

## SECTION 33 21 00 - WATER SUPPLY WELLS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. **Rotary drilled** water supply wells.
  - 2. **Submersible** well pumps.

#### 1.3 DEFINITIONS

- A. PE: Polyethylene plastic.
- B. PVC: Polyvinyl chloride plastic.

#### 1.4 PERFORMANCE REQUIREMENTS

- A. Minimum Tested Water Supply Well Performance Capacity: 120 gallons per minute

#### 1.5 ALLOWANCES

- A. Allowance amounts and quantities are specified in Section 012100 "Allowances."
  - 1. Water Supply Well Depth Allowance: Install complete and functional well to depth indicated on Drawings. If water supply well depths vary from quantities on drawings, the Contract Sum will be adjusted according to unit prices listed in "Unit Prices" Article. Include the following in the Contract Amount:
    - 2. Labor for water supply well installation.
    - 3. Furnishing and installing casing materials, grout, well screen, and packing materials in required diameter to comply with minimum performance requirements specified above.
    - 4. Furnishing and installing well pump.
    - 5. Run water supply lines to each building as shown on drawings
- B. Water supply well and well pump shall be fully priced as shown on drawings

#### 1.6 UNIT PRICES

- A. Unit-Price Amounts: Show unit price per foot for additional well depth beyond 150' in depth.
- B. Measurement and Payment Procedures: Specified in Section 012200 "Unit Prices."

- C. Measurement Units for Water Supply Wells, Casings, and Grout: Per linear foot of well depth.

#### 1.7 ACTION SUBMITTALS

- A. Product Data: Submit certified performance curves and rated capacities of selected well pump and furnished specialties and accessories for each type and size of well pump indicated on drawings.
- B. Shop Drawings: Show layout and connections for well pumps.
  - 1. Copy of Texas well drilling and pump installers license
  - 2. Wiring Diagrams: Power, signal, and control wiring.
  - 3. Setting Drawings: Include templates and directions for installing foundation bolts, anchor bolts, and other anchorages.
  - 4. Project Record Documents: Record the following data for water supply well:
    - a. Casings: Material, diameter, thickness, weight per foot of length, and depth below grade.
    - b. Screen: Material, construction, diameter, and opening size.
    - c. Pumping Test: Static water level, maximum safe yield, and drawdown at maximum yield.
    - d. Log: Formation log indicating strata encountered.
    - e. Alignment: Certification that well is aligned and plumb within specified tolerances.
  - 5. Provide submittal on VFD matched with submersible pump.

#### 1.8 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports, including the following:
  - 1. Substrata formations. Well log to be filed with State of Texas
  - 2. Water-bearing formations.
  - 3. Water levels.
  - 4. Laboratory water analysis.
  - 5. Well-screen analysis.
  - 6. Performance test data.

#### 1.9 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For well pump to include in emergency, operation, and maintenance manuals.

#### 1.10 QUALITY ASSURANCE

- A. Well Driller Qualifications: An experienced water supply well driller licensed in the jurisdiction where Project is located.
- B. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7.

- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. Comply with AWWA A100 for water supply wells.

#### 1.11 PROJECT CONDITIONS

- A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:
  - 1. Notify Engineer no fewer than seven days in advance of proposed interruption of water service.
  - 2. Do not proceed with interruption of water service without Owner's written permission.
- B. Well Drilling Water: **Owner will provide** temporary water for drilling purposes. Contractor to provide necessary piping for water supply to buildings.

#### 1.12 WARRANTY

- A. Warranty on all products will be free of defects in workmanship for a period of three (3) years from date of installation.

### PART 2 - PRODUCTS

#### 2.1 WELL CASINGS

- A. PVC Casing: ASTM F 480, PVC, Schedule 80 bell-and-spigot pipe and couplings for solvent-cemented joints. Include NSF listing mark "NSF w.c."
- B. Pit-less Adapter: Fitting, of shape required to fit onto casing, with waterproof seals.
- C. Pit-less Unit: Factory-assembled equipment that includes pit-less adapter.
- D. Well Seals: Casing cap, with holes for piping and cables, that fits into top of casing and is removable, waterproof, and vermin proof.

#### 2.2 GROUT

- A. Cement: ASTM C 150, Type V.
- B. Aggregates: ASTM C 33, fine and coarse grades.
- C. Water: Potable.

### 2.3 WATER WELL SCREENS

- A. Screen Material: Fabricated of ASTM A 666, slotted PVC; with continuous-slot, V-shaped openings that widen inwardly and designed for well-screen applications.
  - 1. Screen Couplings: Butt-type, PVC coupling rings.
  - 2. Screen Fittings: Screen, with necessary fittings, closes bottom and makes tight seal between top of screen and well casing.
  - 3. Maximum Entering Velocity: 0.1 fps.

### 2.4 PACK MATERIALS

- A. Coarse, uniformly graded filter sand, maximum 1/8 inch in diameter.
- B. Fine gravel, maximum 1/4 inch in diameter.

### 2.5 SUBMERSIBLE WELL PUMPS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Grundfos Pumps Corporation.
  - 2. Franklin Electric Pumps.
  - 3. Goulds Pumps
- B. Description: Submersible, vertical well pump complying with HI 2.1-2.2 and HI 2.3; with the following features:
  - 1. Impeller Material: Stainless steel.
  - 2. Motor: Capable of continuous operation under water, with protected submersible power cable.
  - 3. Column Pipe: ASTM A 53/A 53M, Schedule 80, PVC pipe with threaded ends and threaded couplings.
  - 4. Discharge Piping: ASTM D 2239, SDR Numbers 9 PE pipe; made with PE compound number required to give pressure rating not less than 160 psig. Include NSF listing mark "NSF pw."
- C. Capacities and Characteristics:
  - 1. Capacity: 120 GPM
  - 2. Discharge Head: 60 psig
  - 3. Discharge Size: 1-1/2"
  - 4. Speed: 3450
  - 5. Motor Horsepower: 5 HP
  - 6. Lift: 90 ft
  - 7. Pressure Rating: 150
  - 8. Volts: 460
  - 9. Phases: 3
  - 10. Hertz: 60

## 2.6 MOTORS

- A. General requirements for motors are specified in Section 220513 "Common Motor Requirements for Plumbing Equipment."
  - 1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
  - 2. Controllers, Electrical Devices, and Wiring: Electrical devices and connections are specified in electrical Sections. Pump shall be variable flow with VFD controller

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Neighborhood Well Data: Review operating and test analyses and address any concerns with Engineer.

### 3.2 INSTALLATION

- A. Construct well using rotary drilling method.
- B. Take samples of substrata formation at 10-foot intervals and at changes in formation throughout entire depth of each water supply well. Carefully preserve samples on-site in glass jars properly labeled for identification.
- C. Excavate for mud pit or provide aboveground structure, acceptable to authorities having jurisdiction, to allow settlement of cuttings and circulation of drill fluids back to well without discharging to on-site waterways.
- D. Set casing and liners round, plumb, and true to line.
- E. Join casing pipe as follows:
  - 1. Ream ends of pipe and remove burrs.
  - 2. Remove scale, dirt, and debris from inside and outside casing before installation.
  - 3. Cut bevel in ends of casing pipe and make joints.
  - 4. Clean and make solvent-cemented joints.
- F. Mix grout in proportions of 1 cu. ft. or a 94-lb sack of cement with 5 to 6 gal. of water. Bentonite clay may be added in amounts of 3 to 5 lb/cu. ft. for a 94-lb sack of cement. If bentonite clay is added, water may be increased to 6.5 gal./cu. ft. of cement.
- G. Place grout continuously, from 50' to top surface, to ensure filling of annular space in one operation. Do not perform other operations in well within 72 hours after grouting of casing.
- H. Provide permanent casing with temporary well cap. Install with top of casing 36 inches above finished grade.
- I. Develop well to maximum yield per foot of drawdown.
  - 1. Extract maximum practical quantity of sand, drill fluid, and other fine materials from water-bearing formation.

2. Avoid settlement and disturbance of strata above water-bearing formation.
  3. Do not disturb sealing around well casings.
  4. Continue developing well until water contains no more than 2 ppm of sand by weight when pumped at maximum testing rate.
- J. Install **submersible** well pumps according to HI 2.1-2.4 and provide access for periodic maintenance.
1. Before lowering permanent pump into well, lower a dummy pump that is slightly longer and wider than permanent pump to determine that permanent pump can be installed. Correct alignment problems.
  2. Before lowering permanent pump into well, start pump to verify correct rotation.
  3. Securely tighten discharge piping joints.
  4. Connect motor to submersible pump and locate near well bottom.
    - a. Connect power cable while connection points are dry and undamaged.
    - b. Do not damage power cable during installation; use cable clamps that do not have sharp edges.
    - c. Install pit-less adapter that will support pump and piping.

### 3.3 CONNECTIONS

- A. Piping installation requirements are specified in "Facility Water Distribution Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
1. Connect piping between well pump and water piping.
  2. Connect water distribution system in trench to well pipe at pit-less **adapter**.
  3. Connect building water distribution to well.
- B. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- C. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

### 3.4 WELL ABANDONMENT

- A. Comply with AWWA A100 when abandoning water supply wells. Fill and seal holes and casings and restore ground surface to finished grade.
- B. Follow well-abandonment procedures of authorities having jurisdiction. Restore ground surface to finished grade.
- C. Contact Engineer immediately if this condition applies.

### 3.5 FIELD QUALITY CONTROL

- A. Test Preparation: Clean water supply wells of foreign substances. Swab casings using alkalis, if necessary, to remove foreign substances.
- B. Perform tests and inspections and prepare test reports.

C. Tests and Inspections:

1. Plumbness and Alignment Testing: Comply with AWWA A100.
2. Furnish samples of water-bearing formation to testing laboratory and well-screen manufacturer for mechanical sieve analysis.
3. Prepare reports on static level of ground water, level of water for various pumping rates, and depth to water-bearing strata.
4. Performance Test Preparation: Start well pump and adjust controls and pressure setting. Replace damaged and malfunctioning controls and equipment.
5. Performance Testing: Conduct final pumping tests after wells have been constructed, cleaned, and tested for plumbness and alignment.
  - a. Arrange to conduct tests, with seven days' advance notice, after test pump and auxiliary equipment have been installed. Note water-level elevations referred to for each assigned datum in wells.
  - b. Provide discharge piping to conduct water to locations where disposal will not create a nuisance or endanger adjacent property. Comply with requirements of authorities having jurisdiction.
  - c. Provide and maintain equipment of adequate size and type for measuring flow of water, such as weir box, orifice, or water meter.
  - d. Measure elevation to water level in wells.
  - e. Perform two bailer or air-ejection tests to determine expected yield. Test at depths with sufficient quantity of water to satisfy desired yields.
  - f. Test Pump: Variable capacity test pump with capacity equal to maximum expected yields at pressure equal to drawdown in wells, plus losses in pump columns and discharge pipes.
  - g. Start and adjust test pumps and equipment to required pumping rates.
  - h. Record readings of water levels in wells and pumping rates at 15-minute maximum intervals throughout 10-hour minimum period.
  - i. Record maximum yields when drawdown is 48" above top of suction screens after designated times.
  - j. Operate pumping units continuously for 24 hours after maximum drawdown is reached.
  - k. Record returning water levels in wells and plot curves of well recovery rates.
  - l. Remove sand, stones, and other foreign materials that may become deposited in wells after completing final tests.

D. Water Analysis Testing:

1. Engage a qualified testing agency to make bacteriological, physical, and chemical analyses of water from each finished well and report the results. Make analyses according to requirements of authorities having jurisdiction.
2. Analyze water sample from finished well for bacteriological, physical, and chemical quality and report the results. Make analyses according to requirements of authorities having jurisdiction.

3.6 CLEANING

- A. Disinfect water supply wells according to AWWA A100 and AWWA C654 before testing well pumps.
- B. Follow water supply well disinfection procedures required by authorities having jurisdiction before testing well pumps.

3.7 PROTECTION

- A. Water Quality Protection: Prevent well contamination, including undesirable physical and chemical characteristics.
- B. Ensure that mud pit will not leak or overflow into streams or wetlands. When well is accepted, remove mud and solids in mud pit from Project site and restore site to finished grade.
- C. Provide casings, seals, sterilizing agents, and other materials to eliminate contamination; shut off contaminated water.
- D. Exercise care to prevent breakdown or collapse of strata overlaying that from which water is to be drawn.
- E. Protect water supply wells to prevent tampering and introducing foreign matter. Retain temporary well cap until installation is complete.

**END OF SECTION 33 21 00**