
USACE / NAVFAC / AFCEC / NASA UFGS-33 32 16 (August 2016)

Preparing Activity: NAVFAC Superseding
UFGS-33 32 13.14 (January 2008)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2018

SECTION TABLE OF CONTENTS

DIVISION 33 - UTILITIES

SECTION 33 32 16

PACKAGED UTILITY WASTEWATER PUMPING STATIONS

08/16

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 MAINTENANCE MATERIAL SUBMITTALS
 - 1.3.1 Spare Parts
- 1.4 QUALITY CONTROL
 - 1.4.1 Installer Qualifications
- 1.5 DELIVERY, STORAGE, AND HANDLING OF MATERIALS
 - 1.5.1 Delivery and Storage
 - 1.5.2 Handling
- 1.6 WARRANTY

PART 2 PRODUCTS

- 2.1 SYSTEM DESCRIPTION
- 2.2 SUBMERSIBLE SEWAGE GRINDER NONCLOG PUMPS
 - 2.2.1 Casing
 - 2.2.2 Impeller
 - 2.2.3 Shaft and Shaft Seals
 - 2.2.4 Bearings
- 2.3 PUMP MOTOR
- 2.4 PUMP CONTROL SYSTEM
 - 2.4.1 Controls
 - 2.4.2 Level Control System
 - 2.4.3 Alternator
 - 2.4.4 Sewage Pump Alarm and Control Panel
 - 2.4.4.1 Alarms
 - 2.4.4.2 Circuit Breakers
 - 2.4.4.3 Motor Starter and Overload Protection
 - 2.4.4.4 Power Lugs
 - 2.4.4.5 Anti-Condensation Heater
 - 2.4.4.6 Trouble Light
 - 2.4.4.7 Convenience Outlets
 - 2.4.4.8 Connection for Portable Generator
 - 2.4.4.9 Additional Requirements

- 2.4.5 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
- 2.6 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 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 Force Main
- 3.2 FIELD TESTS AND INSPECTIONS
 - 3.2.1 Testing Procedure
 - 3.2.2 Sewage Pump Station

-- End of Section Table of Contents --

USACE / NAVFAC / AFCEC / NASA UFGS-33 32 16 (August 2016)

Preparing Activity: NAVFAC Superseding
UFGS-33 32 13.14 (January 2008)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2018

SECTION 33 32 16

PACKAGED UTILITY WASTEWATER PUMPING STATIONS 08/16

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 WATER WORKS ASSOCIATION (AWWA)

AWWA C104/A21.4	(2016) Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
AWWA C110/A21.10	(2012) Ductile-Iron and Gray-Iron Fittings for Water
AWWA C111/A21.11	(2017) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C115/A21.15	(2011) Flanged Ductile-Iron Pipe With Ductile-Iron or Gray-Iron Threaded Flanges
AWWA C151/A21.51	(2017) Ductile-Iron Pipe, Centrifugally Cast
AWWA C500	(2009) Metal-Seated Gate Valves for Water Supply Service
AWWA C509	(2015) Resilient-Seated Gate Valves for Water Supply Service
AWWA C515	(2015) Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service
AWWA C517	(2009) Resilient-Seated Cast-Iron Eccentric Plug Valves
AWWA C600	(2017) Installation of Ductile-Iron Mains and Their Appurtenances
AWWA C605	(2014) Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVC0) Pressure Pipe and Fittings
AWWA M23	(2002; 2nd Ed) Manual: PVC Pipe - Design and Installation

ASME INTERNATIONAL (ASME)

ASME B1.20.1	(2013) Pipe Threads, General Purpose (Inch)
ASME B16.1	(2015) Gray Iron Pipe Flanges and Flanged Fittings Classes 25, 125, and 250
ASME B16.11	(2016) Forged Fittings, Socket-Welding and

Threaded

ASME B16.3 (2011) Malleable Iron Threaded Fittings, Classes 150 and 300

ASTM INTERNATIONAL (ASTM)

ASTM A126 (2004; R 2014) Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings

ASTM A48/A48M (2003; R 2012) Standard Specification for Gray Iron Castings

ASTM A53/A53M (2012) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

ASTM A536 (1984; R 2014) Standard Specification for Ductile Iron Castings

ASTM A615/A615M (2016) Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

ASTM C443 (2012; R 2017) Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets

ASTM C443M (2012; R 2017) 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 D1784 (2011) 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	(1998; R 2011) Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM D3753	(2012; E 2013) Glass-Fiber-Reinforced Polyester Manholes and Wetwells
ASTM D883	(2017) Standard Terminology Relating to Plastics
ASTM F477	(2014) Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

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

MSS SP-80	(2013) Bronze Gate, Globe, Angle and Check Valves
-----------	---

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG 1	(2016; SUPP 2016) Motors and Generators
-----------	---

UNDERWRITERS LABORATORIES (UL)

UL 489	(2016) UL Standard for Safety Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
UL 67	(2018) UL Standard for Safety Panelboards

1.2 SUBMITTALS

NOTE: Review Submittal Description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project.

The Guide Specification technical editors have designated 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 submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation 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.

The "S" following a submittal item indicates that the submittal is required for the Sustainability eNotebook to fulfill federally mandated sustainable requirements in accordance with Section 01 33 29 SUSTAINABILITY REPORTING. Locate the "S" submittal under the SD number that best describes the submittal item.

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" designation; submittals not having a "G" designation are [for Contractor Quality Control approval.][for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

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 [, [_____]]

List of Spare Parts; G [, [_____]]

SD-04 Samples

Warranty; G [, [_____]]

SD-05 Design Data

Buoyancy Calculations; G [, [_____]]

SD-10 Operation and Maintenance Data

Submersible Sewage GrinderNonclog Pumps Data Package 3; G [,
[_____]]

Submit in accordance with Section 01 78 23 OPERATION AND
MAINTENANCE DATA.

Include pumps, alarms, and motors. Include information on
equipment, alarm panel and controls, pumps and pump performance
curves, station layout, piping, valves and other accessories in
data for submersible sewage grinder nonclog pump station.

[1.3 MAINTENANCE MATERIAL SUBMITTALS

1.3.1 Spare Parts

Provide list of spare parts as recommended by the manufacturer of the
packaged pump station.

]1.4 QUALITY CONTROL

1.4.1 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.

1.5 DELIVERY, STORAGE, AND HANDLING OF MATERIALS

1.5.1 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 and fittings free of dirt
and debris.

1.5.2 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.

1.6 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 standard manufacturer's warranty for a minimum of one year for package pump station including pumps, 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 complete including equipment and materials, installed and ready for operation. The pump supplier furnishes the controls, pumps and rail system to ensure unit integrity.

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 Casing

Provide hard, close-grained cast iron casing which is free from blow holes, porosity, hard spots, shrinkage defects, cracks, and other injurious defects. Provide casings permitting replacement of wearing parts. 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.

2.2.2 Impeller

Provide stainless steel [or bronze] impeller for grinder pump with stainless steel cutter, grinder, or slicer assembly. Provide nonclogging type cast-iron impeller, conforming to ASTM A48/A48M, Class 30, for submersible nonclog pump. Make impeller with smooth surfaces, 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.

2.2.3 Shaft and Shaft Seals

Provide shaft of stainless steel and the mechanical seal of double carbon and ceramic construction. Hold rotating ceramics in mating position with stationary carbons by a stainless steel spring. Oil lubricate bearings.

2.2.4 Bearings

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

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 shall 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 Controls

Automatically alternate operation from one pump to the other and start second pump in the event first pump cannot handle incoming flow. Provide manual "on-off" switch for each pump.

Provide independent adjustable high and low water level switches.

Provide level control system, supports, and alarm. Metal parts, if used, must be of bronze or equivalent corrosion resistant material.

2.4.2 Level Control System

[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.

2.4.3 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, with manual disconnect switch, to operate in connection with level control system. Use 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. Provide a 30 second time delay to prevent both pumps from starting together. Use delay function designed to operate in any condition of start-up in either normal or emergency operational mode.

2.4.4 Sewage Pump Alarm and Control Panel

Enclose alarm panel in NEMA 4X 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.

2.4.4.1 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.

2.4.4.2 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.

2.4.4.3 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.

2.4.4.4 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.

2.4.4.5 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.

2.4.4.6 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.

2.4.4.7 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.

2.4.4.8 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.

2.4.4.9 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.

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

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.

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

- 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. Identically key the locks.

2.5.3 Wet Well Base Material

Provide crushed stone as indicated and specified in Section 31 00 00 EARTHWORK31 23 00.00 20 EXCAVATION AND FILL.

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

AWWA C151/A21.51, Pressure Class 350.

2.6.1.1 Flanged Pipe

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 setscrew flange gaskets. Use setscrew 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 coupling determined by previous service to be acceptable for use in the wastewater environment 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 Valves in Valve Vault

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.

12.7.1.2 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.

12.7.2 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.

2.7.4 Identification Tags and Plates

Provide valves with tags or plates numbered and stamped for their usage. Use plates and tags of brass or nonferrous material and mounted or attached to the valve.

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

[Flanged ductile iron pipe and bend, AWWA C115/A21.15] [Galvanized steel pipe and bend, ASTM A53/A53M] with insect screening.

2.8 EXCAVATION, TRENCHING, AND BACKFILLING

Provide in accordance with Section [31 00 00 EARTHWORK] [31 23 00.00 20 EXCAVATION AND FILL], 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 up 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

Installation of Valves: 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. Install check valves as described in AWWA C600 for valve-and-fitting installation. Make and assemble joints to gate valves and check valves as specified for making

and assembling the same type joints between pipe and fittings.

3.1.5 Force Main

Provide force main and connections in accordance with Section 33 30 00 SANITARY SEWERAGE.

3.2 FIELD TESTS AND INSPECTIONS

Perform field tests, and provide labor, equipment, and incidentals required for testing, except that water and electric power needed for field tests will be provided as set forth in Division 01. Produce evidence, when required, that items of work have been constructed in accordance with Contract requirements.

3.2.1 Testing Procedure

Test piping in accordance with Section 33 30 00 SANITARY SEWERAGE. Test in operation all equipment to demonstrate compliance with the Contract requirements.

3.2.2 Sewage Pump Station

Test pumps and controls, in operation and in accordance with the authority having jurisdiction over sewage pumping stations, under design conditions to ensure operation of equipment. Provide appliances, materials, water, and equipment for testing, and bear full expenses in connection with the testing. Conduct testing after equipment is installed, electrical services and piping are installed, liquid is flowing, and the pump station is ready for operation. Correct defects discovered to the satisfaction of the Contracting Officer, and tests repeated, at the expense of the Contractor, until the equipment functions as intended and designed.

-- End of Section --