Preparing Activity: AFCEC Superseding
UFGS 33 32 16 (August 2016)
UFGS 33 32 13.13 (May 2014)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2023
****

SECTION TABLE OF CONTENTS

DIVISION 33 - UTILITIES

SECTION 33 32 16

PACKAGED UTILITY WASTEWATER PUMPING STATIONS

11/19

PART 1 GENERAL

1.1 REFERENCES
1.2 SUBMITTALS
1.3 QUALITY CONTROL
1.3.1 Installer Qualifications
1.4 DELIVERY, STORAGE, AND HANDLING OF MATERIALS
1.4.1 Delivery and Storage
1.4.2 Handling
1.5 WARRANTY

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION
2.2 SUBMERSIBLE SEWAGE GRINDER NONCLOG PUMPS
2.2.1 Pump Construction
2.2.1.1 Casing
2.2.1.2 Impeller
2.2.1.3 Bearings
2.2.1.4 Lubrication
2.2.1.5 Balance
2.3 PUMP MOTOR
2.4 PUMP CONTROL SYSTEM
2.4.1 General
2.4.2 Enclosure
2.4.3 Level Control System
2.4.4 Alternator
2.4.5 Sewage Pump Alarm and Control Panel
2.4.5.1 Alarms
2.4.5.2 Circuit Breakers
2.4.5.3 Motor Starter and Overload Protection
2.4.5.4 Power Lugs
2.4.5.5 Anti-Condensation Heater
2.4.5.6 Trouble Light

2.4.5.7 Convenience Outlets
2.4.5.8 Connection for Portable Generator
2.4.5.9 Additional Requirements
2.4.6 Electrical Requirements
2.5 WET WELL AND VALVE VAULT
2.5.1 Wet Well and Valve Vault
2.5.1.1 Fiberglass Basins
2.5.1.2 Precast Concrete Structures
2.5.2 Access Hatch Covers
2.5.3 Wet Well Base Material
2.5.3.1 Ventilating Blower
2.5.3.2 Dehumidifier
2.6 STATION PIPING
2.6.1 Ductile-Iron Pressure Pipe and Associated Fittings
2.6.1.1 Flanged Pipe
2.6.1.2 Fittings
2.6.1.3 Joints
2.6.2 PVC Plastic Pressure Pipe and Associated Fittings
2.6.2.1 Pipe and Fittings Less Than 100 mm 4 inch Diameter
2.6.3 Insulating Joints
2.6.4 Accessories
2.6.5 Flexible Flanged Coupling
2.7 VALVES AND OTHER PIPING ACCESSORIES
2.7.1 Isolation Gate Valves in Valve Vault
2.7.1.1 Valves Larger Than 50mm 2 Inches
2.7.1.2 Valves 50mm 2 Inches and Smaller
2.7.2 Check Valves Less Than 100 mm 4 inch Diameter
2.7.3 Check Valves 100 mm 4 inch and Larger Diameter
2.7.4 Identification Tags and Plates
2.7.5 Pipe Support
2.7.6 Miscellaneous Metals
2.7.7 Quick Disconnect System with Hydraulic Sealing Flange and Rail System
2.7.8 Wet Well Vent
2.8 EXCAVATION, TRENCHING, AND BACKFILLING

PART 3 EXECUTION

3.1 INSTALLATION
3.1.1 Equipment Installation
3.1.2 Installation of Ductile-Iron Pressure Pipe and Fittings
3.1.3 Installation of PVC Plastic Pressure Pipe and Fittings
3.1.3.1 Pipe Less than 100 mm 4 Inch Diameter:
3.1.4 Valves
3.1.5 Miscellaneous
3.2 FIELD QUALITY CONTROL
3.2.1 Testing Procedure
3.2.2 Field Representative
3.3 CLOSEOUT ACTIVITIES
3.3.1 Operation and Maintenance

-- End of Section Table of Contents --

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USACE / NAVFAC / AFCEC / NASA **UFGS-33 32 16 (November 2019)**

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UFGS 33 32 16 (August 2016)
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UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2023

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SECTION 33 32 16

PACKAGED UTILITY WASTEWATER PUMPING STATIONS
11/19

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NOTE: This guide specification covers the requirements for Packaged Submersible Sewage Grinder Nonclog Pump Stations including alarm requirements, station piping, and O&M data packages.

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable item(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a Criteria Change Request (CCR).

****

PART 1 GENERAL

1.1 REFERENCES

****

NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a Reference Identifier (RID) outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also

use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

****

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B1.20.1	(2013; R 2018) Pipe Threads, General Purpose (Inch)
ASME B16.1	(2020) Gray Iron Pipe Flanges and Flanged Fittings Classes 25, 125, and 250
ASME B16.3	(2021) Malleable Iron Threaded Fittings, Classes 150 and 300
ASME B16.11	(2022) Forged Fittings, Socket-Welding and Threaded

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C104/A21.4	(2022) Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
AWWA C110/A21.10	(2021) Ductile-Iron and Gray-Iron Fittings
AWWA C111/A21.11	(2017) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C115/A21.15	(2020) Flanged Ductile-Iron Pipe With Ductile-Iron or Gray-Iron Threaded Flanges
AWWA C151/A21.51	(2017) Ductile-Iron Pipe, Centrifugally Cast
AWWA C500	(2019) Metal-Seated Gate Valves for Water Supply Service
AWWA C509	(2015) Resilient-Seated Gate Valves for Water Supply Service
AWWA C515	(2020) Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service
AWWA C517	(2009) Resilent-Seated Cast-Iron Eccentric Plug Valves
AWWA C600	(2017) Installation of Ductile-Iron Mains and Their Appurtenances
AWWA C605	(2021) Underground Installation of

	Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings
AWWA M23	(2020) Manual: PVC Pipe - Design and Installation - Third Edition

ASTM INTERNATIONAL (ASTM)

ASTM A48/A48M	(2003; R 2021) Standard Specification for Gray Iron Castings
ASTM A53/A53M	(2022) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A126	(2004; R 2019) Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
ASTM A536	(1984; R 2019; E 2019) Standard Specification for Ductile Iron Castings
ASTM A615/A615M	(2022) Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM C443	(2021) Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
ASTM C443M	(2021) Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric)
ASTM C478	(2018) Standard Specification for Circular Precast Reinforced Concrete Manhole Sections
ASTM C478M	(2018) Standard Specification for Precast Reinforced Concrete Manhole Sections (Metric)
ASTM C618	(2023; E 2023) Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C989/C989M	(2022) Standard Specification for Slag Cement for Use in Concrete and Mortars
ASTM D883	(2020a) Standard Terminology Relating to Plastics
ASTM D1784	(2020) Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D1785	(2015; E 2018) Standard Specification for

	Poly(Vinyl Chloride) (PVC), Plastic Pipe, Schedules 40, 80, and 120
ASTM D2241	(2015) Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
ASTM D2464	(2015) Standard Specification for Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D2466	(2017) Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
ASTM D2467	(2015) Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D3139	(2019) Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM D3753	(2019) Glass-Fiber-Reinforced Polyester Manholes and Wetwells
ASTM F477	(2014; R 2021) Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 1940-1	(2003; R 2008) Mechanical Vibration - Balance Quality Requirements for Rotors in a Constant (Rigid) State - Part 1: Specification and Verification of Balance Tolerances

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-80	(2019) Bronze Gate, Globe, Angle and Check Valves

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG 1	(2021) Motors and Generators

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2023) National Electrical Code
NFPA 820	(2016) Standard for Fire Protection in Wastewater Treatment and Collection Facilities

UNDERWRITERS LABORATORIES (UL)

UL 67	(2018; Reprint May 2023) UL Standard for Safety Panelboards

UL 489 (2016; Rev 2019) UL Standard for Safety Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures

1.2 SUBMITTALS

****
NOTE: Review Submittal Description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list, and corresponding submittal items in the text, to reflect only the submittals required for the project. The Guide Specification technical editors have classified those items that require Government approval, due to their complexity or criticality, with a "G." Generally, other submittal items can be reviewed by the Contractor's Quality Control System. Only add a "G" to an item, if the submittal is sufficiently important or complex in context of the project.

For Army projects, fill in the empty brackets following the "G" classification, with a code of up to three characters to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

Use the "S" classification only in SD-11 Closeout Submittals. The "S" classification indicates submittals required as proof of compliance for sustainability Guiding Principles Validation or Third Party Certification and as described in Section 01 33 00 SUBMITTAL PROCEDURES.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.
****

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are [for Contractor Quality Control approval.][for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Fabrication Drawings

Erection/Installation Drawings

SD-03 Product Data

Submersible Sewage Grindernonclog Pumps; G [, [_____]]

Pump Performance Curve; G [, [_____]]

Pump Motor; G [, [_____]]

Pump Control System; G [, [_____]]

Wet Well and Valve Vault; G [, [_____]]

Flexible Flanged Coupling; G [, [_____]]

Station Piping and fittings; G [, [_____]]

Valves; G [, [_____]]

Spare Parts Data; G [, [_____]]

Access Hatch Covers

SD-05 Design Data

Buoyancy Calculations; G [, [_____]]

SD-06 Test Reports

Pump Test[; G[, [____]]]

[Pressure Sensor Test[; G[, [____]]]

][Float Test[; G[, [____]]]

] SD-07 Certificates

Submersible Sewage Grindernonclog Pumps; G [, [_____]]

Recycled Material Content[; G[, [____]]]

Manhole Chamber[; G[, [____]]]

Access Hatch Covers

Gate Valves[; G[, [____]]]

Check Valves[; G[, [____]]]

Blowers[; G[, [____]]]

Dehumidifier[; G[, [____]]]

Pump Motor[; G[, [____]]]

SD-08 Manufacturer's Instructions

Manhole Chamber[; G[, [____]]]

Access Hatch Covers

Pump Control System[; G[, [____]]]

Gate Valves[; G[, [____]]]

Check Valves[; G[, [____]]]

Blowers[; G[, [____]]]

Dehumidifier[; G[, [____]]]

Pump Motor[; G[, [____]]]

Special Tools[; G[, [____]]]

Posted Instructions[; G[, [____]]]

SD-10 Operation and Maintenance Data

Operation And Maintenance Manuals

SD-11 Closeout Submittals

Warranty[; G[, [____]]]

1.3 QUALITY CONTROL

1.3.1 Installer Qualifications

Provide manufacturer's authorized pump representative who is trained and approved for installation of pumps and packaged pump station required for this project.

1.4 DELIVERY, STORAGE, AND HANDLING OF MATERIALS

1.4.1 Delivery and Storage

Inspect materials delivered to site for damage. Unload and store with minimum handling. Store materials in enclosures or under protective covering. Rubber gaskets which are not to be installed immediately must be stored under cover, out of direct sunlight. Do not store materials directly on the ground. Keep interior of pipes, valves and fittings free of dirt and debris.

1.4.2 Handling

Handle pipe, fittings, valves, and other accessories in such manner as to ensure delivery to the trench in sound, undamaged condition. Avoid injury to coatings and linings on pipe and fittings; make repairs if coatings or linings are damaged. Carry pipe to the trench; do not drag it. Do not use any device or fitting inserted into (such as loader forks) or attached to (such as chain hooks) the bell or spigot ends of the pipe to transport pipe. Handle ductile iron pipe, fittings, and accessories in accordance with AWWA C600. Handle PVC pipe, fittings, and accessories in accordance with AWWA C605.

1.5 WARRANTY

****

NOTE: Typical warranty of pumps, controls, wet well basin and accessories is for one year. Consider extended warranty for pump stations utilized in critical mission facilities and for pump stations with flow rates greater than 300 gpm.
****

Provide manufacturer's standard warranty for a minimum of one year for package pump station including pumps, valves, controls, wet well basin and accessories.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Provide a complete packaged sewage pump station with submersible grinder nonclog pumps including equipment and materials, installed and ready for operation. The pump supplier furnishes the controls, pumps and rail system to ensure unit integrity.

Submit fabrication drawings before installation. Submit drawings covering necessary or recommended changes to accommodate the equipment offered. Show on the drawings the design of the chamber, with dimensions, types, and thicknesses of materials, and elevation levels with reference to those elevations indicated.

Submit erection/installation drawings for the manhole chamber with the required equipment and accessories. Provide precast reinforced concrete manhole sections conforming to ASTM C478MASTM C478. Show the design of the chamber, with dimensions, types, and thicknesses of materials, and elevation levels with reference to those elevations indicated.

2.2 SUBMERSIBLE SEWAGE GRINDER NONCLOG PUMPS

Provide submersible sewage nonclog pumps with grinder units as indicated. Provide UL listed pumps for explosion proof Class 1, Division 1, Groups C and D hazardous locations. Provide submersible, centrifugal sewage pumps and grinder units capable of grinding the materials found in normal domestic sewage, including plastics, rubber, sanitary napkins, disposable diapers, animal hair and wooden articles into a finely ground slurry with particle dimensions no greater than [6][_____] mm [1/4][_____] inch of the nonclogging type with passageways designed to pass 75 mm 3 inch diameter spheres without clogging. Provide pump capacity, number of pumps and motor characteristics as indicated on the drawings. Select pumps to continuously operate in a submerged or partially submerged condition.

2.2.1 Pump Construction

2.2.1.1 Casing

Provide hard, close-grained cast iron casing or steel that is free from blow holes, porosity, hard spots, shrinkage defects, cracks, and other injurious defects. Provide casings permitting replacement of wearing parts. Ensure all joints are gasketed to prevent leakage. Ensure passageways permit smooth flow of sewage and are free of sharp turns and projections. Use free standing pump support legs of cast-iron providing enough clearance for the solids to get into the grinder.

2.2.1.2 Impeller

Provide a [stainless steel] [bronze] [_____] impeller for the grinder pump with stainless steel cutter, grinder, or slicer assembly. Provide nonclogging type cast-iron impeller, conforming to ASTM A48/A48M, Class 30, for a submersible nonclog pump. Ensure the impeller has a smooth surface and allows free flowing with the clearance to permit objects in the sewage to pass. Fit and key, spline, or thread impeller on shaft, and lock in such manner that lateral movement is prevented and reverse rotation will not cause loosening.

2.2.1.3 Bearings

****
NOTE: Specify sealed bearings on motors. Properly installed sealed bearings with warranty for minimal maintenance requirements.
****

Provide heavy duty ball thrust bearing or roller type bearing sized to withstand imposed loads. Oil lubricate bearings.

2.2.1.4 Lubrication

Provide [grease type lubrication with fittings for a grease gun and, if not easily accessible, with grease tubing extending to convenient locations.][the pump manufacturer's standard type grease fittings.] [self lubricating, permanently sealed bearings.]

2.2.1.5 Balance

Balance rotating parts of the equipment mechanically and hydraulically to operate throughout the required range without excessive end thrust, vibration, and noise. Conform allowable vibration limits with ISO 1940-1, Table 1. Existence of defects that cannot be eliminated by adjustment will be sufficient cause for rejection of the equipment.

2.3 PUMP MOTOR

Provide hermetically sealed electric motors with moisture and temperature-sensing probes in the wet well NEMA MG 1, [_____] RPM, [_____] volt, [_____] phase, and [_____] Hz cycle for submersible pumps. Motor horsepower must not be less than pump horsepower at any point on the pump performance curve. Fit motors with lifting "eyes" capable of supporting entire weight of pump and motor. Seal the power cable inside the motor end bell. Provide a waterproof power cable for its full length. Motors will be UL listed for explosion proof Class 1, Division 1, Groups C and D. Air filled motors are not acceptable. Oil used must be able to be disposed as non-hazardous waste.

2.4 PUMP CONTROL SYSTEM

2.4.1 General

Provide an automatic type pump operating control including all necessary components to function reliably. Mount controls in a NEMA [3R][_____] rated [stainless steel][_____] control panel. Ensure equipment subject to contact with sewage or sewage gases is corrosion-resistant metal. Provide an electronic controller that automatically activates and alternates the

pump operation. If the liquid level continues to rise to the plans-specified level, the controller engages both pumps to operate simultaneously until both shut off at the specified low level. Provide hand-off-auto switches to choose the mode of operation for each pump. Provide controls with a 12 VDC powered float switch connected to the alarm contact of the battery charger to activate high-level alarms.

Protect pumping stations from lightning and transient voltage surges and equip with phase protection.

Provide the station with a three-wire, 4-pole (grounding) receptacle for a portable generator in case there is an external power outage.

Design the control system to operate pumps at the power characteristics as shown on the plans. Ensure all controls and wiring meet or exceed the requirements of NFPA 70.

For pumps specified as explosion proof, have pump power and control installation meets NEC requirements for Class 1, Division 1, Group D Hazardous Location, including intrinsically safe controls. Provide components that are UL listed or FM approved.

Require the control function to provide for the operation of the pumps under normal conditions and alternates the pumps on each pump down cycle.

In the event the incoming flow exceeds the pumping capacity of the lead pump, the offline pumps automatically start to handle the increased flow. As the flow decreases, the pumps cut off at the elevations set on the controller.

2.4.2 Enclosure

Provide a NEMA 3R rated enclosure manufactured from stainless steel. [The enclosure is a wall mount type suitable for mounting on strut or channel with a minimum depth sized to adequately house all the components.]Provide a rubber composition door gasket and assures a positive weatherproof seal. Provide a door that opens a minimum of 180 degrees and is equipped with a 3-point latch and padlockable handle.

Provide a dead front mounted in the panel to provide protection of personnel from live internal wiring. Install cutouts for breaker handles to allow operation of breakers without entering the compartment.

Mount all control switches, indicator pilot lights, elapsed time meters, duplex receptacle and other operational devices on the external surface of the dead front.

Ensure the dead front opens a minimum of 150 degrees to allow access to equipment for maintenance.

[Manufacture the back plate from 2.78 mm 12-gauge (minimum) steel and finished with a primer coat and two (2) coats of baked on white enamel.]Mount all hardware to the subpanel with machine thread tapped holes. Sheet metal screws are not acceptable. Permanently identify all devices to match the schematic diagram.

Provide an enclosure ventilator located near the top of the enclosure on the opposite side of the generator receptacle. Provide a rain and vermin proof ventilator and made of fire retardant thermoplastic material.

2.4.3 Level Control System

****

NOTE: Select either the mercury-free float switch or the submersible pressure level sensor level control system.

****

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NOTE: Closed Float Switches:
Float switches that are configured to stay closed until liquid flips open the circuit, are referred to as a, "normally closed float switch." Once liquid reaches a certain level it then forces the circuit open and activates the next step, which could be a power shut off, or alarm sound off. As water levels rise in the tank, the float is lifted too and the circuits open. Common uses for a closed float switch would be to measure water, stop overfills and when avoiding high water levels is desired.

****

****

NOTE: Open Float Switches:
When a float switch circuit is open, it is referred to as a, "normally open float switch" and is set to close when liquids reach a certain level. In the standard position when dry, this switch is above the liquid line and not floating. A common use for an open float switch would be in sump pumps, lift station pumps, and general pumping applications to signal a high level of liquid present and help operators to control the pumps.

****

[Provide a sealed, mercury-free float switch control system to sense variations of sewage level in the wet well.

Use a direct acting float switch consisting of a normally-open mercury switch enclosed in a float. Use float molded of rigid high-density polyurethane foam, color-coded and coated with a durable, water and corrosion-resistant jacket of clear urethane.

Provide stainless steel float brackets in accordance with manufacturer's recommendations.

Mount floats at fixed elevations as shown on the drawings.

Use floats designed to tilt and operate their switches causing sequential turn-on turn-off of the pump, when the liquid level being sensed rises or falls past the float.

Float switches must be intrinsically safe relays. Provide an intrinsically safe barrier relay between the wet well and the control panel.

][Provide the pump station with a submersible pressure type level sensor and

an electronic pump controller. Sense levels by a 24 DVC, 1 percent submersible pressure transmitter provided by controller manufacturer. Construct the system as follows:

a. The pressure type level sensor is a submersible type, suspended on its cable.

b. Install the sensor per manufacturer's instructions for wet well installations, including any recommended mounting accessories.

c. The level sensor is as follows:

(1) Select the sensor range based on the wet well depth.

(2) The sensor output is 4-20mA proportional to water level, 2-wire type.

(3) Construct all exposed parts of [316 Stainless Steel][_____].

(4) Fill the sensor with Silicon Oil.

(5) Power the Sensor by 24 VDC output from electronic pump controller.

d. Mount the electronic pump controller in the starter panel enclosure, and be visible from the front of the swing-out panel, with the enclosure door opened. The electronic pump controller is as follows:

(1) Accept a 4-20 mA, 2 wire level signal, and indicate the wet well level digitally in direct engineering units (meters) (feet).

(2) Provide pump control outputs, with independent adjustment for each pump starting and stopping setpoint. Indicate each level setpoint digitally in direct engineering units.

(3) Power to the unit is 120 VAC.

(4) Equip controller with hand/off/auto (H.O.A.) switches and pump on indicating lights (one each per pump).

] Provide an intrinsically safe barrier relay between the wet well and the control panel.

2.4.4 Alternator

****

NOTE: For the lag pump, incorporate time delay function and devices in the alternator controls such that both sewage pumps cannot be started simultaneously for an adjustable period of 10 to 120 seconds after shutdown.

****

Provide an alternator control switch to operate in connection with each float. Use an alternator control switch to alternate the operation of the pumps and operate both pumps if the water level rises above the second high water level. Incorporate time delay function and devices in the alternator controls such that both sewage pumps cannot be started simultaneously for an adjustable period of 10 to 120 seconds after shutdown. Use the delay function designed to operate in any condition of

start-up in either normal or emergency operational mode.

2.4.5 Sewage Pump Alarm and Control Panel

Enclose alarm panel in NEMA [4X] [3R] enclosure and with a flashing red light that is visible from 15 m 50 feet away, with long life bulb in guarded enclosure and 150 mm 6 inch diameter horn. Use horns capable of emitting 120 DB at 3 meters 10 feet. Power alarm horn and light from 12V DC power supply with battery backup. Provide a rechargeable battery rated to power both the horn and light for a minimum of two hours upon loss of main power. Provide circuitry to automatically recharge the battery after main power is restored. Use batteries capable of being fully recharged in no more than 20 hours. Use panel with power on light, push to test button for horn and light and push to silence button for horn and light with automatic reset for next alarm.

2.4.5.1 Alarms

Provide a test function ability for the alarm system. Provide alarms to activate under the following conditions:

a. High liquid level as sensed by the level control system.

b. Loss of main power.

c. No flow light as sensed by limit switch on the check valve or as sensed by current sensors.

d. Pump failure via temperature overload or motor heat sensor trip; provide motor high temperature light.

e. Seal failure with indication light.

****

NOTE: Remote Alarm Monitoring Systems vary widely. Insert telemetry information consistent with facility requirements.

****

2.4.5.2 Circuit Breakers

a. Provide an individual circuit breaker for each pump.

b. Include a control circuit breaker and an alarm circuit breaker in the control panel.

c. Allow for two additional spare 115V single phase 20A circuit breakers for local pole lighting and future spare.

d. Provide circuit breakers in accordance with UL 489

e. Conform to UL 67 for circuit breaker mounting.

2.4.5.3 Motor Starter and Overload Protection

Provide an International Electrotechnical Commission (IEC) rated motor starter and thermal overload protection located in the control panel for each pump. Include undervoltage release, manual reset buttons and hand-automatic selector switches.

2.4.5.4 Power Lugs

a. Size the incoming power lugs for the proper voltage, amperage, and horsepower for each pump station.

b. Include grounding lugs for the incoming power. Provide a dedicated grounding lug in the control panel for each pump.

c. Size ground lug and rod according to local and base electrical codes and install by a licensed electrician.

d. Use UL listed power lugs.

e. Conform to UL 67 for required power lug mounting.

2.4.5.5 Anti-Condensation Heater

a. Provide an anti-condensation heater in the control panel that is sized based upon the size of the particular pump station's control panel size.

b. Power the heater from the control voltage transformer for three phase pump motor units and from the incoming power for single phase pump motor units.

c. Control the heater by a thermostat, coming on at 16 degree C 50 degree F and going off at 18 degree C 65 degree F.

d. Clearly label panel directory for breakers.

2.4.5.6 Trouble Light

Provide a fluorescent trouble shooting light in the panel that is hard-wired into an appropriately sized circuit breaker. It is acceptable for the light and one of the convenience outlets to share the same circuit breaker.

2.4.5.7 Convenience Outlets

a. Place two duplex convenience outlets in the control panel; utilize one for the battery charger. The battery receives power from the control voltage transformer via the alarm fuse.

b. Upsize the alarm fuse to 1 to 1.5 amps for the battery charger.

c. Provide each outlet with its own 20 amp 115/1/60 circuit breaker.

[2.4.5.8 Connection for Portable Generator

****
NOTE: Delete this paragraph if a permanent, onsite generator is provided for the pump station.
****

Provide receptacle for connection for portable generator. Provide manual transfer switch for receptacle matching generator electrical power requirements.

]2.4.5.9 Additional Requirements

a. Provide elapsed time meter for each pump that measures run time in hours to 9999.9.

b. Do not place junction boxes between pumps, control systems and control panels; provide conduit seals at all wet well penetrations. If this is unavoidable, use NEMA 7 construction.

2.4.6 Electrical Requirements

Install labels to identify switches and controls. Provide internal wiring for components of packaged equipment as an integral part of the equipment. Provide power wiring and conduit for field installed equipment.

2.5 WET WELL AND VALVE VAULT

2.5.1 Wet Well and Valve Vault

Provide a fiberglass reinforced polyester resin basin with integral valve vault precast concrete wet well; include a separate precast concrete valve vault. Provide a wet well and valve vault with inside diameters [as indicated][of [_____] mm [_____] inch] and to the depths indicated on the drawings.[

Precast structures may be provided in lieu of cast-in-place structures.]

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NOTE: Buoyancy calculations are required during design. Since design drawings typically only show one type of wet well, buoyancy calculations are required as a submittal to ensure submitted wet well basin incorporates manufacturer's recommended measures to prevent flotation.

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2.5.1.1 Fiberglass Basins

a. Buoyancy Calculations: Submit buoyancy calculations sealed by a licensed professional engineer assuming seasonal high groundwater elevation at proposed finished grade. Prevent flotation in accordance with manufacturer's written instructions. Include manufacturer's written instructions with submitted calculations.

b. Select Fiberglass Reinforced Polyester (FRP) wet well in accordance with ASTM D883 relating to plastics and ASTM D3753.

(1) Use commercial grade polyester resins evaluated as a laminate by test or determined by previous service to be acceptable for use in the wastewater environment.

(2) Use a commercial grade continuous strand fiberglass reinforcement material.

(3) Design FRP based on the following assumed conditions. Provide independent third party testing.

(a) Hydrostatic pressure of 305 kilogram-force/square meter 62.4 pounds/square foot with water at ground surface.

(b) Saturated soil weight of 1,922 kilogram/cubic meter 120 pounds/cubic foot.

(c) Soil modulus of 3,418 kilogram-force/square meter 700 pounds/square foot.

(d) Pipe stiffness values as specified in ASTM D3753.

(e) Provide FRP laminate with a surface hardness of 90 percent Barcol.

2.5.1.2 Precast Concrete Structures

Submit manufacturer's data indicating percentage of recycled material content in packaged sewage lift stations to verify affirmative procurement compliance.

Fly ash is required as an admixture and is to conform to ASTM C618, Class [F][C]. Fly ash replacement of cement is not to exceed 20 percent (maximum one part fly ash to four parts cement) by weight.

****

NOTE: Ground granulated blast furnace slag and fly ash are materials listed in the EPA's Comprehensive Procurement Guidelines (CPG) (http://www.epa.gov/cpg/). If the Architect/Engineer determines that use of certain materials meeting the CPG content standards and guidelines would result in inadequate competition, do not meet quality/performance specifications, are available at an unreasonable price or are not available within a reasonable time frame, the Architect/Engineer may submit written justification and supporting documentation for not procuring designated items containing recovered material. Written justification may be submitted on a Request for Waiver Form to the NASA Environmental Program Manager for approval. The Request for Waiver Form is located in the NASA Procedures and Guidelines (NPG 8830.1) (http://nodis3.gsfc.nasa.gov).

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Ground granulated blast furnace slag [is required] [used] as an admixture [and] is to conform to ASTM C989/C989M, Grade [120] with between 25 to 50 percent maximum cement replacement by weight. Submit certificate to verify EPA-CPG compliance.

a. Buoyancy Calculations: Submit buoyancy calculations sealed by a licensed professional engineer assuming seasonal high groundwater elevation at proposed finished grade.

b. Construct precast concrete structures in accordance with ASTM C478M ASTM C478, except as specified herein. Provide precast concrete structures with a compressive strength of 30 MPa 4000 psi at 28 days and an air entrainment of 6 percent, plus or minus 2 percent, and a minimum wall thickness of 125 mm 5 inches. ASTM A615/A615M reinforcing bars. ASTM C443MASTM C443, Type B gaskets for joint

connections. Use monolithic base and first riser.

2.5.2 Access Hatch Covers

Provide [aluminum][_____] access hatch covers as indicated. Include lifting mechanism, automatic hold open arm, slam lock with handle, and flush lift handle with vinyl grip. Use automatic hold open arm that locks in the 90 degree position. Use cover that is 6 mm 1/4 inch diamond plate with 6 mm 1/4 inch channel frame and continuous anchor flange. Use access hatch cover capable of withstanding a live load of 1500 kg/sq. meter 300 lb/sq. ft. Provide stainless steel cylinder lock with two keys per lock. Key all the locks the same.

2.5.3 Wet Well Base Material

Provide crushed stone as indicated and specified in Section 31 00 00 EARTHWORK.[Provide a polyethylene vapor barrier as indicated and specified in Section 03 30 00 CAST-IN-PLACE CONCRETE.]

2.5.3.1 Ventilating Blower

Ensure blowers maintain air changes in accordance with[NFPA 820][every [5] [_____] minutes]. Mount a manual and automatic switch on the side of the entrance tube for operation of the blower. Provide vent to atmosphere with covers and screens to prevent the entrance of rain, insects, and rodents. Automatically actuate blower upon opening the entrance tube cover, unless overridden by the manual control.

2.5.3.2 Dehumidifier

Furnish and install a packaged dehumidifier in accordance with lift station manufacturer's recommendations. Include in controls a humidistat and low-temperature cutout/discharge condensate to the wet well.

2.6 STATION PIPING

Provide pressure piping, emergency pump connection, air release valves, and related accessories for force main piping outside the sewage wet well and valve vault in accordance with Section 33 30 00 SANITARY SEWERAGE.

2.6.1 Ductile-Iron Pressure Pipe and Associated Fittings

Conform to AWWA C151/A21.51, Pressure Class 350.

2.6.1.1 Flanged Pipe

Conform to AWWA C115/A21.15, ductile iron.

2.6.1.2 Fittings

AWWA C110/A21.10, flanged. Provide flanged joint fittings within wet well and valve vault as indicated. Provide mechanical joint fittings outside valve vault enclosure as indicated. Use fittings with pressure rating at least equivalent to that of the pipe.

2.6.1.3 Joints

AWWA C115/A21.15 for flanged joints. Use bolts, nuts, and gaskets for flanged connections recommended in the Appendix to AWWA C115/A21.15.

Provide ductile iron flange for setscrewed flanges in accordance with ASTM A536, Grade 70-50-05 or 60-42-10, and meeting the applicable requirements of ASME B16.1, Class 125. Use 1310 MPa 190,000 psi tensile strength, heat treated, and zinc-coated steel setscrews for setscrewed flanges. Conform to the applicable requirements for mechanical-joint gaskets specified in AWWA C111/A21.11 for setscrewed flange gaskets. Use setscrewed gasket designed to provide for confinement and compression of gasket when joint to adjoining flange is made.

2.6.2 PVC Plastic Pressure Pipe and Associated Fittings

2.6.2.1 Pipe and Fittings Less Than 100 mm 4 inch Diameter

Use pipe, couplings and fittings manufactured of materials conforming to ASTM D1784, Class 12454-B.

a. Screw-Joint: Follow dimensional requirements of ASTM D1785 Schedule 80 pipe, with joints meeting requirements of 1.03 MPa 150 psi working pressure, 1.38 MPa 200 psi hydrostatic test pressure, unless otherwise shown or specified. Follow ASTM D2464 and ASME B1.20.1 for use with Schedule 80 threaded pipe and fittings. Test pipe couplings when used, as required by ASTM D2464.

b. Push-On Joint: ASTM D3139, with ASTM F477 gaskets. Fittings for push-on joints: AWWA C110/A21.10 or AWWA C111/A21.11. Iron fittings and specials: cement-mortar lined (standard thickness) in accordance with AWWA C104/A21.4.

c. Solvent Cement Joint: Use pipe that matches the dimensional requirements of ASTM D1785 or ASTM D2241 with joints meeting the requirements of 1.03 MPa 150 psi working pressure and 1.38 MPa 200 psi hydrostatic test pressure. Use fittings for solvent cement jointing that match the requirements of ASTM D2466 or ASTM D2467.

2.6.3 Insulating Joints

Provide between pipes of dissimilar metals a rubber gasket or other approved type of insulating joint or dielectric coupling to effectively prevent metal-to-metal contact between adjacent sections of piping.

2.6.4 Accessories

Provide flanges, connecting pieces, transition glands, transition sleeves, and other adapters as required.

2.6.5 Flexible Flanged Coupling

Provide flexible flanged couplings applicable for sewage as indicated. Use flexible flanged coupling designed for a working pressure of 2.41 MPa 350 psi.

2.7 VALVES AND OTHER PIPING ACCESSORIES

2.7.1 Isolation Gate Valves in Valve Vault

Conform to AWWA C500 for gate valves with outside-screw-and-yoke rising-stem type with double disc gates and flanged ends. Conform to AWWA C509 for valves with outside-screw-and-yoke rising-stem type with flanged ends. Provide valves that open by counterclockwise rotation of

the valve stem. [Bolt and construct stuffing boxes to permit easy removal of parts for repair of gate valves.] Use valves from one manufacturer.

2.7.1.1 Valves Larger Than 50mm 2 Inches

[Resilient seat gate valves conforming to AWWA C509 with non-rising stems and flanged ends.

][Resilient seat eccentric plug valves conforming to AWWA C517 with operating handle and flanged ends.

]2.7.1.2 Valves 50mm 2 Inches and Smaller

[Gate valves conforming to MSS SP-80 with non-rising stems and threaded ends.

][Ball valves with PTFE seats and seals, brass body and end cups, chrome plated brass ball and screwed ends.

]2.7.2 Check Valves Less Than 100 mm 4 inch Diameter

Neoprene ball check valve with integral hydraulic sealing flange, designed for a hydraulic working pressure of 1.21 MPa 175 psi.

2.7.3 Check Valves 100 mm 4 inch and Larger Diameter

Provide nonclogging swing check valve rated for not less than 1210 kPa 175 psig working pressure capable of passing 76-mm 3-inch diameter solids. Match cast iron to ASTM A126 and flanged ends to AWWA C110/A21.10 Buna-N disc and integral seat.

Provide a positive horizontal, swing check type check valves. Provide valves that permit a free flow of sewage forward and a positive check against backflow. Provide iron body valves with a removable cover for inspection and removal of the gate assembly. Provide [bronze][_____] gate, gate seats, shaft, studs, and nuts.

2.7.4 Identification Tags and Plates

Provide the manufacturer's name or trademark on a corrosion-resistant identification plate or cast integrally, stamped, or otherwise permanently marked in a conspicuous place on each item of equipment. Include on the pump identification plate the pump capacity in liter per minute gpm, pump head in meter feet and speed of rotation. Cast on the body of the pump the direction of rotation.

2.7.5 Pipe Support

Use pipe support schedule 40 galvanized steel piping matching ASTM A53/A53M. Provide either ASME B16.3 or ASME B16.11 galvanized threaded fittings.

2.7.6 Miscellaneous Metals

Use stainless steel bolts, nuts, washers, anchors, and supports for installation of equipment.

2.7.7 Quick Disconnect System with Hydraulic Sealing Flange and Rail System

Use quick disconnect system consisting of a steel base plate for

supporting the pumps, a hydraulic sealing flange, pump guide rails and the discharge pipe supports. Provide stainless steel guide rails, brackets and lifting chain for raising and lowering the pump in the basin. Build guides onto pump housing to fit the guide post to assure perfect alignment between pump and guide rails.

2.7.8 Wet Well Vent

Provide a [flanged ductile iron pipe and bend, conforming to AWWA C115/A21.15] [galvanized steel pipe and bend, conforming to ASTM A53/A53M] with insect screening.

2.8 EXCAVATION, TRENCHING, AND BACKFILLING

Provide in accordance with Section 31 00 00 EARTHWORK except as specified herein.

PART 3 EXECUTION

3.1 INSTALLATION

Provide pump station in accordance with drawings and requirements of the respective equipment manufacturers. Dampen and isolate equipment vibration.

3.1.1 Equipment Installation

Install equipment in accordance with these specifications and the manufacturer's installation instructions. Grout equipment mounted on concrete foundations before installing piping. Install piping to avoid imposing stress on equipment. Match flanges before securing bolts.

3.1.2 Installation of Ductile-Iron Pressure Pipe and Fittings

Unless otherwise specified, install pipe and fittings in accordance with the paragraph GENERAL REQUIREMENTS FOR INSTALLATION OF PIPELINES of Section 33 30 00 SANITARY SEWERAGE, and with the requirements of AWWA C600 for pipe installation, joint assembly, and valve-and-fitting installation.

Make flanged joint with gaskets, bolts, and nuts specified for this type joint. Make flanged joints tight, avoid strain on flanges, fittings, and other accessories. Align bolt holes for each flanged joint. Use bolts sized for the bolt holes; use of undersized bolts is not permitted. Do not allow adjoining flange faces to be out of parallel to such degree that the flanged joint cannot be made watertight without overstraining the flange.

3.1.3 Installation of PVC Plastic Pressure Pipe and Fittings

Unless otherwise specified, install pipe and fittings in accordance with the paragraph GENERAL REQUIREMENTS FOR INSTALLATION OF PIPELINES of Section 33 30 00 SANITARY SEWERAGE, with the recommendations for pipe joint assembly and appurtenance installation in AWWA M23, "Installation."

3.1.3.1 Pipe Less than 100 mm 4 Inch Diameter:

a. Make threaded joints by wrapping the male threads with joint tape or by applying an approved thread lubricant, then threading the joining members together. Tighten joints with strap wrenches that will not

damage the pipe and fittings. Do not tighten joint more than 2 threads past hand-tight.

b. Push-On Joints: Bevel ends of pipe for push-on joints to facilitate assembly. Mark pipe to indicate when the pipe is fully seated. Lubricate gasket to prevent displacement. Ensure that the gasket remains in position in the bell or coupling while making the joint.

c. Solvent-weld joints: Comply with the manufacturer's instructions.

3.1.4 Valves

Make and assemble joints to gate valves and check valves as specified for making and assembling the same type joints between pipe and fittings.

Install valves in accordance with manufacturer's installation instructions. Install gate valves as described in AWWA C500, AWWA C509, and AWWA C515 and with AWWA C600 for valve-and-fitting installation and with the recommendations of the Appendix ("Installation, Operation, and Maintenance of Gate Valves") to AWWA C500.

3.1.5 Miscellaneous

Attach a plactic laminated final as-built controls drawing to the inside of the front door. Include a list of all legends. Identify the pump nameplate data on the drawing and on the as-built plans.

Permanently mark all component parts in the control panel and identified as they are indicated on the drawing. Mark on the back plate adjacent to the component. Identify all control conductors with wire markers at each end as close as practical to the end of conductor.

3.2 FIELD QUALITY CONTROL

Provide appliances, materials, water, and equipment for testing, [except that water and electric power needed for field tests will be provided as set forth in Division 01] [and bear full expenses in connection with the testing]. Conduct testing after equipment, electrical services, and piping are installed, and the pump station is ready for operation. Correct defects discovered to the satisfaction of the Contracting Officer, and tests repeated, at no expense to the Government, until the equipment functions as intended and designed.

3.2.1 Testing Procedure

Perform a pump test, [pressure sensor test][float test]. Submit the test results to the Contracting Officer.

Test all panels to the power requirements as shown on the plans to assure proper component operation. Activate each control function to check for proper operation and indication.

3.2.2 Field Representative

A representative of the pump manufacturer is to direct the startup of the station and instruct representatives of the Government in startup and operation procedures.

3.3 CLOSEOUT ACTIVITIES

3.3.1 Operation and Maintenance

Submit operation and maintenance manuals in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA for package lift stations, including Equipment Description, Assembly and Installation Procedures, Adjustment and Alignment, Checkout Procedures, Procedures of Operation and Troubleshooting. Include preventative maintenance and inspection procedures for package lift stations. Include in procedures the frequency of preventative maintenance, inspection, adjustment, lubrication, and cleaning necessary to minimize corrective maintenance and repair.

Supply special tools that are required for maintenance and testing of the package lift stations.

Submit spare parts data, including a complete list of parts and supplies with current unit prices and source of supply. List parts and supplies that are either normally furnished at no extra cost with the purchase of equipment, or specified to be furnished as a part of the contract, and list additional items recommended by the manufacturer to ensure an efficient operation for a period of one year.

Install on or near the package lift stations, a complete package of posted instructions, consisting of labels, signs, and templates of operating instructions.

Provide a list or reference all specific operation and maintenance procedures that are required to keep the warranty valid.

-- End of Section --