



Wight & Company

wightco.com

.....  
2500 North Frontage Road

Darien, IL 60561

.....

P 630.969.7000

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DATE: May 31, 2019

FROM: Wight Construction Services, Inc.  
2500 N. Frontage Road  
Darien, IL 60561

SUBJECT: ADDENDUM #1 TO THE BIDDING DOCUMENTS FOR:  
**BID GROUP #6**  
**MASTER FACILITY PLAN IMPLEMENTATION**  
**COMMUNITY HIGH SCHOOL DISTRICT 99**  
**SOUTH HIGH SCHOOL**  
**1436 NORFOLK STREET**  
**DOWNERS GROVE, IL 60516**

This addendum forms a part of the Bidding Contract Documents. Bidders must acknowledge receipt of this Addendum in the space provided on the Bid Form.

**Attached is the Elevator scope of work, Fire pump generator scope of work and the schedule:**

BP#50 – Elevators Scope of Work  
BP#50 – Fire Pump Generator Scope of Work – North High School  
Construction Schedule attached.

**Drawing:**

E3.00FP

**Specifications:**

Firetrol FTA1930 - Digital Solid State Starting with Power Transfer Switch  
Section 263213-Engine Generators Automatic Transfer Switch

END OF ADDENDUM

**Scope – This TRADE CONTRACTOR's scope shall include but not be limited to the scope listed below. Please see entirety of bid documents for all scope requirements.**

**BG6 BP50 SCOPE OF WORK FOR ELEVATORS –SOUTH HIGH SCHOOL (Phase B)**

1. This TRADE CONTRACTOR shall reference ALL General, Civil, Structural, Architectural sheets included in this Bid Group 6 as they relate to Elevators. This TRADE CONTRACTOR shall read all Specification Sections in this manual as well as Notes and General Notes included in the drawings as they pertain to this scope of work.
2. This TRADE CONTRACTOR is to perform under guidelines of phasing and scheduling. The schedule contained in this Bid Group may be updated by future adjustments that will become part of said contractors' agreement. The phasing plan and schedule to this project manual indicate areas of work. All labor and materials should be priced accordingly per schedule.
3. All mobilizations and demobilizations related costs of this TRADE CONTRACTOR are to be included without consideration of additional compensation.
4. This TRADE CONTRACTOR shall perform all the required scope of work according to the drawings, specifications, contract documents, local and state codes, etc.
5. This TRADE CONTRACTOR shall furnish, deliver, install, complete and/or otherwise comply with all elevator work as referenced and/or implied in any aspect of this bid group package of documents.
6. This TRADE CONTRACTOR shall furnish and install all elevators as described in specification section 14123.16 included as part of the bid documents, including elevator L1 and L2. This TRADE CONTRACTOR shall provide fully operational elevators and all of its components, including but not limited to operation systems, door reopening devices, signal equipment, car enclosures, passenger hoistway entrances, interior cab finishes, excluding flooring, and all other elements as required.

**NOTE:** Both elevators shall be installed in June 2021. A detailed schedule will be provided to this TRADE CONTRACTOR in the future. Cost escalation shall be included in this TRADE CONTRACTOR's base bid. No additional cost for this concept will be covered by the owner or construction manager.

7. Beginning at **Substantial Completion**, this TRADE CONTRACTOR shall provide one year's full maintenance service by skilled employees of elevator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation at rated speed and capacity. Use parts and supplies as used in the manufacture and installation of original equipment. Perform maintenance, including emergency callback service, during normal working hours with a response time of 24 hours or less.
8. This TRADE CONTRACTOR shall be responsible for furnish and install of elevator items even if not shown on the drawings as required for the installation of this TRADE CONTRACTOR'S scope of work.
9. Attachment Plates and angle brackets for supporting guide-rail brackets are to be surface mounted to concrete elevator pit and embedded in 6" CMU masonry walls. THIS TRADE CONTRACTOR shall verify all shaft dimensions to confirm surface mounted brackets are acceptable in the concrete elevator pit walls. This contractor will be responsible for supplying loose embeds to the masonry contractor with detailed/dimensioned installation plans.

- 10. This TRADE CONTRACTOR shall be responsible for providing all submittals as listed in contract documents.
- 11. This TRADE CONTRACTOR shall be responsible to submit shop drawings in a timely manner. The foundations and elevator shaft dimensions and configuration will be designed based on the shop drawings provided for this TRADE CONTRACTOR.

**ALLOWANCES, BOND, AND ALTERNATES**

- 1. This TRADE CONTRACTOR shall include an allowance of **\$10,000.00 in their base bid** to account for any unforeseen conditions. Contract amounts will be adjusted by change order for amounts greater or less than the allowance. Allowance to be utilized only at the direction of Construction Manager.
- 2. This TRADE CONTRACTOR will be required to provide a Performance and Payment Bond for their work in accordance with 00201 of the General Conditions.

**ACCEPTANCE**

Accepted as listed above in addition to terms and conditions of the original construction documents on which the bid was based.

Company: Wight Construction Services, Inc.  
2500 North Frontage Road  
Darien, IL 60561

Signed: \_\_\_\_\_

Printed Name: \_\_\_\_\_

Position: \_\_\_\_\_

Date: \_\_\_\_\_

**END OF SECTION 00300 –Scope**

**BG6 BP50 SCOPE OF WORK FOR GENERATOR – NORTH HIGH SCHOOL**

**Scope – This TRADE CONTRACTOR’s scope shall include but not be limited to the scope listed below. Please see entirety of bid documents for all scope requirements.**

1. This TRADE CONTRACTOR shall reference attached DG North Fire Pump Drawings and Firetrol and 50kw Generator specs. This TRADE CONTRACTOR shall complete this work by 8-15-2019.

**Note: This TRADE CONTRACTOR’S scope of work is a complete package and includes all components to get the generator operational. Work shall include all electrical, gas piping, removal of ACT ceiling and replacement for access, coring, testing, etc.**

2. This TRADE CONTRACTOR shall be responsible for furnishing and installing all materials, skilled and/or licensed labor, equipment, tools, etc. to complete all aspects of this trade contractor’s work for the complete electrical package including but not limited to **entire scope of work to turn over a completely function generator and** all work as listed in the specifications and shown on the construction documents.

**NOTE:** This TRADE CONTRACTOR IS **NOT** responsible for any finish painting of exposed conduits.

**NOTE:** This TRADE CONTRACTOR is responsible for fire stopping all thru wall penetrations in rated walls as indicated on construction documents and/or as specified in the project manual.

3. This TRADE CONTRACTOR shall review and become familiar with ALL documents included in this bid group. This Trade Contractor shall furnish, install, complete and/or otherwise comply with all work as noted and or implied by the following but not limited to: All Specification sections related to the Generator and firetrol specs.

**Note:** All Demolition work and disconnects will be completed by this TRADE CONTRACTOR and shall be responsible to verify all demolition work and make safe any connections and remove wiring back to existing panels.

4. This TRADE CONTRACTOR is responsible for shop drawings, layout, and field layout of conduits, boxes, hangers, fixtures, etc...

**Note:** This TRADE CONTRACTOR acknowledges that this contractor shall coordinate conduit layout in a neat and orderly fashion. This Trade Contractor further acknowledges that the design team will have some input on location and routing of exposed raceways.

5. This TRADE CONTRACTOR is responsible for shop drawings, layout, and field layout of this Trade Contractor’s work.

6. This TRADE CONTRACTOR shall be responsible for testing of electrical and gas systems as required in obtaining approval of inspection authorities having jurisdiction

**Note: This TRADE CONTRACTOR’s Guarantee/warranty period of equipment will not start until after final acceptance, including any and all equipment utilized before final acceptance.**

00300-1

- 7. This TRADE CONTRACTOR shall coordinate all piping to avoid conflicts with areas required for other trade contractor's work (i.e., F.P. piping, F.P. heads, ductwork, etc...).

**ALLOWANCES, BOND, & ALTERNATES**

- 1. This TRADE CONTRACTOR will be required to provide a Performance and Payment Bond for their work in accordance with 00201 of the General Conditions.

**ACCEPTANCE**

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Signed: \_\_\_\_\_

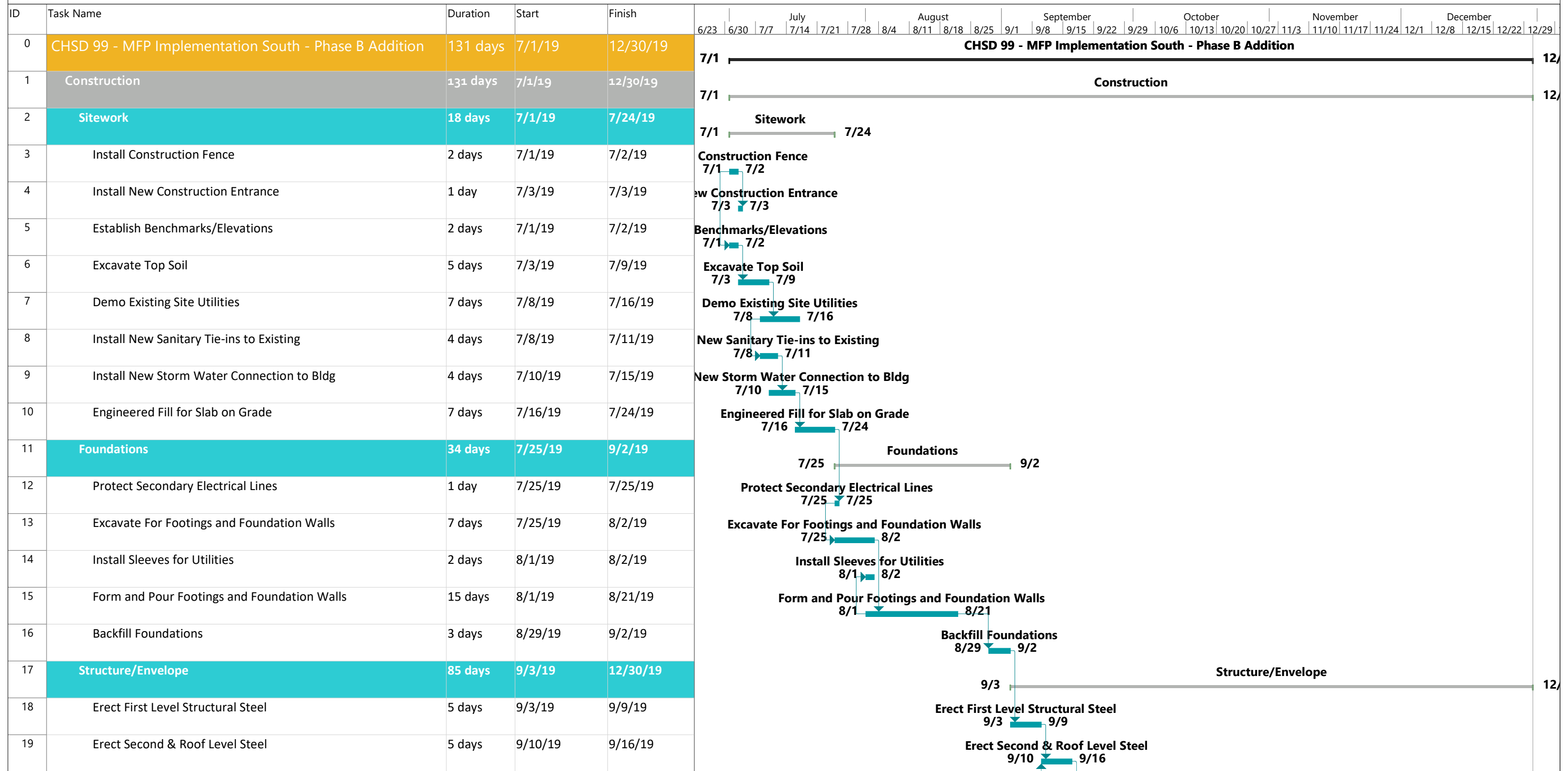
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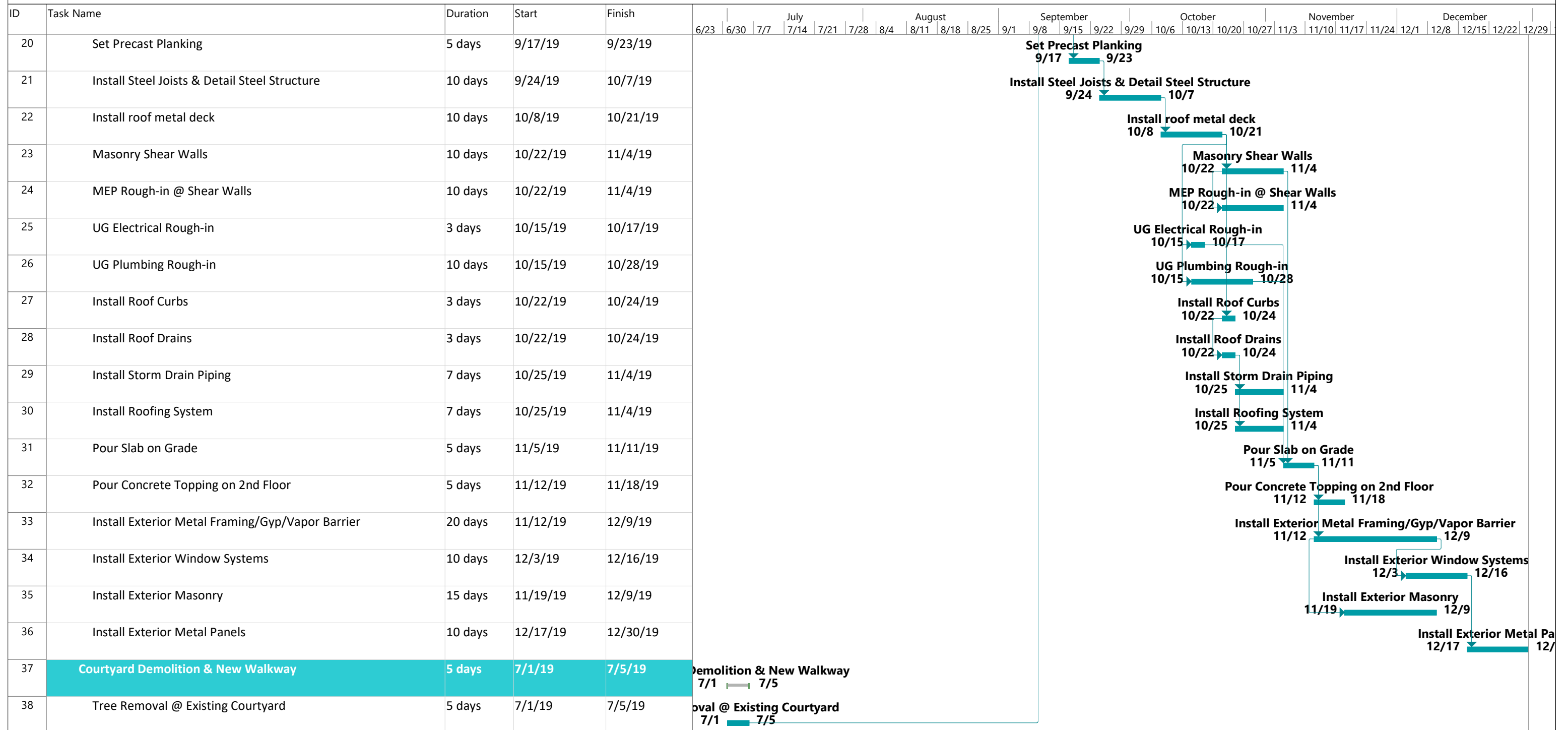
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**END OF SECTION 00300 –Scope**

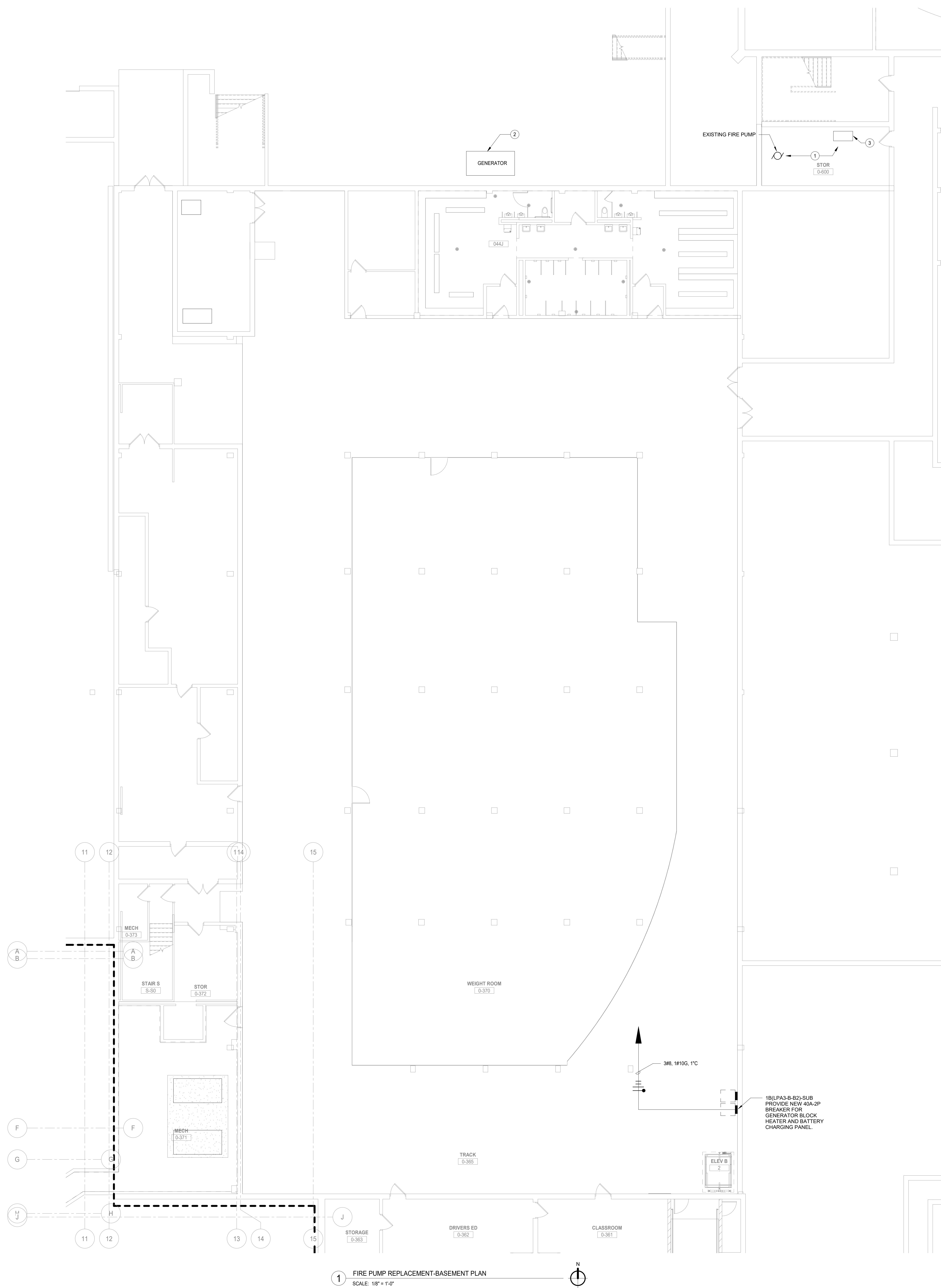
## CHSD 99 - MFP Implementation - South Bid Group 6 - Phase B Construction Schedule



## CHSD 99 - MFP Implementation - South Bid Group 6 - Phase B Construction Schedule



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**1 FIRE PUMP REPLACEMENT-BASEMENT PLAN**  
 SCALE: 1/8" = 1'-0"

**GENERAL NOTES**

1. THESE NOTES ARE APPLICABLE TO ALL POWER PLANS
2. THE MINIMUM WIRE SIZE SHALL BE #12 AWG EXCEPT FOR SHARED NEUTRAL CONDUCTORS WHICH THE MINIMUM SIZE SHALL BE #10 AWG. THE MINIMUM CONDUIT SIZE FOR HOMERUNS AND BRANCH FEEDS TO POWER OUTLETS SHALL BE 3/4" 1/2" CONDUIT IS ACCEPTABLE FOR BRANCH WIRING TO END OF THE LINE RECEPTACLES ONLY.
3. ALL POWER BRANCH CIRCUITS SHALL TERMINATE AT 20A/1-POLE CIRCUIT BREAKERS IN PANELS AND INDICATED UNLESS NOTED OTHERWISE.
4. THE CONTRACTOR SHALL PROVIDE ALL PENETRATIONS, SLEEVES, AND SEALANT AS REQUIRED THROUGH PARTITIONS TO ACCOMMODATE THE FIRE ALARM, PAGING, SECURITY, AUDIOVISUAL, VOICE, AND DATA CABLING. ANY PENETRATIONS THROUGH WALLS AND FLOORS SHALL BE PROPERLY SEALED AND TREATED TO MAINTAIN THE FIRE STOPPING RATING OF THE WALLS, FLOORS, AND CEILINGS.
5. BACKBOXES ARE TO BE MOUNTED OFFSET, NOT BACK TO BACK.
6. CIRCUIT NUMBERS, WHERE SHOWN, ARE TO INDICATE QUANTITY OF CIRCUITS REQUIRED. VERIFY EXACT CIRCUIT NUMBER TO BE UTILIZED IN FIELD. CONTRACTOR SHALL PROVIDE ACTUAL CIRCUITING AS PART OF "AS BUILT" DRAWINGS.
7. UNLESS INDICATED OTHERWISE, ALL MATERIALS REQUIRED TO PROVIDE BRANCH CIRCUITS AND FEEDERS ARE TO BE NEW.
8. REFER TO MECHANICAL AND PLUMBING SHEETS FOR ADDITIONAL EQUIPMENT INFORMATION.
9. ANY ELECTRICAL DEVICES ON NEW WALLS SHALL BE FLUSH MOUNTED. NO WREMOVALS ARE ACCEPTABLE ON NEW WALLS UNLESS NOTED OTHERWISE.
10. VERIFY RECEPTACLE LOCATIONS WITH ARCHITECTURAL FURNITURE LAYOUT TO ENSURE PROPER ACCESSIBILITY.
11. LOW VOLTAGE WIRING SHALL NOT LIE ON TOP OF CEILING GRID SYSTEM. WIRING SHALL BE SUPPORTED AT INTERVALS NOT EXCEEDING 5 FEET BY UTILIZING J-HOOKS SUPPORTED BY STRUCTURAL MEMBERS. WIRING SHALL BE ROUTED PARALLEL OR PERPENDICULAR TO STRUCTURAL MEMBERS.
12. PROVIDE PULL BOX(ES) BETWEEN PULL POINTS AS REQUIRED TO COMPLY WITH NEC 344.28 SUCH THAT THESE SHALL NOT BE MORE THAN THE EQUIVALENT OF FOUR QUARTER BENDS (90 DEGREE TOTAL) BETWEEN PULL POINTS.
13. SPECIAL ATTENTION SHALL BE PAID TO ALL CONDUIT ROUTING IN OPEN CEILING SPACE FOR AESTHETIC PURPOSES. ALL EXPOSED CONDUITS SHALL BE ROUTED PERPENDICULAR AND PARALLEL TO BUILDING LINES AND TIGHT TO CEILING/STRUCTURAL CORNERS. WHERE THIS IS NOT FEASIBLE, SUBMIT CONDUIT ROUTING PLAN TO ARCHITECT/ENGINEER FOR APPROVAL PRIOR TO INSTALLATION.
14. CONTRACTOR SHALL PROVIDE COMMON DISCONNECTING MEANS FOR BRANCH CIRCUITS UTILIZING SHARED NEUTRALS PER ARTICLE 210.4(B). HANDLE TIES ARE ACCEPTABLE WHEN BREAKERS ARE "SLASH RATED" FOR THE HIGHER SYSTEM VOLTAGE RATING OF THE SYSTEM. WHEN HANDLE TIES ARE NOT POSSIBLE DUE TO NON-ADJACENT BREAKERS, PROVIDE A DEDICATED NEUTRAL FOR EACH UNGROUNDED CONDUCTOR.
15. PROVIDE MANUAL MOTOR STARTER THERMAL OVERLOAD SWITCH AND 120V 20A CONTROL RELAY CONTRACTOR TO CONTROL PUMP/FAN. VERIFY CONTROL VOLTAGE WITH BUILDING AUTOMATION SYSTEM CONTRACTOR.
16. PROVIDE AUXILIARY RELAY WIRING FOR REVERSING OF HVAC CONTROLS AS REQUIRED. SEE MECHANICAL PLANS FOR ALL REQUIREMENTS. SEE MECHANICAL PLANS FOR ROUGH-IN LOCATION OF CONTROLS.

**# KEYNOTES**

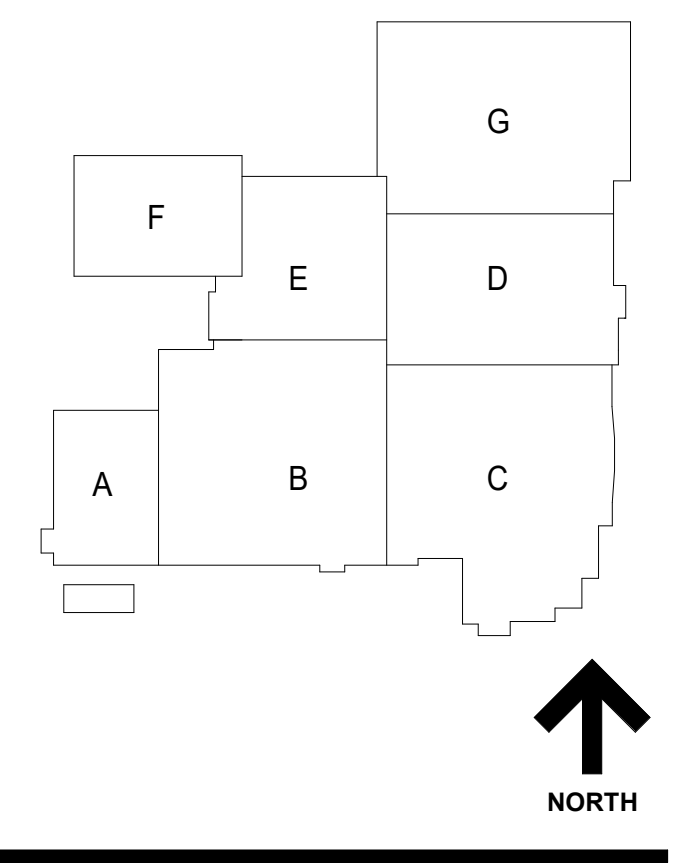
1. DISCONNECT AND REMOVE EXISTING CABLES AND CONDUIT FEEDING THE FIRE PUMP AND CONTROLLER. PULL CIRCUITS BACK TO THE SOURCE AND IDENTIFY AS SPARE. TURN OFF THE CIRCUIT BREAKER.
2. NEW NATURAL GAS GENERATOR ON EXISTING PAD ON GRADE.
3. NEW FIRE PUMP CONTROLLER TO REPLACE EXISTING.



COMMUNITY HIGH SCHOOL  
DISTRICT 99



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REV      ISSUE      DATE

**MFP  
 IMPLEMENTATION -  
 NORTH**

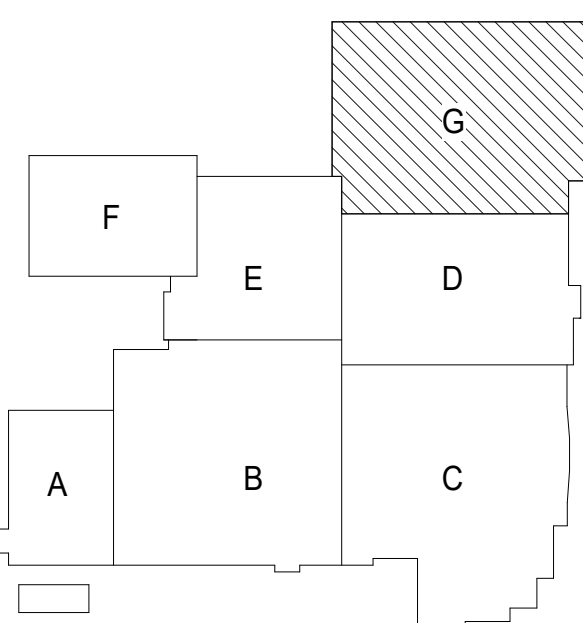
4436 MAIN STREET  
 DOWNERS GROVE, IL 60515

**FIRE PUMP  
 REPLACEMENT-BASEMENT  
 PLAN**

Project Number:  
 5274-42  
 Drawn By:  
 Author  
 Sheet:

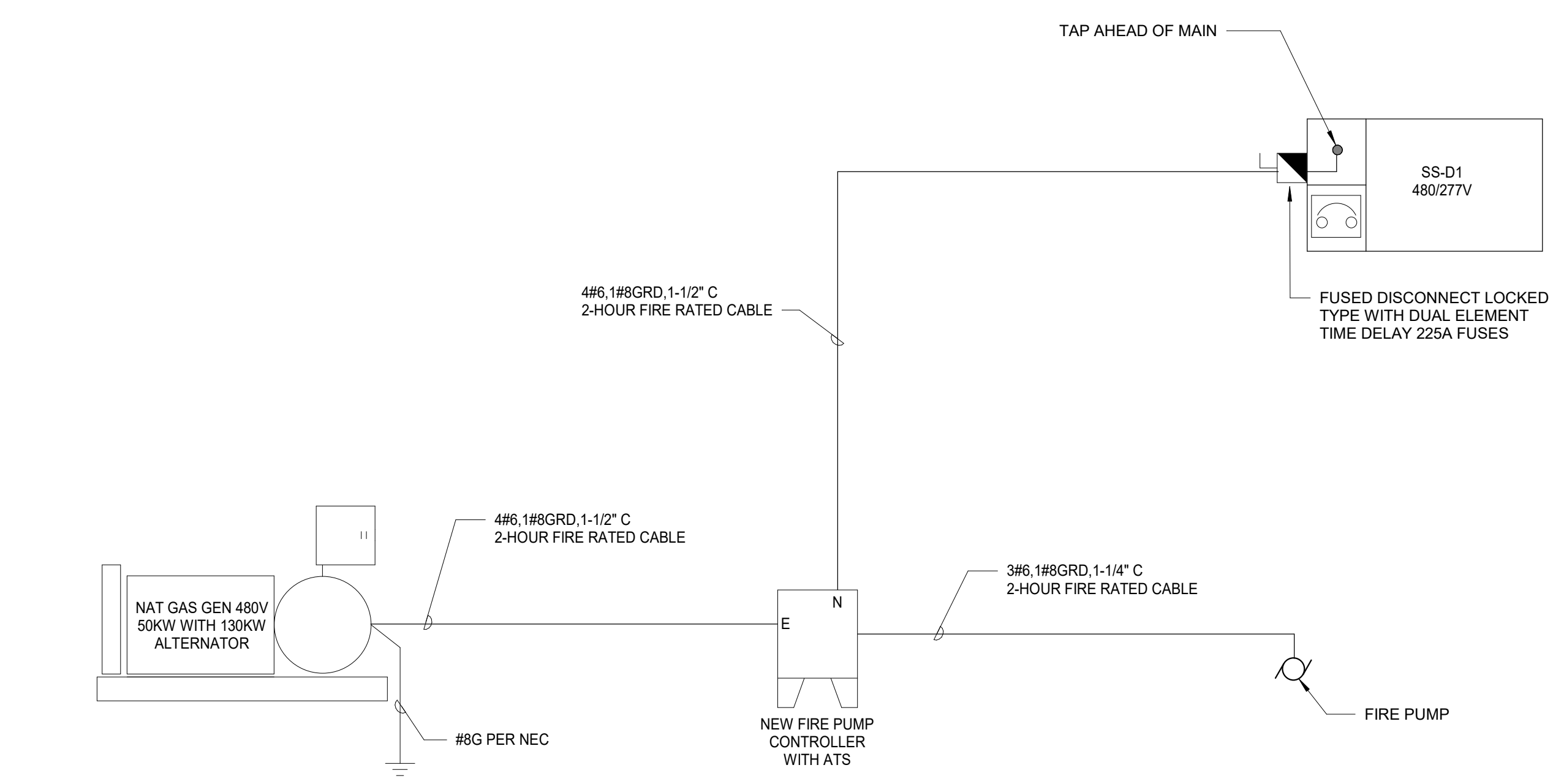
E3.00FP





GENERAL NOTES

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4. THE CONTRACTOR SHALL PROVIDE ALL PENETRATIONS, SLEEVES, AND SEALANT AS REQUIRED THROUGH PARTITIONS TO ACCOMMODATE THE FIRE ALARM, PAGING, SECURITY, AUDIOVISUAL, VOICE, AND DATA CABLING. ANY PENETRATIONS THROUGH WALLS AND FLOORS SHALL BE PROPERLY SEALED AND TREATED TO MAINTAIN THE FIRE STOPPING RATINGS OF THE WALLS, FLOORS, AND CEILINGS.
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15. PROVIDE MANUAL MOTOR STARTER THERMAL OVERLOAD SWITCH AND 120V, 20A, CONTROL RELAY CONTACTOR TO CONTROL PUMP-FAN (VERIFY CONTROL VOLTAGE WITH BUILDING AUTOMATION SYSTEM CONTRACTOR).
16. PROVIDE AUXILIARY RELAY (AR4) FOR INTERFACING OF HVAC CONTROLS AS REQUIRED. SEE MECHANICAL PLANS FOR ALL REQUIREMENTS. SEE MECHANICAL PLANS FOR ROUGH-IN LOCATION OF CONTROLS.



2 FIRE PUMP RISER  
N.T.S.



1 FIRE PUMP REPLACEMENT-LEVEL-2  
SCALE: 1/8" = 1'-4"

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REV ISSUE DATE

**MFP IMPLEMENTATION - NORTH**

4436 MAIN STREET  
DOWNERS GROVE, IL 60515

**FIRE PUMP REPLACEMENT-LEVEL 2**

Project Number:  
5274-42  
Drawn By:  
Author  
Sheet:  
**E3.02FP**

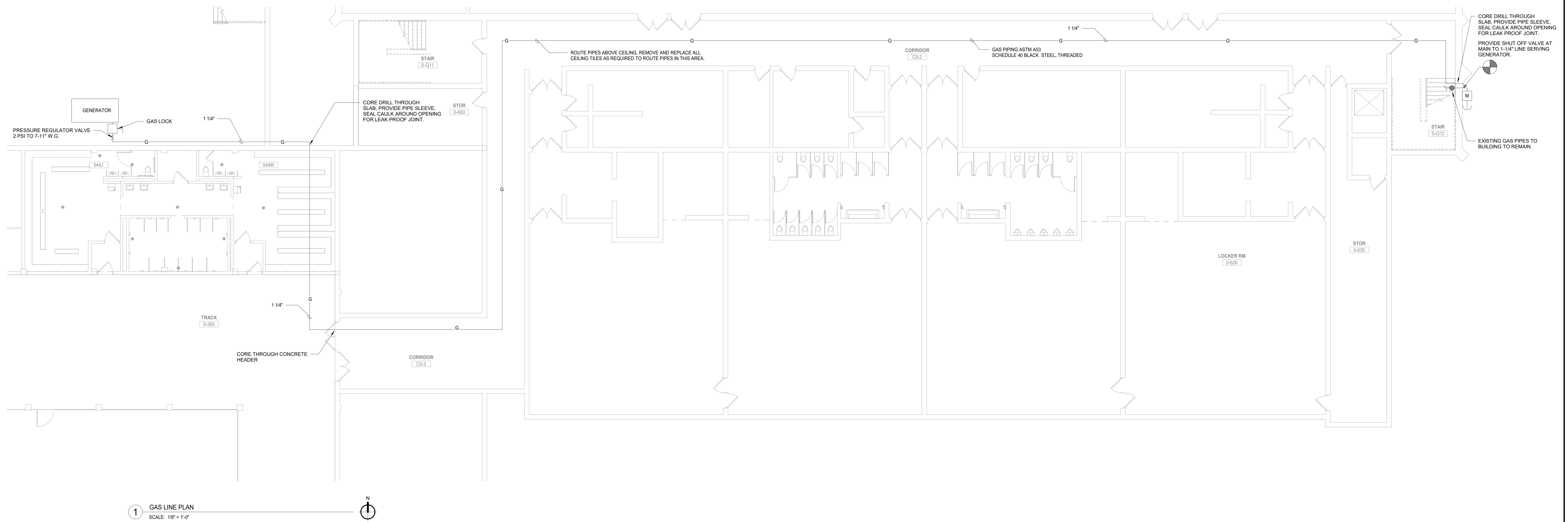
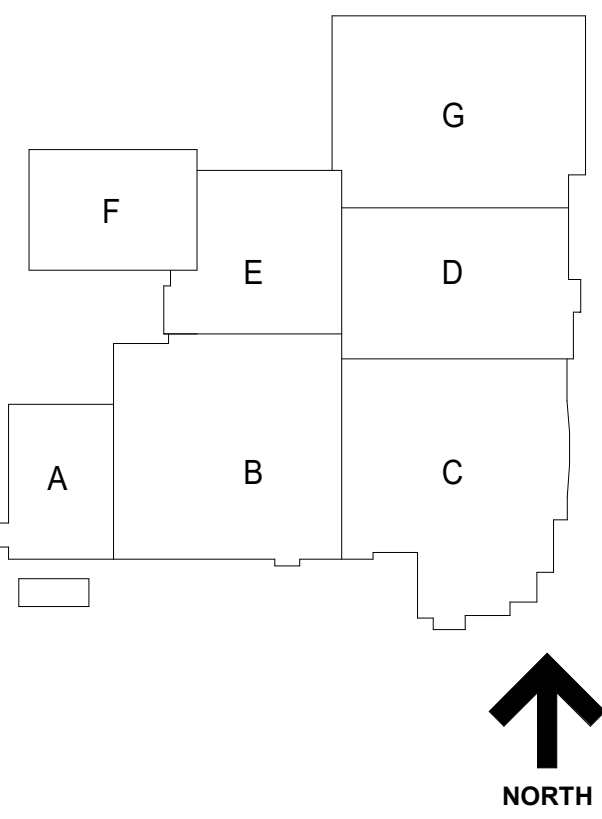
5/22/2019 11:15:20 AM C:\Users\jshah\Documents\10-6274-42\_DCN\_MFP-F2\_2019\_Central\_jshah.rvt Wight & Co. © Copyright 2019. All rights reserved. No part of these documents may be reproduced, stored, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior written consent of Wight & Co.



COMMUNITY HIGH SCHOOL  
DISTRICT 99



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1 GAS LINE PLAN  
SCALE: 1/8" = 1'-0"

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CONSTRUCTION**

REV      ISSUE      DATE

**MFP  
IMPLEMENTATION -  
NORTH**

4436 MAIN STREET  
DOWNERS GROVE, IL 60515

**GAS LINE PLAN**

Project Number:  
5274-42  
Drawn By:  
Author

Sheet:  
**E3.01FP**

## **Firetrol FTA1930 - Digital Solid State Starting with Power Transfer Switch Specifications**

### **Fire Pump Controller**

#### **General**

The fire pump controller shall be a factory assembled, wired and tested unit. The controller shall be of the combined manual and automatic type, designed for digital solid state (soft) starting of the fire pump motor having the horsepower, voltage, phase and frequency rating shown on the plans and drawings. The unit shall be complete with integral power transfer switch, specifically listed for fire pump service and suitable for usage with a generator emergency power source.

#### **Standards, Listings & Approvals**

The controller shall conform to all the requirements of the latest editions of:  
NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection*  
NFPA 70, *National Electrical Code*.

The controller shall be listed by:

Underwriters Laboratories, Inc., in accordance with UL218, *Standard for Fire Pump Controllers*  
Canadian Standards Association CSA-C22.2, Standard for Industrial Control Equipment (cUL)  
CE - Low Voltage Directive

The controller shall be approved by:

Factory Mutual (IEC 62091)  
The City of New York for fire pump service

#### **Enclosure**

The controller components shall be housed in a NEMA Type 2 (IEC IP22) drip-proof, floor mounted enclosure.

#### **Withstand Ratings (Short Circuit Current Ratings)**

All controller components shall be front mounted, wired and front accessible for maintenance. The minimum withstand rating of the controllers shall not be less than 100,000 Amps RMS Symmetrical at 200-600 Volts.

#### **Isolation Switch and Circuit Breaker**

The controller shall include a motor rated combination isolating disconnect switch/circuit breaker, mechanically interlocked and operated with a single, externally mounted handle. When moving the handle from OFF to ON, the interlocking mechanism shall sequence the isolating disconnect switch ON first, and then the circuit breaker. When the handle is moved from ON to OFF, the interlocking mechanism shall sequence the circuit breaker OFF first, and then the isolating disconnect switch. The isolating disconnect switch/circuit breaker shall be mechanically interlocked so that the enclosure door cannot be opened with the handle in the ON position except by a hidden tool operated bypass mechanism. The isolating disconnect switch/circuit breaker shall be capable of being padlocked in the OFF position for installation and maintenance safety, and shall also be capable of being locked in the ON position without affecting the tripping characteristics of the circuit breaker. The controller door shall have a locking type handle and three point cam and roller vault type hardware. The circuit breaker trip curve adjustment shall be factory set, tested and sealed for the full load amps of the connected motor. The circuit breaker shall be capable of being field tested to verify actual pick up, locked rotor, and instantaneous trip points after field installation without disturbing incoming line and load conductors.

#### **Operator Interface**

The fire pump controller shall feature an operator interface with user keypad. The interface shall

monitor and display motor operating conditions, including all alarms, events, and pressure conditions. All alarms, events, and pressure conditions shall be displayed with a time and date stamp. The display shall be a 128x64 Backlit LCD capable of customized graphics. The display and interface shall be NEMA rated for Type 2, 3R, 4, 4X, and 12 protections and shall be fully accessible without opening the controller door. The display and user interface shall utilize multiple levels of password protection for system security. A minimum of 3 password levels shall be provided.

### **Ammeter/Voltmeter**

The fire pump controller operator interface shall be capable of displaying true RMS digital motor voltage and current measurements for all three phases simultaneously. Displays requiring push-button and selector switches to toggle between phases or current and voltage shall not be accepted.

Voltage and current shall be measured by True RMS technology to provide the most accurate measurement for all sine waves, including non-sinusoidal waveforms. Average responding meters will not be accepted.

### **Digital Status/Alarm Messages**

The digital display shall indicate text messages for the status and alarm conditions of:

- Motor On
- Local Start / Off Delay Time
- Fail to Start
- Over Voltage
- Emergency Start
- Motor Overload
- Pressure Error
- Sequential Start Time
- System Battery Low
- Locked Rotor Trip
- Motor Over 320%
- Disk Error
- Minimum Run Time
- Remote Start
- Under Voltage
- Over Frequency

The Sequential Start Timer and Minimum Run Timer/Off Delay Timer shall be displayed as numeric values reflecting the value of the remaining time.

### **LED Visual Indicators**

LED indicators, visible with the door closed, shall indicate:

- Power Available
- Remote Start
- Transfer Switch Emergency
- Phase Reversal
- Motor Overload
- Overvoltage
- Alarm
- Pump Running
- Transfer Switch Normal
- Interlock On
- Emerg. Iso. Switch Off
- Undervoltage
- System Pressure Low
- Deluge Open
- Phase Failure
- Fail To Start
- Automatic Shutdown Disabled

### **Data Logging**

The digital display shall monitor the system and log the following data:

- Motor Calls/Starts
- Total Controller Pwr On Time
- Min/Max System Pressure
- Last Locked Rotor Trip
- Max Starting Currents
- Min/Max Voltage per Phase while idle (not running)
- Min/Max Voltage per Phase during Run
- Pump Total Run Time
- Last Locked Rotor Current
- Max Run Currents
- Last Locked Rotor Current
- Min Voltage per Phase during Start
- Pump Last Run Time
- Last Pump Start
- Last Phase Fail/Reversal
- Min/Max Frequency

## **Event Recording**

Memory - The controller shall record all operational and alarm events to system memory. All events shall be time and date stamped and includes an index number. The system memory shall have the capability of storing 3000 events and allow the user access to the event log via the user interface. The user shall have the ability to scroll through the stored messages in groups of 1 or 10.

## **USB Host Controller**

The controller shall have a built-in USB Host Controller. A USB port capable of accepting a USB Flash Memory Disk shall be provided. The controller shall save all operational and alarm events to the flash memory on a daily basis. Each saved event shall be time and date stamped. The total amount of historical data saved shall solely depend on the size of the flash disk utilized. The controller shall have the capability to save settings and values to the flash disk on demand via the user interface.

## **Solid State Pressure Transducer**

The controller shall be supplied with a solid state pressure transducer with a range of 0-300 psi (0-20.7 bar)  $\pm 1$  psi. The solid state pressure switch shall be used for both display of the system pressure and control of the fire pump controller. Systems using analog pressure devices or mercury switches for operational control will not be accepted.

The START, STOP and SYSTEM PRESSURE shall be digitally displayed and adjustable through the user interface. The pressure transducer shall be mounted inside the controller to prevent accidental damage. The pressure transducer shall be directly pipe mounted to a bulkhead pipe coupling without any other supporting members. Field connections shall be made externally at the controller coupling to prevent distortion of the pressure switch element and mechanism.

## **Seismic Certification**

The controller shall be certified to meet or exceed the requirements of the 2006 International Building Code and the 2010 California Building Code for Importance Factor 1.5 Electrical Equipment for Sds equal to 1.88 or less severe seismic regions. Qualifications shall be based upon successful tri-axial shake-table testing in accordance with ICC-ES AC-156. Certification without testing shall be unacceptable.

## **Controller Operation**

A digitally set On Delay (Sequential Start) timer shall be provided as standard. Upon a call to start, the user interface shall display a message indicating the remaining time value of the On-Delay timer. The controller shall be field programmable for manual stop or automatic stop. If set for automatic stopping, the controller shall allow the user to select either a Minimum Run Timer or an Off-Delay Timer. Both timers shall be programmable through the user interface.

A nonadjustable restart delay timer shall be provided to allow the residual voltage of the motor to decay prior to restarting the motor. At least 2 seconds, but no more than 3 seconds, shall elapse between stopping and restarting the pump motor.

A weekly test timer shall be provided as standard. The controller shall have the ability to program the time, date, and frequency of the weekly test. In addition, the controller shall have the capability to display a preventative maintenance message for a service inspection. The message text and frequency of occurrence shall be programmable through the user interface.

A Lamp Test feature shall be included. The user interface shall also have the ability to display the status of the system inputs and outputs.

An Audible Test feature shall be included to test the operation of the audible alarm device. The controller shall not start the fire pump motor under a single-phase condition. If the motor is already running when a phase loss occurs, the controller shall continue to run the motor, but still display a Phase Failure alarm.

The fire pump controller software shall be automatically upgraded through the USB port by simply inserting a flash disk with the new software. Fire pump controllers that require laptop computers, handheld equipment or specialized devices for software upgrades shall be prohibited.

### **Remote Alarm Contacts**

Remote alarm contacts shall be supplied as standard for the following conditions:

- Pump Running
- Power/Phase Failure
- Phase Reversal

### **Power Transfer Switch Switch Enclosure**

The power transfer switch shall be housed within the fire pump controller enclosure or in a NEMA Type 2 (IEC IP22) drip-proof enclosure attached directly to the fire pump controller. Where the power transfer switch is provided in an attached enclosure, the enclosures shall be fitted so that the assembly constitutes a single unit. The fire pump controller/power transfer switch shall be factory assembled, wired and tested as a unit prior to shipment.

### **Circuit Breaker**

The power transfer switch shall include a motor rated combination isolating disconnect switch/circuit breaker, mechanically interlocked and operated with a single, externally mounted handle. When moving the handle from OFF to ON, the interlocking mechanism shall sequence the isolating disconnect switch closed first, and then the circuit breaker. When the handle is moved from ON to OFF, the interlocking mechanism shall sequence the circuit breaker open first, and then the isolating disconnect switch. The isolating disconnect switch/circuit breaker shall be mechanically interlocked so that the enclosure door cannot be opened with the handle in the ON position except by a hidden tool operated bypass mechanism. The isolating disconnect switch/circuit breaker shall be capable of being padlocked in the OFF position for installation and maintenance safety, and shall also be capable of being locked in the ON position without affecting the tripping characteristics of the circuit breaker. The circuit breaker trip curve adjustment shall be factory set, tested and sealed for the connected full load amps of the motor. The circuit breaker shall be capable of being field tested to verify actual pick up, locked rotor, and instantaneous trip points after field installation without disturbing incoming line and load conductors.

### **Operator Interface**

The transfer switch control panel shall have a 4 line, 20 character LCD display and keypad for viewing all available data and setting desired operational parameters. Voltage and frequency on both the normal and emergency sources shall be continuously monitored. The normal source pick up shall be set at 95% of nominal voltage and the emergency source pick up set at 90% of nominal voltage and 95% nominal frequency. Source status screens shall be provided for both normal & emergency to provide digital readout of voltage, frequency and phase rotation on all 3 phases.

### **Automatic Transfer Switch**

The automatic transfer switch shall consist of an inherently double throw power transfer switch mechanism and a microprocessor control panel to provide automatic operation. The transfer switch and control panel shall be of the same manufacturer. The automatic transfer switch shall be an ASCO 7000 series with a group 5 control panel.

The transfer switch shall be electrically operated and mechanically held. The electrical operator shall be a momentarily energized, single solenoid mechanism. The switch shall be mechanically interlocked to ensure only two possible positions, normal or emergency. Switches having a neutral position shall not be permitted.

The switch shall be positively locked and unaffected by momentary outages, so that contact pressure is maintained at a constant value and contact temperature rise is minimized for maximum reliability and operating life. All main contacts shall be silver composition and inspection of all contacts shall be possible from the front of the switch without disassembly of operating linkages and without disconnection of power.

Designs utilizing components of molded case circuit breakers, contactors, or parts thereof, which are not intended for continuous duty, repetitive switching or transfer between two active power

sources are not acceptable. A selector switch shall be supplied to manually test the transfer to emergency and the re-transfer to normal power.

### **Visual Indicators**

Indicators, visible with the door closed, shall indicate:

- Transfer Switch in Normal
- Transfer Switch in Emergency
- Emergency Isolation Switch Open

### **Audible Alarm Indication**

An audible alarm shall sound for the following conditions:

- Emergency Isolation Switch Open
- Transfer Switch in Emergency

### **Remote Alarm Contacts**

Remote alarm contacts shall be supplied as standard for the following conditions:

- Emergency Source Isolation Switch Open
- Transfer Switch Position

### **Manufacturer**

The basis of design is Firetrol Model FTA1930-TSA

## SECTION 263213 - ENGINE GENERATORS – AUTOMATIC TRANSFER SWITCH

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section includes packaged engine-generator sets for emergency power supply with the following features:
- B. **50 kW Natural Gas Generator upsized 130 kW Alternator with Level 1 Sound Attenuated Steel Enclosure**
  - 1. Gas engine.
  - 2. Unit-mounted cooling system.
  - 3. Unit-mounted control and monitoring.
  - 4. Performance requirements for sensitive loads.
  - 5. Fuel system.
  - 6. Outdoor enclosure.

## 1.3 DEFINITIONS

- A. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.
- B. EPS: Emergency power supply.
- C. EPSS: Emergency power supply system.
- D. Emergency Power Supply: NEC700, essential for life safety loads. Generator to meet NFPA 110 Level 1.

## 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
  - 2. Include thermal damage curve for generator.
  - 3. Include time-current characteristic curves for generator protective device.
  - 4. Include fuel consumption in cubic feet per hour at 0.8 power factor at 0.5, 0.75 and 1.0 times generator capacity.
  - 5. Include generator efficiency at 0.8 power factor at 0.5, 0.75 and 1.0 times generator capacity.



6. Include air flow requirements for cooling and combustion air in cfm at 0.8 power factor and rated load. Testing shall be performed per ISO3046 standards. Provide drawings showing requirements and limitations for location of air intake and exhausts.
7. Include generator characteristics, including, but not limited to kw rating, efficiency, reactances, and short-circuit current capability.

B. Shop Drawings:

1. Include plans and elevations for engine-generator set and other components specified. Indicate access requirements affected by height of subbase fuel tank.
2. Include details of equipment assemblies. Indicate dimensions, weights, 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. Design calculations for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
5. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include base weights.
6. Include diagrams for power, signal, and control wiring. Complete schematic, wiring, and interconnection diagrams showing terminal markings for EPS equipment and functional relationship between all electrical components.

#### 1.5 INFORMATIONAL SUBMITTALS

1. Statement of quality from manufacturer detailing acceptance as an ISO9001 manufacturer.

B. Source quality-control reports, including, but not limited to the following:

1. Certified summary of prototype-unit test report.
2. Certified Test Reports: For components and accessories that are equivalent, but not identical, to those tested on prototype unit.
3. Certified Summary of Performance Tests: Certify compliance with specified requirement to meet performance criteria for sensitive loads.
4. Report of factory test on units to be shipped for this Project, showing evidence of compliance with specified requirements.
5. Report of sound generation.
6. Report of exhaust emissions showing compliance with applicable regulations.
7. Certified Torsional Vibration Compatibility: Comply with NFPA 110.

C. Field quality-control reports.

D. Warranty: For special warranty.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For packaged engine generators to include in emergency, operation, and maintenance manuals.

## 1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer accepted as an ISO9001 manufacturer.
- B. Installer Qualifications: Manufacturer's authorized representative who is trained and approved by manufacturer.

## 1.8 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: 7 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. **Basis-of-Design Product: provide Generac Industrial Power Systems, Inc; natural gas model SG50 generator set with upsized 130 kW alternator, rated 50 KW 277/480 Volt 3 phase, 60 hz**
- 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. No special ratings will be permitted.
- C. Engineering changes resulting from the substitution of another product will be the responsibility of the electrical contractor.

### 2.2 PERFORMANCE REQUIREMENTS

- A. NFPA Compliance:
  - 1. Comply with NFPA 37.
  - 2. Comply with NFPA 70.
  - 3. Comply with NFPA 110 requirements for Level 1 emergency power supply system.
- B. UL Compliance: Comply with UL 2200/CSA.
- C. Engine Exhaust Emissions: Comply with EPA Tier requirements and applicable state and local government requirements.
- D. 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 40 deg C for spark-ignited.
  - 2. Relative Humidity: Zero to 95 percent.
  - 3. Altitude: Sea level to 700 Feet

## 2.3 ASSEMBLY DESCRIPTION

- A. Factory-assembled and -tested, water-cooled engine, with PMG generator and accessories.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
- C. Governor: Adjustable isochronous, with speed sensing.
- D. Emissions: Comply with EPA Tier and local requirements for stand by generation.
- E. 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.
- F. 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[, **with capacity as required to operate as a unit as evidenced by records of prototype testing.**
  - 2. Output Connections: Three-phase, **four** wire.
  - 3. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of component. Nameplate shall be in accordance with NFPA70.
- G. 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: 1 percent of rated output voltage from no load to full load.
  - 3. 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 5 seconds.
  - 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-Hz variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within 5 seconds.
7. Output Waveform: At no load, harmonic content measured line to neutral shall not exceed 2 percent total with no slot ripple. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.
8. Sustained Short-Circuit Current: For a three-phase, bolted short circuit at system output terminals, system shall 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.
9. Block Load Performance: per NFPA110, the unit shall be able to fully recover from a 100% block load.
10. 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.
11. Start Time: Comply with NFPA 110, Type 10, system requirements.

## 2.4 ENGINE

- A. Fuel: Natural gas.
- 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. Maximum Piston Speed for Four-Cycle Engines: 1800 fpm
- D. Lubrication System: The following items are mounted on engine or skid:
  1. Filter and Strainer: Per manufacturer recommendations.
  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.
  4. Crank Case Oil Heater for Cold Weather Starting assistance
  5. Extreme Cold Weather Kit for Breather Assembly
- E. Jacket Coolant Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with NFPA 110 requirements for Level 1 equipment for heater capacity.
- F. Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine-generator-set mounting frame and integral engine-driven coolant pump.
  1. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.

2. Cooling System Sizing: Sized to adequately cool the generator set, including aftercooler, without de-rate to an ambient temperature of 104 deg F (40 deg C) for gas. Maximum external restriction shall be no greater than 0.5 inch (12.7 mm) of water column.
  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. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
  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 (345-kPa) maximum working pressure with coolant at 180 deg F (82 deg C), and noncollapsible under vacuum.
    - b. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.
- G. Air-Intake Filter: Engine-mounted air cleaner with replaceable dry-filter element.
- H. 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: As required by NFPA 110 for system level specified.
  4. 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.
  5. Battery Cable: Size as recommended by engine manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.
  6. Battery Compartment: Factory fabricated of metal with acid-resistant finish and thermal insulation. Thermostatically controlled heater shall be arranged to maintain battery above 10 deg C regardless of external ambient temperature within range specified in "Performance Requirements" Article. Include accessories required to support and fasten batteries in place. Provide ventilation to exhaust battery gases.
  7. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and continuous rating adequate for batteries provided.
  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. Operation: Equalizing-charging rate of 10 A shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
    - b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 40 deg F (minus 40 deg C) to 140 deg F (60 deg C) to prevent overcharging at high temperatures and undercharging at low temperatures.

- c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.
- d. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates.
- e. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
- f. Enclosure and Mounting: NEMA 250, Type 1, Battery chargers mounted within the Automatic Transfer Switch are not acceptable.
- g. Thermostatically controlled battery blanket

## 2.5 GASEOUS FUEL SYSTEM

- A. Natural-Gas Piping: Comply with requirements in Section 231123 "Facility Natural-Gas Piping" and with requirements of NFPA 37 and 54.
  - 1. Gas piping is the responsibility of the installing contractor.
  - 2. Gas piping shall be sized to provide adequate fuel to the engine while allowing for no greater than 1 inch (25 mm) water column pressure drop from no load to full load.
  - 3. Natural gas piping will supply pressure to the generator set inlet per manufacturer's recommendations, nominally 11 to 14 inches (279.4 to 356 mm) of water column.
  - 4. Natural gas regulator shall be sized to provide 125 percent of full-load generator set capacity.
- B. Gas Train: Comply with NFPA 37.
- C. Engine Fuel System:
  - 1. Natural-Gas, Vapor-Withdrawal System:
    - a. Carburetor.
    - b. Secondary Gas Regulators: One for each fuel type, with atmospheric vents piped to building exterior.
    - c. Fuel-Shutoff Solenoid Valves: NRTL-listed, normally closed, safety shutoff valves; one for each fuel source.
    - d. Fuel Filters: One for each fuel type.
    - e. Manual Fuel Shutoff Valves: One for each fuel type.
    - f. Flexible Fuel Connectors: Minimum one for each fuel connection.

## 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 manual position, generator set starts. The off position of same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms.

- B. Manual Starting System Sequence of Operation: Switching on-off switch on the generator control panel to the manual position starts generator set. The off position of same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms.
- C. Provide minimum run time control set for **15** minutes with override only by operation of a emergency-stop switch.
- D. Comply with UL 508A.
- E. 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.
    - b. For engines without ECM functionality or for any additional generator set controller monitoring, sensors are to be conditioned to a 4 to 20 ma signal level to enhance noise immunity and all sensor connections shall be sealed to prevent corrosion.
  - 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. Enclosed circuit boards and terminal strips that are susceptible to corrosion are not acceptable.
  - 3. Custom ladder logic functionality inside the generator controller shall be supported to provide application support flexibility. The ladder logic function shall have access to all the controller inputs and customer assignable outputs.
- F. 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.
- G. 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. Main fuel tank low-level alarm.
    - a. Low fuel level alarm shall be initiated when the level falls below that required for operation for the duration required in "Fuel Tank Capacity" Paragraph in "Diesel Fuel-Oil System" Article.
  18. Run-Off-Manual selector 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.
  24. Generator overcurrent protective device not closed alarm.
- 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. Sensors are to be conditioned to a 4 to 20 mA signal level to enhance noise immunity and all sensor connections shall be sealed to prevent corrosions.
- I. Connection to Datalink: Provide connections for datalink transmission of indications to remote data terminals via **ModBus RS232**. Data system connections to terminals are covered in Section 260913 "Electrical Power Monitoring and Control."
- J. Remote Alarm Annunciator: Comply with NFPA 99. An LED labeled with proper alarm conditions shall identify each alarm event, and a common audible signal shall sound for each alarm condition. Silencing switch in face of panel shall silence signal without altering visual indication. Connect so that after an alarm is silenced, clearing of initiating condition will



reactivate alarm until silencing switch is reset. Cabinet and faceplate are surface- or flush-mounting type to suit mounting conditions indicated.

1. Overcrank alarm.
  2. Coolant low-temperature alarm.
  3. High engine temperature prealarm.
  4. High engine temperature alarm.
  5. Low lube oil pressure alarm.
  6. Overspeed alarm.
  7. Low fuel main tank alarm.
  8. Low coolant level alarm.
  9. Low cranking voltage alarm.
  10. Contacts for local and remote common alarm.
  11. Audible-alarm silencing switch.
  12. Control switch not in automatic position alarm.
  13. Fuel tank derangement alarm.
  14. Fuel tank high-level shutdown of fuel supply alarm.
  15. Lamp test.
  16. Low cranking voltage alarm.
  17. Generator overcurrent protective device not closed.
- K. The control system shall provide pre-wired customer use I/O: 4 relay outputs (user definable functions), 4 contact inputs, 2 analog inputs, communications support via RS232, RS485, or an optional modem. Additional I/O must be an available option. Customer I/O shall be software configurable providing full access to all alarm, event, data logging, and shutdown functionality.
- L. 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.
- M. Maintenance:
1. All engine, voltage regulator, control panel, and accessory units shall be accessible through a single electronic service tool. The following maintenance functionality shall be integral to the generator set controls:
    - a. Engine running hours.
    - b. Service maintenance interval (running hours, calendar days).
    - c. Engine crank attempt counter.
    - d. Engine successful starts counter.
    - e. 20 events are stored in control panel memory.
    - f. Control panel shall time and date stamp all alarms and warnings. A snap shot of key parameters shall be saved in the control panel for use in troubleshooting alarms.
    - g. A predictive maintenance algorithm will determine the optimal time for maintenance service based on the generator loading and operation.
- N. 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.
5. Ability to program custom I/O alarms as well as modify standard alarm settings for applications (password protected).

## 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 and each located in a separate box per NEC700 separation of circuits.
- B. Generator Circuit Breaker: Molded-case, thermal-magnetic type; 80 percent rated; complying with UL 489. Refer to One Line Drawing for Size.
  1. Tripping Characteristic: Designed specifically for generator protection.
  2. Trip Rating: Matched to generator output rating.
  3. Mounting: Each circuit breaker installed in separate box in accordance with NEC700 separation of circuits.
- C. Generator Protector: Microprocessor-based unit shall continuously monitor current level in each phase of generator output, integrate generator heating effect over time, and predict when thermal damage of alternator will occur. When signaled by generator protector or other generator-set protective devices, a shunt-trip device in the generator disconnect switch shall open the switch to disconnect the generator from load circuits. Protector performs the following functions:
  1. Initiates a generator overload alarm when generator has operated at an overload equivalent to 110 percent of full-rated load for 60 seconds. Indication for this alarm is integrated with other generator-set malfunction alarms. Contacts shall be available for load shed functions.
  2. Under single or three-phase fault conditions, regulates generator to 300 percent of rated full-load current for up to 10 seconds.
  3. As overcurrent heating effect on the generator approaches the thermal damage point of the unit, protector switches the excitation system off, opens the generator disconnect device, and shuts down the generator set.
  4. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot.

## 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.
- D. Stator-Winding Leads: Brought out to terminal box to permit future reconnection for other voltages if required. Provide **12** lead alternator.
- E. Winding Coils: Skewed to improve sine wave shape and eliminate ripple effects caused by air gaps.
- F. Range: Provide broad range of output voltage by adjusting the excitation level.
- G. 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.
- H. Enclosure: Dripproof.
- I. Instrument Transformers: Mounted within generator enclosure.
- J. 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 5 percent adjustment of output-voltage operating band.
  - 2. Provide anti-hunt provision to stabilize voltage.
- K. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.

## 2.9 OUTDOOR GENERATOR-SET ENCLOSURE

- A. Description: OEM Factory manufactured, vandal-resistant, weatherproof sound attenuated LEVEL 1 Steel housing, wind resistant up to 100 mph (160 km/h). Multiple panels shall be lockable and provide adequate access to components requiring maintenance. Panel shall be removable by one person without tools. Instruments and control shall be mounted within enclosure.
  - 1. Structural Design and Anchorage: Comply with ASCE 7 for wind loads up to **100 mph (160 km/h)**
  - 2. Hinged Doors:
    - a. Door Panels: With integral stiffeners, and capable of being removed by one person without tools.
    - b. Slip-pin hinges and latches stainless steel with nylon spacers.
    - c. Gasketed for weather and rodent protection.
    - d. Handles to have padlocking provisions.
  - 3. Muffler Location: **Within** enclosure. All exhaust piping shall be wrapped for personnel protection and to eliminate excessive heat build up during generator operation.
  - 4. Assembly Hardware (Nuts and Bolts): Use JS500 and nylon washers to prevent paint deterioration.

- B. Engine Cooling Airflow through Enclosure: Maintain temperature rise of system components within required limits when unit operates at 110 percent of rated load for 2 hours with ambient temperature at top of range specified in system service conditions.
  - 1. Louvers: Fixed-engine, cooling-air inlet and discharge. Storm-proof and drainable louvers prevent entry of rain and snow.
- C. Convenience Outlets: Factory wired, GFCI. Arrange for external electrical connection.
- D. Unit Mounted Load Center with all generator heater, battery charger, and control panel power pre-wired from factory.
- E. Pre-fabricated OEM generator bottom for units mounted above grade with exposed bottom, in order to maintain proper air flow thru enclosure.

## 2.10 FINISHES

- A. Outdoor Enclosures and Components: Electrostatically applied Rhino Coat finish over corrosion-resistant pretreatment and compatible primer.
- B. Powder coated paint surfaces, meeting the following applicable standards:
  - 1. Paint Thickness: More than 2.5 mil per ASTM D 1186.87.
  - 2. Material Hardness: ASTM D 3363-92a.
  - 3. Resistance to Cracking: ASTM D 522-B.
  - 4. Paint Adhesion: ASTM D 3359-B.
  - 5. Resistance to Salt Water Corrosion: ASTM B 117 or ASTM D 1654.
  - 6. Resistance to Humidity: ASTM D 1735 or ASTM D 1654.
  - 7. Impact Resistance: ASTM 2784.
  - 8. UV Protection: SAE J1690.

## 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.

3.1 OWNER'S MANUALS Three (3) sets of owner's manuals specific to the product supplied must accompany delivery of the equipment. General operating instruction, preventive maintenance, wiring diagrams, schematics and parts exploded views specific to this model must be included.

## 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 Construction Manager no fewer than 2 working days in advance of proposed interruption of electrical service.
  - 2. Do not proceed with interruption of electrical service without Construction Manager's written permission.

### 3.3 INSTALLATION

- A. Comply with packaged engine-generator manufacturers' written installation and alignment instructions and with NFPA 110.
- B. Equipment Mounting:
  - 1. Coordinate size and location of concrete bases for packaged engine generators. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.
- C. Install packaged engine-generator to provide access, without removing connections or accessories, for periodic maintenance.
- D. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.

### 3.4 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 service and maintenance.
- C. Connect engine exhaust pipe to engine with flexible connector.
- D. Connect fuel piping to engines with a gate valve and union and flexible connector.
  - 1. Natural-gas piping, valves, and specialties for gas distribution are specified in Section 231123 "Facility Natural-Gas Piping."
  - 2. Install manual shutoff valve in a remote location to isolate **natural-gas** supply to the generator enclosure.
  - 3. Vent gas pressure regulators outside building a minimum of 60 inches (1500 mm) from building openings.

- E. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- F. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Provide a minimum of one 90 degree bend in flexible conduit routed to the generator set from a stationary element.
- G. Balance single-phase loads to obtain a maximum of 10 percent unbalance between any two phases.

### 3.5 IDENTIFICATION

- A. Identify system components according to Section 230553 "Identification for HVAC Piping and Equipment" and Section 260553 "Identification for Electrical Systems."

### 3.6 FIELD QUALITY CONTROL

- A. Testing Agency: At the owner's request, the contractor shall engage a qualified, third-party, testing agency to witness tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections.
  - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections.
- D. Tests and Inspections:
  - 1. Perform tests recommended by manufacturer and each visual and mechanical inspection and electrical and mechanical test listed in the first two subparagraphs 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.
    - 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) Functionally test engine shutdown for low oil pressure, overtemperature, overspeed, and other protection features as applicable.
      - 4) Conduct performance test in accordance with NFPA 110.
      - 5) Verify correct functioning of the governor and regulator.

2. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here including, but not limited to, single-step full-load pickup test.
  3. Provide portable load bank for 2-hour full load test.
  4. 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.
  5. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.
  6. 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.
  7. Voltage and Frequency Transient Stability Tests: Use data capture from manufacturer control panel and software to measure voltage and frequency transients for 50 and 100 percent step-load increases and decreases, and verify that performance is as specified.
- E. Coordinate tests with tests for transfer switches and run them concurrently.
- 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.
- 3.7 MAINTENANCE SERVICE
- A. Initial Maintenance Service: Beginning at Substantial Completion, provide 12 months' full maintenance by EGSA Certified employees of manufacturer's designated service organization. Include quarterly exercising 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. Provide parts and supplies same as those used in the manufacture and installation of original equipment.

3.8 TRAINING

- A. A. The equipment supplier shall provide training for the facility operating personnel covering operation and maintenance of the equipment provided at the time of startup.
- B. END OF SECTION 263213