****
USACE / NAVFAC / AFCESA / NASA **UFGS-22 14 29.00 40 (August 2011)**

Preparing Activity: NASA **Superseding UFGS-22 14 29.00 40 (February 2011)**

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated October 2011
****

SECTION TABLE OF CONTENTS

DIVISION 22 - PLUMBING

SECTION 22 14 29.00 40

SUMP PUMPS

08/11

-- End of Section Table of Contents --

****
USACE / NAVFAC / AFCESA / NASA | **UFGS-22 14 29.00 40 (August 2011)**

Preparing Activity: NASA | **Superseding UFGS-22 14 29.00 40 (February 2011)**

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated October 2011
****

SECTION 22 14 29.00 40

SUMP PUMPS
08/11

****
NOTE: This guide specification covers the requirements for automatic, electric-motor-driven, centrifugal, wet-pit and submersible sump pumps.

Motors are covered in Section 26 60 13.00 40 LOW-VOLTAGE MOTORS.

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 items(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 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 BEARING MANUFACTURERS ASSOCIATION (ABMA)

ABMA 11	(1990) Load Ratings and Fatigue Life for Roller Bearings
ABMA 9	(1990; R 2008) Load Ratings and Fatigue Life for Ball Bearings

ASTM INTERNATIONAL (ASTM)

ASTM A53/A53M	(2010) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

HYDRAULIC INSTITUTE (HI)

HI M100	(2009) HI Pump Standards Set

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 1940-1	(2003; Cor 2005) Mechanical Vibration - Balance Quality Requirements for Rotors in a Constant (Rigid) State - Part 1: Specification and Verification of Balance
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

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)

RCBEA GUIDE	(2004) NASA Reliability Centered Building and Equipment Acceptance Guide

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250	(2008) Enclosures for Electrical Equipment (1000 Volts Maximum)
NEMA MG 1	(2009) Motors and Generators

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-02 Shop Drawings

Connection Diagrams[; G][; G, [_____]]

Control Diagrams[; G][; G, [_____]]

Fabrication Drawings[; G][; G, [_____]]

Installation Drawings[; G][; G, [_____]]

SD-03 Product Data

Manufacturer's Catalog Data[; G][; G, [_____]]

Pump Performance Curve[; G][; G, [_____]]

Pump and Motor Specifications[; G][; G, [_____]]

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

Special Tools[; G][; G, [_____]]

Wet-Pit Sump Pumps[; G][; G, [_____]]

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

Accessories[; G][; G, [_____]]

SD-06 Test Reports

Hydrostatic Leak[; G][; G, [_____]]

Static Heads[; G][; G, [_____]]

Pump Flow Capacity[; G][; G, [_____]]

SD-07 Certificates

Manufacturer's Certification of Bearing Life[; G][; G, [_____]]

SD-08 Manufacturer's Instructions

Manufacturer's Installation Instructions[; G][; G, [_____]]

Vibration Specifications[; G][; G, [_____]]

1.3 PREDICTIVE TESTING AND INSPECTION TECHNOLOGY REQUIREMENTS

****
NOTE: The Predictive Testing and Inspection (PT&I) tests prescribed in Section 01 86 12.07 40 RELIABILITY CENTERED ACCEPTANCE FOR MECHANICAL SYSTEMS are MANDATORY for all [NASA] [_____] assets and systems identified as Critical, Configured, or Mission Essential. If the system is non-critical, non-configured, and not mission essential, use sound engineering discretion to assess the value of adding these additional test and acceptance requirements. See Section 01 86 12.07 40 RELIABILITY CENTERED ACCEPTANCE FOR MECHANICAL SYSTEMS for additional information regarding cost feasibility of (PT&I).
****

This section contains systems and/or equipment components regulated by NASA's Reliability Centered Building and Equipment Acceptance Program. This program requires the use of Predictive Testing and Inspection (PT&I) technologies in conformance with RCBEA GUIDE to ensure building equipment and systems installed by the Contractor have been installed properly and contain no identifiable defects that shorten the design life of a system and/or its components. Satisfactory completion of all acceptance requirements is required to obtain Government approval and acceptance of the Contractor's work.

Perform PT&I tests and provide submittals as specified in Section 01 86 12.07 40 RELIABILITY CENTERED ACCEPTANCE FOR MECHANICAL SYSTEMS.

1.4 DELIVERY, STORAGE, AND HANDLING

Inspect the pump for damage or other distress when received at the project site. Store the pump and associated equipment indoors as recommended by the pump manufacturer, protected from construction or weather hazards at the project site. Provide adequate short-term storage for the pump and equipment in a covered, dry, and ventilated location prior to installation. Follow the manufacturer's instructions for extended storage.

1.5 EXTRA MATERIALS

Submit [10][_____] copies of manufacturers complete spare parts list showing all parts, spare parts, and bulletins for pumps. Clearly show all details, parts, and adequately describe parts or have proper identification marks. Drawings incorporated in the parts lists may be reduced to one page size provided they are clear and legible, or they may be folded into the bound lists to page size. Photographs or catalog cuts of components may be included for identification.

a. Furnish the following spare parts:

(1) One complete set of bearings and seals.

(2) Replacement wearing rings and O-rings.

[(3) One impeller.

] b. Furnish one set of all special tools required to completely assemble, disassemble, or maintain the pumps. Special tools refers to oversized or specially dimensioned tools, special attachment or fixtures, or any similar items.

PART 2 PRODUCTS

Provide pump and motor with vibration levels conforming to ISO 1940-1 unless otherwise noted. Ensure motor vibration levels conform to NEMA MG 1, Motors and Generators, Part 7 unless otherwise noted.

2.1 SYSTEM DESCRIPTION

Show details of connection of cables and pump motors on connection diagrams for sump pumps.

Submit control diagrams for sump pumps showing motor starters, relays, or any other component necessary for safe operation.

Indicate the sump pump size, type, and efficiency rating on fabrication drawings.

Ensure installation drawings for sump pumps are in accordance with the manufacturer's recommended instructions.

Submit manufacturer's catalog data for sump pumps showing performance data including; performance curves and indicating brake horsepower, head liter per minute gpm, and NPSH. Also include equipment foundation data and equipment data.

Provide manufacturer's installation instructions and vibration

specifications.

2.2 WET-PIT SUMP PUMPS

****
NOTE: Select simplex or duplex pump units; delete the parts and the paragraphs not applicable to the project requirements.

Unit-capacity conditions should be specified herein or shown on the drawings.

Cast-iron, carbon-steel, or concrete cast-in-place sumps or basins should be dimensioned on the drawings or specified herein. Capacities for each pump of the simplex or duplex unit range from 150 to 3800 liter 40 to 1,000 gallons per minute; total dynamic heads range from 3 to 40 meter 10 to 130 feet.

The number of pump units required should be indicated on the drawings or specified herein.
****

This specification covers automatic, electric-motor-driven, centrifugal, wet-pit, suspended, sump pumps and accessories.

Construct and furnish pumps in accordance with the applicable requirements of ISO 2858 and ISO 5199 HI M100 standards and those specified herein.

Include with the simplex pump unit a vertical, submerged, volute, centrifugal pump mounted below a coverplate; a vertical, flexible-connected, solid-shaft motor; a motor and bearing-support housing attached to the coverplate; pump-support and shaft-housing pipe; discharge pipe; and automatic controls.

Include with the duplex pump unit two individual, vertical, submerged, volute, centrifugal pumps mounted below a coverplate; vertical, flexible-connected, solid-shaft motors; motor and bearing-support housing attached to the coverplate; pump-support and shaft-housing pipes; discharge pipes; and automatic controls. Design the installation of the unit to permit removal of one pump assembly without disturbing the operation of the other.

Ensure requirements for each material designation are in accordance with the applicable definition listed in the centrifugal pump section of ISO 2858 and ISO 5199 HI M100 standards. Materials for components and accessories not covered by these definitions are as specified herein.

Avoid contact between dissimilar metals. Where such contact cannot be avoided, protect joints between dissimilar metals against galvanic corrosion by plating, organic-insulation coatings, gaskets, or other suitable means.

2.2.1 Pump Selection

Where parallel pump operation is indicated, select pumps with characteristics specifically suited for the service without unstable operation.

Select pumps for service within 4 percent of maximum efficiency for a given casing and impeller series.

Do not select pumps having impeller diameter larger than 90 percent of the published maximum diameter of the casing or less than 15 percent larger than the published minimum diameter of the casing.

****
NOTE: Show duty conditions on drawings and select the following paragraph or rewrite the paragraph to include duty conditions.
****

Provide a pump with duty conditions as [indicated on drawings.][follows: [_____]].

a. Provide a pump unit that delivers, at rated speed, not less than the specified litergallons per minute against the specified or indicated discharge head while the liquid level is not more than 300 millimeter 1 foot above the datum elevation of the pump. Use the level of the entrance eye of the impeller as the datum elevation. Include in the calculations of the the discharge head, both the friction head of the system piping external to the pump unit and the static head measured from a point of reference on the sump to the highest point in the system. Base ratings on pumping clear, fresh water at a temperature of 20 degrees C 68 degrees F.

b. Provide Pump Performance Curve, and Pump and Motor Specifications.

2.2.2 Pump Casing

Provide cast iron pump casing. Provide a volute and discharge nozzle of the pump casing cast as one piece. Construct casing with a bolted plate to permit inspection and removal of the impeller. Design casing to withstand a hydrostatic pressure of not less than 1-1/2 times the design shutoff head of the pump.

2.2.3 Impeller

Provide cast iron or bronze impeller, enclosed or semi-open, with vanes on back shroud. Refer to the paragraph entitled, "Bearings and Lubrication," of this section for additional requirements. Ensure impeller is dynamically balanced.

2.2.4 Strainer

Protect intake with a large cast-iron, slotted intake strainer with an effective free area sufficient to prevent cavitation and degradation of efficiency. Provide a strainer with a free area of at least four times the cross-sectional area of the suction casing.

2.2.5 Pump Shaft

Construct the pump shaft of ground and polished AISI Type 304 or 316 corrosion-resistant steel with hardened wearing surfaces at intermediate shaft-bearing locations. Hardened surfaces may be overlays of 500 Brinell, Deloro Stellite, Wall Colmonoy, or similar proprietary metals, or plasma-spray-applied ceramic materials of not less than 900 Brinell hardness.

Provide mechanical properties and diameter of the shaft to ensure that whip, deflection, or vibration is not of sufficient magnitude to impose greater than design loads on the specified shaft bearings under normal operating conditions. Provide the means for external adjustment of the clearance between the impeller and the inner surfaces of the volute section.

2.2.6 Bearings and Lubrication

Furnish one or more antifriction ball- or roller-bearings in the motor and bearing support housing above the cover-plate surface, with full provision for the mechanical and hydraulic radial and thrust loads imposed. Provide sealed and grease lubricated bearings that have an L-10 rating of not less than 80,000 hours in accordance with ABMA 9 or ABMA 11. Ensure the shop drawings bear the manufacturer's certification of bearing life. Provide bearings manufactured from vacuum-processed or degassed-alloy steels. Furnish bearings with grease and pressure-relief fittings at bottom or opposite side the bearing where discharge may be viewed.

Provide sleeve type intermediate shaft bearings. Ensure center distance between any two bearings on the shaft does not exceed 1370 millimeter 4 feet 6 inches for pumps operating between 1,700 and 1,800 revolutions per minute (rpm) or 1520 millimeter 5 feet for pumps operating at 1,200 rpm or less. Provide sleeve bearing not less than 2 times the shaft diameter and locate near the lower extremity of the shaft.

****

NOTE: Select the appropriate paragraphs for grease or water lubricated intermediate bearings.

Where water contains suspended matter such as sand, etc., supply solenoid-operated flush water to bearings from protected potable or other clean water source.

If heads are sufficiently high, a plastic centrifugal separator may be provided to cleanse suspended matter from flushing water taken from pump discharge. Drain separator underflow back to sump.

****

[Provide heavy-duty bronze or bronze-backed, babbitt-lined sleeve bearings. Provide appropriate nonferrous piping and fittings to permit individual lubrication of the intermediate and lower bearings from above the sump coverplate. Provide means to prevent the pumped fluid from entering the lower bearing. Include a suitable seal or a system wherein a partial vacuum developed below the bearing by the impeller rotation induces a positive flow of lubricant into the bearing. Fit bearings with a centralized grease lubricator that is manually or electrically operated from a single point.

][Provide heavy-duty bronze- or corrosion-resistant steel-backed cutless-rubber type sleeve bearings.

]

****

NOTE: Where flushing water is used, delete the previous paragraph and select the following paragraph.

****

[Provide heavy-duty bronze- or corrosion-resistant steel-backed cutless-rubber type sleeve bearings with nonferrous piping and fittings provided for individual flushing of intermediate and lower bearings.
]

****

NOTE: Where potable water is used, include the following paragraph. If discharge water is centrifugally cleaned, delete the following paragraph and specify centrifugal separator and performance requirements.

****

[Supply potable water through a piping system containing a pressure regulator, a solenoid, and a backflow preventer. Provide plastic, nonmetallic composition, elastomer, or nonferrous metal for all wetted components.

]2.2.7 Flexible Couplings

Connect the pump shaft to the motor shaft through a flexible coupling. Provide a tire shape or a solid-mass serrated-edge disk shape flexible member made of chloroprene material and retained by fixed flanges. Provide flexible coupling that acts as a dielectric connector, that does not transmit vibration or end thrust, and that permits up to 4-degree misalignment under normal duty.

2.2.8 Support Pipe

Provide a wrought-iron or steel support pipe concentric with the pump shaft that connects the pump to the sump coverplate. Provide support-pipe flanges that are machined and doweled to ensure proper alignment of the pump and shaft whenever the pipe is disassembled and reassembled in the field.

2.2.9 Discharge Pipe

Furnish a discharge pipe running from the pump-discharge outlet to the sump coverplate as an integral part of the pump unit. Arrange the discharge pipe to preclude discharge piping beyond the pump assembly from imposing loads which would tend to cause shaft misalignment. Provide black steel or wrought iron pipe, with wall thickness not less than that specified in ASTM A53/A53M for Schedule 40 pipe. Ensure discharge pipe is gastight through the sump coverplate. Ensure discharge end of the pipe terminates in a screwed or flanged connection in accordance with the manufacturer's standard practice.

2.2.10 Liquid-Level Control

Provide a simplex unit with a float mechanism to provide automatic operation of the pump unit when the liquid in the sump rises to a predetermined level. Provide a means of adjustment, such as float-rod stops, to allow for variation in the start and stop level-control points. Provide AISI Type 304 or 316 corrosion-resistant steel float and stem. For all other parts of the fluid-level-sensing mechanism below the coverplate, provide bronze, brass, or material of equivalent resistance to the corrosive effects of sewage.

Provide a duplex pump unit with the electrical and mechanical devices

required to provide automatic operation of the pump unit when the liquid in the sump rises to a predetermined level. Ensure controls automatically transfer the operating cycle from one pump to the other and operates both pumps simultaneously whenever the inflow to the sump exceeds the capacity of the operating pump. Provide a means of adjustment such as float-rod stops to allow for variations in the start and stop level-control points. Provide AISI Type 304 or 316 corrosion-resistant steel float and rod. For all other parts of the fluid-level-sensing mechanism below the coverplate, provide bronze, brass, or material of equivalent resistance to the corrosive effects of sewage.

****
NOTE: Select the following paragraph for deep settings and where a great deal of turbulence may be expected.
****

Provide stilling tubes where indicated.

Floatless electrode level controls may be submitted for approval, provided the electrodes are isolated from the fluid being sensed.

2.2.11 High-Water Alarm

****
NOTE: Coordinate with electrical drawings.
****

[Provide a high-water alarm switch, complete with actuating mechanism, for operation on an electrical circuit other than the motor circuit. Design the switch to operate indicated alarm device(s) whenever a predetermined high-water level is reached in the sump because of failure of either pump or a fluid inflow that exceeds the combined capacity of both pumps. Mount the controls on the [sump coverplate][_____].

]2.2.12 Sump Tank and Coverplate

****
NOTE: Delete the following paragraph if a concrete sump is designed.

If size of tank is such that a fabricated steel tank is specified, provide coal-tar epoxy internal protection.

Drawings or specifications should show size of tank and influent line.

For deep settings, drawing should show antisway bracing of shaft column.
****

[2.2.12.1 Tank

Provide a [cast iron][polypropylene, corrosion-resistant], sump tank sized to provide a clearance of 150 millimeter 6 inches or one discharge pipe iron pipe size (ips) diameter, whichever is larger, between the bottom of the pump and the bottom of the tank.

Furnish a standard opening for connection to the sewage inflow pipe in the indicated size and location with respect to the top of the tank.

[Polypropylene tanks require a minimum 100 millimeter 4 inches compacted sub-base.
]

****

NOTE: If concrete sump is provided, include the following paragraph if concrete requires protection from sewage components.

****

[Protect concrete sump-tank interior surfaces by not less than a two-coat, two-component system of amine-cured coal-tar epoxy totaling 0.381 millimeter 15 mils in thickness.

]]2.2.12.2 Coverplate

Provide a [cast iron or steel][polypropylene, corrosion-resistant][aluminum] sump tank, of adequate strength to support the pumps without distortion, and of adequate strength to safely support maintenance personnel. Provide gasketed openings through the sump tank coverplate, unless otherwise specified. Provide a DN50 2-inch ips or larger threaded outlet to permit installation of a vent pipe. Ensure sump coverplate provides either manhole or handhole access to the tank.

2.2.13 Painting

Treat and paint equipment in accordance with the manufacturer's standard practice for the specified duty.

2.3 SUBMERSIBLE PUMPS

****

NOTE: Select simplex or duplex; delete the parts and the paragraphs not applicable to the project.

Unit capacity conditions should be specified herein or shown on the drawings.

Cast-iron, carbon-steel, or concrete cast-in-place sumps or basins should be dimensioned on the drawings or specified herein. Capacities for each pump of the simplex or duplex unit range from 150 to 320 liter 40 to 85 gallons per minute; total dynamic heads range from 3 to 32 meter at 110 liter per minute 10 to 105 feet at 29 gpm.

Number of pump units required should be indicated on the drawings or specified herein.

****

Construct and furnish pumps and accessories in accordance with the requirements of ISO 2858 and ISO 5199 HI M100 standards and those specified herein.

****

NOTE: Take precautions to properly identify pump.

Revise if other type controls are required.
****

[Provide a simplex pump unit that includes a submersible pump with an automatic level-control mechanism mounted above water level.

][Provide a simplex pump unit that includes a submersible pump with an integral diaphragm or float-switch automatic level-control mechanism.

] Install operating switch such that in case of failure, the operating switch does not require breaking of pump-motor seals for repairs.

Provide a duplex unit that includes float level controls for each submersible pump.

Ensure requirements for each material designation are in accordance with the applicable definition listed in the centrifugal pump section of ISO 2858 and ISO 5199 HI M100 standards. Ensure materials for components and accessories not covered by these definitions are as specified herein.

Avoid contact between dissimilar metals. Where such contact cannot be avoided, protect joints between dissimilar metals against galvanic corrosion by plating, organic insulation coatings, gaskets, or other suitable means.

2.3.1 Pump Selection

Select pumps for the service within 4 percent of maximum efficiency for a given casing and impeller series.

****
NOTE: Modify to include project duty conditions.

Due to the nature of construction, submersible pump motors are not always nonoverloading for a given motor-volute-impeller series, and therefore avoid possible operation at low heads.
****

Provide pump with duty conditions as [indicated on drawings.] [follows:]

a. [_____]

b. [_____]

c. [_____]

Ensure pump seals, lubricant, and electrical insulation are suitable for service in liquids up to 60 degrees C 140 degrees F.

2.3.2 Pump Housing

Provide a pump housing that encloses the pump motor and volute with its integrally cast feet. Provide a cast iron pump housing that is watertight under all heads normal to the service, and constructed to permit inspection and repair. Furnish with a volute designed to withstand a hydrostatic pressure of not less than 1-1/2 times the design shutoff head of the pump.

2.3.3 Impeller

Provide a dynamically balanced and totally enclosed [bronze][_____] impeller.

****
NOTE: Submersible pumps may be furnished for heavy debris or sewage service by specifying as follows and deleting the preceding paragraph.

Modify solid-sphere handling-capability dimension as required. Lower the capacity, the smaller the passable solid sphere.
****

Provide [cast-iron][_____] nonclogging type impeller with design features to provide maximum freedom from clogging when liquid containing rags and stringy material is handled. Provide impeller that is dynamically balanced and that has a minimum size solid-sphere handling capability of 40 millimeter 1-1/2 inches.

2.3.4 Pump Shaft

Provide a pump shaft that is an extension of the motor shaft and constructed of ground and polished AISI Type 300 or 400 series corrosion-resistant steel with hard wearing surfaces (over 300 Brinell).

2.3.5 Mechanical Seal

Provide manufacturer's standard mechanical type pump shaft seal specifically constructed for the service duty temperature and resistance to pumped fluid.

2.3.6 Bearings and Lubrication

Furnish antifriction ball- or roller-bearings with full provision for the mechanical and hydraulic, radial, and thrust loads imposed. Seal and permanently grease or oil lubricate bearings.

2.3.7 Motor and Power Cord

Provide permanently sealed, oil-filled, and watertight motor and that is manufacturer's standard construction for the service. Fit the motor space with watertight expansion provisions to accommodate temperature normal to specified duty. Ensure motor seals remain watertight under any pressure developed in the volute and under a sump-level static head of not less than 9100 millimeter 30 feet of water. Ensure motor control for three phase motor provides overload protection.

****
NOTE: Some submersible pumps are available as three-phase type in 560 watt 3/4 horsepower and larger only.

Select the following paragraph for single-phase motors only.
****

Provide single phase motors with automatic-reset thermal-overload

protection.

Provide waterproof, internally grounded, oil-resistant, Type SO chloroprene power cord, with three-prong plug of indicated length.

2.3.8 Liquid-Level Control

****
NOTE: Simplex unit controls are specified to be integral with housing. Following remote controls may be specified upon revision of selected paragraph under general heading.
****

Furnish simplex units with a float-operated switch mechanism to ensure automatic operation of the pump unit when the liquid in the sump rises to a predetermined level. Provide cover-mounted switch and Type 1, general purpose enclosure in accordance with NEMA 250. Provide means of adjustment such as float-rod stops to allow for variation in the start and stop level-control points. Provide AISI Type 304 or 316 corrosion-resistant steel float and stem. Provide bronze, brass, or material of equivalent resistance to the corrosive effects of the pumped fluid for all other wetted parts of the fluid-level sensing mechanism.

****
NOTE: Select two of the following three paragraphs if duplex units are used.
****

Furnish a duplex pump unit with the electrical and mechanical devices required to provide automatic operation of the pump unit when the liquid in the sump rises to predetermined level. Provide controls that automatically transfer the operating cycle from one pump to the other, and that operate both pumps simultaneously whenever the inflow to the sump exceeds the capacity of the operating pump. Provide means of adjustment such as float-rod stops to allow for variations in the start and stop level-control points. Provide AISI Type 304 or 316 corrosion-resistant steel float and rod. Provide bronze, brass, or material of equivalent resistance to the corrosive effects of the pumped fluid for all other wetted parts of the fluid-level sensing mechanism.

Mount the controls on the discharge pipe below the basin cover. Provide Type 6, submersible, watertight, dusttight, and sleet (ice) resistant enclosures in accordance with NEMA 250.

Pedestal mount controls above the coverplate. Provide Type 1, general purpose enclosures conforming to NEMA 250.

****
NOTE: Select the following paragraph for deep settings and where a great deal of turbulence may be expected.
****

Provide stilling tubes where indicated.

Floatless electrode level controls may be submitted for approval provided the electrodes are isolated from the fluid being sensed.

2.3.9 High-Water Alarm

****
NOTE: Coordinate with project requirements and electrical drawings.
****

Provide a high-water alarm switch complete with actuating mechanism for operation on an electrical circuit other than the motor circuit. Design the switch to operate indicated alarm device(s) whenever a predetermined high-water level is reached in the sump because of failure of either pump or a fluid inflow that exceeds the capacity of both pumps. Provide switch enclosure that is the same as the level-control switch.

2.3.10 Sump Tank and Coverplate

****
NOTE: Delete the following paragraph if a concrete sump is designed.

If size of tank is such that a fabricated steel tank is specified, provide coal-tar epoxy internal protection.

Drawings or specifications should show size of tank and influent line.

For deep settings, drawings should show antisway bracing and support of power cord and discharge pipe.
****

2.3.10.1 Tank

Provide [cast iron,] [high-density linear polyethylene,] sump tank sized as indicated.

Furnish a standard opening for connection to the drainage inflow pipe in the indicated size and location with respect to the top of the tank.

****
NOTE: If concrete sump is provided, include the following paragraph if concrete requires protection from sewage components.
****

Protect the concrete-sump interior surfaces by not less than a two-coat, two-component system of amine-cured coal-tar epoxy totaling 0.381 millimeter 15 mils in thickness.

2.3.10.2 Coverplate

Provide [cast iron or steel][aluminum] sump coverplate, of adequate strength to support not less than 9500 pascal 200 pounds per square foot without distortion. Seal all openings through the sump cover to be gastight and watertight. Provide a standard outlet for a vent pipe. Ensure sump cover provides either manhole or handhole access to the interior.

2.3.11 Painting

Treat and paint equipment in accordance with the manufacturer's standard practice for specified duty.

PART 3 EXECUTION

3.1 INSTALLATION

Install equipment in accordance with manufacturer's recommendations.

3.1.1 Alignment

Before attempting alignment, demonstrate that the pump does not have any load/force imposed by the piping system. Minimum alignment values (below) are for pump and driver at normal running temperatures. Compensate values for thermal growth. Correct limited movement of the pump or driver (commonly known as bolt-bound) to ensure alignment capability. Ensure hold down bolts are not undercut in order to perform adjustment.

Ensure shims are commercially die-cut, without seams or folds, and are made of corrosion resistant stainless steel. Do not use more than four shims at any single point.

For units with drive motor over [5.6] [7.5] [11.2] [14.9] [18.6] Kw[7.5] [10] [15] [20] [25] hp install alignment jack bolts.

Pump and driver may have an intermediate shaft, spacer, or spool piece (sometimes called a jackshaft) Based on the motor nominal operating speed. Align the pump and driver to the following minimum specifications:

Speed(RPM)	close-coupled offset (mils)	close-coupled angle(mils/in.)	spool piece angle (mils/in. @ coupling pt.)
600	6.0	2.0	3.0
900	5.0	1.5	2.0
1200	4.0	1.0	1.5
1800	3.0	0.5	1.0
3600	1.5	0.4	0.5
7200	1.0	0.3	0.4

Provide final alignment settings as part of the final test data.

3.2 FIELD QUALITY CONTROLS

****
NOTE: If the specified system is identified as critical, configured, or mission essential, use Section 01 86 12.07 40 RELIABILITY CENTERED ACCEPTANCE FOR MECHANICAL SYSTEMS to establish predictive and acceptance testing criteria, above and beyond that listed below.
****

Perform PT&I tests and provide submittals as specified in Section 01 86 12.07 40 RELIABILITY CENTERED ACCEPTANCE FOR MECHANICAL SYSTEMS.

3.2.1 Vibration Analyzer

Use a FFT (Fast Fourier Transform) analyzer to measure vibration levels. Provide an FFT analyzer with the following characteristics: A dynamic range greater than 70 dB; a minimum of 400 line resolution; a frequency response range of 5 Hz-10 KHz (300-600000 cpm); the capacity to perform ensemble averaging, the capability to use a Hanning window; auto-ranging frequency amplitude; a minimum amplitude accuracy over the selected frequency range of plus or minus 20 percent or plus or minus 1.5 dB.

Use an accelerometer, either stud-mounted or mounted using a rare earth, low mass magnet and sound disk(or finished surface) with the FFT analyzer to collect data. Ensure the mass of the accelerometer and its mounting has minimal influence on the frequency response of the system over the selected measurement range.

3.2.2 Pump Acceptance

Ensure vibration analysis verifies pump conformance to specifications. Ensure vibration levels are not more than 1.9 mm/sec .075 in/sec at 1 times run speed and at pump frequency, and 1 mm/sec .04 in/sec at other multiples of run speed.

Perform tests, including hydrostatic leak checking of piping and operation of equipment, in accordance with manufacturer's instructions.

Operate pumps against static heads indicated, and verify pump-flow capacity.

Provide final test reports to the Contracting Officer. Provide reports with a cover letter/sheet clearly marked with the System name, Date, and the words "Final Test Reports - Forward to the Systems Engineer/Condition Monitoring Office/Predictive Testing Group for inclusion in the Maintenance Database."

-- End of Section --