
USACE / NAVFAC / AFCEA / NASA UFGS-33 32 13.13 40 (April 2007)

Preparing Activity: NASA UFGS-33 32 13.13 40 (January 2007)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated 19 March 2007

Latest change indicated by CHG tags

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SECTION 33 32 13.13 40

PACKAGED SEWAGE LIFT STATIONS, WET WELL TYPE 04/07

NOTE: This specification covers the requirements for furnishing and installing a package-type underground sewage-lift station of a capacity required by the project.

Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable items(s) or insert appropriate information.

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

Comments and suggestions on this guide specification are welcome and should be directed to the technical proponent of the specification. A listing of technical proponents, including their organization designation and telephone number, is on the Internet.

Recommended changes to a UFGS 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 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 ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)

AASHTO M 198 (2005) Standard Specification for Joints for Concrete Pipe, Manholes and Precast Box Sections Using Preformed Flexible Joint Sealants

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C104/A21.4 (2003) Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water

AWWA C110/A21.10 (2003) Ductile-Iron and Gray-Iron Fittings for Water

AWWA C111/A21.11 (2000) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings

AWWA C115/A21.15 (2005) Flanged Ductile-Iron Pipe With Ductile-Iron or Gray-Iron Threaded Flanges

AWWA C151/A21.51 (2002; Errata 2002) Ductile-Iron Pipe, Centrifugally Cast, for Water

AWWA C207 (2001; R 2002) Standard for Steel Pipe Flanges for Waterworks Service-Sizes 100 mm through 3600 mm 4 in. through 144 in.

ASME INTERNATIONAL (ASME)

ASME B16.1 (1998) Standard for Gray Iron Threaded Fittings; Classes 125 and 250

ASME B16.3 (1998) Malleable Iron Threaded Fittings, Classes 150 and 300

ASME B16.11 (2005) Forged Fittings, Socket-Welding and Threaded

ASME B31.3 (2004) Process Piping

ASTM INTERNATIONAL (ASTM)

ASTM A 105/A 105M (2005) Standard Specification for Carbon Steel Forgings for Piping Applications

ASTM A 123/A 123M	(2002) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 36/A 36M	(2005) Standard Specification for Carbon Structural Steel
ASTM A 53/A 53M	(2004a) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A 536	(1984; R 2004) Standard Specification for Ductile Iron Castings
ASTM A 615/A 615M	(2006a) Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM C 443	(2005) Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
ASTM C 443M	(2005) Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric)
ASTM C 478	(2003a) Standard Specification for Precast Reinforced Concrete Manhole Sections
ASTM C 478M	(2003a) Standard Specification for Precast Reinforced Concrete Manhole Sections (Metric)
ASTM C 618	(2005) Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C 989	(2005) Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars

HYDRAULIC INSTITUTE (HI)

HI SCRRP	(1994) Standards for Centrifugal, Rotary and Reciprocating Pumps
ISO 7005-2	(1988) Metallic Flanges Part 2: Cast Iron Flanges

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 1940-1	(2003) Mechanical Vibration - Balance Quality Requirements for Rotors in a Constant (Rigid) State - Part 1: Specification and Verification of Balance Tolerance - International Restrictions
ISO 2858	(1975) End Suction Centrifugal Pump

(Rating 16 Bar) Designation Nominal Duty
Point and Dimensions - International
Restrictions

ISO 5199

(2002) Technical Specifications for
Centrifugal Pumps, Class II

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

MSS SP-70

(1998) Standard for Cast Iron Gate Valves,
Flanged and Threaded Ends

MSS SP-86

(2002) Guidelines for Metric Data in
Standards for Valves, Flanges, Fittings
and Actuators

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250

(2003) Enclosures for Electrical Equipment
(1000 Volts Maximum)

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. Submittals should be kept
to the minimum required for adequate quality control.

A "G" following a submittal item indicates that the
submittal requires Government approval. Some
submittals are already marked with a "G". Only
delete an existing "G" if the submittal item is not
complex and can be reviewed through the Contractor's
Quality Control system. Only add a "G" 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.

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.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Submit [Material, Equipment, and Fixtures List](#) in accordance with paragraph entitled, "General Requirements," of this section.

SD-02 Shop Drawings

Submit the following in accordance with paragraph entitled, "Design Requirements," of this section.

[Fabrication Drawings](#)
[Erection/Installation Drawings](#)

SD-03 Product Data

Submit manufacturer's catalog data and equipment and performance data for the following items:

Submit [Spare Parts Data](#) also for the following in accordance with paragraph entitled, "General Requirements," of this section.

[Man Hole Chambers](#)
[EPA-CPG Compliance](#)
[Entrance Covers](#)
[Sump Pumps](#)
[Sewage Pumps](#)
[Pump Controls](#)
[Impellers](#)
[Couplings](#)
[Bearings](#)
[Stuffing Boxes](#)
[Valves](#)
[Piping](#)
[Blowers](#)
[Dehumidifier](#)
[Electric Motors](#)

SD-05 Design Data

Submit [Design Data](#) of [Motor/Pumps](#) with Manufacturer part number following:

[Rotor Bars](#)
[Stator Slots](#)
[Speed of Rotation](#)
[Cooling Fan Blades](#)
[Bearing Manufacturer](#)
[Bearing Style](#)
[Bearing Type](#)
[Balls/Elements](#)
[Commutator Bars](#)
[Commutator Brushes](#)
[SCR Firing Frequencies](#) (for variable speed motors)

Pump Impellers

SD-07 Certificates

Submit the following in accordance with paragraph entitled, "General Requirements," of this section.

Listing of Product Installations
Safety Considerations

Submit Certificates for the following items in accordance with the applicable reference standards and description of this section.

Man Hole Chambers
Entrance Covers
Sump Pumps
Sewage Pumps
Bearings
Pump Controls
Impellers
Couplings
Stuffing Boxes
Valves
Piping
Blowers
Dehumidifier
Electric Motors

SD-08 Manufacturer's Instructions

Submit manufacturer's instructions including special provisions required to install equipment components and system packages for the following items.

Submit operating instructions, including standard operating procedures with startup, shutdown, and emergency operation for [Package Lift Station](#), and the following:

Man Hole Chambers
Entrance Covers
Sump Pumps
Sewage Pumps
Pump Controls
Impellers
Couplings
Stuffing Boxes
Valves
Piping
Blowers
Dehumidifier
Electric Motors

Submit the following in accordance with paragraph entitled, "General," of this section.

Preventative Maintenance and Inspection
Special Tools
Posted Instructions

SD-10 Operation and Maintenance Data

Submit [Operation and Maintenance Manuals](#) for package lift stations including the following in accordance with paragraph entitled, "Operation and Maintenance," of this section.

[Equipment Description](#)
[Assembly and Installation Procedures](#)
[Adjustment and Alignment](#)
[Checkout Procedures](#)
[Procedures of Operation](#)
[Troubleshooting](#)

1.3 DESIGN REQUIREMENTS

Actual range in capacities may vary from that stipulated if the minimum and maximum capacities specified are included.

Provide each station with two pumps with controls capable of operating the pumps either simultaneously or individually, depending on the load conditions.

Furnish and install each lift station as a complete unit with necessary appurtenances factory installed within a pump chamber and a vertical entrance tube cover and access ladder, all designed for the following:

**NOTE: Pump capacity, head, and service life must be
as required by the project.**

Service life - [15] [_____] years

Pump capacity - [475] [125] [_____] liter gallons per minute (gpm)

Total head - [35] [115] [_____] meter feet

Submit [Fabrication Drawings](#) after receiving tentative approval of the equipment and the materials list but before installation, Contractor to submit drawings covering necessary or recommended changes to accommodate the equipment offered. Show clearly 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 that are inclusive. Precast reinforced concrete manhole sections must conform to [ASTM C 478M](#) [ASTM C 478](#), and [AASHTO M 198](#). Show clearly on the drawings the design of the chamber, with dimensions, types, and thicknesses of materials, and elevation levels with reference to those elevations indicated.

Provide the following [motor/pumps design data](#) provided prior to final turnover - number of motor [rotor bars](#) and [stator slots](#); number of [cooling fan blades](#); RPM of motor; [bearings](#), [bearing manufacturer](#), [bearing type](#), [bearing style](#) and number of [balls/elements](#); number of [commutator bars](#) and [commutator brushes](#); [SCR firing frequencies](#); and number of [pump impellers](#).

1.4 PROTECTION FROM MOVING PARTS

Locate and guard belts, pulleys, chains, gears, couplings, projecting setscrews, keys, and other rotating parts in accordance with applicable OSHA standards and so that personnel are properly protected from injury.

1.5 NAMEPLATES

Provide⁴ the manufacturer's name or trademark on a corrosion-resistant identification plate or cast integrally, on each item of equipment, stamped, or otherwise permanently marked in a conspicuous place. 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. On the identification plate indicate all necessary information to complete identification such as the manufacturer.

1.6 FIELD REPRESENTATIVE

A representative of the lift station manufacturer must direct the startup of the station and instruct representatives of the Government in startup and operation procedures.

1.7 GENERAL REQUIREMENTS

Submit **Material, Equipment, and Fixtures List** of all major components including manufacturer's catalog numbers, specification and drawing reference number, warranty information, and fabrication site.

Submit **Listing of Product Installations** similar to the package lift station the Contractor is installing.

Submit **Safety Considerations** including information relating to load limits, speed of operation, environmental criteria (temperature and pressure limitations), and personnel hazards and equipment safety precautions for the package lift station.

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.

PART 2 PRODUCTS

Verify conformance of materials and equipment for **package lift station** to the referenced publications or as specified. Verify manufacturers regularly engaged in the manufacture of such products.

2.1 CHAMBER

Fabricate [Chamber, including base, walls, and entrance tube with **35 Megapascal 5000 psi** precast concrete designed to form an integral unit. [Fabricate wet well as an integral part of the unit with a separate manhole entrance.] Ladder, pipe supports, brackets, and other miscellaneous components of steel conforming to **ASTM A 36/A 36M, ASME B16.3, ASME B16.11** and hot-dipped galvanized in accordance with **ASTM A 123/A 123M**.]

Fly ash is required as an admixture and must conform to **ASTM C 618**, Class C

or F. Fly ash replacement of cement must not 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>).

Ground granulated blast furnace slag [is required] [used] as an admixture [and] must conform to [ASTM C 989](#), Grade [120] with between 25 to 50 percent maximum cement replacement by weight. Submit certificate to verify [EPA-CPG compliance](#)

Submit [Man hole chambers](#), including base, entrance tube, air ducts, and similar structural parts, with [steel conforming to [ASTM A 36/A 36M](#), [ASTM A 615/A 615M](#)] [reinforced fiberglass]. Protect steel from corrosion by means of hot-dip galvanizing conforming to [ASTM A 123/A 123M](#) epoxy-resin coatings. [Provide Cathodic protection in accordance with Section [[26 42 14.00 10](#) CATHODIC PROTECTION SYSTEM (SACRIFICIAL ANODE).]]

2.2 [ENTRANCE COVERS](#)

Fabricate entrance-tube cover with reinforced fiberglass or steel. Secure steel covers with bolts to the shaft flanges.

2.3 [SUMP PUMPS](#)

NOTE: Capacity in [liter gallons](#) and the discharge head must be as required by the project.

Provide a submersible, direct-motor-driven unit with a capacity of [3800 liter 1,000 gallons](#) per hour at a [12.2 meter 40-foot](#) discharge head. Enclose sump and pump in [6 millimeter 1/4-inch](#) mesh of corrosion-resistant metal.

Conform sump pumps to the applicable requirements of Section [[22 14 29.00 40](#) SUMP PUMPS.] [Section [22 14 29.00 40](#) SUMP PUMPS.]

2.4 [SEWAGE PUMPS](#)

NOTE: Pump capacity must be as required by the project.

Provide pumps of the nonclogging, centrifugal type designed to pump unscreened sewage. Each pump must have a rated capacity as specified and be capable of passing 75 millimeter 3-inch solids. Conform to the requirements of ISO 2858 and ISO 5199 HI SCRRP and [Section 44 46 00 PUMPS; SEWAGE AND SLUDGE]. [Pump speed must not exceed 1,800 revolutions per minute.]

2.5 PUMP CONTROLS

Conform pump controls to the applicable requirements of Section [26 05 73.00 40 OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY.]

Provide automatic type pump operating controls recommended by the pump station manufacturer, including necessary switches, relays, and appurtenances, complete. Mount controls on a control panel. Make equipment subject to contact with sewage of corrosion-resistant metal. Provide Controls with a high-level switch for remote monitoring.

Provide at each station a three-wire receptacle for a portable generator in case there is an external power outage. Provide at each station a double-throw switch in an enclosure conforming to NEMA 250, Type 3R. Conform all wiring to the requirements of Section 26 27 26.00 40 WIRING DEVICES.

2.6 PUMP CONSTRUCTION

Fabricate castings in cast iron or steel free from injurious defects. Design castings to permit easy replacement of parts. Joints must be gasketed and must not leak under a test pressure equal to 50 percent more than the pump discharge pressure or total dynamic head, whichever is greater. Design and install passageways to permit the smooth flow of sewage and free from sharp turns and projections. Provide pump castings with cleanout plates in the suction line and drain plugs.

2.7 IMPELLERS

Fabricate Impellers in of cast iron, cast steel, or an alloy suitable for the service required. Impellers must be free flowing and permit objects in the sewage that enter the pump to pass into the discharge pipe. Each impeller must be keyed, splined, or threaded on the shaft and locked in such manner that lateral movement will be prevented and reverse rotation will not cause loosening.

2.8 COUPLINGS

Couplings must be the heavy-duty flexible type, keyed to the shaft. Provide universal type couplings for vertical pumps.

2.9 SHAFT SLEEVES

Protect the shaft from the liquid being pumped, points in contact with the stuffing boxes, and other wearing parts with sleeves designed in bronze or a suitable alloy.

2.10 STUFFING BOXES

Grease-seal stuffing boxes with a seal ring, designed to ensure tight packing without excessive wear or friction on the shafts, and prevent the leakage of air or water. Provide split type glands which can be easily removed for repacking.

2.11 BALANCE

Balance rotating parts of the equipment mechanically and hydraulically to operate throughout the required range without excessive end thrust, vibration, and noise. Comply 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.

2.12 SHAFTS

Provide high-grade steel shafts of a size and strength to perform the work required.

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

2.13 BEARINGS

Provide ball or roller type main bearings to withstand radial and end thrust. Pumps dependent upon hydraulic balance are prohibited..

2.14 LUBRICATION

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

2.15 PIPING CONNECTIONS

Provide pump suction and discharge with flanged connections of the proper size for the pump type and capacity. Conform pipe flanges to [AWWA C104/A21.4, AWWA C110/A21.10, AWWA C111/A21.11, AWWA C115/A21.15, AWWA C151/A21.51, ASTM A 53/A 53M, ASTM A 536 for ductile iron or gray-iron threaded flanges and piping] ASTM A 105/A 105M, MSS SP-86, ISO 7005-2 ASME B16.1 or AWWA C207. Piping must conform to the requirements of ASME B31.3.

2.16 SUMP PUMP CONTROL

NOTE: Insert head differential size.

Automatically actuated sump pump by a built-in float responsive to a [_____] [_____] mm pascal inchhead differential.

2.17 VALVES

Conform gate valves to MSS SP-70. Provide horizontal, swing check type check valves. Provide valves 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.

2.18 PIPING

Terminate discharge lines 1.5 meter 5-feet outside the lift station in flanged connections. Include the pipe from the wet well manhole in the suction line. External connection joints for pipe using rubber gaskets must comply with the standards of ASTM C 443M ASTM C 443.

2.19 VENTILATING BLOWER

Blowers must maintain one air change every [3] [_____] 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 actuated blower upon opening the entrance tube cover, unless overridden by the manual control.

Conform blower motor to the applicable requirements of Section [26 18 39.00 40 MEDIUM-VOLTAGE MOTOR CONTROLLERS.]

Conform blower controls to the applicable requirements of Section [26 05 73.00 40 OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY.]

2.20 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.

Conform dehumidifier controls to the applicable requirements of Section [26 05 73.00 40 OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY.]

2.21 EMERGENCY OVERFLOW

Provide a gravity-overflow line from the wet well. Terminate overflow line with a headwell and flap valve.

2.22 ELECTRIC MOTORS

Conform motors to the requirements of Section [26 18 39.00 40 MEDIUM-VOLTAGE MOTOR CONTROLLERS] and must be 60-hertz, 3-phase.

2.23 PAINT

Treat and paint equipment in accordance with the manufacturer's standard practice for sewage resistance.

PART 3 EXECUTION

3.1 GENERAL

Install lift station as indicated, in accordance with drawings and the

manufacturer's instructions.

Submit [Preventative Maintenance and Inspection](#) procedure for package lift stations. Procedures should include frequency of preventative maintenance, inspection, adjustment, lubrication, and cleaning necessary to minimize corrective maintenance and repair.

Submit [Special Tools](#) that are required for maintenance and testing of the package lift stations.

Submit [Posted Instructions](#) to be posted consisting of labels, signs, and templates of operating instructions that are required to be mounted or installed on or near the package lift stations.

3.2 TESTS

Perform Tests, including hydrostatic leak checking of piping and operation of equipment.

3.3 OPERATION AND MAINTENANCE

Submit [Operation and Maintenance Manuals](#) for package lift stations, including [Equipment Description](#), [Assembly and Installation Procedures](#), [Adjustment and Alignment](#), [Checkout Procedures](#), [Procedures of Operation](#) and [Troubleshooting](#).

-- End of Section --