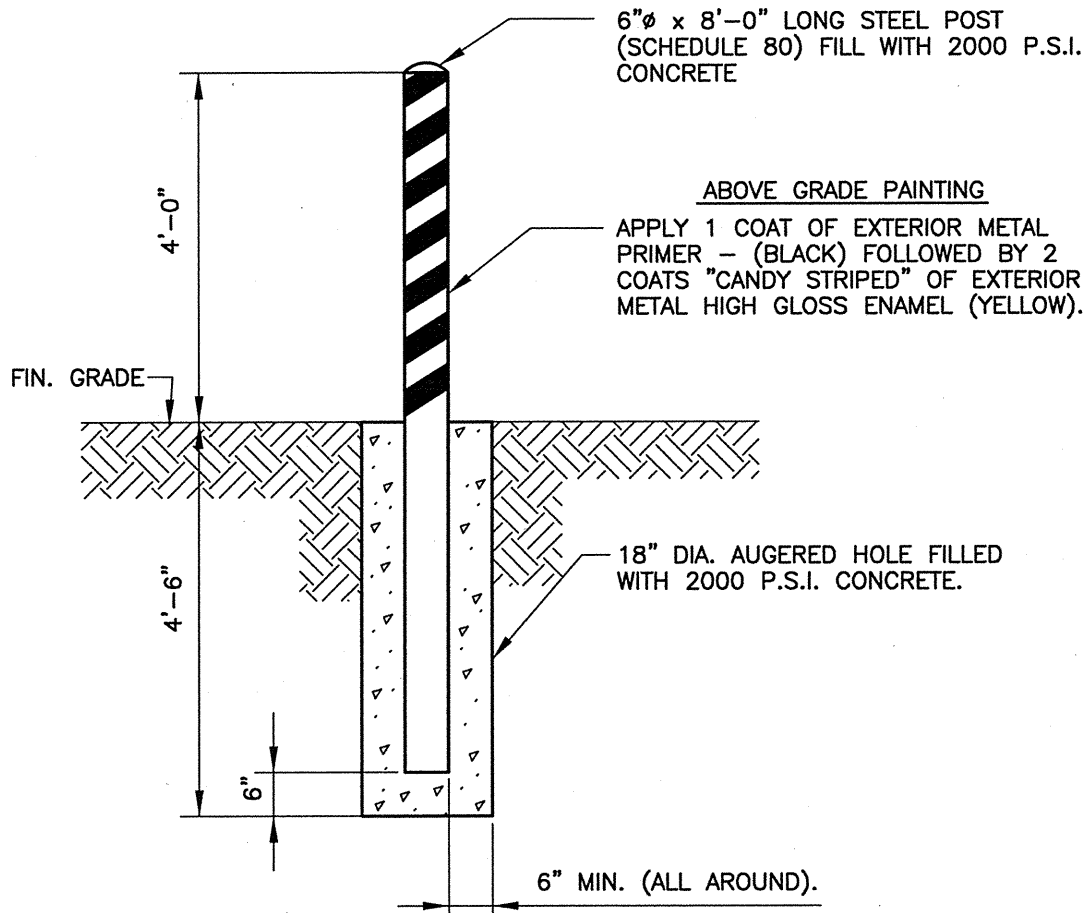


EXISTING BOLLARD PLAN
SCALE : NTS

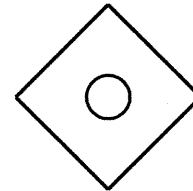


PROPOSED BOLLARD PLAN
SCALE : NTS

- NOTE:
1. STEEL POST SHALL BE FIELD LOCATED.
2. ALTERNATIVE A SHALL INCLUDE 3 ADDITIONAL STEEL POST.



SECTION



DIAMOND AROUND POST
WITH TYPE "A" JOINT

PLAN

STEEL POST DETAIL