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TRANSMITTAL COVER SHEET

DATE: **December 29, 2025**

TO: **ALL CONTRACTORS**

FROM: **DENISE KING**

PROJECT: **RUSSIAN ROAD PRODUCTION WELL PHASE II**
ORANGE BEACH WATER AUTHORITY
GMC PROJECT NO. CMOB200009(2)

RE: **ADDENDUM #3**

PLEASE COMPLETE BELOW AND RETURN IMMEDIATELY.

Ashley Morris
Email: ashley.nobles@gmcnetwork.com

I, the undersigned, hereby acknowledge receipt of this Addendum.

_____ _____
Authorized Representative of Contractor Date

_____ _____
Company Name Telephone

_____
Contractor's License Number (if applicable)

ADDENDUM NUMBER 3

RUSSIAN ROAD PRODUCTION WELL PHASE II

FOR

ORANGE BEACH WATER AUTHORITY

GMC PROJECT NO. CMOB200009(2)

1. Revisions to Project Manual

1.1 The following revisions are hereby added as Addendum No. 3 to the referenced Project Manual and Plans and shall be considered when preparing bids.

2. Clarifications

2.1 The flow meter shown to be installed in the well building is called out on the plans as a turbine meter. The meter shall be an electromagnetic flow meter as specified in the attached revised Section 33 11 13.

2.2 The check valve to be installed in the well building shall be a swing check valve with outside lever and spring, in accordance with attached Section 40 05 65 – Swing and Disc Check Valves.

2.3 The HDPE piping for the raw and potable water main directional bores shall be DR9, and the HDPE piping for the force main directional bore shall be DR11.

2.4 Revised Section 26 32 13.14 – Diesel Engine Generators is attached with this Addendum. The revision adds Cummins as an approved manufacturer.

3. Attachments

3.1 The following specification sections are attached and shall be inserted into the project manual:

- Section 26 32 13.14 – Diesel Engine Generators (Revised)
- Section 33 11 13 – Water Supply Wells (Revised)
- Section 40 05 64 – Butterfly Valves
- Section 40 05 65 – Swing and Disc Check Valves
- Section 40 05 57 – Actuators for Process Valves and Gates
- Section 40 05 93 – Common Motor Requirements for Process Equipment

4. Acknowledgement of Receipt

4.1 Receipt of Addendum No. 3 shall be acknowledged in two ways:

4.1.1 Note on (EJCDC C-410) page 3 of Bid Form – Bidder acknowledges receipt of "Addendum No. 3" and date of "December 29, 2025".

AND

4.1.2 EMAIL the signed transmittal sheet to ashley.nobles@gmcnetwork.com to confirm the addendum has been received and is legible.

5. Conclusion

5.1 This is the end of Addendum Number 3, dated Monday, December 29, 2025.

SECTION 26 32 13.14 - DIESEL ENGINE GENERATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Engine.
2. Diesel fuel system.
3. Control and monitoring.
4. Generator overcurrent and fault protection.
5. Generator, exciter, and voltage regulator.
6. Outdoor generator-set enclosure.
7. Vibration isolation devices.

B. Related Requirements:

1. Section 26 36 00 "Transfer Switches" for transfer switches including sensors and relays to initiate automatic-starting and -stopping signals for engine generators.

1.2 DEFINITIONS

A. EPS: Emergency power supply.

B. EPSS: Emergency power supply system.

C. 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 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 gallons per hour (liters 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, with air supply temperature of 95 deg F (35 deg C), 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, reactance, and short-circuit current capability.

8. Include generator step report, load summary, transient analysis, and harmonic analysis for the following loads and project parameters:

    a. Project Parameters

        1) Vdip max: 10%
        2) Fdip max: 8%

    b. Loads (Step 1)

        1) 480V, 3Φ, 200HP well pump motor controlled by 6 pulse filtered fast ramp VFD.
        2) BPS building lighting and receptacle loads.

B. Shop Drawings:

1. Include plans and elevations for engine generator and other components specified.
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 indicating terminal markings for EPS equipment and functional relationship between all electrical components.

1.4 INFORMATIONAL SUBMITTALS

A. 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. Report of factory test on units to be shipped for this Project, indicating evidence of compliance with specified requirements.
4. Report of sound generation.
5. Report of exhaust emissions indicating compliance with applicable regulations.
6. Requirement in subparagraph below is from Section 5.6.10.2 of NPFA 110.
7. Certified Torsional Vibration Compatibility: Comply with NFPA 110.
8. Dimensioned Outline Drawings of Equipment Unit: With engine and generator mounted on rails, identify center of gravity and total weight including full fuel tank, supplied enclosure, external silencer, subbase-mounted fuel tank, and each piece of equipment not integral to the engine generator, and locate and describe mounting and anchorage provisions.
9. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements

B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

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

1. In addition to items specified in Section 01 78 23 "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 QUALITY ASSURANCE

A. Manufacturer Qualifications: Current certificate holder for compliance with ISO 9001.

B. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

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: 5 years from date of startup, to include parts and labor.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain packaged engine generators and auxiliary components through one source from a single manufacturer.

B. Pre-Approved Manufacturers

1. Cummins
2. Caterpillar

2.2 PERFORMANCE REQUIREMENTS

A. NFPA Compliance:

1. Comply with NFPA 37.
2. Comply with NFPA 70.
3. Comply with NFPA 99.
4. Comply with NFPA 110 requirements for Level 1 EPSS.

B. UL Compliance: Comply with UL 2200.

C. Engine Exhaust Emissions: Comply with EPA requirements and applicable state and local government requirements.

D. Noise Emission: Comply with applicable state and local government requirements, 83 dB(A) at 23 ft, 7 meters or maximum noise level at adjacent property boundaries due to sound emitted by engine generator including engine, engine exhaust, engine cooling-air intake and discharge, and other components of installation.

E. Environmental Conditions: Engine generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:

1. Ambient Temperature: 0 to 104 deg F (-17 to 40 deg C)
2. Relative Humidity: Zero to 95 percent.
3. Altitude: Sea level to 1000 ft. (300 m)

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 testing agency acceptable to authorities having jurisdiction, and marked for intended location and use.

C. Power Rating: As shown on drawings.

D. Power Factor: 0.8, lagging.

E. Frequency: 60 Hz.

F. Voltage: 277/480 V ac.

G. Phase: Three-phase, four wire, Wye.

H. Governor: Adjustable isochronous, with speed sensing.

I. 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.

J. 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. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of components.

K. Engine Generator Performance:

1. Steady-State Voltage Operational Bandwidth: 3 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: 0.5 percent of rated frequency from no load to full load.
4. 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.
5. Transient Frequency Performance: Less than 5 percent variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within five seconds.
6. Output Waveform: At no load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3.5 percent for single harmonics. Telephone influence factor, determined in accordance with NEMA MG 1, shall not exceed 50 percent.
7. 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 generator system components.
8. Start Time:

    a. Comply with NFPA 110, Type 10 system requirements.
    b. 10 seconds start time

2.4 DIESEL ENGINE

A. Fuel: ASTM D975, diesel fuel oil, Grade 2-D S15.

1. Off road, Ultra low Sulphur diesel fuel (15ppm)

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 and with NFPA 110 requirements for Level 1 equipment for heater capacity. Heater shall be no greater than 1500W @ 120Vac.

E. Integral Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine generator 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 gauge 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. Maximum Ambient Operating Temperature: 104 deg F (40 deg C).
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 no collapsible under vacuum.
b. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.

F. Muffler/Silencer:

1. Critical type sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.

a. Sound level measured at 23 ft. (7 m) from exhaust discharge after installation is complete shall be 83 dBA or less.

G. Air-Intake Filter: Standard-duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.

H. Starting System: 12 or 24vdc 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, 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-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35 A minimum continuous rating.

7. 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. Charging Rate: Automatic 10-A, dual rate float/equalize with reverse polarity protection.
    b. Charging current output measured by generator controller to support remote monitoring and diagnostics.
    c. Factory installed on engine-generator. Due to voltage drop concerns, transfer-switch-mounted battery chargers are not acceptable.
    d. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.
    e. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
    f. Enclosure and Mounting: NEMA 250, Type 1, wall-mounted cabinet.

2.5 DIESEL FUEL-OIL SYSTEM

A. Comply with NFPA 37.

B. Main Fuel Pump: Mounted on engine to provide primary fuel flow under starting and load conditions.

C. Fuel Filtering: Remove water and contaminants larger than 1 micron.

D. Relief-Bypass Valve: Automatically regulates pressure in fuel line and returns excess fuel to source.

E. 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: 24 hours based on full load fuel consumption rates.
3. Leak detection in interstitial space.
4. Low-Level Alarm Sensor: Liquid-level device operates alarm contacts at 25 percent of normal fuel level.
5. High-Level Alarm Sensor: Liquid-level device operates alarm and redundant fuel shutoff contacts at midpoint between overflow level and 90 percent of normal fuel level.
6. Vandal-resistant fill cap.
7. Containment Provisions: Comply with requirements of authorities having jurisdiction.
8. Overfill prevention valve

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 generator-set shutdown. When engine generator is running, specified system or equipment failures or derangements automatically shut down engine generator and initiate alarms.

B. Fully integrated microprocessor-based control system specifically designed for standby emergency engine generators, meeting all requirements of NFPA 110, Level 1 EPSS.

C. Fully integrated control system enabling remote diagnostics and easy building management integration of all generator functions. The generator controller shall provide integrated and digital control over all generator functions, including engine protection, alternator protection, speed governing, voltage regulation, synchronizing, load-sharing (real and reactive), and all related generator operations. The generator controller must also provide seamless digital integration with the engine's electronic engine control module (ECM) if so equipped.

D. Control panel shall comply with UL 6200.

E. Remote Connectivity: User interface available both internally and externally to the user's network, based on network security preferences. All remote connectivity may be disabled at any time by the user.

F. Automated Notification: Controller capable of sending multiple automated e-mail and SMS alerts without intermediate service provider.

G. Notification Customization: User configurable allowing any operational or fault condition to initiate notification to any personnel including (but not limited to) generator service provider.

H. Environmentally Hardened Design: Open circuit boards, edge cards, and PC ribbon cable connections are unacceptable.

I. Circuit boards with surface-mounted components to provide vibration durability. Circuit boards utilizing large capacitors or heat sinks must utilize encapsulation methods to securely support these components.

J. Configuration:

1. Operating and safety indications, protective devices, basic system controls, and engine gauges shall be grouped in a common control and monitoring panel mounted on the engine generator. Mounting method shall isolate the control panel from generator-set vibration. Panel shall be powered from the engine generator battery.

K. Control and Monitoring Panel:

1. Digital controller with integrated touch screen, controls, and microprocessor, capable of local and remote control, monitoring, and programming, with battery backup.
2. Instruments: Located on the control and monitoring panel and viewable during operation.

a. Engine lubricating-oil pressure gauge.
b. Engine-coolant temperature gauge.
c. DC voltmeter (alternator battery charging).
d. Running-time meter.
e. AC voltmeter, for each phase.

f. AC ammeter, for each phase.
g. AC frequency meter.
h. Generator-voltage adjusting feature.

3. Controls and Protective Devices: Controls, shutdown devices, and common visual alarm indication, including the following:

a. Cranking control equipment.
b. Run-Off-Auto switch.
c. Control switch not in automatic position alarm.
d. Overcrank alarm.
e. Overcrank shutdown device.
f. Low water temperature alarm.
g. High engine temperature prealarm.
h. High engine temperature.
i. High engine temperature shutdown device.
j. Overspeed alarm.
k. Overspeed shutdown device.
l. Coolant low-level alarm.
m. Coolant low-level shutdown device.
n. Coolant high-temperature pre-alarm.
o. Coolant high-temperature alarm.
p. Coolant low-temperature alarm.
q. Coolant high-temperature shutdown device.
r. EPS supplying load indicator.
s. Battery high-voltage alarm.
t. Low cranking voltage alarm.
u. Battery-charger malfunction alarm.
v. Battery low-voltage alarm.
w. Lamp test.
x. Contacts for local and remote common alarm.
y. Hours of operation.
z. Engine generator metering, including voltage, current, Hz, kW, kVA, and power factor.
aa. Generator overcurrent protective device not closed alarm.

L. Connection to Datalink:

1. A separate terminal block, factory wired to Form C dry contacts, for each alarm and status indication.
2. Provide connections for datalink transmission of indications to remote data terminals via Ethernet/IP or Modbus.

M. Remote Alarm Annunciator: An LED indicator light 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 pre-alarm.
4. High engine temperature alarm.
5. Low lube oil pressure alarm.
6. Overspeed alarm.
7. Low coolant level alarm.
8. Low cranking voltage alarm.
9. Contacts for local and remote common alarm.
10. Audible-alarm silencing switch.
11. Air shutdown damper when used.
12. Run-Off-Auto switch.
13. Control switch not in automatic position alarm.
14. Fuel tank derangement alarm.
15. Fuel tank high-level shutdown of fuel supply alarm.
16. Lamp test.
17. Low cranking voltage alarm.
18. Generator overcurrent protective device not closed.

N. Remote Emergency-Stop Switch: Flush; wall mounted, unless otherwise indicated; and labeled. Push button protected from accidental operation.

O. 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.

2.7 GENERATOR OVERCURRENT AND FAULT PROTECTION

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

B. 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.

C. Overcurrent protective devices for the EPSS shall be accessible only to authorized personnel.

D. Generator Overcurrent Protective Device:

1. Molded-case circuit breaker, electronic-trip type; **100 percent rated**; complying with UL 489:

   a. Tripping Characteristics: Adjustable long-time and short-time delay and instantaneous.
   b. Trip Settings: Selected to coordinate with generator thermal damage curve.
   c. Mounting: Adjacent to or integrated with control and monitoring panel.

E. Generator Protector: Integrated controller base 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 engine generator.
4. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot.

F. Ground-Fault Indication: Comply with NFPA 70, "Emergency System" signals for ground fault.

1. Indicate ground fault with other engine generator alarm indications.
2. Trip generator protective device on ground fault.

G. Arc Energy Reduction: Comply with NFPA 70 for arc energy reduction for circuit breakers 1200A and greater.

1. Energy reducing maintenance switch with local status indicator.
2. Instantaneous override that is less than the available arcing current.

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. Range: Provide broad range of output voltage by adjusting the excitation level.

F. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.

G. Enclosure: Drip proof.

H. Instrument Transformers: Mounted within generator enclosure.

I. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified and as required by NFPA 110.

1. Voltage Adjustment on Control and Monitoring Panel: Provide plus or minus 5 percent adjustment of output-voltage operating band.

2. Maintain voltage within 20 percent on one step,
3. Provide anti-hunt provision to stabilize voltage.
4. Maintain frequency within 10 percent and stabilize at rated frequency within 5 seconds.

J. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.

K. Sub-transient Reactance: 15 percent, maximum based on the rating of the engine generator set.

L. Permanent magnet brushless excitation (PMG).

1. PMG shall derive excitation current from pilot exciter mounted on the rotor shaft. It is to be able to sustain 300% of rated current for ten seconds during a fault condition.
2. Self-excited system to be brushless and consist of a 3 Ph armature and a 3 Ph full wave bridge rectifier mounted on the rotor shaft. Include surge suppressors to protect the diodes
3. Capable of sustaining 300% overcurrent for 10 seconds under a 3 Ph symmetrical short circuit

2.9 OUTDOOR GENERATOR-SET ENCLOSURE

A. Generator packaged within weather protective enclosure.

B. Sound Insulation: Enclosure and air discharge hood completely lined with 3 inches (76 mm) of fiberglass and perforated aluminum.

C. Enclosure Construction: Minimum 14 gauge steel with hinged, removable doors to allow access to the engine, alternator, and control panel. Adjustable hinges to allow for door alignment. Hinges and all exposed fasteners must be stainless steel. Pop-rivets weaken the paint system and are not allowed on external painted surfaces. Each door will be equipped with lockable hardware and identical keys.

D. Upward discharging enclosure ventilation exhaust hood.

E. Enclosure Finish: Electrostatic applied powered paint, baked and finished to manufacturer's specifications.

F. Enclosure Color: Manufacturer’s standard.

G. Silencer mounted on top of enclosure.

H. 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.

I. Convenience Outlets: Factory wired, GFCI. Arrange for external electrical connection.

2.10 VIBRATION ISOLATION DEVICES

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

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

2.11 FINISHES

A. Indoor and Outdoor Enclosures and Components: Manufacturer's standard finish over corrosion-resistant pretreatment and compatible primer.

B. Powder Coated Paint Surfaces:

1. Minimum Paint Thickness: 2.5 mil (0.06 mm) in accordance with ASTM D1186-87.
2. Material Hardness: ASTM D3363-92a.
3. Resistance to Cracking: ASTM D522-B.
4. Paint Adhesion: ASTM D3359-B.
5. Resistance to Saltwater Corrosion: ASTM B117, ASTM D1654.
6. Resistance to Humidity: ASTM D1735, ASTM D1654.
7. Impact Resistance: ASTM 2784.
8. UV Protection: SAE J1690.

2.12 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 and with NFPA 110, Level 1 Energy Converters.

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 components and accessories furnished with installed unit that are not identical to those on tested prototype to demonstrate compatibility and reliability.
2. Test generator, exciter, and voltage regulator as a unit.
3. Full load run.
4. Maximum power.
5. Voltage regulation.
6. Transient and steady-state governing.
7. Single-step load pickup.
8. Safety shutdown.
9. Provide 14 days' advance notice of tests and opportunity for observation of tests by Owner's representative.
10. 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 in accordance with requirements indicated:

1. Notify Owner no fewer than two working days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Owner’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 and with NFPA 110.

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 033000 "Cast-in-Place Concrete."
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.

D. Install packaged engine generator to provide access, without removing connections or accessories, for periodic maintenance.

E. 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. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

C. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Provide a minimum of one 90-degree bend in flexible conduit routed to the engine generator from a stationary element.

D. Balance single-phase loads to obtain a maximum of 10 percent unbalance between any two phases.

3.5 IDENTIFICATION

A. Identify system components in accordance with Section 260553 "Identification for Electrical Systems."

B. 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. Testing Agency:

1. Owner will engage a qualified testing agency to perform tests and inspections.
2. Engage a qualified testing agency to perform tests and inspections.
3. Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
4. Perform tests and inspections with the assistance of a factory-authorized service representative.

B. 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 below as specified.

a. Visual and Mechanical Inspection:

1) Compare equipment nameplate data with drawings and specifications.
2) Inspect physical and mechanical condition.
3) Inspect anchorage, alignment, and grounding.
4) Verify the unit is clean.
5) Test protective relay devices.
6) Verify phase rotation, phasing, and synchronized operation as required by the application.
7) Functionally test engine shutdown for low oil pressure, overtemperature, overspeed, and other protection features as applicable.
8) Perform vibration test for each main bearing cap.

9) 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. Testing to include cold start, 25, 50, 75, and 100% step loads (slow addition of load to confirm operation),
4. 4 hour testing at rated nameplate.
5. Loading shall be by resistive load bank and building load.

    a. Building load tests shall include simulation of utility power loss to ensure all automatic controls, process equipment, general electrical equipment, etc. are operating properly to meet the design intent.

6. 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.

7. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.
8. 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.
9. Exhaust Emissions Test: Comply with applicable government test criteria.
10. 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.
11. Harmonic-Content Tests: Measure harmonic content of output voltage at 25 percent and 100 percent of rated linear load. Verify that harmonic content is within specified limits.

C. Coordinate tests with tests for transfer switches and run them concurrently.

D. Test instruments shall have been calibrated within the last 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.

3.7 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, provide quarterly inspections by skilled 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 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

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SECTION 33 11 13 – WATER SUPPLY WELLS

PART 1 - GENERAL

1.1 GENERAL:

A. The production well was drilled by Clark's Well Drilling in 2023/2024. The well outer and inner casing, screens, and gravel pack were installed and capped above ground as part of the well drilling project. The Well Construction Diagram is included at the end of this Section. The outer casing has a 30-inch O.D. and a wall thickness of 0.500-inch. The inner casing has a 24-inch O.D. and a wall thickness of 0.375-inch, which reduces down to 18-inch diameter screens.

B. The work covered under this Contract consists generally of the installation of the well pump and motor and related appurtenances inside the well and the construction of the pump foundation, discharge head and concrete apron around the well. Also covered under this Contract is the installation of the well head enclosure, above-ground piping, valves, meters, etc. for the well, which are covered in other Specifications in this manual.

C. All work and materials shall be in accordance with applicable sections of AWWA A100.

D. The well pumping equipment shall be installed by a licensed and certified well driller that has experience in constructing public water supply wells and related work. The well driller may be required to submit a satisfactory experience and qualification record to the Owner/Engineer.

E. All requirements concerning licensed well contractors, well construction, water samples, water quality and well testing and other related matters contained in the latest release of Regulations Governing Public Water Supplies issued by the Alabama Department of Environmental Management Water Supply Division are hereby incorporated into these Specifications.

F. There is a required one (1) year warranty on the well pumping equipment manufacture and installation as specified elsewhere in these Specifications.

1.2 PROCEDURES AND METHODS:

A. Notwithstanding any general clauses, wording, paragraphs, or other references contained in the plans, specifications, general conditions or elsewhere in the Special Provisions the Engineer is not charged with the responsibility of directing the actual procedures and detail methods of construction to be used by the Contractor in accomplishing the work contained in the contract between the Owner and the Contractor, nor is the Engineer responsible to act as superintendent, foreman, or safety engineer for the Contractor, nor for the safety of the Contractor's personnel.

1.3 REGULATIONS:

A. All work, test procedures, etc., shall be in accordance with the latest Administrative Code, Division 7, Alabama Department of Environmental Management, herein referred to as the Regulations.

1.4 SUBMITTALS:

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit manufacturer information for materials of construction and fabrication.

C. Shop Drawings:

1. Submit detailed dimensions for materials and equipment, including wiring and control diagrams, performance charts and curves, installation and anchoring requirements, fasteners, and other details.
2. Include manufacturer's specified displacement tolerances for vibration at operational speed specified for pumps.

D. Critical Speed Analysis: Identify speeds at which pumps will be prone to damaging vibrations.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements. Include separate Paragraphs for additional certifications.

F. Manufacturer Instructions: Submit detailed instructions on installation requirements, including storage and handling procedures, anchoring, and layout.

G. Source Quality-Control Submittals: Indicate results of shop/factory tests and inspections.

H. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

I. Manufacturer Reports: Certify that equipment has been installed according to manufacturer instructions

PART 2 – PRODUCTS

2.1 WELL PUMP:

A. Description:

1. The pump to be installed shall be a water-lubricated, vertical turbine line-shaft well pump of heavy construction throughout and suitable for continuous operation at the conditions specified.

B. Manufacturer:

1. Xylem-Goulds Water Technology
2. Or Approved Equal

C. Performance and Design Criteria:

1. Design Flow Rate: 2,000 GPM
2. Design Total Dynamic Head: 250 FT
3. Minimum Efficiency at Design Flow: 80%
4. Minimum Column Diameter: 12-inch
5. Pump Discharge Size: 12-inch

6. Pump Setting: 280’ depth below ground surface. This is the basis of design, but the pump installer shall submit the recommended pump setting if it differs from this depth.

D. Pump Base:

1. The pump base shall be of extra heavy construction throughout and of sufficient size to properly support the column, bowl and driver. It shall be of cast iron or carbon steel construction, fitted with a flanged outlet connection, a machine steel sole plate. The sole plate shall have an extra heavy separate steel baseplate machined to provide water tight seal against the sole plate. The baseplate shall be perfectly leveled and permanently grouted into the concrete foundation. The grouting shall provide a water proof seal. The discharge flange shall be faced and drilled to match ANSI Class 125 steel flange connections. The design shall permit the vertical hollow shaft motor drive shaft to be coupled above the stuffing box. The discharge head shall be of the shrouded type with a 1/2-inch, minimum, NPT drain connection so that the relief water from the stuffing box and water leaking around the packing gland can be collected and piped away from the well site. The discharge base will be designed to withstand the pressure produced by the pump at shut off head as the pump may be operated against a closed valve. The motor drive shaft shall be the same diameter as the line shaft and shall be manufactured of 416 stainless steel. The coupling to connect the motor drive shaft to the line shaft shall be manufactured of 416 stainless steel and the O.D. of the coupling shall be machined. The shaft above the stuffing box shall be equipped with a rubber water slinger to protect the motor. The discharge base shall also be fitted with a connection for the pre-lubrication water line.

2. Cast iron stuffing box shall be of the deep bore type with a minimum of five (5) rings of packing and a seal cage. Connections for grease inlet and pressure relief shall be provided. The packing gland shall be of the bronze split type and severed in place with ASTM A193, Grade B8 stainless steel studs and silicon bronze nuts. The bottom of the stuffing box casting shall be provided with a bronze bearing of adequate length to prevent shaft deflection through the box and to serve as a throttle bushing. The stuffing box will be designed to withstand pressure produced by the pump at shutoff head as the pump will operate against a closed valve.

3. The pump base shall be equipped with two fittings through which to pass a 3/8” air line and install a 2” cap.

E. Column Pipe:

1. Column assembly shall be flanged-connected to the discharge head. Column pipe shall be of ASTM A53, Grade B steel pipe. Ends shall be machined with 8 threads per inch and faced. Intermediate sections of column shall not exceed ten feet (10’). Top and bottom section of column pipe shall not exceed five feet (5’). All column pipe couplings shall be steel, long pattern, fully threaded to allow the installation of a machined SAE 43 bronze drop-in spider bearing retainer that has a 3/4” thick web for column pipe joints to tightly butt against. The line shaft bearing shall be of synthetic rubber (R-3). The external shape of the bearing shall be such as to retain it in the spider without use of auxiliary collars or rings. The shape of the bearings shall be polygon to provide minimum friction contact to the shaft. Replacement bearings shall be capable of being installed by hand without special tools. Line shafts shall be of A276, Type 416 stainless steel ground and polished with a surface not to exceed 40 rms. Shaft diameter selection shall be based on a combined shear stress of not more than eighteen percent (18%) of the ultimate strength or not in excess of thirty percent (30%) of the elastic limit in tension.

Intermediate shaft sections shall be interchangeable and shall not exceed ten feet (10') in length. The butting ends shall be machined square to the axis of the shaft and shall be threaded and coupled by stainless steel couplings designed with a safety factor of 1 1/2 times the shaft factor.

2. Column Pipe: 12" x 0.38" carbon steel epoxy coated

F. Pump Bowls:

1. The pump bowls shall be constructed of ASTM A48 Class 30 cast iron and shall be so designed to operate in accordance with the pumping conditions as specified. Each bowl interior shall be enameled to provide smooth passage of water and increase efficiency. The bowl exterior shall be epoxy coated. The impeller shaft shall be Type 416 stainless steel and of sufficient size to carry the full load of the impellers. Each stage shall be fitted with a removable bowl wear ring and the impellers shall be of the fully enclosed type, non-overloading and so designed that the motor will not be overloaded nor the pump break suction in the event the above ground head is removed from the pump. The impellers, wear rings and bushings shall be bronze, SAE 43 or SAE 660. The bowls shall be set with a minimum submergence of 30 feet below the drawdown level attained when pumping at the rated capacity.

G. Suction Pipe:

1. The pump bowl shall be equipped with not less than thirty (30') feet of standard weight suction pipe. The inlet shall include a Type 304 stainless steel inlet strainer.

H. Air Line:

1. The pump assembly will be equipped with an air line for monitoring water levels. The air line shall be 3/8-inch (minimum inside diameter) red brass pipe, 3/8-inch copper tubing or 3/8-inch polyethylene tubing attached to the discharge column from the pump head to a point 20 feet below the pump bowls. The installation shall be made in such a manner as to prevent the intrusion of foreign matter. Piping, fittings, air valves and a pressure gauge indicating pressure in feet shall be provided and mounted to facilitate water level and drawdown monitoring.

2. In addition, a 2-inch diameter casing access portal shall be installed and capped to allow direct measurement of the water level by tape or 3/4-inch probe.

2.2 MOTOR:

A. The electric motor shall be manufactured by U.S. Motors. The electrical motor shall conform in construction and performance with the National Electrical Manufacturers Association standards for motors as last revised. It shall be of the squirrel cage, low starting current type in vertical, weather-protected frame. The motor shall be the vertical hollow shaft type for high trust with 40-degree centigrade rise, Class B insulation WP-1 enclosure with epoxy encapsulated windings. The service shall be 480V, 3-Ph, 60 Hz; WP-1 "Premium Efficiency Inverter Duty Rated". Motor shall be rated with 1.15 service factor, and shall have a non-reverse ratchet.

B. The rotors shall run in the ball bearings provided with adequate means of continuous lubrication. The thrust bearing shall be of ample size to carry the thrust load of the pump, the weight of the shaft, couplings and impellers without overheating. It shall be of ample size to

ensure long life when operating continuously in carrying maximum load. Minimum thrust rating allowable as by Anti-Friction Bearing Manufacturers Association (A.F.B.M.A.) is 175% of Standard High Trust. The motor shall be overloaded, operating continuously or intermittently at any point on the pump operating curve.

C. Thermostats shall be provided in the windings of each phase to afford protection of the motor against excessive operating temperature. Thermostats shall be the Klixon type, suitable for use with 120VAC control power. Thermostat leads shall be routed to the conduit box as outlined below, for connection to monitoring circuitry separate from the power wiring. Special purpose relays will not be required for the operation/monitoring of the thermostats provided.

D. Provide 120VAC silicon space heaters in the windings of each motor to prevent the formation of condensation. Space heaters shall be sized by the motor manufacturer for the frame size provided, and shall be installed prior to shipment. Location of the space heaters shall not interfere with the operation of the winding thermostats specified above. Leads from space heaters will be to the conduit box mounted on the side of the motor frame. The main terminal box shall be sized to allow field wiring of all electrical connections to/from the motor. Conduit boxes shall be fitted with gaskets, O-rings, etc... so as to provide a watertight seal.

E. Motor wiring shall be routed to oversized suitably-sized conduit box(es), sized as required to accommodate the specified wiring/conduits, mounted on the side of the motor housing. The conduit box shall be of adequate size to allow field wiring of the motor power and ground leads without excessive bending of the leads. All wiring leads from the space heaters and thermostats shall be routed to a separate accessory conduit box mounted on the side of the motor frame. If the motor frame size does not lend itself to provision of separate conduit boxes, the main terminal box shall be oversized to facilitate field wiring of all electrical connections to/from the motor.

F. Shaft grounding ring(s) shall be provided on the drive end, by the motor manufacturer for all inverter-duty motors to prevent damage to the motor bearings from induced shaft voltages and parasitic capacitance. Grounding rings shall be AEGIS bearing protection rings, which provides a conductive discharge path away from the motor bearings to ground. Shaft surfaces shall be conductive and free of any finish flaws that inhibit conductivity, and shall be provided with a manufacturer-approved silver-based colloidal coating during installation of the grounding rings to enhance conductivity.

2.3 MISCELLANEOUS:

A. Data Plates: The pump shall be equipped with a data plate securely fastened to the pump that contains the manufacturer’s name, pump size and type, serial number, pump speed, impeller data, capacity and head rating, and any other pertinent information.

B. Testing: The pump shall be performance tested prior to shipment to confirm pump performance. Test shall comply with ANSI/HI 14.6 Grade 1U requirements, and shall include, but not be limited to, checking the unit at its rated speed, capacity, head, efficiency, and brake horsepower at such conditions of head and capacity so as to properly establish the actual performance curve. Certified copies of the test reports shall be submitted for review prior to shipment. The Standards of the Hydraulic Institute shall govern the procedures and calculations for the prescribed testing.

2.4 FLOW METER:

A. The flow meter shall be a velocity sensing electromagnetic type flanged tube meter with sealed housing for 150 PSI working pressure. The meter shall be equipped with a digital indicator having a range of 0 to 1200, and a 9-digit digital totalizer reading in units of GPM and shall be accurate within 0.5% of actual flow. The meter assembly shall operate within a range of 0.2 FPS to 32 FPS and be constructed as follows:

1. Meter tube (sensor) shall be fabricated stainless steel pipe and use 150 lb. AWWA Class "D" flat face steel flanges. The internal and external of the meter tube shall be blasted and lined with an NSF-approved fusion bonded epoxy UltraLiner™, applied by the fluidized bed method. Meter tubes shall have a constant nominal inside diameter offering no obstruction to the flow. Electrodes shall be 316 stainless steel.

2. Mag shield shall be welded to the tube providing a completely sealed environment for all coils, electrode connections and wiring harness capable of NEMA 6P/IP68 operation.

3. Signal converter shall be pulsed DC coil excitation type with auto zeroing. The converter shall indicate direction of flow and provide a flow rate indication and a totalization of flow volume for both forward and reverse directions. Both forward and reverse totalizers shall be electronically resettable. The flow meter converter shall be microprocessor based with a keypad for instrument set up and LCD displays for totalized flow, flow rate engineering units and velocity. The converter shall power the flow sensing element and provide galvanically isolated dual 4-20mA outputs. It shall be possible, in the test mode, to easily set the converter outputs to any desired value within the range. The 4-20mA scaling, time constants, pipe size, flow proportional output, engineering units and test mode values shall be easily set via the keypad and display. Four separate fully programmable alarm outputs shall be provided to indicate empty pipe, forward/reverse polarity (normally open/close), analog over-range, fault conditions, high/low flow rates, percent of range and pulse cutoff. The converter shall periodically perform self-diagnostics and display and resulting error messages. All set up and data and totalizer values may be protected by a password. The converter shall be integrally mounted our remotely mounted up to 200 feet from the sensor and shall be supplied in a sealed IP67 rated enclosure. Calibration will be completed at the manufacturer's location in accordance with customer supplied application-based requirements.

4. Grounding rings shall be 316 stainless steel and shall be supplied with the meter tube.

5. Volumetric testing of all meters must be performed and approved prior to shipment. The complete meter assembly and signal converter must be wet accuracy tested and calibrated. The test facility must be rigorously traceable to an accuracy of ±0.15% with the National Institute of Standards and Technology. If desired, the test shall be witnessed by the customer or their selected agent. A copy of the certified accuracy test record must be furnished at no charge to the customer.

6. The meter shall be manufactured and tested in the U.S.A.

7. The meter shall be Bermad MUT2300 or approved equal.

B. The register shall have the capability of interfacing with SCADA system in order to read instantaneous flow and totalized flow from remote location.

C. The Well Pump Control Panel shall provide power and flow monitoring to the meter.

2.5 PRESSURE GAUGES:

A. The pressure gauges within the booster pumping station shall be 4" minimum diameter faces. The case shall be 304 stainless steel, self-supporting type with close type ring and clear glass face. Gauge shall be NSF-61 compliant. The gauge connections shall be at the bottom of the gauge and will be 1/4" NPT. The gauge internal construction shall include phosphor bronze bourdon tube with a brass movement, bronze-bushed, independently mounted. Pressure gauge range and scale graduation shall be in feet of water and psi as follows.

Suction Pressure - 100 psi, 10 psi figure intervals with graduation marks every 1 psi.

Discharge Pressure - 300 psi, 20 psi figure intervals with graduation marks every 2 psi

PART 3 - EXECUTION

3.1 DISINFECTION:

A. Before mobilizing any drill rig or other equipment potentially having contact with the aquifer through physical contact or through the transport of fluids, such equipment shall be decontaminated using steam, mechanical cleaning, or disinfection with a chlorine bleach solution applied by a hand sprayer. Thereupon, the exterior of all drill rigs, tools, and equipment shall be cleaned. The purpose of the decontamination shall be the prevention of the introduction of iron bacteria or other bacteriological contaminants to the aquifer.

B. After the pumping equipment has been installed and the well is completed, the installation shall be disinfected by introducing a chlorine solution into the well and starting and stopping the pump until the solution has been thoroughly mixed with the water. The solution shall contain 50 ppm of chlorine and shall remain in the well for a period of 12 hours. The well shall then be pumped to waste until an orthotolidine test indicates that all chlorinated water has been pumped out.

C. The Contractor shall secure three (3) sterilized sample bottles from the nearest State Testing Laboratory and carefully obtain samples of the water. The bottles shall be promptly delivered to the nearest branch Laboratory. If the report on the samples is not satisfactory, the Contractor shall re-disinfect the well for as many times as is necessary to obtain a satisfactory report.

3.2 WELL CAPACITY TEST:

A. The pumping equipment installer will be required to perform a well capacity test utilizing a temporary test pump of suitable size. The test shall be conducted in accordance with ADEM Administrative Code 335-7-5. The approximate design capacity was determined as part of the well drilling project. The maximum test capacity shall be 150% of the design capacity.

B. The capacity test shall be run at design capacity until the water level in the water supply well has stabilized (+/- 1.0 foot) and shall then be continued for a period of 24 hours with water level readings collected at regular intervals (the test shall be run for 21 hours after the drawdown has shown to remain constant for three consecutive hourly readings). The pumping rate shall then be increased to the maximum test capacity and shall continue to run until the water level is stabilized (+/- 1.0 foot) and shall then continue to run for a period of six (6) hours with water level readings collected at regular intervals. Immediately upon pump shut-down a

full recovery test shall be performed. The conduction of the well capacity test shall meet the requirements of the Measurement section below.

C. Measurements:

1. The pumping test shall be conducted to determine the aquifer storage coefficient and transmissivity. Accurate drawdown readings shall be taken in both the production well and observation well simultaneously. Water levels shall be recorded three times within one day prior to the start of the capacity test and within five (5) minutes of the start of the test to provide background water level information. Drawdown readings shall be taken at two-minute intervals the first hour of the test; at five-minute intervals the second hour; at ten-minute intervals for the next two hours; thirty-minute intervals for the next two hours; and hourly thereafter to the end of the test. Drawdown data collected during the period of the test shall be corrected for changes in barometric pressure and tidal oscillations.

2. Immediately upon pump shut-down a full recovery test shall be performed. Water level recordings shall be made no less than one-minute intervals the first ten minutes; two-minute intervals the next ten minutes; five-minute intervals the next thirty minutes; and ten-minute intervals until practical recovery

3.3 WATER QUALITY:

A. During the testing of the water supply well capacity (pumping test) periodic water samples shall be taken during the pumping test and analyzed for turbidity. Complete analysis shall be performed for Primary and Secondary drinking water containments per Chapters 335-7-2 and 335-7-3 of the ADEM Administrative Code. All other samples shall be stored in clean glass containers for future analysis if needed. A complete chemical analysis to include inorganic, radiological and VOC (regulated and unregulated) analysis shall be performed. The analyses must be performed by a laboratory certified by the Alabama Department of Environmental Management. Levels of primary and secondary contaminants shall be reported along with pH, total alkalinity, carbon dioxide, calcium, magnesium, hardness, sodium, and specific conductance.

3.4 WELL PUMP:

A. Well Pump:

1. The well pump shall be set, aligned and made fully operational by the licensed well driller. The Contractor shall employ a factory-trained engineer to supervise the installation and alignment of all items of mechanical and electrical equipment. He shall see that all items of equipment are installed, piped and wired in accordance with the manufacturer's recommendations, and shall place all equipment in satisfactory operation and demonstrate such to the satisfaction of the Owner/Engineer. The Contractor shall guarantee the satisfactory operation of all apparatus and machinery against defects in workmanship, materials and installation for a period of one (1) year.

B. Pump Foundation:

1. After the well has been completed and the Contractor, Engineer and Owner have reviewed all results from the Well Completion Report and after the Contractor has been given the authorization to proceed, the Contractor may begin construction of the pump foundation and pumping equipment. The foundation shall consist of Class A concrete

and be formed in a workmanlike manner with chamfered edges on the sides and top. All unsuitable soils around the casing pipe shall be removed and approved fill material places as specified elsewhere.

2. The top of the foundation shall be set approximately 12-inches above ground. The bottom of the foundation shall be carried to a firm bearing capacity of 2,500 psf and not less than 2-feet below the surface. The concrete foundation shall be at least 2-feet square and the exposed surfaces shall be rubbed with a carborundum stone to remove form marks.

3. The Contractor shall provide a schematic drawing to the Engineer for approval of the pump foundation which shows the dimensions of the foundation, base plate design, details of the base plate-to-casing connection, airline and electric cable penetration, discharge elbow or tee, connections for pump removal, etc.

4. The Casing shall project a minimum of 12-inches above the finished concrete slab around the well.

3.5 FIELD QUALITY CONTROL:

A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.

B. Section 01 70 00 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.

C. Preoperational Check: Before operating system or components, perform following:

1. Check pump and motor alignment.
2. Check for proper motor rotation.
3. Check pump and drive units for proper lubrication.

D. Startup and Performance Testing:

1. Operate the pump at the design point for a minimum continuous period of thirty (30) minutes, under supervision of manufacturer's representative and in presence of Engineer’s Field Representative.

E. Manufacturer Services: Furnish services of manufacturer's representative experienced in installation of products furnished under this Section for not less than two (2) eight-hour days on Site for installation, inspection, startup, field testing, and instructing Owner's personnel in maintenance of equipment.

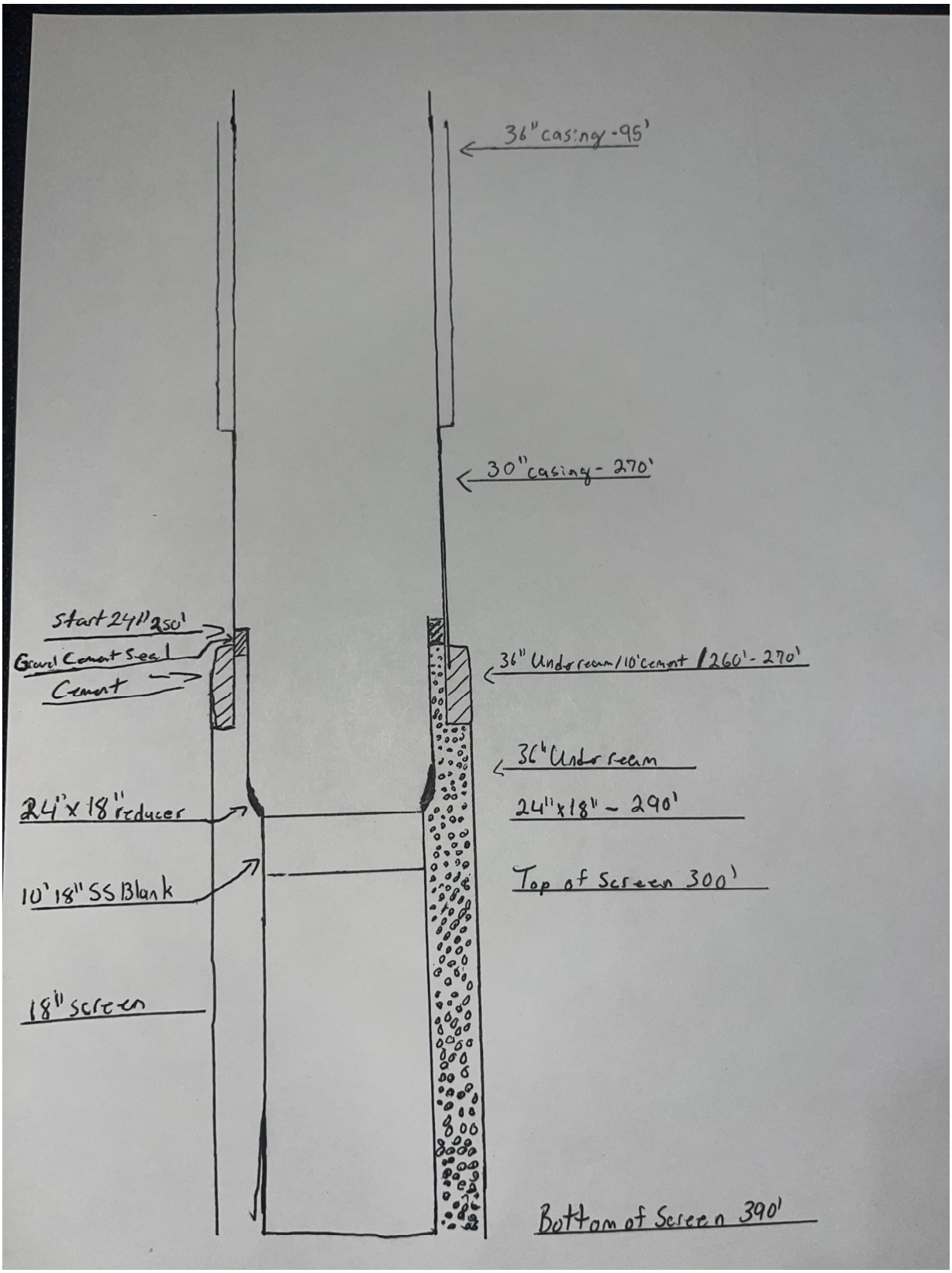
F. Check pump and motor for excessive vibration according to manufacturer instructions. Check for motor overload by taking ampere readings.

G. Equipment Acceptance:

1. Adjust, repair, modify, or replace system components that fail to perform as specified and rerun tests.
2. Make final adjustments to equipment under direction of manufacturer's representative.

END OF SECTION 33 11 13

Well Construction Diagram



SECTION 40 05 57 - ACTUATORS FOR PROCESS VALVES AND GATES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Manual actuators
2. Electric motor actuators

B. Related Requirements:

1. Section 05 50 00 - Metal Fabrications
2. Section 09 96 00 - High-Performance Coatings
3. Division 26 - Electrical
4. Division 40 - Process Interconnections

1.2 REFERENCE STANDARDS

A. American Bearing Manufacturers Association:

1. ABMA 9 - Load Ratings and Fatigue Life for Ball Bearings
2. ABMA 11 - Load Ratings and Fatigue Life for Roller Bearings

B. American Water Works Association:

1. AWWA C500 - Metal-Seated Gate Valves for Water Supply Service
2. AWWA C542 - Electric Motor Actuators for Valves and Slide Gates

C. NFPA:

1. NFPA 70 - National Electrical Code

1.3 COORDINATION

A. Section 01 31 00 - Project Management and Coordination: Requirements for coordination

B. Coordinate Work of this Section with installation of valves and accessories.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals

B. Product Data: Submit manufacturer information for actuator with model number and size indicated.

C. Shop Drawings:

1. Indicate parts list, materials, sizes, position indicators, limit switches, actuator mounting, wiring diagrams, control system, and control system schematics on assembly drawings.
2. Submit actuator Shop Drawings with valve and gate submittal.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Manufacturer Instructions: Submit special procedures and placement requirements.

F. Source Quality-Control Submittals: Indicate results of shop/factory tests and inspections.

G. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

H. Qualifications Statements:

1. Submit qualifications for manufacturer and installer.
2. Submit manufacturer's approval of installer.

1.5 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents: Record actual locations and types of actuators.

1.6 QUALITY ASSURANCE

A. Locations: Comply with NFPA 70.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum ten (10) years' documented experience.

B. Installer: Company specializing in performing Work of this Section with minimum three (3) years' documented experience and approved by manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

C. Store materials according to manufacturer instructions.

D. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Furnish temporary end caps and closures on piping and fittings and maintain in place until installation.
3. Provide additional protection according to manufacturer instructions.

1.9 EXISTING CONDITIONS

A. Field Measurements:

1. Verify field measurements prior to fabrication.
2. Indicate field measurements on Shop Drawings.

1.10 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.

B. The Manufacturer and Contractor shall furnish a warranty extending twelve (12) months after substantial completion date.

PART 2 - PRODUCTS

2.1 DESCRIPTION

A. Furnish gear and power actuators with position indicators.

B. Electric actuators shall be provided where specified in the Valve Schedule.

C. Manual actuators shall be provided on all valves which do not receive electric actuators.

D. Actuators shall be furnished with conservatively-sized extension bonnets, extension stems, or torque tubes. All required appurtenances shall be provided for a complete installation. Actuators furnished with extension bonnets shall include stainless steel extension stems or stainless steel torque tubes.

2.2 MANUAL ACTUATORS

A. Gate Valves: Gave valves shall be fitted with cast iron hand wheels of suitable size or gear and hand wheel operators in accordance with AWWA C500.

B. Butterfly Valves: Butterfly valves 6 inches and smaller shall be lever and locking ratchet operated. Butterfly valves larger than 6 inches shall be equipped with gear and hand wheel operators. The operators shall be furnished by the manufacturer of the valve, in accordance with AWWA C504, who shall be responsible for the compatibility and adequacy of both the valve and operator. Valve operator shall be sized for the maximum torque developed by the maximum pressure in the pipeline in which the valve is to be used.

C. Plug and Ball Valves: Plug and ball valves 6 inches and smaller shall be lever and locking ratchet operated. Plug and ball valves larger than 6 inches shall be provided with gear and hand wheel operators.

D. Manual actuators shall be rigidly attached to the valve body unless otherwise specified or shown on the Drawings.

E. All actuators shall turn counter-clockwise to open and shall have the open direction clearly and permanently marked.

F. Provide gear and power actuators with position indicators.

G. Manual actuators that are below-grade (or installed inside a vault) shall have permanently lubricated, watertight, valves under an external pressure of 10 psi.

H. Gear-Assisted Manual Actuators:

1. Drive Type: Worm gear except where otherwise shown or specified
2. Provide totally enclosed gears.
3. Gearing: Designed for 100 percent overload.
4. Bearings:

    a. Type: Ball or Roller; comply with ABMA 9 or ABMA 11.
    b. Permanently lubricated bronze.
    c. Minimum L10 Life: 100,000 hours.

5. Maximum Operating Force: 60 lbf.
6. Handwheel: Minimum 12-inch diameter.
7. Packing: Accessible for adjustment without requiring removal of actuator from valve.

I. Chain Actuators:

1. Description:

    a. Chain actuators for shutoff valves mounted 7 feet and greater above operating floor level.
    b. Chain guides and hot-dip galvanized operating chain extending to 5-1/2 feet above operating floor level.

2. Chain Wheels: Sprocket rim type.
3. Furnish chain storage if chains may interfere with pedestrian traffic.

J. Buried Valves:

1. Buried valves shall be equipped with: nut operators, extended stems, and valve boxes. If the operating nut is more than four (4) feet below finished grade, a valve operator extension shall be provided, bringing the operating nut within 18” – 24” of the surface.
2. Nut operators shall have standard 2” square AWWA operating nuts, designed in accordance with AWWA C504-94.
3. Floors:

a. Furnish extension stems to grade, and square nuts or floor stands with position indicators.
b. Cast-iron/Steel pipe extensions with valve boxes, covers, and operating keys.
c. Floor Boxes: Hot-dip galvanized cast iron or steel, with bronze cover.
d. Lid Inscription: An arrow at least 2" long showing direction of opening. The word OPEN shall also be cast on the flange.

4. Valve Boxes:

a. Material: Cast iron.
b. 12 Inch Diameter Valves and Smaller: Two-piece, screw type.
c. Valves larger than 12 Inch Diameter: Three-piece, screw type.
d. Lid Inscription: An arrow at least 2" long showing direction of opening. The word OPEN shall also be cast on the flange.

2.3 ELECTRIC MOTOR ACTUATORS

A. Manufacturers:

1. Auma Actuators, Inc.; Canonsburg, PA
2. Approved Equivalent

B. Description:

1. Motor, reduction gearing, torque switches, limit switches, auxiliary hand wheel, starter, mechanical position indicator, and accessories.
2. Comply with AWWA C542.
3. Open-close operation or modulation, as specified, or as shown on the Drawings.
4. Valve closing time shall be 60 seconds, unless otherwise noted.
5. Actuators shall be capable of operating in an ambient temperature range of -20 to +175 ºF.
6. All actuators in open/close service shall be furnished with integral motor controls consisting of reversing starters, control transformer, phase discriminator, monitor relay, positioner, “open-stop-close” pushbuttons, “local-off-remote” selector switch in addition to red and green indicating lights. The positioner shall be capable of accepting a 4~20 mADC signal from the controller and positioning the valve by comparing the command signal with the present valve position as indicated by the feedback potentiometer mounted inside the actuator. The positioner shall be field adjustable to fail in the “open”, “closed” or “last” position on loss of 4~20 mADC command signal.

C. Enclosure:

1. Minimum NEMA 250 Type 4. When specified, motor and all electrical enclosure shall be available to meet NEMA 6 submersible, or NEMA 7 hazardous requirements.
2. Mounting: Attached actuator housing using flanged motor adapter.

D. Motors:

1. As specified in Section 40 05 93 - Common Motor Requirements for Process Equipment.
2. Type:

a. Reversing or modulating, as specified, or as shown on the Drawings.
b. Totally enclosed, non-ventilated, high starting torque, low starting current.
c. Full-voltage starting.

3. Electrical Characteristics:

a. Connections: As specified in Division 26 – Electrical.
b. Torque: A running torque per valve manufacturer's recommendation.
c. Sufficient horsepower to open or close a valve against the maximum specified differential pressure when voltage to the motor is ±10% of nominal voltage with a factor of safety of 1.5.
d. Voltage: 480 V, three phase, 60 Hz, or 120 V, one phase, 60 Hz (see electrical drawings).
e. Lubrication: Pre-lubricated.
f. Bearings Type: Anti-friction
g. Motor Rating: 30 minute duty.

E. Reduction Gearing:

1. Description: Single- or double-reduction unit of spur or helical gears and worm-gearing.
2. Lubrication: Grease or oil.
3. Bearings:

a. Type: Ball or Roller; comply with ABMA 9 or ABMA 11.
b. Minimum L10 Life: 100,000 hours.

F. Limit Switches:

1. Type: Heavy duty, open contact.
2. Actuation: Rotor cam.
3. Compartment: Totally enclosed and equipped with a heater and thermostat to prevent build-up of moisture and contamination.
4. Switches shall be SPDT and rated 10A at 120 VAC or as specified.
5. Actuating Point: Adjustable at any point of valve between fully open and fully closed.
6. Adjustment: Capable of quick adjustment requiring no more than five (5) turns of the adjustment spindle.
7. Contacts: One set of normally open and one set of normally closed contacts shall be furnished and available for use by the plant control system at each end of travel where indicated. Contact shall be of silver and capable of reliably switching a low voltage DC source from the control system furnished by other.

G. Torque Limiting Switches:

1. Torque limiting switches shall be provided.
2. Torque limiting switches shall be responsive to the mechanical torque developed in seating, backseating, or by obstruction.
3. Accuracy: Within ±5%
4. Calibration: The use of torque wrenches for calibration shall not be required. Calibrated by use of a dynamometer in order to accurately predict the output of the actuator.
5. A calibration tag stating the maximum torque output of each torque switch at 100% setting shall be permanently affixed to the torque switch dial.

H. Extended Shafts

1. Bonnets/shaft enclosures for valve shafts that extend through grating shall be connected to the valve body. No force shall be applied to the grating to actuate the valve.

I. Hand Wheel Operation:

1. A permanently attached hand wheel shall be provided for emergency manual operation.
2. A seized or inoperable motor shall not prevent manual operation.
3. The hand wheel shall not rotate during electrical operation.
4. Maximum Torque Required: 60 lb-ft.
5. Maximum Force Required: 60 lbs.
6. Inscription: An arrow and either the work OPEN or CLOSE shall be cast in the hand wheel to indicate the direction to turn hand wheel.
7. Minimum Diameter: 8 inches.

J. Seals

1. Electric actuators shall have double seals.

2.4 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for testing, inspection, and analysis.

B. Provide shop inspection and testing of completed assemblies.

C. Certificate of Compliance:

1. If manufacturer is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at manufacturer's facility conforms to Contract Documents.
2. Specified shop tests are not required for Work performed by approved manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify that field dimensions are as indicated on Shop Drawings.

3.2 INSTALLATION

A. Securely mount actuators using brackets or hardware specifically designed for attachment to valves.

B. Extend chain actuators to 5-1/2 feet above operating floor level.

3.3 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.

B. Section 01 70 00 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.

C. After installation, inspect for proper supports and interferences.

D. Repair damaged coatings with material equal to original coating as specified in Section 09 96 00 - High-Performance Coatings.

END OF SECTION 40 05 57

SECTION 40 05 64 - BUTTERFLY VALVES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rubber-seated butterfly valves.

B. Conform to the requirements of Section 40 05 51 - Common Requirements for Process Valves.

C. Related Requirements:

1. Division 40 – Process Interconnections.

1.2 REFERENCE STANDARDS

A. American Water Works Association:

1. AWWA C504 - Rubber-Seated Butterfly Valves.

B. ASME International:

1. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.
2. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard.
3. ASME B16.42 - Ductile Iron Pipe Flanges and Flanged Fittings: Classes 150 and 300.

C. ASTM International:

1. ASTM A536 - Standard Specification for Ductile Iron Castings.
2. ASTM D1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
3. ASTM D3222 - Standard Specification for Unmodified Poly (Vinylidene Fluoride) (PVDF) Molding Extrusion and Coating Materials.
4. ASTM D4101 - Standard Specification for Propylene Injection and Extrusion Materials.

PART 2 - PRODUCTS

2.1 RUBBER-SEATED BUTTERFLY VALVES

A. Manufacturers:

1. Milliken; Henry Pratt Company, Aurora, IL.
2. DeZurik, Sartell, MN.

3. American
4. Mueller
5. M&H
6. Or Approved Equal.

B. Description:

1. Comply with AWWA C504, Class 150.
2. Minimum Working Pressure: 150 psig.
3. Shaft: Bearings shall be non-metallic and permanently lubricated.
4. Seats:

    a. Mounting: On body for valves 24 inches and smaller.
    b. Type: Field replaceable for valves larger than 30 inches.

5. Packing: V-type packing with a minimum of 4 sealing rings or multiple U-cups.
6. End Connections: Flanged end valves of short body design with 125 lb. flanged ends faced and drilled per ANSI B16.1 standard for cast iron flanges.

C. Operator:

1. As specified in Section 40 05 57 – Actuators for Process Valves and Gates.
2. Gear Actuators for Manual Valves: Comply with AWWA C504.

D. Materials:

1. Body: Cast iron, ASTM A126 or ductile iron, ASTM A536 Grade 65-45-12.
2. Stem: Stainless steel.
3. Disc: Cast iron, ASTM A48, Class 4C or ductile iron, ASTM A536 Grade 65-45-12.
4. Seats:

    a. Type: Resilient.
    b. Material: Buna N or EPDM for water, or as required for other services.

5. Seating Surfaces: Type 316 stainless steel.
6. Bearings: Non-metallic and permanently lubricated.
7. Connecting Hardware: Type 316 stainless steel.

E. Finishes: As specified in Section 09 96 00 – High-Performance Coatings.

2.2 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for testing, inspection, and analysis.

B. As specified in Section 40 05 51 - Common Requirements for Process Valves.

C. Testing: Test butterfly valves according to AWWA C504.

PART 3 - EXECUTION

3.1 EXAMINATION, INSTALLATION AND FIELD QUALITY CONTROL

A. As specified in Section 40 05 51 - Common Requirements for Process Valves.

B. According to AWWA C504.

END OF SECTION 40 05 64

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SECTION 40 05 65 - SWING AND DISC CHECK VALVES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Swing check valves.
2. Synthetic Disc Check Valves.

B. Related Requirements:

1. Section 40 05 51 – Common Requirements for Process Valves

1.2 REFERENCE STANDARDS

A. American Water Works Association:

1. AWWA C508 - Swing-Check Valves for Waterworks Service, 2-In. Through 24-In. (50-mm through 600-mm) NPS.

B. ASME International:

1. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.
2. ASME B16.11 - Forged Fittings, Socket-Welding and Threaded.
3. ASME B16.42 - Ductile Iron Pipe Flanges and Flanged Fittings: Classes 150 and 300.

C. ASTM International:

1. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
2. ASTM A536 - Standard Specification for Ductile Iron Castings.
3. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings.
4. ASTM B148 - Standard Specification for Aluminum-Bronze Sand Castings.

PART 2 - PRODUCTS

2.1 SWING CHECK VALVES

A. Manufacturers:

1. DeZurik
2. Milliken; Henry Pratt Company; Aurora, IL
3. APCO
4. Val-Matic

5. Or Approved Equal

B. Description:

1. Type: Swing, resilient seated with outside lever and adjustable spring.
2. Comply with AWWA C508.
3. Swing check valves shall be used for water and wastewater service.
4. Minimum Working Pressure: 200 psig for 2” - 12” and 150 psig for 14” - 30”
5. Flow area: Full open, equal to connecting nominal pipe diameter.
6. Check valves 6 inches and larger: Furnish with adjustable air cushion chambers.
7. Mounting: Horizontal or vertical.
8. End Connections: Integral flange ends shall be ANSI B16.1 Class 125, suitable for horizontal or vertical installation.

C. Materials:

1. Body and Cover: Ductile iron, ASTM A536.
2. Disc, Disc Arm: Ductile iron, ASTM A536.
3. Body Seat: Replaceable, Type 316 ASTM A276 with Buna-N renewable seat ring.
4. Shaft: Type 303 Stainless Steel ASTM A582.
5. Disc Seat: Buna-N.
6. Lever and Counterweight: Ductile Iron, ASTM A536.
7. Hinge Pin and Key: Type 316 Stainless Steel.
8. Rubber Components: Buna-N .
9. Connecting Hardware: Type 304 Stainless Steel.

D. Finishes: As specified in Section 40 05 51 - Common Requirements for Process Valves.

2.2 SYNTHETIC DISC CHECK VALVE

A. Manufacturers:

1. Valmatic
2. APCO
3. Or approved equal.

B. Description:

1. Comply with AWWA C508
2. Minimum Working Pressure: 200 psig for 2” - 12” and 150 psig for 14” - 30”
3. Type: Swing, flexible disc check valve, full body flow type with hold-open backflow actuator.
4. Mounting: Horizontal or vertical.
5. End Connections: Integral flange ends shall be ANSI B16.1 Class 125, suitable for horizontal or vertical installation

C. Materials:

1. Body and Cover: Ductile iron, ASTM A536.
2. Disc: Precision molded Buna-N ASTM D2000

3. Epoxy Coated Interior
4. Screw-Type Stainless Steel backflow actuator
5. Mechanical Position indicator
6. Open-Close position indicator limit switch where shown.

D. Finishes: As specified in Section 40 05 51 - Common Requirements for Process Valves.

2.3 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for testing, inspection, and analysis.

B. Testing:

1. Hydrostatically test check valves at twice rated pressure according to AWWA C508.
2. Permitted Leakage at Indicated Working Pressure: None.

PART 3 - EXECUTION

3.1 EXAMINATION, INSTALLATION AND FIELD QUALITY CONTROL

A. As specified in Section 40 05 51 - Common Requirements for Process Valves.

B. According to AWWA C508.

END OF SECTION 40 05 65

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SECTION 40 05 93 - COMMON MOTOR REQUIREMENTS PROCESS EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Single- and three-phase motors for application on equipment provided under other Sections and for motors furnished loose to Project.

B. Related Requirements:

1. Division 26 – Electrical.

1.2 REFERENCE STANDARDS

A. American Bearing Manufacturers Association:

1. ABMA 9 – Load Ratings and Fatigue Life for Ball Bearings.

B. National Electrical Manufacturers Association:

1. NEMA MG 1 – Motors and Generators.

C. International Electrical Testing Association:

1. NETA ATS – Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

1.3 SUBMITTALS

A. Section 01 33 00 – Submittal Procedures: Requirements for submittals.

B. Product Data: Submit catalog data for each motor furnished loose. Indicate nameplate data, standard compliance, electrical ratings and characteristics, physical dimensions, weights, mechanical performance data, and support points.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Test and Evaluation Reports: Indicate procedures and results for specified factory and field testing and inspection.

E. Qualifications Statements:

1. Submit qualifications for manufacturer and testing agency.

1.4 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum ten (10) years' documented experience.

B. Testing Agency: Member of International Electrical Testing Association and specializing in testing products specified in this Section with minimum ten (10) years' documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 – Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Lift only with lugs provided. Handle carefully to avoid damage to components, enclosure, and finish.

C. Protect products from weather and moisture by covering with plastic or canvas and by maintaining heating within enclosure.

D. For extended outdoor storage, remove motors from equipment and store separately.

PART 2 - PRODUCTS

2.1 PRODUCT REQUIREMENTS FOR MOTORS FURNISHED WITH EQUIPMENT

A. Motors 3/4 hp and Larger: Three-phase motor as specified below.

B. Motors Smaller than 3/4 hp: Single-phase motor as specified below, except motors less than 250 watts or 1/4 hp may be equipment manufacturer's standard.

C. Three-Phase Motors: NEMA MG 1, Design B, energy-efficient squirrel-cage induction motor with windings to accomplish starting methods and number of speeds.

1. Voltage:

   a. As indicated on Drawings.

2. Service Factor: 1.15.
3. Enclosure: Meet conditions of installation unless specific enclosure is indicated on Drawings.
4. Design for continuous operation in 40°C environment, with temperature rise according to NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.
5. Insulation System: NEMA Class H.
6. Motors driven by VFDs shall be inverter duty rated.
7. Shaft grounding rings as recommended by Aegis shall be provided on any VFD driven motors.
8. Motor Frames: NEMA Standard T-Frames of steel, aluminum, or cast iron with end brackets of cast iron or aluminum with steel inserts.

9. Thermistor System (Motor Frame Sizes 254T and Larger): Three (3) PTC thermistors embedded in motor windings and epoxy-encapsulated solid state-control relay with wiring to terminal box. Relay shall be configured for 120VAC power input and shall include NO/NC 120VAC-rated dry contacts for alarm indication.
10. Motor Anti-Condensation Heaters (Motor Frame Sizes 254T and Larger): Integral 120VAC anti-condensation heaters shall be embedded in motor windings to prevent corrosion.
11. Bearings: Grease lubricated anti-friction ball bearings with housings equipped with plugged provision for relubrication, rated for minimum ABMA 9, L-10 life of 200,000 hours. Calculate bearing load with NEMA minimum, V-belt pulley with belt center line at end of NEMA standard shaft extension. Stamp bearing sizes on nameplate.
12. Sound Power Levels: Conform to NEMA MG 1.

D. Single-Phase Motors:

1. Permanent split-capacitor type where available; otherwise use split-phase start/capacitor run or capacitor start/capacitor run motor.
2. Voltage: 115/230 volts, single phase, 60 Hz.

E. Wiring Terminations: Furnish terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Provide oversized tap boxes.

2.2 THREE-PHASE MOTORS FURNISHED LOOSE

A. Manufacturers:

1. General Electric; Boston, MA.
2. US Motors; Memphis, TN.
3. WEG; Duluth, GA.
4. Or Approved Equal.

B. Description: NEMA MG 1, Design B, energy-efficient squirrel-cage induction motor, with windings to accomplish starting methods and number of speeds indicated.

C. Shall be suitable for VFD operation.

D. Voltage: As indicated on Drawings.

E. Service Factor: 1.15.

F. Enclosure: Meet conditions of installation unless specific enclosure is specified or indicated.

G. Design for continuous operation in 40 °C environment, with temperature rise according to NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.

H. Insulation System: NEMA Class H.

I. Motors driven by VFDs shall be inverter duty rated.

J. Shaft grounding rings as recommended by Aegis shall be provided on any VFD driven motors.

K. Motor Frames: NEMA Standard T-Frames of steel, aluminum, or cast iron with end brackets of cast iron or aluminum with steel inserts.

L. Thermistor System (Motor Frame Sizes 254T and Larger): Two (2) PTC thermistors per winding embedded in motor windings and epoxy-encapsulated solid state-control relay with wiring to terminal box. Relay shall be configured for 120VAC power input and shall include NO/NC 120VAC-rated dry contacts for alarm indication.

M. Motor Anti-Condensation Heaters (Motor Frame Sizes 254T and Larger): Integral 120VAC anti-condensation heaters shall be embedded in motor windings to prevent corrosion.

N. Bearings: Grease lubricated anti-friction ball bearings with housings equipped with plugged provision for relubrication, rated for minimum ABMA 9, L-10 life of 200,000 hours. Calculate bearing load with NEMA minimum, V-belt pulley with belt center line at end of NEMA standard shaft extension. Stamp bearing sizes on nameplate. Lubricant shall be identified in the submittal and on motor data plate.

O. Sound Power Levels: Conform to NEMA MG 1.

P. Wiring Terminations: Furnish terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Provide oversized tap boxes.

2.3 SOURCE QUALITY CONTROL

A. Section 01 40 00 – Quality Requirements: Requirements for testing, inspection, and analysis.

B. Factory Testing: Test motors according to NEMA MG 1, including winding resistance, no-load speed, and current, locked rotor current, insulation high-potential test, and mechanical alignment tests.

PART 3 - EXECUTION

3.1 PREPARATION

A. Section 01 70 00 – Execution and Closeout Requirements: Requirements for installation preparation.

B. Disconnect and remove abandoned motors.

C. Clean and repair existing motors to remain or those to be reinstalled.

3.2 INSTALLATION

A. Maintain access to existing motors and other installations remaining active and requiring access. Modify installation or provide access panel.

B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.

C. Install engraved plastic nameplates according to Section 26 05 53 – Identification for Electrical Systems.

D. Ground and bond motors according to Section 26 05 26 – Grounding and Bonding Electrical Systems.

3.3 FIELD QUALITY CONTROL

A. Section 01 40 00 – Quality Requirements: Requirements for inspecting and testing.

B. Section 01 70 00 – Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.

C. Inspect and factory test according to NETA ATS, except Section 4.

END OF SECTION 40 05 93

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SECTION 26 32 13.14 - DIESEL ENGINE GENERATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Engine.
2. Diesel fuel system.
3. Control and monitoring.
4. Generator overcurrent and fault protection.
5. Generator, exciter, and voltage regulator.
6. Outdoor generator-set enclosure.
7. Vibration isolation devices.

B. Related Requirements:

1. Section 26 36 00 "Transfer Switches" for transfer switches including sensors and relays to initiate automatic-starting and -stopping signals for engine generators.

1.2 DEFINITIONS

A. EPS: Emergency power supply.

B. EPSS: Emergency power supply system.

C. 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 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 gallons per hour (liters 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, with air supply temperature of 95 deg F (35 deg C), 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, reactance, and short-circuit current capability.

8. Include generator step report, load summary, transient analysis, and harmonic analysis for the following loads and project parameters:

    a. Project Parameters

        1) Vdip max: 10%
        2) Fdip max: 8%

    b. Loads (Step 1)

        1) 480V, 3Φ, 200HP well pump motor controlled by 6 pulse filtered fast ramp VFD.
        2) BPS building lighting and receptacle loads.

B. Shop Drawings:

1. Include plans and elevations for engine generator and other components specified.
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 indicating terminal markings for EPS equipment and functional relationship between all electrical components.

1.4 INFORMATIONAL SUBMITTALS

A. 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. Report of factory test on units to be shipped for this Project, indicating evidence of compliance with specified requirements.
4. Report of sound generation.
5. Report of exhaust emissions indicating compliance with applicable regulations.
6. Requirement in subparagraph below is from Section 5.6.10.2 of NPFA 110.
7. Certified Torsional Vibration Compatibility: Comply with NFPA 110.
8. Dimensioned Outline Drawings of Equipment Unit: With engine and generator mounted on rails, identify center of gravity and total weight including full fuel tank, supplied enclosure, external silencer, subbase-mounted fuel tank, and each piece of equipment not integral to the engine generator, and locate and describe mounting and anchorage provisions.
9. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements

B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

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

1. In addition to items specified in Section 01 78 23 "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 QUALITY ASSURANCE

A. Manufacturer Qualifications: Current certificate holder for compliance with ISO 9001.

B. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

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: 5 years from date of startup, to include parts and labor.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain packaged engine generators and auxiliary components through one source from a single manufacturer.

B. Pre-Approved Manufacturers

1. Cummins
2. Caterpillar

2.2 PERFORMANCE REQUIREMENTS

A. NFPA Compliance:

1. Comply with NFPA 37.
2. Comply with NFPA 70.
3. Comply with NFPA 99.
4. Comply with NFPA 110 requirements for Level 1 EPSS.

B. UL Compliance: Comply with UL 2200.

C. Engine Exhaust Emissions: Comply with EPA requirements and applicable state and local government requirements.

D. Noise Emission: Comply with applicable state and local government requirements, 83 dB(A) at 23 ft, 7 meters or maximum noise level at adjacent property boundaries due to sound emitted by engine generator including engine, engine exhaust, engine cooling-air intake and discharge, and other components of installation.

E. Environmental Conditions: Engine generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:

1. Ambient Temperature: 0 to 104 deg F (-17 to 40 deg C)
2. Relative Humidity: Zero to 95 percent.
3. Altitude: Sea level to 1000 ft. (300 m)

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 testing agency acceptable to authorities having jurisdiction, and marked for intended location and use.

C. Power Rating: As shown on drawings.

D. Power Factor: 0.8, lagging.

E. Frequency: 60 Hz.

F. Voltage: 277/480 V ac.

G. Phase: Three-phase, four wire, Wye.

H. Governor: Adjustable isochronous, with speed sensing.

I. 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.

J. 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. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of components.

K. Engine Generator Performance:

1. Steady-State Voltage Operational Bandwidth: 3 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: 0.5 percent of rated frequency from no load to full load.
4. 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.
5. Transient Frequency Performance: Less than 5 percent variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within five seconds.
6. Output Waveform: At no load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3.5 percent for single harmonics. Telephone influence factor, determined in accordance with NEMA MG 1, shall not exceed 50 percent.
7. 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 generator system components.
8. Start Time:

    a. Comply with NFPA 110, Type 10 system requirements.
    b. 10 seconds start time

2.4 DIESEL ENGINE

A. Fuel: ASTM D975, diesel fuel oil, Grade 2-D S15.

1. Off road, Ultra low Sulphur diesel fuel (15ppm)

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 and with NFPA 110 requirements for Level 1 equipment for heater capacity. Heater shall be no greater than 1500W @ 120Vac.

E. Integral Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine generator 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 gauge 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. Maximum Ambient Operating Temperature: 104 deg F (40 deg C).
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 no collapsible under vacuum.
b. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.

F. Muffler/Silencer:

1. Critical type sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.

a. Sound level measured at 23 ft. (7 m) from exhaust discharge after installation is complete shall be 83 dBA or less.

G. Air-Intake Filter: Standard-duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.

H. Starting System: 12 or 24vdc 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, 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-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35 A minimum continuous rating.

7. 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. Charging Rate: Automatic 10-A, dual rate float/equalize with reverse polarity protection.
    b. Charging current output measured by generator controller to support remote monitoring and diagnostics.
    c. Factory installed on engine-generator. Due to voltage drop concerns, transfer-switch-mounted battery chargers are not acceptable.
    d. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.
    e. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
    f. Enclosure and Mounting: NEMA 250, Type 1, wall-mounted cabinet.

2.5 DIESEL FUEL-OIL SYSTEM

A. Comply with NFPA 37.

B. Main Fuel Pump: Mounted on engine to provide primary fuel flow under starting and load conditions.

C. Fuel Filtering: Remove water and contaminants larger than 1 micron.

D. Relief-Bypass Valve: Automatically regulates pressure in fuel line and returns excess fuel to source.

E. 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: 24 hours based on full load fuel consumption rates.
3. Leak detection in interstitial space.
4. Low-Level Alarm Sensor: Liquid-level device operates alarm contacts at 25 percent of normal fuel level.
5. High-Level Alarm Sensor: Liquid-level device operates alarm and redundant fuel shutoff contacts at midpoint between overflow level and 90 percent of normal fuel level.
6. Vandal-resistant fill cap.
7. Containment Provisions: Comply with requirements of authorities having jurisdiction.
8. Overfill prevention valve

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 generator-set shutdown. When engine generator is running, specified system or equipment failures or derangements automatically shut down engine generator and initiate alarms.

B. Fully integrated microprocessor-based control system specifically designed for standby emergency engine generators, meeting all requirements of NFPA 110, Level 1 EPSS.

C. Fully integrated control system enabling remote diagnostics and easy building management integration of all generator functions. The generator controller shall provide integrated and digital control over all generator functions, including engine protection, alternator protection, speed governing, voltage regulation, synchronizing, load-sharing (real and reactive), and all related generator operations. The generator controller must also provide seamless digital integration with the engine's electronic engine control module (ECM) if so equipped.

D. Control panel shall comply with UL 6200.

E. Remote Connectivity: User interface available both internally and externally to the user's network, based on network security preferences. All remote connectivity may be disabled at any time by the user.

F. Automated Notification: Controller capable of sending multiple automated e-mail and SMS alerts without intermediate service provider.

G. Notification Customization: User configurable allowing any operational or fault condition to initiate notification to any personnel including (but not limited to) generator service provider.

H. Environmentally Hardened Design: Open circuit boards, edge cards, and PC ribbon cable connections are unacceptable.

I. Circuit boards with surface-mounted components to provide vibration durability. Circuit boards utilizing large capacitors or heat sinks must utilize encapsulation methods to securely support these components.

J. Configuration:

1. Operating and safety indications, protective devices, basic system controls, and engine gauges shall be grouped in a common control and monitoring panel mounted on the engine generator. Mounting method shall isolate the control panel from generator-set vibration. Panel shall be powered from the engine generator battery.

K. Control and Monitoring Panel:

1. Digital controller with integrated touch screen, controls, and microprocessor, capable of local and remote control, monitoring, and programming, with battery backup.
2. Instruments: Located on the control and monitoring panel and viewable during operation.

a. Engine lubricating-oil pressure gauge.
b. Engine-coolant temperature gauge.
c. DC voltmeter (alternator battery charging).
d. Running-time meter.
e. AC voltmeter, for each phase.

f. AC ammeter, for each phase.
g. AC frequency meter.
h. Generator-voltage adjusting feature.

3. Controls and Protective Devices: Controls, shutdown devices, and common visual alarm indication, including the following:

a. Cranking control equipment.
b. Run-Off-Auto switch.
c. Control switch not in automatic position alarm.
d. Overcrank alarm.
e. Overcrank shutdown device.
f. Low water temperature alarm.
g. High engine temperature prealarm.
h. High engine temperature.
i. High engine temperature shutdown device.
j. Overspeed alarm.
k. Overspeed shutdown device.
l. Coolant low-level alarm.
m. Coolant low-level shutdown device.
n. Coolant high-temperature pre-alarm.
o. Coolant high-temperature alarm.
p. Coolant low-temperature alarm.
q. Coolant high-temperature shutdown device.
r. EPS supplying load indicator.
s. Battery high-voltage alarm.
t. Low cranking voltage alarm.
u. Battery-charger malfunction alarm.
v. Battery low-voltage alarm.
w. Lamp test.
x. Contacts for local and remote common alarm.
y. Hours of operation.
z. Engine generator metering, including voltage, current, Hz, kW, kVA, and power factor.
aa. Generator overcurrent protective device not closed alarm.

L. Connection to Datalink:

1. A separate terminal block, factory wired to Form C dry contacts, for each alarm and status indication.
2. Provide connections for datalink transmission of indications to remote data terminals via Ethernet/IP or Modbus.

M. Remote Alarm Annunciator: An LED indicator light 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 pre-alarm.
4. High engine temperature alarm.
5. Low lube oil pressure alarm.
6. Overspeed alarm.
7. Low coolant level alarm.
8. Low cranking voltage alarm.
9. Contacts for local and remote common alarm.
10. Audible-alarm silencing switch.
11. Air shutdown damper when used.
12. Run-Off-Auto switch.
13. Control switch not in automatic position alarm.
14. Fuel tank derangement alarm.
15. Fuel tank high-level shutdown of fuel supply alarm.
16. Lamp test.
17. Low cranking voltage alarm.
18. Generator overcurrent protective device not closed.

N. Remote Emergency-Stop Switch: Flush; wall mounted, unless otherwise indicated; and labeled. Push button protected from accidental operation.

O. 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.

2.7 GENERATOR OVERCURRENT AND FAULT PROTECTION

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

B. 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.

C. Overcurrent protective devices for the EPSS shall be accessible only to authorized personnel.

D. Generator Overcurrent Protective Device:

1. Molded-case circuit breaker, electronic-trip type; **100 percent rated**; complying with UL 489:

   a. Tripping Characteristics: Adjustable long-time and short-time delay and instantaneous.
   b. Trip Settings: Selected to coordinate with generator thermal damage curve.
   c. Mounting: Adjacent to or integrated with control and monitoring panel.

E. Generator Protector: Integrated controller base 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 engine generator.
4. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot.

F. Ground-Fault Indication: Comply with NFPA 70, "Emergency System" signals for ground fault.

1. Indicate ground fault with other engine generator alarm indications.
2. Trip generator protective device on ground fault.

G. Arc Energy Reduction: Comply with NFPA 70 for arc energy reduction for circuit breakers 1200A and greater.

1. Energy reducing maintenance switch with local status indicator.
2. Instantaneous override that is less than the available arcing current.

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. Range: Provide broad range of output voltage by adjusting the excitation level.

F. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.

G. Enclosure: Drip proof.

H. Instrument Transformers: Mounted within generator enclosure.

I. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified and as required by NFPA 110.

1. Voltage Adjustment on Control and Monitoring Panel: Provide plus or minus 5 percent adjustment of output-voltage operating band.

2. Maintain voltage within 20 percent on one step,
3. Provide anti-hunt provision to stabilize voltage.
4. Maintain frequency within 10 percent and stabilize at rated frequency within 5 seconds.

J. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.

K. Sub-transient Reactance: 15 percent, maximum based on the rating of the engine generator set.

L. Permanent magnet brushless excitation (PMG).

1. PMG shall derive excitation current from pilot exciter mounted on the rotor shaft. It is to be able to sustain 300% of rated current for ten seconds during a fault condition.
2. Self-excited system to be brushless and consist of a 3 Ph armature and a 3 Ph full wave bridge rectifier mounted on the rotor shaft. Include surge suppressors to protect the diodes
3. Capable of sustaining 300% overcurrent for 10 seconds under a 3 Ph symmetrical short circuit

2.9 OUTDOOR GENERATOR-SET ENCLOSURE

A. Generator packaged within weather protective enclosure.

B. Sound Insulation: Enclosure and air discharge hood completely lined with 3 inches (76 mm) of fiberglass and perforated aluminum.

C. Enclosure Construction: Minimum 14 gauge steel with hinged, removable doors to allow access to the engine, alternator, and control panel. Adjustable hinges to allow for door alignment. Hinges and all exposed fasteners must be stainless steel. Pop-rivets weaken the paint system and are not allowed on external painted surfaces. Each door will be equipped with lockable hardware and identical keys.

D. Upward discharging enclosure ventilation exhaust hood.

E. Enclosure Finish: Electrostatic applied powered paint, baked and finished to manufacturer's specifications.

F. Enclosure Color: Manufacturer’s standard.

G. Silencer mounted on top of enclosure.

H. 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.

I. Convenience Outlets: Factory wired, GFCI. Arrange for external electrical connection.

2.10 VIBRATION ISOLATION DEVICES

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

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

2.11 FINISHES

A. Indoor and Outdoor Enclosures and Components: Manufacturer's standard finish over corrosion-resistant pretreatment and compatible primer.

B. Powder Coated Paint Surfaces:

1. Minimum Paint Thickness: 2.5 mil (0.06 mm) in accordance with ASTM D1186-87.
2. Material Hardness: ASTM D3363-92a.
3. Resistance to Cracking: ASTM D522-B.
4. Paint Adhesion: ASTM D3359-B.
5. Resistance to Saltwater Corrosion: ASTM B117, ASTM D1654.
6. Resistance to Humidity: ASTM D1735, ASTM D1654.
7. Impact Resistance: ASTM 2784.
8. UV Protection: SAE J1690.

2.12 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 and with NFPA 110, Level 1 Energy Converters.

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 components and accessories furnished with installed unit that are not identical to those on tested prototype to demonstrate compatibility and reliability.
2. Test generator, exciter, and voltage regulator as a unit.
3. Full load run.
4. Maximum power.
5. Voltage regulation.
6. Transient and steady-state governing.
7. Single-step load pickup.
8. Safety shutdown.
9. Provide 14 days' advance notice of tests and opportunity for observation of tests by Owner's representative.
10. 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 in accordance with requirements indicated:

1. Notify Owner no fewer than two working days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Owner’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 and with NFPA 110.

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 033000 "Cast-in-Place Concrete."
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.

D. Install packaged engine generator to provide access, without removing connections or accessories, for periodic maintenance.

E. 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. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

C. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Provide a minimum of one 90-degree bend in flexible conduit routed to the engine generator from a stationary element.

D. Balance single-phase loads to obtain a maximum of 10 percent unbalance between any two phases.

3.5 IDENTIFICATION

A. Identify system components in accordance with Section 260553 "Identification for Electrical Systems."

B. 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. Testing Agency:

1. Owner will engage a qualified testing agency to perform tests and inspections.
2. Engage a qualified testing agency to perform tests and inspections.
3. Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
4. Perform tests and inspections with the assistance of a factory-authorized service representative.

B. 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 below as specified.

a. Visual and Mechanical Inspection:

1) Compare equipment nameplate data with drawings and specifications.
2) Inspect physical and mechanical condition.
3) Inspect anchorage, alignment, and grounding.
4) Verify the unit is clean.
5) Test protective relay devices.
6) Verify phase rotation, phasing, and synchronized operation as required by the application.
7) Functionally test engine shutdown for low oil pressure, overtemperature, overspeed, and other protection features as applicable.
8) Perform vibration test for each main bearing cap.

9) 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. Testing to include cold start, 25, 50, 75, and 100% step loads (slow addition of load to confirm operation),
4. 4 hour testing at rated nameplate.
5. Loading shall be by resistive load bank and building load.

    a. Building load tests shall include simulation of utility power loss to ensure all automatic controls, process equipment, general electrical equipment, etc. are operating properly to meet the design intent.

6. 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.

7. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.
8. 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.
9. Exhaust Emissions Test: Comply with applicable government test criteria.
10. 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.
11. Harmonic-Content Tests: Measure harmonic content of output voltage at 25 percent and 100 percent of rated linear load. Verify that harmonic content is within specified limits.

C. Coordinate tests with tests for transfer switches and run them concurrently.

D. Test instruments shall have been calibrated within the last 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.

3.7 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, provide quarterly inspections by skilled 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 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

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SECTION 33 11 13 – WATER SUPPLY WELLS

PART 1 - GENERAL

1.1 GENERAL:

A. The production well was drilled by Clark's Well Drilling in 2023/2024. The well outer and inner casing, screens, and gravel pack were installed and capped above ground as part of the well drilling project. The Well Construction Diagram is included at the end of this Section. The outer casing has a 30-inch O.D. and a wall thickness of 0.500-inch. The inner casing has a 24-inch O.D. and a wall thickness of 0.375-inch, which reduces down to 18-inch diameter screens.

B. The work covered under this Contract consists generally of the installation of the well pump and motor and related appurtenances inside the well and the construction of the pump foundation, discharge head and concrete apron around the well. Also covered under this Contract is the installation of the well head enclosure, above-ground piping, valves, meters, etc. for the well, which are covered in other Specifications in this manual.

C. All work and materials shall be in accordance with applicable sections of AWWA A100.

D. The well pumping equipment shall be installed by a licensed and certified well driller that has experience in constructing public water supply wells and related work. The well driller may be required to submit a satisfactory experience and qualification record to the Owner/Engineer.

E. All requirements concerning licensed well contractors, well construction, water samples, water quality and well testing and other related matters contained in the latest release of Regulations Governing Public Water Supplies issued by the Alabama Department of Environmental Management Water Supply Division are hereby incorporated into these Specifications.

F. There is a required one (1) year warranty on the well pumping equipment manufacture and installation as specified elsewhere in these Specifications.

1.2 PROCEDURES AND METHODS:

A. Notwithstanding any general clauses, wording, paragraphs, or other references contained in the plans, specifications, general conditions or elsewhere in the Special Provisions the Engineer is not charged with the responsibility of directing the actual procedures and detail methods of construction to be used by the Contractor in accomplishing the work contained in the contract between the Owner and the Contractor, nor is the Engineer responsible to act as superintendent, foreman, or safety engineer for the Contractor, nor for the safety of the Contractor's personnel.

1.3 REGULATIONS:

A. All work, test procedures, etc., shall be in accordance with the latest Administrative Code, Division 7, Alabama Department of Environmental Management, herein referred to as the Regulations.

1.4 SUBMITTALS:

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit manufacturer information for materials of construction and fabrication.

C. Shop Drawings:

1. Submit detailed dimensions for materials and equipment, including wiring and control diagrams, performance charts and curves, installation and anchoring requirements, fasteners, and other details.
2. Include manufacturer's specified displacement tolerances for vibration at operational speed specified for pumps.

D. Critical Speed Analysis: Identify speeds at which pumps will be prone to damaging vibrations.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements. Include separate Paragraphs for additional certifications.

F. Manufacturer Instructions: Submit detailed instructions on installation requirements, including storage and handling procedures, anchoring, and layout.

G. Source Quality-Control Submittals: Indicate results of shop/factory tests and inspections.

H. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

I. Manufacturer Reports: Certify that equipment has been installed according to manufacturer instructions

PART 2 – PRODUCTS

2.1 WELL PUMP:

A. Description:

1. The pump to be installed shall be a water-lubricated, vertical turbine line-shaft well pump of heavy construction throughout and suitable for continuous operation at the conditions specified.

B. Manufacturer:

1. Xylem-Goulds Water Technology
2. Or Approved Equal

C. Performance and Design Criteria:

1. Design Flow Rate: 2,000 GPM
2. Design Total Dynamic Head: 250 FT
3. Minimum Efficiency at Design Flow: 80%
4. Minimum Column Diameter: 12-inch
5. Pump Discharge Size: 12-inch

6. Pump Setting: 280’ depth below ground surface. This is the basis of design, but the pump installer shall submit the recommended pump setting if it differs from this depth.

D. Pump Base:

1. The pump base shall be of extra heavy construction throughout and of sufficient size to properly support the column, bowl and driver. It shall be of cast iron or carbon steel construction, fitted with a flanged outlet connection, a machine steel sole plate. The sole plate shall have an extra heavy separate steel baseplate machined to provide water tight seal against the sole plate. The baseplate shall be perfectly leveled and permanently grouted into the concrete foundation. The grouting shall provide a water proof seal. The discharge flange shall be faced and drilled to match ANSI Class 125 steel flange connections. The design shall permit the vertical hollow shaft motor drive shaft to be coupled above the stuffing box. The discharge head shall be of the shrouded type with a 1/2-inch, minimum, NPT drain connection so that the relief water from the stuffing box and water leaking around the packing gland can be collected and piped away from the well site. The discharge base will be designed to withstand the pressure produced by the pump at shut off head as the pump may be operated against a closed valve. The motor drive shaft shall be the same diameter as the line shaft and shall be manufactured of 416 stainless steel. The coupling to connect the motor drive shaft to the line shaft shall be manufactured of 416 stainless steel and the O.D. of the coupling shall be machined. The shaft above the stuffing box shall be equipped with a rubber water slinger to protect the motor. The discharge base shall also be fitted with a connection for the pre-lubrication water line.

2. Cast iron stuffing box shall be of the deep bore type with a minimum of five (5) rings of packing and a seal cage. Connections for grease inlet and pressure relief shall be provided. The packing gland shall be of the bronze split type and severed in place with ASTM A193, Grade B8 stainless steel studs and silicon bronze nuts. The bottom of the stuffing box casting shall be provided with a bronze bearing of adequate length to prevent shaft deflection through the box and to serve as a throttle bushing. The stuffing box will be designed to withstand pressure produced by the pump at shutoff head as the pump will operate against a closed valve.

3. The pump base shall be equipped with two fittings through which to pass a 3/8” air line and install a 2” cap.

E. Column Pipe:

1. Column assembly shall be flanged-connected to the discharge head. Column pipe shall be of ASTM A53, Grade B steel pipe. Ends shall be machined with 8 threads per inch and faced. Intermediate sections of column shall not exceed ten feet (10’). Top and bottom section of column pipe shall not exceed five feet (5’). All column pipe couplings shall be steel, long pattern, fully threaded to allow the installation of a machined SAE 43 bronze drop-in spider bearing retainer that has a 3/4” thick web for column pipe joints to tightly butt against. The line shaft bearing shall be of synthetic rubber (R-3). The external shape of the bearing shall be such as to retain it in the spider without use of auxiliary collars or rings. The shape of the bearings shall be polygon to provide minimum friction contact to the shaft. Replacement bearings shall be capable of being installed by hand without special tools. Line shafts shall be of A276, Type 416 stainless steel ground and polished with a surface not to exceed 40 rms. Shaft diameter selection shall be based on a combined shear stress of not more than eighteen percent (18%) of the ultimate strength or not in excess of thirty percent (30%) of the elastic limit in tension.

Intermediate shaft sections shall be interchangeable and shall not exceed ten feet (10') in length. The butting ends shall be machined square to the axis of the shaft and shall be threaded and coupled by stainless steel couplings designed with a safety factor of 1 1/2 times the shaft factor.

2. Column Pipe: 12" x 0.38" carbon steel epoxy coated

F. Pump Bowls:

1. The pump bowls shall be constructed of ASTM A48 Class 30 cast iron and shall be so designed to operate in accordance with the pumping conditions as specified. Each bowl interior shall be enameled to provide smooth passage of water and increase efficiency. The bowl exterior shall be epoxy coated. The impeller shaft shall be Type 416 stainless steel and of sufficient size to carry the full load of the impellers. Each stage shall be fitted with a removable bowl wear ring and the impellers shall be of the fully enclosed type, non-overloading and so designed that the motor will not be overloaded nor the pump break suction in the event the above ground head is removed from the pump. The impellers, wear rings and bushings shall be bronze, SAE 43 or SAE 660. The bowls shall be set with a minimum submergence of 30 feet below the drawdown level attained when pumping at the rated capacity.

G. Suction Pipe:

1. The pump bowl shall be equipped with not less than thirty (30') feet of standard weight suction pipe. The inlet shall include a Type 304 stainless steel inlet strainer.

H. Air Line:

1. The pump assembly will be equipped with an air line for monitoring water levels. The air line shall be 3/8-inch (minimum inside diameter) red brass pipe, 3/8-inch copper tubing or 3/8-inch polyethylene tubing attached to the discharge column from the pump head to a point 20 feet below the pump bowls. The installation shall be made in such a manner as to prevent the intrusion of foreign matter. Piping, fittings, air valves and a pressure gauge indicating pressure in feet shall be provided and mounted to facilitate water level and drawdown monitoring.

2. In addition, a 2-inch diameter casing access portal shall be installed and capped to allow direct measurement of the water level by tape or 3/4-inch probe.

2.2 MOTOR:

A. The electric motor shall be manufactured by U.S. Motors. The electrical motor shall conform in construction and performance with the National Electrical Manufacturers Association standards for motors as last revised. It shall be of the squirrel cage, low starting current type in vertical, weather-protected frame. The motor shall be the vertical hollow shaft type for high trust with 40-degree centigrade rise, Class B insulation WP-1 enclosure with epoxy encapsulated windings. The service shall be 480V, 3-Ph, 60 Hz; WP-1 "Premium Efficiency Inverter Duty Rated". Motor shall be rated with 1.15 service factor, and shall have a non-reverse ratchet.

B. The rotors shall run in the ball bearings provided with adequate means of continuous lubrication. The thrust bearing shall be of ample size to carry the thrust load of the pump, the weight of the shaft, couplings and impellers without overheating. It shall be of ample size to

ensure long life when operating continuously in carrying maximum load. Minimum thrust rating allowable as by Anti-Friction Bearing Manufacturers Association (A.F.B.M.A.) is 175% of Standard High Trust. The motor shall be overloaded, operating continuously or intermittently at any point on the pump operating curve.

C. Thermostats shall be provided in the windings of each phase to afford protection of the motor against excessive operating temperature. Thermostats shall be the Klixon type, suitable for use with 120VAC control power. Thermostat leads shall be routed to the conduit box as outlined below, for connection to monitoring circuitry separate from the power wiring. Special purpose relays will not be required for the operation/monitoring of the thermostats provided.

D. Provide 120VAC silicon space heaters in the windings of each motor to prevent the formation of condensation. Space heaters shall be sized by the motor manufacturer for the frame size provided, and shall be installed prior to shipment. Location of the space heaters shall not interfere with the operation of the winding thermostats specified above. Leads from space heaters will be to the conduit box mounted on the side of the motor frame. The main terminal box shall be sized to allow field wiring of all electrical connections to/from the motor. Conduit boxes shall be fitted with gaskets, O-rings, etc... so as to provide a watertight seal.

E. Motor wiring shall be routed to oversized suitably-sized conduit box(es), sized as required to accommodate the specified wiring/conduits, mounted on the side of the motor housing. The conduit box shall be of adequate size to allow field wiring of the motor power and ground leads without excessive bending of the leads. All wiring leads from the space heaters and thermostats shall be routed to a separate accessory conduit box mounted on the side of the motor frame. If the motor frame size does not lend itself to provision of separate conduit boxes, the main terminal box shall be oversized to facilitate field wiring of all electrical connections to/from the motor.

F. Shaft grounding ring(s) shall be provided on the drive end, by the motor manufacturer for all inverter-duty motors to prevent damage to the motor bearings from induced shaft voltages and parasitic capacitance. Grounding rings shall be AEGIS bearing protection rings, which provides a conductive discharge path away from the motor bearings to ground. Shaft surfaces shall be conductive and free of any finish flaws that inhibit conductivity, and shall be provided with a manufacturer-approved silver-based colloidal coating during installation of the grounding rings to enhance conductivity.

2.3 MISCELLANEOUS:

A. Data Plates: The pump shall be equipped with a data plate securely fastened to the pump that contains the manufacturer’s name, pump size and type, serial number, pump speed, impeller data, capacity and head rating, and any other pertinent information.

B. Testing: The pump shall be performance tested prior to shipment to confirm pump performance. Test shall comply with ANSI/HI 14.6 Grade 1U requirements, and shall include, but not be limited to, checking the unit at its rated speed, capacity, head, efficiency, and brake horsepower at such conditions of head and capacity so as to properly establish the actual performance curve. Certified copies of the test reports shall be submitted for review prior to shipment. The Standards of the Hydraulic Institute shall govern the procedures and calculations for the prescribed testing.

2.4 FLOW METER:

A. The flow meter shall be a velocity sensing electromagnetic type flanged tube meter with sealed housing for 150 PSI working pressure. The meter shall be equipped with a digital indicator having a range of 0 to 1200, and a 9-digit digital totalizer reading in units of GPM and shall be accurate within 0.5% of actual flow. The meter assembly shall operate within a range of 0.2 FPS to 32 FPS and be constructed as follows:

1. Meter tube (sensor) shall be fabricated stainless steel pipe and use 150 lb. AWWA Class "D" flat face steel flanges. The internal and external of the meter tube shall be blasted and lined with an NSF-approved fusion bonded epoxy UltraLiner™, applied by the fluidized bed method. Meter tubes shall have a constant nominal inside diameter offering no obstruction to the flow. Electrodes shall be 316 stainless steel.

2. Mag shield shall be welded to the tube providing a completely sealed environment for all coils, electrode connections and wiring harness capable of NEMA 6P/IP68 operation.

3. Signal converter shall be pulsed DC coil excitation type with auto zeroing. The converter shall indicate direction of flow and provide a flow rate indication and a totalization of flow volume for both forward and reverse directions. Both forward and reverse totalizers shall be electronically resettable. The flow meter converter shall be microprocessor based with a keypad for instrument set up and LCD displays for totalized flow, flow rate engineering units and velocity. The converter shall power the flow sensing element and provide galvanically isolated dual 4-20mA outputs. It shall be possible, in the test mode, to easily set the converter outputs to any desired value within the range. The 4-20mA scaling, time constants, pipe size, flow proportional output, engineering units and test mode values shall be easily set via the keypad and display. Four separate fully programmable alarm outputs shall be provided to indicate empty pipe, forward/reverse polarity (normally open/close), analog over-range, fault conditions, high/low flow rates, percent of range and pulse cutoff. The converter shall periodically perform self-diagnostics and display and resulting error messages. All set up and data and totalizer values may be protected by a password. The converter shall be integrally mounted our remotely mounted up to 200 feet from the sensor and shall be supplied in a sealed IP67 rated enclosure. Calibration will be completed at the manufacturer's location in accordance with customer supplied application-based requirements.

4. Grounding rings shall be 316 stainless steel and shall be supplied with the meter tube.

5. Volumetric testing of all meters must be performed and approved prior to shipment. The complete meter assembly and signal converter must be wet accuracy tested and calibrated. The test facility must be rigorously traceable to an accuracy of ±0.15% with the National Institute of Standards and Technology. If desired, the test shall be witnessed by the customer or their selected agent. A copy of the certified accuracy test record must be furnished at no charge to the customer.

6. The meter shall be manufactured and tested in the U.S.A.

7. The meter shall be Bermad MUT2300 or approved equal.

B. The register shall have the capability of interfacing with SCADA system in order to read instantaneous flow and totalized flow from remote location.

C. The Well Pump Control Panel shall provide power and flow monitoring to the meter.

2.5 PRESSURE GAUGES:

A. The pressure gauges within the booster pumping station shall be 4" minimum diameter faces. The case shall be 304 stainless steel, self-supporting type with close type ring and clear glass face. Gauge shall be NSF-61 compliant. The gauge connections shall be at the bottom of the gauge and will be 1/4" NPT. The gauge internal construction shall include phosphor bronze bourdon tube with a brass movement, bronze-bushed, independently mounted. Pressure gauge range and scale graduation shall be in feet of water and psi as follows.

Suction Pressure - 100 psi, 10 psi figure intervals with graduation marks every 1 psi.

Discharge Pressure - 300 psi, 20 psi figure intervals with graduation marks every 2 psi

PART 3 - EXECUTION

3.1 DISINFECTION:

A. Before mobilizing any drill rig or other equipment potentially having contact with the aquifer through physical contact or through the transport of fluids, such equipment shall be decontaminated using steam, mechanical cleaning, or disinfection with a chlorine bleach solution applied by a hand sprayer. Thereupon, the exterior of all drill rigs, tools, and equipment shall be cleaned. The purpose of the decontamination shall be the prevention of the introduction of iron bacteria or other bacteriological contaminants to the aquifer.

B. After the pumping equipment has been installed and the well is completed, the installation shall be disinfected by introducing a chlorine solution into the well and starting and stopping the pump until the solution has been thoroughly mixed with the water. The solution shall contain 50 ppm of chlorine and shall remain in the well for a period of 12 hours. The well shall then be pumped to waste until an orthotolidine test indicates that all chlorinated water has been pumped out.

C. The Contractor shall secure three (3) sterilized sample bottles from the nearest State Testing Laboratory and carefully obtain samples of the water. The bottles shall be promptly delivered to the nearest branch Laboratory. If the report on the samples is not satisfactory, the Contractor shall re-disinfect the well for as many times as is necessary to obtain a satisfactory report.

3.2 WELL CAPACITY TEST:

A. The pumping equipment installer will be required to perform a well capacity test utilizing a temporary test pump of suitable size. The test shall be conducted in accordance with ADEM Administrative Code 335-7-5. The approximate design capacity was determined as part of the well drilling project. The maximum test capacity shall be 150% of the design capacity.

B. The capacity test shall be run at design capacity until the water level in the water supply well has stabilized (+/- 1.0 foot) and shall then be continued for a period of 24 hours with water level readings collected at regular intervals (the test shall be run for 21 hours after the drawdown has shown to remain constant for three consecutive hourly readings). The pumping rate shall then be increased to the maximum test capacity and shall continue to run until the water level is stabilized (+/- 1.0 foot) and shall then continue to run for a period of six (6) hours with water level readings collected at regular intervals. Immediately upon pump shut-down a

full recovery test shall be performed. The conduction of the well capacity test shall meet the requirements of the Measurement section below.

C. Measurements:

1. The pumping test shall be conducted to determine the aquifer storage coefficient and transmissivity. Accurate drawdown readings shall be taken in both the production well and observation well simultaneously. Water levels shall be recorded three times within one day prior to the start of the capacity test and within five (5) minutes of the start of the test to provide background water level information. Drawdown readings shall be taken at two-minute intervals the first hour of the test; at five-minute intervals the second hour; at ten-minute intervals for the next two hours; thirty-minute intervals for the next two hours; and hourly thereafter to the end of the test. Drawdown data collected during the period of the test shall be corrected for changes in barometric pressure and tidal oscillations.

2. Immediately upon pump shut-down a full recovery test shall be performed. Water level recordings shall be made no less than one-minute intervals the first ten minutes; two-minute intervals the next ten minutes; five-minute intervals the next thirty minutes; and ten-minute intervals until practical recovery

3.3 WATER QUALITY:

A. During the testing of the water supply well capacity (pumping test) periodic water samples shall be taken during the pumping test and analyzed for turbidity. Complete analysis shall be performed for Primary and Secondary drinking water containments per Chapters 335-7-2 and 335-7-3 of the ADEM Administrative Code. All other samples shall be stored in clean glass containers for future analysis if needed. A complete chemical analysis to include inorganic, radiological and VOC (regulated and unregulated) analysis shall be performed. The analyses must be performed by a laboratory certified by the Alabama Department of Environmental Management. Levels of primary and secondary contaminants shall be reported along with pH, total alkalinity, carbon dioxide, calcium, magnesium, hardness, sodium, and specific conductance.

3.4 WELL PUMP:

A. Well Pump:

1. The well pump shall be set, aligned and made fully operational by the licensed well driller. The Contractor shall employ a factory-trained engineer to supervise the installation and alignment of all items of mechanical and electrical equipment. He shall see that all items of equipment are installed, piped and wired in accordance with the manufacturer's recommendations, and shall place all equipment in satisfactory operation and demonstrate such to the satisfaction of the Owner/Engineer. The Contractor shall guarantee the satisfactory operation of all apparatus and machinery against defects in workmanship, materials and installation for a period of one (1) year.

B. Pump Foundation:

1. After the well has been completed and the Contractor, Engineer and Owner have reviewed all results from the Well Completion Report and after the Contractor has been given the authorization to proceed, the Contractor may begin construction of the pump foundation and pumping equipment. The foundation shall consist of Class A concrete

and be formed in a workmanlike manner with chamfered edges on the sides and top. All unsuitable soils around the casing pipe shall be removed and approved fill material places as specified elsewhere.

2. The top of the foundation shall be set approximately 12-inches above ground. The bottom of the foundation shall be carried to a firm bearing capacity of 2,500 psf and not less than 2-feet below the surface. The concrete foundation shall be at least 2-feet square and the exposed surfaces shall be rubbed with a carborundum stone to remove form marks.

3. The Contractor shall provide a schematic drawing to the Engineer for approval of the pump foundation which shows the dimensions of the foundation, base plate design, details of the base plate-to-casing connection, airline and electric cable penetration, discharge elbow or tee, connections for pump removal, etc.

4. The Casing shall project a minimum of 12-inches above the finished concrete slab around the well.

3.5 FIELD QUALITY CONTROL:

A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.

B. Section 01 70 00 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.

C. Preoperational Check: Before operating system or components, perform following:

1. Check pump and motor alignment.
2. Check for proper motor rotation.
3. Check pump and drive units for proper lubrication.

D. Startup and Performance Testing:

1. Operate the pump at the design point for a minimum continuous period of thirty (30) minutes, under supervision of manufacturer's representative and in presence of Engineer’s Field Representative.

E. Manufacturer Services: Furnish services of manufacturer's representative experienced in installation of products furnished under this Section for not less than two (2) eight-hour days on Site for installation, inspection, startup, field testing, and instructing Owner's personnel in maintenance of equipment.

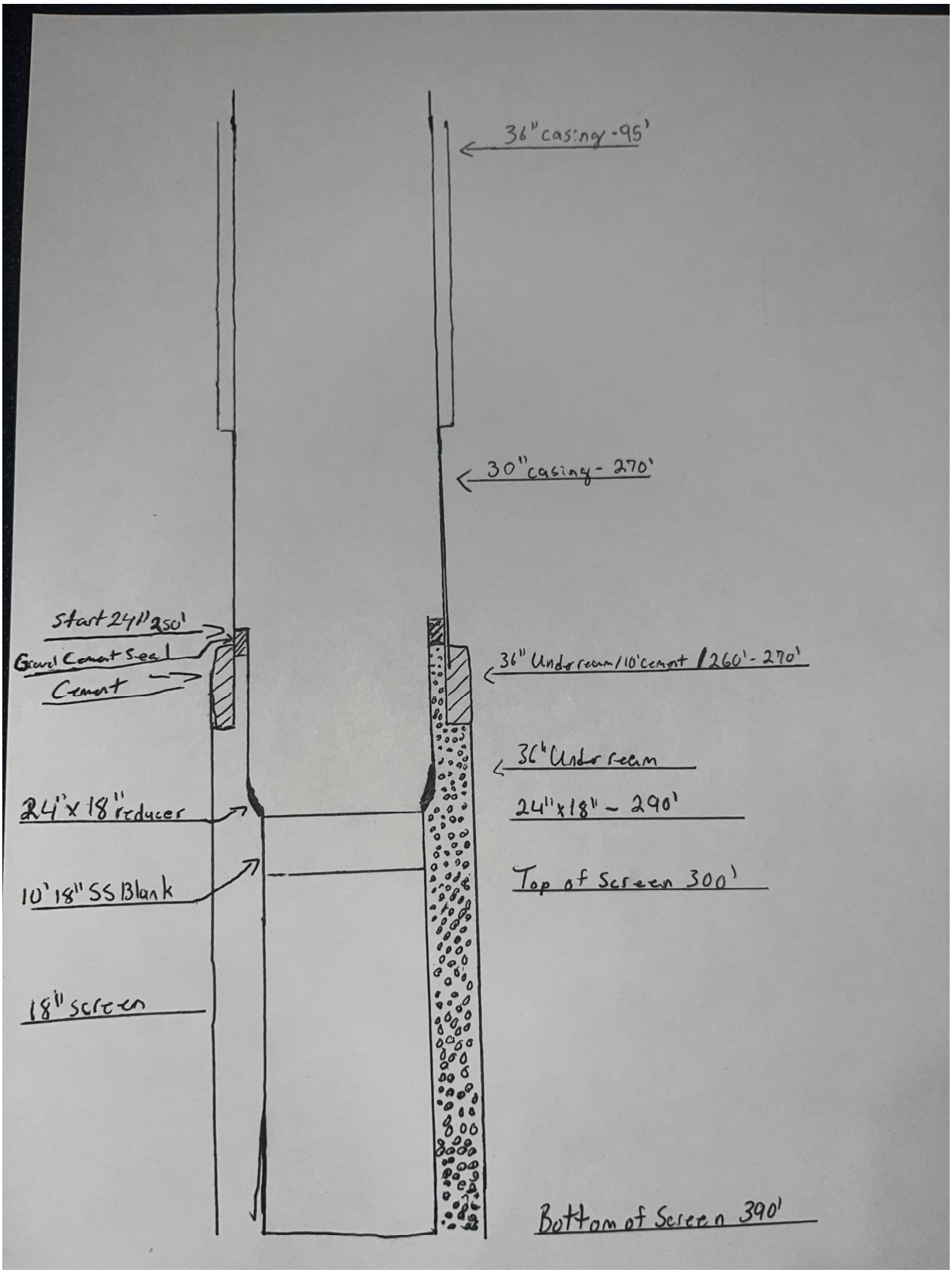
F. Check pump and motor for excessive vibration according to manufacturer instructions. Check for motor overload by taking ampere readings.

G. Equipment Acceptance:

1. Adjust, repair, modify, or replace system components that fail to perform as specified and rerun tests.
2. Make final adjustments to equipment under direction of manufacturer's representative.

END OF SECTION 33 11 13

Well Construction Diagram



SECTION 40 05 57 - ACTUATORS FOR PROCESS VALVES AND GATES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Manual actuators
2. Electric motor actuators

B. Related Requirements:

1. Section 05 50 00 - Metal Fabrications
2. Section 09 96 00 - High-Performance Coatings
3. Division 26 - Electrical
4. Division 40 - Process Interconnections

1.2 REFERENCE STANDARDS

A. American Bearing Manufacturers Association:

1. ABMA 9 - Load Ratings and Fatigue Life for Ball Bearings
2. ABMA 11 - Load Ratings and Fatigue Life for Roller Bearings

B. American Water Works Association:

1. AWWA C500 - Metal-Seated Gate Valves for Water Supply Service
2. AWWA C542 - Electric Motor Actuators for Valves and Slide Gates

C. NFPA:

1. NFPA 70 - National Electrical Code

1.3 COORDINATION

A. Section 01 31 00 - Project Management and Coordination: Requirements for coordination

B. Coordinate Work of this Section with installation of valves and accessories.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals

B. Product Data: Submit manufacturer information for actuator with model number and size indicated.

C. Shop Drawings:

1. Indicate parts list, materials, sizes, position indicators, limit switches, actuator mounting, wiring diagrams, control system, and control system schematics on assembly drawings.
2. Submit actuator Shop Drawings with valve and gate submittal.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Manufacturer Instructions: Submit special procedures and placement requirements.

F. Source Quality-Control Submittals: Indicate results of shop/factory tests and inspections.

G. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

H. Qualifications Statements:

1. Submit qualifications for manufacturer and installer.
2. Submit manufacturer's approval of installer.

1.5 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents: Record actual locations and types of actuators.

1.6 QUALITY ASSURANCE

A. Locations: Comply with NFPA 70.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum ten (10) years' documented experience.

B. Installer: Company specializing in performing Work of this Section with minimum three (3) years' documented experience and approved by manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

C. Store materials according to manufacturer instructions.

D. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Furnish temporary end caps and closures on piping and fittings and maintain in place until installation.
3. Provide additional protection according to manufacturer instructions.

1.9 EXISTING CONDITIONS

A. Field Measurements:

1. Verify field measurements prior to fabrication.
2. Indicate field measurements on Shop Drawings.

1.10 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.

B. The Manufacturer and Contractor shall furnish a warranty extending twelve (12) months after substantial completion date.

PART 2 - PRODUCTS

2.1 DESCRIPTION

A. Furnish gear and power actuators with position indicators.

B. Electric actuators shall be provided where specified in the Valve Schedule.

C. Manual actuators shall be provided on all valves which do not receive electric actuators.

D. Actuators shall be furnished with conservatively-sized extension bonnets, extension stems, or torque tubes. All required appurtenances shall be provided for a complete installation. Actuators furnished with extension bonnets shall include stainless steel extension stems or stainless steel torque tubes.

2.2 MANUAL ACTUATORS

A. Gate Valves: Gave valves shall be fitted with cast iron hand wheels of suitable size or gear and hand wheel operators in accordance with AWWA C500.

B. Butterfly Valves: Butterfly valves 6 inches and smaller shall be lever and locking ratchet operated. Butterfly valves larger than 6 inches shall be equipped with gear and hand wheel operators. The operators shall be furnished by the manufacturer of the valve, in accordance with AWWA C504, who shall be responsible for the compatibility and adequacy of both the valve and operator. Valve operator shall be sized for the maximum torque developed by the maximum pressure in the pipeline in which the valve is to be used.

C. Plug and Ball Valves: Plug and ball valves 6 inches and smaller shall be lever and locking ratchet operated. Plug and ball valves larger than 6 inches shall be provided with gear and hand wheel operators.

D. Manual actuators shall be rigidly attached to the valve body unless otherwise specified or shown on the Drawings.

E. All actuators shall turn counter-clockwise to open and shall have the open direction clearly and permanently marked.

F. Provide gear and power actuators with position indicators.

G. Manual actuators that are below-grade (or installed inside a vault) shall have permanently lubricated, watertight, valves under an external pressure of 10 psi.

H. Gear-Assisted Manual Actuators:

1. Drive Type: Worm gear except where otherwise shown or specified
2. Provide totally enclosed gears.
3. Gearing: Designed for 100 percent overload.
4. Bearings:

    a. Type: Ball or Roller; comply with ABMA 9 or ABMA 11.
    b. Permanently lubricated bronze.
    c. Minimum L10 Life: 100,000 hours.

5. Maximum Operating Force: 60 lbf.
6. Handwheel: Minimum 12-inch diameter.
7. Packing: Accessible for adjustment without requiring removal of actuator from valve.

I. Chain Actuators:

1. Description:

    a. Chain actuators for shutoff valves mounted 7 feet and greater above operating floor level.
    b. Chain guides and hot-dip galvanized operating chain extending to 5-1/2 feet above operating floor level.

2. Chain Wheels: Sprocket rim type.
3. Furnish chain storage if chains may interfere with pedestrian traffic.

J. Buried Valves:

1. Buried valves shall be equipped with: nut operators, extended stems, and valve boxes. If the operating nut is more than four (4) feet below finished grade, a valve operator extension shall be provided, bringing the operating nut within 18” – 24” of the surface.
2. Nut operators shall have standard 2” square AWWA operating nuts, designed in accordance with AWWA C504-94.
3. Floors:

a. Furnish extension stems to grade, and square nuts or floor stands with position indicators.
b. Cast-iron/Steel pipe extensions with valve boxes, covers, and operating keys.
c. Floor Boxes: Hot-dip galvanized cast iron or steel, with bronze cover.
d. Lid Inscription: An arrow at least 2" long showing direction of opening. The word OPEN shall also be cast on the flange.

4. Valve Boxes:

a. Material: Cast iron.
b. 12 Inch Diameter Valves and Smaller: Two-piece, screw type.
c. Valves larger than 12 Inch Diameter: Three-piece, screw type.
d. Lid Inscription: An arrow at least 2" long showing direction of opening. The word OPEN shall also be cast on the flange.

2.3 ELECTRIC MOTOR ACTUATORS

A. Manufacturers:

1. Auma Actuators, Inc.; Canonsburg, PA
2. Approved Equivalent

B. Description:

1. Motor, reduction gearing, torque switches, limit switches, auxiliary hand wheel, starter, mechanical position indicator, and accessories.
2. Comply with AWWA C542.
3. Open-close operation or modulation, as specified, or as shown on the Drawings.
4. Valve closing time shall be 60 seconds, unless otherwise noted.
5. Actuators shall be capable of operating in an ambient temperature range of -20 to +175 ºF.
6. All actuators in open/close service shall be furnished with integral motor controls consisting of reversing starters, control transformer, phase discriminator, monitor relay, positioner, “open-stop-close” pushbuttons, “local-off-remote” selector switch in addition to red and green indicating lights. The positioner shall be capable of accepting a 4~20 mADC signal from the controller and positioning the valve by comparing the command signal with the present valve position as indicated by the feedback potentiometer mounted inside the actuator. The positioner shall be field adjustable to fail in the “open”, “closed” or “last” position on loss of 4~20 mADC command signal.

C. Enclosure:

1. Minimum NEMA 250 Type 4. When specified, motor and all electrical enclosure shall be available to meet NEMA 6 submersible, or NEMA 7 hazardous requirements.
2. Mounting: Attached actuator housing using flanged motor adapter.

D. Motors:

1. As specified in Section 40 05 93 - Common Motor Requirements for Process Equipment.
2. Type:

a. Reversing or modulating, as specified, or as shown on the Drawings.
b. Totally enclosed, non-ventilated, high starting torque, low starting current.
c. Full-voltage starting.

3. Electrical Characteristics:

a. Connections: As specified in Division 26 – Electrical.
b. Torque: A running torque per valve manufacturer's recommendation.
c. Sufficient horsepower to open or close a valve against the maximum specified differential pressure when voltage to the motor is ±10% of nominal voltage with a factor of safety of 1.5.
d. Voltage: 480 V, three phase, 60 Hz, or 120 V, one phase, 60 Hz (see electrical drawings).
e. Lubrication: Pre-lubricated.
f. Bearings Type: Anti-friction
g. Motor Rating: 30 minute duty.

E. Reduction Gearing:

1. Description: Single- or double-reduction unit of spur or helical gears and worm-gearing.
2. Lubrication: Grease or oil.
3. Bearings:

a. Type: Ball or Roller; comply with ABMA 9 or ABMA 11.
b. Minimum L10 Life: 100,000 hours.

F. Limit Switches:

1. Type: Heavy duty, open contact.
2. Actuation: Rotor cam.
3. Compartment: Totally enclosed and equipped with a heater and thermostat to prevent build-up of moisture and contamination.
4. Switches shall be SPDT and rated 10A at 120 VAC or as specified.
5. Actuating Point: Adjustable at any point of valve between fully open and fully closed.
6. Adjustment: Capable of quick adjustment requiring no more than five (5) turns of the adjustment spindle.
7. Contacts: One set of normally open and one set of normally closed contacts shall be furnished and available for use by the plant control system at each end of travel where indicated. Contact shall be of silver and capable of reliably switching a low voltage DC source from the control system furnished by other.

G. Torque Limiting Switches:

1. Torque limiting switches shall be provided.
2. Torque limiting switches shall be responsive to the mechanical torque developed in seating, backseating, or by obstruction.
3. Accuracy: Within ±5%
4. Calibration: The use of torque wrenches for calibration shall not be required. Calibrated by use of a dynamometer in order to accurately predict the output of the actuator.
5. A calibration tag stating the maximum torque output of each torque switch at 100% setting shall be permanently affixed to the torque switch dial.

H. Extended Shafts

1. Bonnets/shaft enclosures for valve shafts that extend through grating shall be connected to the valve body. No force shall be applied to the grating to actuate the valve.

I. Hand Wheel Operation:

1. A permanently attached hand wheel shall be provided for emergency manual operation.
2. A seized or inoperable motor shall not prevent manual operation.
3. The hand wheel shall not rotate during electrical operation.
4. Maximum Torque Required: 60 lb-ft.
5. Maximum Force Required: 60 lbs.
6. Inscription: An arrow and either the work OPEN or CLOSE shall be cast in the hand wheel to indicate the direction to turn hand wheel.
7. Minimum Diameter: 8 inches.

J. Seals

1. Electric actuators shall have double seals.

2.4 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for testing, inspection, and analysis.

B. Provide shop inspection and testing of completed assemblies.

C. Certificate of Compliance:

1. If manufacturer is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at manufacturer's facility conforms to Contract Documents.
2. Specified shop tests are not required for Work performed by approved manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify that field dimensions are as indicated on Shop Drawings.

3.2 INSTALLATION

A. Securely mount actuators using brackets or hardware specifically designed for attachment to valves.

B. Extend chain actuators to 5-1/2 feet above operating floor level.

3.3 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.

B. Section 01 70 00 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.

C. After installation, inspect for proper supports and interferences.

D. Repair damaged coatings with material equal to original coating as specified in Section 09 96 00 - High-Performance Coatings.

END OF SECTION 40 05 57

SECTION 40 05 64 - BUTTERFLY VALVES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rubber-seated butterfly valves.

B. Conform to the requirements of Section 40 05 51 - Common Requirements for Process Valves.

C. Related Requirements:

1. Division 40 – Process Interconnections.

1.2 REFERENCE STANDARDS

A. American Water Works Association:

1. AWWA C504 - Rubber-Seated Butterfly Valves.

B. ASME International:

1. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.
2. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard.
3. ASME B16.42 - Ductile Iron Pipe Flanges and Flanged Fittings: Classes 150 and 300.

C. ASTM International:

1. ASTM A536 - Standard Specification for Ductile Iron Castings.
2. ASTM D1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
3. ASTM D3222 - Standard Specification for Unmodified Poly (Vinylidene Fluoride) (PVDF) Molding Extrusion and Coating Materials.
4. ASTM D4101 - Standard Specification for Propylene Injection and Extrusion Materials.

PART 2 - PRODUCTS

2.1 RUBBER-SEATED BUTTERFLY VALVES

A. Manufacturers:

1. Milliken; Henry Pratt Company, Aurora, IL.
2. DeZurik, Sartell, MN.

3. American
4. Mueller
5. M&H
6. Or Approved Equal.

B. Description:

1. Comply with AWWA C504, Class 150.
2. Minimum Working Pressure: 150 psig.
3. Shaft: Bearings shall be non-metallic and permanently lubricated.
4. Seats:

    a. Mounting: On body for valves 24 inches and smaller.
    b. Type: Field replaceable for valves larger than 30 inches.

5. Packing: V-type packing with a minimum of 4 sealing rings or multiple U-cups.
6. End Connections: Flanged end valves of short body design with 125 lb. flanged ends faced and drilled per ANSI B16.1 standard for cast iron flanges.

C. Operator:

1. As specified in Section 40 05 57 – Actuators for Process Valves and Gates.
2. Gear Actuators for Manual Valves: Comply with AWWA C504.

D. Materials:

1. Body: Cast iron, ASTM A126 or ductile iron, ASTM A536 Grade 65-45-12.
2. Stem: Stainless steel.
3. Disc: Cast iron, ASTM A48, Class 4C or ductile iron, ASTM A536 Grade 65-45-12.
4. Seats:

    a. Type: Resilient.
    b. Material: Buna N or EPDM for water, or as required for other services.

5. Seating Surfaces: Type 316 stainless steel.
6. Bearings: Non-metallic and permanently lubricated.
7. Connecting Hardware: Type 316 stainless steel.

E. Finishes: As specified in Section 09 96 00 – High-Performance Coatings.

2.2 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for testing, inspection, and analysis.

B. As specified in Section 40 05 51 - Common Requirements for Process Valves.

C. Testing: Test butterfly valves according to AWWA C504.

PART 3 - EXECUTION

3.1 EXAMINATION, INSTALLATION AND FIELD QUALITY CONTROL

A. As specified in Section 40 05 51 - Common Requirements for Process Valves.

B. According to AWWA C504.

END OF SECTION 40 05 64

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SECTION 40 05 65 - SWING AND DISC CHECK VALVES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Swing check valves.
2. Synthetic Disc Check Valves.

B. Related Requirements:

1. Section 40 05 51 – Common Requirements for Process Valves

1.2 REFERENCE STANDARDS

A. American Water Works Association:

1. AWWA C508 - Swing-Check Valves for Waterworks Service, 2-In. Through 24-In. (50-mm through 600-mm) NPS.

B. ASME International:

1. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.
2. ASME B16.11 - Forged Fittings, Socket-Welding and Threaded.
3. ASME B16.42 - Ductile Iron Pipe Flanges and Flanged Fittings: Classes 150 and 300.

C. ASTM International:

1. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
2. ASTM A536 - Standard Specification for Ductile Iron Castings.
3. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings.
4. ASTM B148 - Standard Specification for Aluminum-Bronze Sand Castings.

PART 2 - PRODUCTS

2.1 SWING CHECK VALVES

A. Manufacturers:

1. DeZurik
2. Milliken; Henry Pratt Company; Aurora, IL
3. APCO
4. Val-Matic

5. Or Approved Equal

B. Description:

1. Type: Swing, resilient seated with outside lever and adjustable spring.
2. Comply with AWWA C508.
3. Swing check valves shall be used for water and wastewater service.
4. Minimum Working Pressure: 200 psig for 2” - 12” and 150 psig for 14” - 30”
5. Flow area: Full open, equal to connecting nominal pipe diameter.
6. Check valves 6 inches and larger: Furnish with adjustable air cushion chambers.
7. Mounting: Horizontal or vertical.
8. End Connections: Integral flange ends shall be ANSI B16.1 Class 125, suitable for horizontal or vertical installation.

C. Materials:

1. Body and Cover: Ductile iron, ASTM A536.
2. Disc, Disc Arm: Ductile iron, ASTM A536.
3. Body Seat: Replaceable, Type 316 ASTM A276 with Buna-N renewable seat ring.
4. Shaft: Type 303 Stainless Steel ASTM A582.
5. Disc Seat: Buna-N.
6. Lever and Counterweight: Ductile Iron, ASTM A536.
7. Hinge Pin and Key: Type 316 Stainless Steel.
8. Rubber Components: Buna-N .
9. Connecting Hardware: Type 304 Stainless Steel.

D. Finishes: As specified in Section 40 05 51 - Common Requirements for Process Valves.

2.2 SYNTHETIC DISC CHECK VALVE

A. Manufacturers:

1. Valmatic
2. APCO
3. Or approved equal.

B. Description:

1. Comply with AWWA C508
2. Minimum Working Pressure: 200 psig for 2” - 12” and 150 psig for 14” - 30”
3. Type: Swing, flexible disc check valve, full body flow type with hold-open backflow actuator.
4. Mounting: Horizontal or vertical.
5. End Connections: Integral flange ends shall be ANSI B16.1 Class 125, suitable for horizontal or vertical installation

C. Materials:

1. Body and Cover: Ductile iron, ASTM A536.
2. Disc: Precision molded Buna-N ASTM D2000

3. Epoxy Coated Interior
4. Screw-Type Stainless Steel backflow actuator
5. Mechanical Position indicator
6. Open-Close position indicator limit switch where shown.

D. Finishes: As specified in Section 40 05 51 - Common Requirements for Process Valves.

2.3 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for testing, inspection, and analysis.

B. Testing:

1. Hydrostatically test check valves at twice rated pressure according to AWWA C508.
2. Permitted Leakage at Indicated Working Pressure: None.

PART 3 - EXECUTION

3.1 EXAMINATION, INSTALLATION AND FIELD QUALITY CONTROL

A. As specified in Section 40 05 51 - Common Requirements for Process Valves.

B. According to AWWA C508.

END OF SECTION 40 05 65

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SECTION 40 05 93 - COMMON MOTOR REQUIREMENTS PROCESS EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Single- and three-phase motors for application on equipment provided under other Sections and for motors furnished loose to Project.

B. Related Requirements:

1. Division 26 – Electrical.

1.2 REFERENCE STANDARDS

A. American Bearing Manufacturers Association:

1. ABMA 9 – Load Ratings and Fatigue Life for Ball Bearings.

B. National Electrical Manufacturers Association:

1. NEMA MG 1 – Motors and Generators.

C. International Electrical Testing Association:

1. NETA ATS – Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

1.3 SUBMITTALS

A. Section 01 33 00 – Submittal Procedures: Requirements for submittals.

B. Product Data: Submit catalog data for each motor furnished loose. Indicate nameplate data, standard compliance, electrical ratings and characteristics, physical dimensions, weights, mechanical performance data, and support points.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Test and Evaluation Reports: Indicate procedures and results for specified factory and field testing and inspection.

E. Qualifications Statements:

1. Submit qualifications for manufacturer and testing agency.

1.4 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum ten (10) years' documented experience.

B. Testing Agency: Member of International Electrical Testing Association and specializing in testing products specified in this Section with minimum ten (10) years' documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 – Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Lift only with lugs provided. Handle carefully to avoid damage to components, enclosure, and finish.

C. Protect products from weather and moisture by covering with plastic or canvas and by maintaining heating within enclosure.

D. For extended outdoor storage, remove motors from equipment and store separately.

PART 2 - PRODUCTS

2.1 PRODUCT REQUIREMENTS FOR MOTORS FURNISHED WITH EQUIPMENT

A. Motors 3/4 hp and Larger: Three-phase motor as specified below.

B. Motors Smaller than 3/4 hp: Single-phase motor as specified below, except motors less than 250 watts or 1/4 hp may be equipment manufacturer's standard.

C. Three-Phase Motors: NEMA MG 1, Design B, energy-efficient squirrel-cage induction motor with windings to accomplish starting methods and number of speeds.

1. Voltage:

   a. As indicated on Drawings.

2. Service Factor: 1.15.
3. Enclosure: Meet conditions of installation unless specific enclosure is indicated on Drawings.
4. Design for continuous operation in 40°C environment, with temperature rise according to NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.
5. Insulation System: NEMA Class H.
6. Motors driven by VFDs shall be inverter duty rated.
7. Shaft grounding rings as recommended by Aegis shall be provided on any VFD driven motors.
8. Motor Frames: NEMA Standard T-Frames of steel, aluminum, or cast iron with end brackets of cast iron or aluminum with steel inserts.

9. Thermistor System (Motor Frame Sizes 254T and Larger): Three (3) PTC thermistors embedded in motor windings and epoxy-encapsulated solid state-control relay with wiring to terminal box. Relay shall be configured for 120VAC power input and shall include NO/NC 120VAC-rated dry contacts for alarm indication.
10. Motor Anti-Condensation Heaters (Motor Frame Sizes 254T and Larger): Integral 120VAC anti-condensation heaters shall be embedded in motor windings to prevent corrosion.
11. Bearings: Grease lubricated anti-friction ball bearings with housings equipped with plugged provision for relubrication, rated for minimum ABMA 9, L-10 life of 200,000 hours. Calculate bearing load with NEMA minimum, V-belt pulley with belt center line at end of NEMA standard shaft extension. Stamp bearing sizes on nameplate.
12. Sound Power Levels: Conform to NEMA MG 1.

D. Single-Phase Motors:

1. Permanent split-capacitor type where available; otherwise use split-phase start/capacitor run or capacitor start/capacitor run motor.
2. Voltage: 115/230 volts, single phase, 60 Hz.

E. Wiring Terminations: Furnish terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Provide oversized tap boxes.

2.2 THREE-PHASE MOTORS FURNISHED LOOSE

A. Manufacturers:

1. General Electric; Boston, MA.
2. US Motors; Memphis, TN.
3. WEG; Duluth, GA.
4. Or Approved Equal.

B. Description: NEMA MG 1, Design B, energy-efficient squirrel-cage induction motor, with windings to accomplish starting methods and number of speeds indicated.

C. Shall be suitable for VFD operation.

D. Voltage: As indicated on Drawings.

E. Service Factor: 1.15.

F. Enclosure: Meet conditions of installation unless specific enclosure is specified or indicated.

G. Design for continuous operation in 40 °C environment, with temperature rise according to NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.

H. Insulation System: NEMA Class H.

I. Motors driven by VFDs shall be inverter duty rated.

J. Shaft grounding rings as recommended by Aegis shall be provided on any VFD driven motors.

K. Motor Frames: NEMA Standard T-Frames of steel, aluminum, or cast iron with end brackets of cast iron or aluminum with steel inserts.

L. Thermistor System (Motor Frame Sizes 254T and Larger): Two (2) PTC thermistors per winding embedded in motor windings and epoxy-encapsulated solid state-control relay with wiring to terminal box. Relay shall be configured for 120VAC power input and shall include NO/NC 120VAC-rated dry contacts for alarm indication.

M. Motor Anti-Condensation Heaters (Motor Frame Sizes 254T and Larger): Integral 120VAC anti-condensation heaters shall be embedded in motor windings to prevent corrosion.

N. Bearings: Grease lubricated anti-friction ball bearings with housings equipped with plugged provision for relubrication, rated for minimum ABMA 9, L-10 life of 200,000 hours. Calculate bearing load with NEMA minimum, V-belt pulley with belt center line at end of NEMA standard shaft extension. Stamp bearing sizes on nameplate. Lubricant shall be identified in the submittal and on motor data plate.

O. Sound Power Levels: Conform to NEMA MG 1.

P. Wiring Terminations: Furnish terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Provide oversized tap boxes.

2.3 SOURCE QUALITY CONTROL

A. Section 01 40 00 – Quality Requirements: Requirements for testing, inspection, and analysis.

B. Factory Testing: Test motors according to NEMA MG 1, including winding resistance, no-load speed, and current, locked rotor current, insulation high-potential test, and mechanical alignment tests.

PART 3 - EXECUTION

3.1 PREPARATION

A. Section 01 70 00 – Execution and Closeout Requirements: Requirements for installation preparation.

B. Disconnect and remove abandoned motors.

C. Clean and repair existing motors to remain or those to be reinstalled.

3.2 INSTALLATION

A. Maintain access to existing motors and other installations remaining active and requiring access. Modify installation or provide access panel.

B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.

C. Install engraved plastic nameplates according to Section 26 05 53 – Identification for Electrical Systems.

D. Ground and bond motors according to Section 26 05 26 – Grounding and Bonding Electrical Systems.

3.3 FIELD QUALITY CONTROL

A. Section 01 40 00 – Quality Requirements: Requirements for inspecting and testing.

B. Section 01 70 00 – Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.

C. Inspect and factory test according to NETA ATS, except Section 4.

END OF SECTION 40 05 93

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