

SECTION 22 13 33
PACKAGED, SUBMERSIBLE SEWERAGE PUMP UNITS

SPEC WRITER NOTES:

1. Use this section only for NCA projects.
2. Delete between // // if not applicable to project. Also delete any other item or paragraph not applicable in the section and renumber the paragraphs.
3. Coordinate unit selection with existing conditions and NCA preference.

PART 1 - GENERAL

1.1 DESCRIPTION

- A. //Packaged submersible centrifugal wastewater pump units// //Packaged submersible grinder type wastewater pump units// including pump, motor, controls, and sump in one complete system. See schedule on Drawings for pumps capacity and head.
- B. A complete listing of common acronyms and abbreviations are included in Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING.

1.2 RELATED WORK

SPEC WRITER NOTE: Retain one of two paragraphs below.

- A. //Section 01 00 01, GENERAL REQUIREMENTS (Major NCA Projects).//
- B. //Section 01 00 02, GENERAL REQUIREMENTS (Minor NCA Projects).//
- C. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- D. Section 01 42 19, REFERENCE STANDARDS.
- E. Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- F. Section 01 81 13, SUSTAINABLE DESIGN REQUIREMENTS.
- G. //Section 01 91 00, GENERAL COMMISSIONING REQUIREMENTS.//

SPEC WRITER NOTE: If Section 13 05 41 is included in this project the section shall be obtained from VA Masters.

- H. //Section 13 05 41, SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS.//
- I. Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING.
- J. Section 22 05 12, GENERAL MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT.
- K. //SECTION 22 08 00, COMMISSIONING OF PLUMBING SYSTEMS: Requirements for commissioning, systems readiness checklist, and training.//

L. Section 26 29 11, MOTOR STARTERS.

1.3 APPLICABLE PUBLICATIONS

SPEC WRITER NOTE: Make material requirements agree with requirements specified in the referenced Applicable Publications. Verify and update the publication list to that which applies to the project, unless the reference applies to all mechanical systems. Publications that apply to all mechanical systems may not be specifically referenced in the body of the specification, but, shall form a part of this specification.

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):
 - A48/A48M-2003 (R2012)....Standard Specification for Gray Iron Castings
 - A532/A532M-2010 (R2014)..Standard Specification for Abrasion-Resistant Cast Irons
 - B36/B36M-2013.....Standard Specification for Brass Plate, Sheet, Strip, and Rolled Bar
 - B584-2014.....Standard Specification for Copper Alloy Sand Castings for General Applications
- C. National Electrical Manufacturers Association (NEMA):
 - 250-2014.....Enclosures for Electrical Equipment (1000 Volts Maximum)
- D. National Fire Protection Association (NFPA):
 - 70-2014.....National Electrical Code
- E. Underwriters Laboratory (UL):
 - 508A-2013 (R2014).....Standard for Industrial Control Panels
 - 778-2010 (R2015).....Standard for Motor-Operated Pumps

1.4 SUBMITTALS

- A. Submittals, including number of required copies, shall be submitted in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Information and material submitted under this section shall be marked "SUBMITTED UNDER SECTION 22 13 36, PACKAGED, WASTEWATER PUMP UNITS", with applicable paragraph identification.

- C. Contractor shall make all necessary field measurements and investigations to assure that the equipment and assemblies will meet contract requirements and will fit the space available.
- D. If equipment is submitted which differs in arrangement from that shown, provide drawings that show the rearrangement of all associated systems. Approval by VA will be given only if all features of the equipment and associated systems, including accessibility, are equivalent to that required by the contract.
- E. Prior to submitting shop drawings for approval, contractor shall certify in writing that manufacturers of all major items of equipment have each reviewed drawings and specifications, and have jointly coordinated and properly integrated their equipment and controls to provide a complete and efficient installation.
- F. Installing Contractor shall provide lists of previous installations for selected items of equipment. Contact persons who will serve as references, with telephone numbers and e-mail addresses shall be submitted with the references.
- G. Submittals and shop drawings for interdependent items, containing applicable descriptive information, shall be furnished together and complete in a group. Coordinate and properly integrate materials and equipment in each group to provide a completely compatible and efficient installation. Final review and approvals will be made only by groups.
- H. Coordination Drawings: Complete consolidated and coordinated layout drawings shall be submitted for all new systems, and for existing systems that are in the same areas. The drawings shall include plan views, elevations, and sections of all systems and shall be on a scale of not less than 1:32 (3/8 inch equal to one foot). Clearly identify and dimension the proposed locations of the principal items of equipment. The drawings shall clearly show the proposed location and adequate clearance for all equipment, controls, piping, pumps, valves and other items. All valves, trap primer valves, water hammer arrestors, strainers, and equipment requiring service shall be provided with an access door sized for the complete removal of plumbing device, component, or equipment. Equipment foundations shall not be installed until equipment or piping layout drawings have been approved. Detailed layout drawings shall be provided for all piping systems. In addition, details of the following shall be provided as necessary.

1. Mechanical equipment rooms.
 2. Interstitial space.
 3. Hangers, inserts, supports, and bracing.
 4. Pipe sleeves.
 5. Equipment penetrations of floors, walls, ceilings, or roofs.
- I. Manufacturer's Literature and Data:
1. The following manufacturer's literature and data shall be submitted under the pertinent section rather than under this section.
 - a. Electric motor data and variable speed drive data shall be submitted with the driven equipment.
 - b. Equipment and materials identification.
 - c. Firestopping materials, if applicable.
 - d. Hangers, inserts, supports and bracing. Provide load calculations for variable spring and constant support hangers.
 - e. Wall, floor, and ceiling plates.
 2. The following manufacturer's literature and data shall include full item description and optional features and accessories. Include dimensions, weights, materials, applications, standard compliance, model numbers, size, and capacity.
 - a. Pump:
 - 1) Manufacturer and model.
 - 2) Operating speed (RPM).
 - 3) Capacity.
 - 4) Characteristic performance curves.
 - b. Motor:
 - 1) Manufacturer//, frame and type//.
 - 2) Speed.
 - 3) Current Characteristics and W (HP).
 - 4) Efficiency.
 - c. Controls and Disconnect Apparatus:
 - 1) Starting switch.
 - 2) Automatic control and level alarm.
 - 3) Alternating relay.
 - 4) Circuiting of control panel.
 - 5) Sensors.
 - d. Sump.
- J. Certified copies of all the factory and construction site test data sheets and reports.

- K. Complete operating and maintenance manuals including wiring diagrams, technical data sheets, information for ordering replaceable parts, and troubleshooting guide:
1. Include complete list indicating all components of the systems.
 2. Include complete diagrams of the internal wiring for each item of equipment.
 3. Diagrams shall have their terminals identified to facilitate installation, operation and maintenance.
- L. //Completed System Readiness Checklist provided by the Commissioning Agent and completed by the contractor, signed by a qualified technician and dated on the date of completion, in accordance with the requirements of Section 22 08 00, COMMISSIONING OF PLUMBING SYSTEMS.//
- M. //Submit training plans and instructor qualifications in accordance with the requirements of Section 22 08 00, COMMISSIONING OF PLUMBING SYSTEMS.//

1.5 QUALITY ASSURANCE

- A. Products Criteria:
1. Standard Products: Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture, supply and servicing of the specified products for at least 5 years. However, digital electronics devices, software and systems such as controls, instruments, computer work station, shall be the current generation of technology and basic design that has a proven satisfactory service record of at least 5 years.
 2. Equipment Service: There shall be permanent service organizations, authorized and trained by manufacturers of the equipment supplied, located within // ___km (___ miles)// //160 km (100 miles)// of the project. These organizations shall come to the site and provide acceptable service to restore operations within four hours of receipt of notification by phone, e-mail or fax in event of an emergency, such as the shut-down of equipment; or within 24 hours in a non-emergency. Names, mail and e-mail addresses and phone numbers of service organizations providing service under these conditions for (as applicable to the project): pumps, compressors, water heaters, critical instrumentation, computer workstation and programming shall be submitted for project record and inserted into the operations and maintenance manual.

3. All items furnished shall be free from defects that would adversely affect the performance, maintainability and appearance of individual components and overall assembly.
 4. The products and execution of work specified in Division 22 shall conform to the referenced codes and standards as required by the specifications. Local codes and amendments enforced by the local code official shall be enforced, if required by local authorities such as the natural gas supplier. If the local codes are more stringent, then the local code shall apply. Any conflicts shall be brought to the attention of the COR.
 5. Multiple Units: When two or more units of materials or equipment of the same type or class are required, these units shall be products of one manufacturer.
 6. Assembled Units: Ensure manufacturers of equipment assemblies, which use components made by others, assume complete responsibility for the final assembled product.
 7. Nameplates: Nameplate bearing manufacturer's name or identifiable trademark shall be securely affixed in a conspicuous place on equipment, or name or trademark cast integrally with equipment, stamped or otherwise permanently marked on each item of equipment.
 8. Use of asbestos containing products, equipment, or materials is prohibited.
- B. Manufacturer's Recommendations: Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed //electronic// copies of these recommendations shall be furnished to the COR prior to installation. Installation of the item will be prohibited to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.
- C. Execution (Installation, Construction) Quality:
1. All items shall be applied and installed in accordance with manufacturer's written instructions. Conflicts between the manufacturer's instructions and the contract documents shall be referred to the COR for resolution. Printed copies or electronic files of manufacturer's installation instructions shall be provided to the COR at least 10 working days prior to commencing installation of any item.

2. All items that require access, such as for operating, cleaning, servicing, maintenance, and calibration, shall be easily and safely accessible by persons standing at floor level, or standing on permanent platforms, without the use of portable ladders. Examples of these items include, but are not limited to: all types of valves, filters and strainers, transmitters, and control devices. Prior to commencing installation work, refer conflicts between this requirement and contract documents to COR for resolution.
 3. Complete layout drawings shall be required by Paragraph, SUBMITTALS. Construction work shall not start on any system until the layout drawings have been approved by VA.
 4. Installer Qualifications: Installer shall be licensed and shall provide evidence of the successful completion of at least five projects of equal or greater size and complexity. Provide tradesmen skilled in the appropriate trade.
 5. If an installation is unsatisfactory to the COR, the Contractor shall correct the installation at no additional cost or additional time to the Government.
- D. Plumbing Systems: IPC, International Plumbing Code. Unless otherwise required herein, perform plumbing work in accordance with the latest version of the IPC. For IPC codes referenced in the contract documents, advisory provisions shall be considered mandatory, the word "should" shall be interpreted as "shall". Reference to the "code official" or "owner" shall be interpreted to mean the COR.
- E. Cleanliness of Equipment Systems:
1. Care shall be exercised in the storage and handling of equipment to be incorporated in the work.
 2. Contractor shall be fully responsible for all costs, damage, and delay arising from failure to provide clean systems.
- F. Guaranty: Warranty of Construction, FAR clause 52.246-21.
- G. Comply with UL 778 for wastewater pump units.
- H. Electronic components, devices, and accessories shall be listed and labeled, as defined in NFPA 70, by a qualified testing agency and marked for intended location and application.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Protection of Equipment:
1. Equipment and material placed on the job site shall remain in the custody of the Contractor until final acceptance, whether or not the

Government has reimbursed the Contractor for the equipment and material. The Contractor is solely responsible for the protection of such equipment and material against any damage.

2. Damaged equipment shall be replaced with an identical unit as determined and directed by the COR. Such replacement shall be at no additional cost or additional time to the Government.
3. Interiors of new equipment shall be protected against entry of foreign matter. Both inside and outside shall be cleaned before painting or placing equipment in operation.
4. Existing equipment and piping being worked on by the Contractor shall be under the custody and responsibility of the Contractor and shall be protected as required for new work.

1.7 AS-BUILT DOCUMENTATION

SPEC WRITER NOTE: Coordinate O&M Manual requirements with Section 01 00 01, GENERAL REQUIREMENTS (Major NCA Projects) or Section 01 00 02, GENERAL REQUIREMENTS (Minor NCA Projects). O&M manuals shall be submitted for content review as part of the close-out documents.

- A. Submit manufacturer's literature and data updated to include submittal review comments and any equipment substitutions.
- B. Submit operation and maintenance data updated to include submittal review comments, substitutions and construction revisions shall be //in electronic version on CD or DVD// inserted into a three ring binder. All aspects of system operation and maintenance procedures, including applicable piping isometrics, wiring diagrams of all circuits, a written description of system design, control logic, and sequence of operation shall be included in the operation and maintenance manual. The operations and maintenance manual shall include troubleshooting techniques and procedures for emergency situations. Notes on all special systems or devices shall be included. A List of recommended spare parts (manufacturer, model number, and quantity) shall be furnished. Information explaining any special knowledge or tools the owner will be required to employ shall be inserted into the As-Built documentation.

SPEC WRITER NOTE: Coordinate As-Built Drawing requirements with Section 01 00 01, GENERAL REQUIREMENTS (Major NCA Projects) or Section 01 00 02, GENERAL REQUIREMENTS (Minor NCA Projects). As-

Built Drawings shall be submitted for content review as part of the close-out documents.

- C. The installing contractor shall maintain as-built drawings of each completed phase for verification; and, shall provide the complete set at the time of final systems certification testing. As-built drawings are to be provided, and a copy of them on Auto-CAD version // // provided on CD or DVD. Should the installing contractor engage the testing company to provide as-built or any portion thereof, it shall not be deemed a conflict of interest or breach of the 'third party testing company' requirement.
- D. Certification documentation shall be provided to COR 10 working days prior to submitting the request for final inspection. The documentation shall include all test results, the names of individuals performing work for the testing agency on this project, detailed procedures followed for all tests, and certification that all results of tests were within limits specified.

PART 2 - PRODUCTS

SPEC WRITER NOTE: Make material requirements agree with requirements specified in the referenced Applicable Publications. Update and specify only that which applies to the project. Coordinate and assure that the electrical characteristics specified below are clearly shown on the proper drawings. Coordinate with electrical engineer.

2.1 WASTEWATER PUMP UNITS

- A. Centrifugal, //vertical// //submersible//, designed for 40 degrees C (104 degrees F) maximum water service. Driver shall be electric motor. Support shall be substantial rigid type. Systems may include one, two, or more pumps as required by conditions. Where needed grinder pumps may be installed.
 - 1. Pump housings shall be //cast iron// //bronze// //stainless steel//. Cast iron housings for submersible pumps shall be epoxy coated.
- B. Impeller: //ASTM A48/A48M, ASTM A532/A532M Cast iron// //Stainless steel// //ASTM B36/B36M Brass// //ASTM B584M Bronze// or any other approved corrosion-resistant material, non-clog, up to 65 mm (2-1/2 inch) solids handling. //Grinder pumps, 316 stainless steel impeller and 440 stainless steel cutter and cutter plate.//

- C. Shaft: //Bronze// //Stainless steel// or other VA approved corrosion-resisting metal.
- D. Bearings: As required to hold shaft alignment, anti-friction type for thrust and permanently lubricated. For vertical sump pumps, if bearings for shaft in sump require lubrication, provide a method to lubricate bearings without opening the sump or removing the pump.
- E. Characteristics: Head capacity characteristics shall prohibit overloading at any point of the curve.

SPEC WRITER NOTE: Use NEMA 4 for drip-proof (vertical) or NEMA 6P for completely enclosed (submersible).

- F. Motor: Maximum 40 degrees C (104 degrees F) ambient temperature rise, drip-proof, voltage and phase as shown in schedule on Electrical drawings conforming to NEMA 250 Type 4. Motor shall be non-overloading over the entire pump curve.. Refer to Section 22 05 12, GENERAL MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT.
- G. Starting Switch: Manually-operated, tumbler type, as specified in Section 26 29 11, MOTOR STARTERS.
- H. Automatic Control and Level Alarm: Furnish a control panel in a //NEMA 1 enclosure for indoors// //NEMA 4X enclosure for outdoors//.
1. The controls shall be suitable for operation with the electrical characteristics listed on the Electrical drawings.
 2. The UL 508A control panel shall have a level control system with switches to start and stop pumps automatically, and to activate a high water alarm.
 3. The level control system will include sensors in the sump that detect the level of the liquid.
 4. The sensors may be float type switches, ultrasonic level sensors, transducers, or other appropriate equipment.
 5. The high water alarm shall have a red beacon light at the control panel and a buzzer, horn, or bell. The alarm shall have a silencing switch. Provide auxiliary contacts for remote alarming //to the Engineering Control Center and BACnet compatible open-protocol type interface to DDC Controls System//. The circuitry of the control panel shall include:
 - a. Power switch to turn on/off the automatic control mechanism
 - b. HOA switches to manually override automatic control mechanism
 - c. Run lights to indicate when pumps are powered up

- d. Level status lights to indicate when water in sump has reached the predetermined on/off and alarm levels
 - e. Magnetic motor contactors
 - f. Disconnect/breaker for each pump
 - g. Automatic motor overload protection
 - h. Built-in rechargeable battery for LED lights and alarm
 - i. Continuous pump run operation
 - j. Breaker tripped alarm operation
 - k. High water alarm
- I. For a duplex system, provide an alternating relay to automatically alternate leadoff and standby duties of each pump of a duplex unit at the end of each pumping cycle. Standby pump shall start when water level in sump rises to a predetermined level that indicates excessive inflow or failure of the lead pump.
- 1. Sensors that detect the level of water in the sump shall be so arranged as to allow the accumulation of enough volume of liquid below the normal on level that the pump will run for a minimum cycle of one minute. Sensors shall be located to activate the alarm adequately before the water level rises to the inlet pipe.
 - 2. Provide two separate power supplies to the control panel, one for the control/alarm circuitry and one for power to the pump motors. Each power supply is to be fed from its own breaker so that if a pump overload trips a breaker, the alarm system will still function. Each power supply is to be wired in its own conduit. Wiring from the sump to the control panel shall have separate conduits for the pump power and for the sensor switches. All conduits are to be sealed at the basin and at the control panel to prevent the intrusion of moisture and of flammable and/or corrosive gases.
- J. Sump: Provide //cast iron// //fiberglass// //polyethylene// basin with gas tight covers. Covers shall have a manhole with a bolted cover of minimum size to inspect and service the pumps, vent connection, and openings for pumps and controls.
- K. Provide a union or flange, and a check and gate valve in the discharge pipe of each pump. Material shall be //bronze// //brass// //ductile iron// //steel//. Provide insulating joints where dissimilar metals are utilized. Valves shall not be installed in basin or pit.
- L. Removal/Disconnect System: Where indicated on drawings, a removal/disconnect system shall be provided //where sump depth, pump

size or other conditions make removal of the pump unusually difficult or unsafe//. The system will consist of a discharge fitting mounted on vertical guide rails attached to the sump. The pump shall be fitted with an adapter fitting that easily connects to/disconnects from the discharge fitting as the pump is raised from or lowered into the sump. The discharge piping will connect to the discharge fitting so that it is not necessary to disconnect any piping in order to remove the pump.

SPEC WRITER NOTE: Delete this paragraph if the sump basin depth is less than 1.5 m (5 feet) deep.

- M. Where the sump depth is greater than 1.5 m (5 feet) or other conditions exist to make the removal of the pump difficult or hazardous, the system shall include a rail guided quick disconnect apparatus to allow the pump to be pulled up out of the sump without workers entering the sump and without disconnecting the piping. System to be compatible with and furnished by pump manufacturer.
- N. Provide a check valve and gate valve in the discharge from each pump.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. If an installation is unsatisfactory to the COR, the Contractor shall correct the installation at no additional cost or time to the Government.

3.2 STARTUP AND TESTING

- A. Make tests as recommended by product manufacturer and listed standards and under actual or simulated operating conditions and prove full compliance with design and specified requirements. Tests of the various items of equipment shall be performed simultaneously with the system of which each item is an integral part.
- B. Tests shall include system capacity and all control and alarm functions.
- C. When any defects are detected, correct defects and repeat test at no additional cost or time to the Government.
- D. //The Commissioning Agent will observe startup and contractor testing of selected equipment. Coordinate the startup and contractor testing schedules with the COR and Commissioning Agent. Contractor shall provide a minimum notice of 10 working days prior to startup and testing.//

3.3 //COMMISSIONING

- A. Provide commissioning documentation in accordance with the requirements of Section 22 08 00, COMMISSIONING OF PLUMBING SYSTEMS.
- B. Components provided under this section of the specification will be tested as part of a larger system.//

3.4 DEMONSTRATION AND TRAINING

- A. Provide services of manufacturer's technical representative for //four// // // hour//s// to instruct each VA personnel responsible in the operation and maintenance of units.
- B. //Submit training plans and instructor qualifications in accordance with the requirements of Section 22 08 00, COMMISSIONING OF PLUMBING SYSTEMS.//

- - - E N D - - -