

SECTION 01 33 00.0000
SUBMITTAL PROCEDURES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes submittal procedures
- B. Related Requirements
 - 1. Section 01 78 00.0000 – Closeout Submittals

PART 2 PRODUCTS (Not applicable)

PART 3 EXECUTION

3.01 SUBMITTAL PROCEDURES

- A. The required submittals are listed in **PART 2 PRODUCTS** of each section.
- B. Provide one copy of each submittal to the Project Officer.
- C. Identify each cut sheet or shop drawing with the following information:
 - 1. Contract or Purchase Order number
 - 2. Supplier
 - 3. Specification Section number
- D. Submit the following information (if applicable):
 - 1. Manufacturer's cut sheets: Show compliance with references (e.g. applicable ASTM, AWWA standards)
 - 2. Laboratory results
 - 3. Any other information necessary to show compliance with the specifications
- E. Identify variations from the Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
- F. Identify and re-submit all changes made since previous submittal.
- G. Distribute copies of approved submittals to concerned parties, (i.e. suppliers, sub-contractors).
- H. Communicate in writing any inability to comply.

- I. Allow three weeks for submittal approval.
- J. Replace unapproved materials at the Contractor's expense.

END OF SECTION

**SECTION 33 21 13.1085
DOMESTIC WELL GROUT**

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes
- B. Related requirements:
 - 1. Section 01 33 00.0000 – Submittal Procedures.
 - 2. Section 33 21 13.1001 – Domestic Well Drilling.
 - 3. Section 33 21 13.1081 – Well Screens.
 - 4. Section 33 21 13.1084 – Well Gravel Pack

1.02 MEASUREMENT AND PAYMENT

- A. Concrete Grout
 - 1. Measurement: Vertical feet of grout installed.
 - 2. Payment: Shall be full compensation for:
 - a. Provision and installation of materials including:
 - 1) Concrete.
 - 2) Water.
 - 3) Aggregates.
 - 4) Tremie pipe and pump.
 - 5) Appurtenances.
 - b. Other work:
 - 1) Record drawings.
- B. Bentonite Grout
 - 1. Measurement: Vertical feet of grout installed.
 - 2. Payment: Shall be full compensation for:
 - a. Provision and installation of materials including:
 - 1) Bentonite grout

- 2) Water.
 - 3) Tremie pipe and pump.
 - 4) Appurtenances.
- b. Other work:
- 1) Record drawings.

1.03 REFERENCES

A. Reference Standards:

1. Use current standard.
2. ASTM C33 – Standard Specification for Concrete Aggregates.
3. ASTM C150 – Standard Specification for Portland Cement.
4. Oklahoma Water Resources Board (OWRB), Title 785, Chapter 35, Subchapter 7, Paragraph d.

B. American Society for Testing and Materials (ASTM)

1.04 SUBMITTALS

A. Product Data:

1. Conform to Section 01 33 00.0000 – Submittal Procedures.
2. Bentonite Grout.

PART 2 PRODUCTS

2.01 MATERIALS

1. Concrete Grout:
2. Annular space of 1.5 inches minimum:
 - a. Cement that conforms to ASTM Standard C-150.
 - b. Water: 6 gallons per 94 lb. sack of cement.
 - c. Additives may not be used to increase the cements fluidity.
3. Annular space greater than 1.5 but less than 4 inches:

- a. Concrete Grout
 - 1) Ratio not more than one part sand to one part cement.
 - 2) Water: 6 gallons per 94 lb. sack of cement.
- b. Annular space Greater than 4 inches:
 - 1) Ratio not more than one part sand to one part cement.
 - 2) Water: 6 gallons per 94 lb. sack of cement.
 - 3) Up to 50% by dry weight ½-inch or smaller gravel may be added.
- 4. Bentonite Grout
 - a. High-solids bentonite grout and water mixture with 20 percent solids mixed and placed in accordance with the manufacturer's written instructions.
 - b. Swelling bentonite clay 10% minimum.
 - c. Conventional bentonite drilling clay and water mixtures are not allowed.

PART 3 EXECUTION

3.01 PREPERATION

- A. Concrete Grout:
 - 1. Mix the water, cement, and aggregates (if allowed) to the proper consistency recommended by the cement manufacturer before placing in the well.
 - 2. Placing dry cement in the annular space and adding water is not allowed.
- B. Bentonite:
 - 1. Pre-hydrate to the manufacturer's recommended consistency.
 - a. Pre-hydration requires the bentonite be properly mixed with the recommended amount of water.
 - 2. Use potable water for mixing cement and bentonite grouts.

3.02 INSTALLATION

1.01 GROUTING

- A. Install a minimum of 10 continuous feet of grout.
 - 1. The top 5 feet of grout must be cement/concrete.
 - 2. The bottom 5 feet of grout may be cement/concrete or Bentonite clay with 20% minimum solids.
- B. Variances:
 - 1. If a sleeve is used at the surface for the sole purpose of attaching a pitless adapter:
 - a. Embed the sleeve within the surface seal.
 - b. Extend 8 feet (minimum) below ground level in the bore hole.
 - 2. If the surface casing does not extend 12 inches above the natural ground level and a pitless cap or sanitary seal is not installed:
 - a. Install 10 feet of grout between the surface casing and the production casing terminating within 4 feet of the ground surface.
- C. The cement/bentonite seal:
 - 1. Total minimum length after settling: 10 feet.
 - 2. Minimum starting depth: 10 feet.
 - 3. Maximum termination depth: 4 feet below the surface.
 - a. If needed for pitless adapters.
 - 4. The Project Officer may require additional grouting.
- D. Well Bore Hole:
 - 1. Surface Casing: Minimum diameter of at least 3 inches greater than the outside diameter of the surface casing (including coupling if they are located in the grout).
 - 2. Production Casing: Minimum diameter of at least 3 inches greater than the outside diameter of the surface casing (including coupling if they are located in the grout).
- E. Annular Space
 - 1. Fill with cement grout or cement/bentonite grout to a minimum depth of 10 feet.
 - a. Additional depth may be required to exclude pollution.

- F. Pitless Well Adapter or Pitless Unit:
 - 1. Start grouting below the junction of the pitless adaptor or pitless unit where it attaches to the well casing.
 - 2. Continue for a minimum depth of 10 feet.
- G. Pump grout under pressure from the bottom of the annular space to the surface.
- H. Place grout in a single uninterrupted operation.
- I. No work on the well will be allowed within 72 hours after completion of grouting.
- J. If quickset grout is used this period may be reduced to 24 hours if approved by the Project Inspector.

END OF SECTION

SECTION 33 21 13.1085
DOMESTIC WELL DISINFECTION

PART 1 GENERAL

1.01 SUMMARY

A. Section includes:

1. The disinfection of domestic water wells.

B. Related requirements:

1. Section 01 78 00.0000 – Closeout Submittals.
2. Section 33 21 13.1001 – Domestic Well Drilling.
3. Section 33 21 13.1015 – Submersible Well Pumps.
4. Section 33 21 13.1081 – Well Screens.
5. Section 33 21 13.1084 – Well Gravel Pack.
6. Section 33 21 13.1085 – Domestic Well Grout.
7. Section 33 21 13.1085 – Domestic Well Development.
8. Section 33 21 13.1085 – Domestic Well Test Pumping.

1.02 MEASUREMENT AND PAYMENT

A. Disinfection:

1. Measurement: lump sum.
2. Payment: Shall be full compensation for:
 - a. Provision and installation of materials including:
 - 1) Equipment.
 - 2) Equipment set up and takedown.
 - 3) Disinfection agent.
 - 4) Potable water.
 - 5) Appurtenances.
 - b. Other work:

- 1) Testing.

1.03 REFERENCES

A. Reference Standards:

1. Use current standard.
2. Oklahoma Water Resources Board: Title 785, Chapter 35, Subchapter 7.
3. AWWA A100-6: Section 4.9 Well Disinfection.
4. ANSI/AWWA C654-3 Disinfection of Wells.

1.04 CLOSEOUT SUBMITTALS

- A. Conform to Section 01 78 00.0000 – Closeout Submittals.
- B. Provide test results to the Project Officer

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

A. PREPARATION

1. Prepare the liquid chlorine solution prior to injection into well.
 - a. Mix volume and strength such that a minimum concentration of 50 ppm of free residual chlorine is obtained in all parts of the well for a minimum of 24 hours after injection.

B. WELL DISINFECTION

1. After test pumping and construction is complete, thoroughly clean the well of all foreign material (i.e. cement, oil, grease, joint dope, scum, etc.)
2. Disinfect well with a liquid chlorine solution.
 - a. Prepare solution prior to injection into well.
 - b. Mix volume and strength such that a minimum concentration of 50 ppm of free residual chlorine is obtained in all parts of the well for a minimum of 12 hours after injection.
 - c. Flush casing above static water level with solution.
3. Testing:
 - a. If the bacteriological test result is positive:
 1. Prepare and apply to the entire depth of the well a total volume of the chlorine solution of at least 100 mg/l available chlorine.
 2. Apply a volume equal to at least four times the volume of water in the well.

3. Allow solution to remain in well for 24 hours.
4. Retest.

C. BACTERIOLOGICAL ANALYSIS

1. Take bacteriological samples immediately after disinfection and flushing of each well.
2. Submit bacteriological samples to State Department of Health or Office of Environmental Health approved lab.
 - a. Provide copy of results within 10 days of receipt of the report.
 - b. If a sample tests positive, notify Project Engineer immediately and repeat chlorination of the well until a sample tests negative.

END OF SECTION

SECTION 33 21 13.1085
DOMESTIC WELL DEVELOPMENT

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Development of domestic water wells.
- B. Related requirements:
 - 1. Section 33 21 13.1001 – Domestic Well Drilling.
 - 2. Section 33 21 13.1081 – Well Screens.
 - 3. Section 33 21 13.1084 – Well Gravel Pack.

1.02 MEASUREMENT AND PAYMENT

- A. Well Development:
 - 1. Measurement: each hour of well development
 - 2. Payment: Shall be full compensation for:
 - a. Development of a domestic water well including
 - 1) Equipment.
 - 2) Sampling

1.03 REFERENCES

- A. Reference Standards:
 - 1. Oklahoma Water Resources Board: Title 785, Chapter 35, Subchapter 7.
 - 2. AWWA A100-6: Section 4.8 Well Development.

PART 2 PRODUCTS (not applicable)

PART 3 EXECUTION

3.01 DEVELOPMENT

- 1. Techniques:
 - a. Develop the well using a method that extracts the maximum practical quantity of drilling mud, fine sand, silt or other fine material.
 - 1) Maximum allowable sands and fine material: 2 ppm (by weight).
 - 2) Maximum allowable turbidity of less than 10 NTU under all conditions.

- a) Failure to meet the turbidity requirement may cause the well to be abandoned by fault of the Contractor.
- 3) Development by continuous over pumping is not be allowed.
- b. Acceptable development methods include surge plungers, compressed air or high velocity jetting.
 - 1) Bailing or pumping is not acceptable.
 - 2) Compressed air must be delivered at a minimum rate of 75 cfm at a minimum pressure of 100 psi.
- c. Conduct development to prevent settlement of the stratum above the water bearing formation.
- 2. Special Techniques:
- 3. High velocity jetting with phosphates may be required.
 - a. Follow established procedures for this type of development.

END OF SECTION

SECTION 33 21 13.1085
DOMESTIC WELL TEST PUMPING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Test pumping of domestic water wells.
- B. Related requirements:
 - 1. Section 01 78 00.0000 – Closeout Submittals.
 - 2. Section 33 21 13.1001 – Domestic Well Drilling

1.02 MEASUREMENT AND PAYMENT

- A. Test Pumping
 - 1. Measurement: hours of testing including drawdown and recovery readings and records. No separate payment will be made for mobilization/demobilization and equipment setup and take down.
 - 2. Payment: Shall be full compensation for:
 - a. Test pumping including:
 - 1) Test pump.
 - 2) Temporary drop pipe.
 - 3) Power.
 - 4) Temporary submersible cable.
 - 5) Flow measurement device.
 - 6) Mobilization and demobilization
 - 7) Record keeping
 - 8) Appurtenances.

1.03 REFERENCES

- A. Reference Standards:
 - 1. Use current standard.
 - 2. Oklahoma Water Resources Board: Title 785, Chapter 35, Subchapter 7.
 - 3. AWWA A100-6: Section 5.1 Performance testing.

PART 2 PRODUCTS

2.01 CLOSEOUT SUBMITTALS

- A. Conform to Section 01 78 00.0000 – Closeout Submittals.
- B. Provide copy of drawdown and recovery measurements.

PART 3 EXECUTION

3.01 TESTING FOR YIELD AND DRAW DOWN

- A. Contact Project Officer two working days prior to the start of test pumping.
- B. Do not begin test pumping until development is complete and accepted by the Project Inspector.
- C. Provide all necessary labor, equipment, materials and power required for test pumping.
 - 1. Supply measuring equipment to determine water levels and the rate of pump discharge to the nearest 0.1-foot and 1-gpm.
 - a. Equipment approved for water level measurements: electrical probes or an air line.
 - b. Equipment approved for flow measurements are a 50 gal barrel, weirs, and calibrated meters.
 - c. Provide all piping necessary to convey water away from test pump site.
- D. Test pump wells at 10 gpm unless otherwise directed.
- E. Do not use the actual pumps to be installed in the well for the test pump operation.
- F. Duration of draw down test:
 - 1. Two hours after the water level draw down stabilizes in the well.
 - 2. Not less than 3 hours
- G. Take draw down and pump discharge measurements every 5 minutes for the first half-hour.
- H. Take draw down and pump discharge measurements every 10 minutes for the remainder of the test.
- I. Record recovery measurements immediately upon completion of test pump for one-hour total, unless otherwise directed by the Project Engineer.
 - 1. Take recovery readings every minute for the first 10 minutes.
 - 2. Take recovery readings every 5 minutes for the remainder of the hour.
 - 3. If requested by the Project Officer, take water samples for field chemical analysis test after test pumping but before grouting.
- J. Remove all temporary-pumping facilities at the conclusion of test pumping.

K. Submit test pump results to the Project Inspector within 5 days of completion.

3.02 CLOSEOUT ACTIVITIES

A. Submit test pump results to the Project Inspector within 5 days of completion.

END OF SECTION

SECTION 33 21 13.1084

WELL GRAVEL PACK

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes
- B. Related requirements:
 - 1. Section 01 33 00.0000 – Submittal Procedures.
 - 2. Section 33 21 13.1001 – Domestic Well Drilling.
 - 3. Section 33 21 13.1081 – Well Screens.
 - 4. Section 33 21 13.1085 – Domestic Well Grout.

1.02 MEASUREMENT AND PAYMENT

- A. Gravel Pack
 - 1. Measurement: Vertical feet of gravel pack installed
 - 2. Payment: Shall be full compensation for:
 - a. Provision and installation of materials including:
 - 1) Gravel pack material.
 - 2) Tremie pipe.
 - 3) Appurtenances.
 - b. Other work:
 - 1) Record drawings.

1.03 REFERENCES

- A. Reference Standards:
 - 1. Use current standard.
 - 2. Oklahoma Water Resources Board (OWRB) Title 785, Chapter 35

1.04 SUBMITTALS

- A. Product Data:

1. Conform to Section 01 33 00.0000 – Submittal Procedures.
1. The manufacturer's gravel pack gradation recommendation for each screen size.

1.05 CLOSEOUT SUBMITTALS

- A. Conform to Section 01 78 00.0000 – Closeout Submittals.
- B. Provide record drawing showing the depth and length of the gravel pack installed.

PART 2 PRODUCTS

2.01 MATERIALS

2. Clean, well-rounded, 95% siliceous material, smooth and uniform, free of foreign material, properly sized, washed and disinfected immediately prior to or during placement.
3. Weight loss by the acid test than 20%.
4. Gradation specified by the manufacturer of the well screen based on the gradation of the submitted water bearing formation.

PART 3 EXECUTION

3.01 PREPERATION

- A. Disinfect filter pack by adding 1 lb of 65 percent available chlorine as pelletized tablets or liquid water mixture to achieve 50 ppm free chlorine to 1 yd³ of gravel pack during placement.
- B. Disinfect immediately prior to or during placement.

3.02 INSTALLATION

- A. Use the screen manufacturer's recommended filter pack material.
 1. The manufacturer recommended filter pack material will be determined using the aquifer samples supplied by the well driller.
 2. Filter pack material.
 - a. Well rounded.
 - b. 95% siliceous material.
 - c. Smooth and uniform.

- d. Properly sized.
 - e. Washed and disinfected immediately before or during placement.
 - f. Minimum thickness of filter pack: 3 inches.
 - g. Maximum thickness of filter pack: 12 inches.
 - h. Extend 20 feet above the highest slot in the well screen.
3. Artificial filter packing will be placed in the well by either the Tremie or the reverse-circulation methods in a manner that will not allow hydraulic separation.
 4. Free dropping of the filter pack material into the drill hole from the ground surface will not be allowed.
 5. Install in one continuous operation throughout each screened interval.
 6. Artificial filter pack shall be placed from the bottom of the well to a point 20 feet above the upper most slots in the screen.
 7. The Project Officer may direct that the annular space from 20 feet above the upper most screen slot in the well to 10 ft below the surface be filled with gravel pack or cement or bentonite grout.

END OF SECTION

SECTION 33 21 13.1081

WELL SCREENS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes well screens
- B. Related requirements:
 - 1. Section 01 33 00.0000 – Submittal Procedures.
 - 2. Section 33 21 13.1001 – Domestic Well Drilling.
 - 3. Section 33 21 13.1015 – Submersible Well Pumps.
 - 4. Section 33 21 13.1084 – Well Gravel Pack.
 - 5. Section 33 21 13.1085 – Domestic Well Grout.

1.02 MEASUREMENT AND PAYMENT

- A. PVC Well Screen:
 - 1. Measurement: Vertical feet of PVC well screen installed.
 - 2. Payment: Shall be full compensation for:
 - a. Provision and installation of materials including:
 - 1) PVC well screen.
 - 2) End plate.
 - 3) Appurtenances.
 - b. Other work:
 - 1) Record drawings.
 - 2) Well log.
- B. Stainless Steel Well Screen:
 - 1. Measurement: Vertical feet of stainless steel well screen installed.
 - 2. Payment: Shall be full compensation for:
 - a. Provision and installation of materials including:

- 1) Stainless steel well screen.
 - 2) End plate.
 - 3) Appurtenances.
- b. Other work:
- 1) Record drawings.
 - 2) Well log.
- C. Perforated Casing:
1. No separate payment for will be made for perforated casings. The cost will be included in the cost of the casing.
 2. Record drawings showing the depth and length of the perforated casing are required.

1.03 REFERENCES

- A. Reference Standards:
1. Use current standard.
 2. ASTM D 1784 – Standard Specification for Rigid PVC Compounds and Chlorinated PVC Compounds
 3. ASTM F480 – Standard Specification for Thermoplastic Well Casing Pipe and Couplings Made in Standard Dimension Ratios (SDR), SCH 40 and SCH 80.
 4. ASTM A276-04 Standard Specification for Stainless Steel Bars and Shapes.
 5. NSF61 – Drinking Water System Components – Health Effects.
 6. NSF14 – Plastic Piping System Components and Related materials.
 7. American Water Works Association (AWWA) publication A-100 and appendices.
 8. Oklahoma Department of Environmental Quality (DEQ).
 9. Oklahoma Water Resources Board (OWRB).
 10. Underwriters Laboratory (UL).
 11. National Sanitation Foundation (NSF).

12. American Society for Testing and Materials (ASTM).

1.04 SUBMITTALS

A. Product Data:

1. Conform to Section 01 33 00.0000 – Submittal Procedures.
2. PVC well screen.
3. Stainless steel well screen

1.05 CLOSEOUT SUBMITTALS

- A. Conform to Section 01 78 00.0000 – Closeout Submittals.
- B. Provide record drawing showing the depth of screens, slot size, and total length of screen installed.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Storage and Handling Requirements.

1. Comply with the manufacturer's instructions.
2. Store in manufacturer's packaging until the screen is placed.
3. Store off ground
4. Fully support screen to prevent bends in the material.

PART 2 PRODUCTS

2.01 MANUFACTURED UNITS

A. Manufacturers.

1. PVC Well Screen:

- a. CertainTeed Corporation, P.O. Box 860, Valley Forge, PA 19482, tele: 866.284.7473, web: www.certainteed.com.
- b. Johnson Screens, Inc., P.O. Box 64118, St. Paul, MN 55164, tele: 651.636.3900, web: www.johnsonscreens.com.

2. Stainless Steel Well Screen:

- a. Amistco Separation Products Inc., 23147 Highway 6, Alvin, Texas 77512, tele: 281.331.5956 Email: amistco@amistco.com, web: www.amistco.com.
- b. Johnson Screens, Inc., P.O. Box 64118, St. Paul, MN 55164, tele: 651.636.3900, web: www.johnsonscreens.com.

3. Substitution Limitations.

- a. Manufacturers meeting the requirements of this specification will be given equal consideration.

B. Materials

1. General Approved Products:

- a. All materials that will come in contact with potable water must be approved by the NSF, API, UL, or AWWA for use in public drinking water supplies.
- b. Made of material that that will not impart taste, odor, toxic substances or bacterial contamination to the water.
- c. Material resistant to damage by chemical action of ground water or cleaning operations.
- d. Openings based on sieve analysis of formation and filter pack (gravel pack) materials to permit maximum transmitting ability without clogging or jamming.
- e. Sufficient diameter and length to provide adequate specific capacity.
- f. Aperture entrance velocity less than or equal to 0.1 feet per second.
- g. Vertical velocity: less than 4 feet per second.

- 2. Provide riser, tail piece, and bottom plate or wash down bottom fitting of the same material as the screen.

C. PVC Screen:

- 1. SDR rating the same or larger p.s.i rating as the casing.
- 2. White PVC Type 1, Grade 1 material as described in ASTM F480 and ASTM D1784, Class 12454B.
- 3. Vee-Wire® screen with a continuous slot widening inwardly to minimize clogging.

D. Stainless Steel Screen:

- 1. Continuous slot design, with outer windings and internal longitudinal bars.
- 2. Type 304 stainless steel conforming to ASTM A276.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Place to utilize the full depth of the water-bearing formation as approved by the Project Officer.
- B. Provide a centralizer on casing just above the screen so an even thickness of filter pack can be installed.
 - 1. For screens longer than 10 feet place a centralizer at the bottom of the screen.
- C. Fill the drill hole with approved material if the bottom is deeper than the screened area.
- D. Acceptable methods for installing PVC well screens:
 - 1. Open hole method.
 - a. Fit PVC well screen with an approved rubber type packer or by solvent welding a threaded adapter on to the PVC casing and threading the screen onto the adapter.
 - 1) Packer material approved by NSF.
 - b. Secure a wash down fitting, bottom or other suitable closure to the bottom of the screen.
- E. Acceptable methods for installing stainless steel well screens:
 - 1. Pull back method
 - a. Provide a 1 1/2-foot section of riser pipe and neoprene type packer.
 - b. Packer material approved by NSF.
 - 2. Open hole method
 - 3. Bail down method
 - 4. Wash down method
 - 5. Welding the screen to the casing.
 - a. Diameter equal to the casing.

- F. Bottom of well screen. Seal the bottom of the deepest well screen using one of the following methods
1. Attach a threaded or welded stainless steel endplate on screen.
 2. Self closing valve installed at the bottom of the screen with a 1-foot thick cement plug above the valve.
- G. Perforated Casing:
1. Perforated Casing
 - a. Well casing may be perforated by the manufacturer or the Contractor.
 - b. Accurately position perforations.
 - c. Cut uniformly sized perforations.
 - d. Cut with power or hand tools.
 - e. Provided clean even cuts free of burrs.
 - f. Base the width of the perforations on the aquifer formation and gravel pack.
 - (1) Do not exceed 0.125 inch.
 - g. The location of the perforations approved by the Project Engineer.
 - h. Construct perforated casing in accordance with the plan detail drawing.

END OF SECTION

SECTION 33 21 13.1015

SUBMERSIBLE PUMPS

PART 1 GENERAL

A. SUMMARY

1. Section includes:
 - a. Installation of submersible pumps in individual water wells.
2. Related Requirements:
 - a. Section 01 33 00.0000 – Submittal Procedures.
 - b. Section 01 78 00.0000 – Closeout Submittals.
 - c. Section 01 78 36.0000 – Warranties.
 - d. Section 26 05 13.0001 - Medium Voltage Cables For Individual Water Systems.
 - e. Section 22 11 13.7418 - PVC Pipe and Fittings for Well Drop Pipes.
 - f. Section 33 11 13.2501 - Polyethylene Pipe and Fittings for Well Drop Pipes.

B. PRICE AND PAYMENT

1. Well Pump:
 - a. Measurement: each approved pump installed.
 - b. Payment: Shall be full compensation for:
 - 1) Provision and installation of materials including:
 - a) Submersible pump.
 - 2) Other work:
 - a) Disinfection.
 - b) Warranty.
 - c) Record drawings.

C. SUBMITTALS

1. Product DATA:
 - a. Submersible Pump data.

- 0) The Project Inspector will approve the pump size, voltage, and depth settings before installation.
2. Closeout Submittals:
 - a. Conform to Section 01 78 00.0000 – Closeout Submittals.
 - b. Provide a complete record of installation and maintenance instructions for each pump install.
 - c. Provide the manufacturer's warranty.
 - d. Provide a completed "Pump Data Report".

D. DELIVERY, STORAGE, AND HANDLING

1. Follow manufacturer's recommendations.

PART 2 PRODUCTS

A. MANUFACTURED UNITS

1. Manufacturers
 - a. Submersible Pumps:
 - 1) Franklin Electric, Corporate Headquarters, 400 E Spring St., Bluffton, IN 46714, Phone 260.824.2900, web site www.franklin-electric.com.
 - 2) Meyers, Water Systems, SSE, Residential Centrifugal - 293 Wright St. Delavan, WI 53115 • Phone 888.987.8677, web site www.femyers.com/products.
 - 3) Redjacket, Residential & Commercial Water, Red Jacket Water and Wastewater Products, phone 866. 325.4210, web site Www.redjacketwaterproducts.com.
 1. Goulds Pumps, 2881 E. Bayard St., Seneca Falls, NY 13148, phone 315.568.7133, web site www.goulds.com.
2. Substitution Limitations.
 - a. All manufacturers meeting these specifications will be given equal consideration.
3. Performance.
 - a. Provide a minimum of gpm with a discharge pressure of 50 psi at the total dynamic head of the system.
 - b. The Engineer will select the appropriate size pump for each well prior to installation based on the depth of the pumping level, the well capacity, and the pump curves submitted by the Contractor.
 - c. Provide most efficient pump to produce the required pumping capacity within the range of the total pumping head.
4. Materials:

- d. Pump motor:
 - 1) Heavy-duty.
 - 2) 4-wire.
 - 3) 230 volt.
 - 4) Single-phase.
 - 5) 60 cycle.
 - 6) Capacitor start and run.
 - 7) 4-inch diameter maximum.
 - 8) Stainless steel case.
 - 9) Stainless steel splined or hexagonal motor shaft.
 - 10) Built in check valve or installed on the pump discharge.
- e. Pump impellers:
 - 1) Stainless steel or high quality thermoplastic.
 - 2) Provide pump controls and 48-inch motor lead assembly.
 - 3) Pumps with brass or bronze components containing lead which may produce water lead levels anywhere within the well that exceed the maximum contaminant level for lead are not allowed.

PART 3 EXECUTION

A. INSTALLATION

- 1. The Project Inspector will approve the pump size, voltage, and depth settings before installation.

B. DISINFECTION

- 1. Disinfect the well, pump, and pressure system with a chlorine solution.
- 2. Prepare the chlorine solution before injection into the well.
- 3. Maintain a minimum concentration of 50 ppm of free residual chlorine in all parts of the well water system for at least 24 hours.
- 4. Dumping of granular HTH into the top of the well will not be allowed.

C. RECORD KEEPING

1. Maintain a notebook during the project showing the locations of all facilities installed under this contract.
 - a. Record shall include, but not be limited to the following:
 - b. The homeowner name and location.
 - c. The location of the water service line and electrical cable.
 - d. The material, length and size of water service line and UF cable.
 - e. The pump data report.

END OF SECTION

SECTION 33 21 13.1002
WELL ABANDONMENT

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes
- B. Related requirements:
 - 1. Section 01 33 00.0000 – Submittal Procedures.
 - 2. Section 01 77 00.0000 - Closeout Procedures.
 - 3. Section 01 78 00.0000 – Closeout Submittals.
 - 4. Section 33 21 13.1001 – Domestic Well Drilling.
 - 5. Section 33 21 13.1015 – Submersible Well Pumps.
 - 6. Section 33 21 13.1081 – Well Screens.
 - 7. Section 33 21 13.1084 – Well Gravel Pack.
 - 8. Section 33 21 13.1085 – Domestic Well Grout.
 - 9. Section 33 21 13.1085 – Domestic Well Development.
 - 10. Section 33 21 13.1085 – Domestic Well Test Pumping.
 - 11. Section 33 21 13.1085 – Domestic Well Disinfection.

1.02 MEASUREMENT AND PAYMENT

- A. Mobilization and demobilization
 - 1. Measurement: Lump sum for mobilization and demobilization.
 - 2. Payment: Shall be full compensation for:
 - a. Moving equipment and materials on site to abandon a test well, monitoring well, observation well, geotechnical well, or existing domestic or public water supply well.
- B. Well Abandonment
 - 1. Measurement: Vertical feet of well abandoned.
 - 2. Payment: Shall be full compensation for:
 - a. Earthwork including all:

- 1) Excavation.
- 2) Backfill.
- 3) Compaction.
- 4) Site restoration.

b. Demolition.

- 1) Removal of well house and appurtenances (if existing).
- 2) Removal of well house slab (if existing).
- 3) Removal of drop pipe, submersible cable, and pump.

c. Provision and installation of materials including:

- 1) Concrete
- 2) Bentonite Clay

d. Other work:

- 1) Well abandonment report.

1.03 REFERENCES

A. Reference Standards:

1. Use current standard.
2. Oklahoma Water Resources Board: Title 785, Chapter 35, Subchapter 7.
3. AWWA A100-6

1.04 CLOSEOUT SUBMITTALS

A. Conform to Section 01 78 00.0000 – Closeout Submittals.

B. Well abandonment report.

1.05 QUALITY ASSURANCE

A. Qualifications

1. Licensure to drill wells in the state of Oklahoma.

PART 2 PRODUCTS

2.01 MANUFACTURED UNITS

A. Materials

1. Cement grout.
 - a. Mix ratio of one 94 lb. sack of cement to a maximum of 6 U.S. gallons.
2. Bentonite pellets, granules, or high solids (20% by dry weight) bentonite grout.

PART 3 EXECUTION

3.01 PREPERATION

A. Demolition:

1. If an existing domestic or public water supply well is to be abandoned:
 - a. Demolish the well house and well house slab.
 - b. Remove the drop pipe, submersible cable, and pump.
 - c. Recycle the debris to the greatest extent possible.
 - d. Haul the remaining debris to a licensed land fill unless otherwise directed by the Project Inspector.

3.02 INSTALLATION

A. Monitoring wells, direct push monitoring wells, site assessment observation wells, and domestic and public water wells.

1. Abandon within 3 days after completion of use or immediately if drilled by:
 - a. An unlicensed person.
 - b. The ORWB determines the well does not meet the minimum construction standards.
2. Wells with uncontaminated soil or water:
 - a. Depth of well is 14 feet or less:
 - 1) Fill with cement grout from the bottom of the well to the land surface.
 - b. Depth of well is greater than 14 feet.
 - 1) Place material with a tremie pipe or pump.
 - 2) Fill from the bottom up to a depth of 4 feet below the ground surface.
 - a) Fill with cement grout.
 - b) Alternative:

- i. Fill from bottom to 14 feet below the ground surface with bentonite pellets, granules or high solids (20% minimum by dry weight) bentonite grout.
 - ii. Fill from 14 feet below the ground surface to 4 feet below the ground surface with cement grout.
- 3) Wells with Contaminated soil or contaminated ground water:
 - a) If the well screen is less than 20 feet below the ground surface:
 - i. Overdrill the well.
 - ii. Remove or drill out the casing with the same size or larger bit than was used to drill the original borehole.
 - iii. Drill out the casing and associated seals, annular space, and filter pack.
 - iv. Place cement grout from the bottom of the bore hole to 4 feet below the ground surface.
 - b) If the top of the well screen is deeper than 20 feet and the well meets current well construction standards:
 - i. The casing need not be removed.
 - ii. Place cement grout from the bottom of the bore hole to 4 feet below the ground surface.
 - c) Remove contaminated materials and dispose of them in an approved landfill.
 - d) Remove casing to a depth of 4 feet.
 - e) Backfill and compact with uncontaminated soil.

3.03 CLOSEOUT ACTIVITIES

- A. Conform to Section 01 78 00.0000 – Closeout Submittals.
- B. Provide the Project Officer with a copy of the OWRB approved well abandonment report.

END OF SECTION

33 21 13.1001

DOMESTIC WELL DRILLING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes
- B. Related requirements:
 - 1. Section 01 33 00.0000 – Submittal Procedures.
 - 2. Section 01 77 00.0000 - Closeout Procedures.
 - 3. Section 01 78 00.0000 – Closeout Submittals.
 - 4. Section 33 21 13.002 – Well Abandonment.
 - 5. Section 33 21 13.1015 – Submersible Well Pumps.
 - 6. Section 33 21 13.1081 – Well Screens.
 - 7. Section 33 21 13.1084 – Well Gravel Pack.
 - 8. Section 33 21 13.1085 – Domestic Well Grout.
 - 9. Section 33 21 13.1085 – Domestic Well Development.
 - 10. Section 33 21 13.1085 – Domestic Well Test Pumping.
 - 11. Section 33 21 13.1085 – Domestic Well Disinfection.

1.02 MEASUREMENT AND PAYMENT

- A. Mobilization and demobilization
 - 1. Measurement: Lump sum for mobilization and demobilization
 - 2. Payment: Shall be full compensation for:
 - a. Moving equipment and materials on site to commence drilling and removing equipment and excess materials from site at conclusion of successful drilling operations.
- B. Drilling for surface casing.
 - 1. Measurement: vertical feet of bore hole drilled for surfacing casing and annular space required for grouting.
 - 2. Payment: Shall be full compensation for:
 - a. All drilling operations and materials required to drill a bore hole of the diameter indicated on the bid schedule.

- 1) Materials include potable water, drilling mud or other drilling fluids.
 - b. Other work:
 - 1) Drilling log.
 - 2) Formation sampling.
- C. Drilling for permanent casing.
 1. Measurement: vertical feet of bore hole drilled for permanent well casing and annual space required for grouting, formation stabilizer, and gravel pack.
 2. Payment: Shall be full compensation for:
 - a. All drilling operations and materials required to drill a bore hole of the diameter indicated on the bid schedule.
 - 1) Materials include potable water, drilling mud or other drilling fluids.
 - b. Other work:
 - 1) Drilling log.
 - 2) Formation sampling.

1.03 REFERENCES

- A. Reference Standards:
 1. Use current standard.
 2. Oklahoma Water Resources Board: Title 785, Chapter 35, Subchapter 7.
 3. AWWA A100-6

1.04 SUBMITTALS

- A. Conform to Section 01 33 00.0000 – Submittal Procedures.
- B. Qualification Statements.
 1. Type of drilling equipment.
 2. Well drilling rig operator experience and license number

1.05 CLOSEOUT SUBMITTALS

- A. Conform to Section 01 78 00.0000 – Closeout Submittals.
 1. Well Log

1.06 QUALITY ASSURANCE

- A. Regulatory
 1. Conflicts With State Well Codes

- a. The materials and construction methods specified herein are minimum requirements. Where the appropriate state well codes require more stringent materials or execution methods, they shall apply.
 2. Notify the Project Officer of any planned deviation from these specifications before proceeding so any price changes or quantity adjustments may be made.
- B. Qualifications
1. Licensure:
 - a. Well drillers performing work within Oklahoma shall be licensed by the state of Oklahoma.
- B. DRILLING EQUIPMENT
1. The drilling may be accomplished by:
 - a. Air rotary drilling machine.
 - b. Combination air-mud rotary machine.
 2. Cable-tool or solely mud-rotary drilling machines are not allowed.
 3. In good repair.
 4. Capable of drilling to a depth of 500 feet.

PART 2 PRODUCTS

2.01 MATERIALS

- C. Drilling Fluid (Air-Mud Rotary Method)
1. Conform to standard accepted well drilling practice for water wells.

PART 3 EXECUTION

3.01 PREPERATION

- A. Minimum Location Standards:
1. Locate wells a minimum distance from possible pollution sources:
 - a. Possible pollution sources:
 - 1) Existing or proposed septic tanks.
 - 2) Sewer lines.
 - 3) Absorption fields or beds.
 - 4) Seepage pits.
 - 5) Building foundations.
 - 6) Waste pits.

- 7) Lagoons.
- 8) Oil or gas wells/
- 9) Landfills

2. Minimum Distances:

- a. 50 feet from a closed or tight sanitary sewer line.
- b. 25 feet from aerobic (above ground) sprinkler spray.
- c. 50 feet from aerobic sprinkler head.
- d. 300 feet from the outside perimeter of an existing or proposed waste lagoon from an animal feed lot.
- e. 100 feet from all other pollution sources if up gradient from the pollution source.
- f. 75 feet from all other pollution sources if level with the pollution source.
- g. 100 feet from all other pollution sources if the if down gradient from the pollution source.
- h. If the well is within 50 to 75 feet and located down gradient from the pollution source a twenty foot surface casing is required.
- i. If a structure, object or other situation is encountered and the driller is unsure if it may be a source of pollution:
 - 1) Contact Cherokee Nation staff.
 - 2) Obtain approval for the well location.

B. Surface Preparation.

C. Demolition.

3.02 INSTALLATION

A. Locate all existing underground utilities.

B. Permanently prevent contaminated water or water with undesirable physical or chemical characteristics from entering the well.

- 1. This includes water contaminants entering the well through the opening made by the Contractor during drilling operations or entering the stratum from which the well draws its water supply.
- 2. Take all necessary and practical precautions to prevent contaminating or polluting substances from entering the well either through the opening or by seepage through the ground surface.

C. All water used during well drilling and developing shall contain at least 50-ppm chlorine.

- D. All drill pipes, bits, and any other drilling equipment used down-hole shall be washed with water containing at least 100-ppm chlorine before drilling operations begin.
- E. Drill and case wells of the type and size specified in the bid schedule.
- F. Locate wells as shown on the plans or staked by the Project Inspector.
- G. Drill wells to the depth specified, unless otherwise approved by the Project Inspector.
 - 1. If satisfactory yield is obtained at a lesser depth, terminate drilling and develop at that depth.

1.02 SAMPLING OF FORMATIONS

A. General

- 1. Do not wash samples.
- 2. Keep samples in cloth bags.
- 3. Tag each bag with the well location, depth of sample, type of sample, and date collected.
- 4. Provide Project Inspector with samples as the drilling progresses.
- 5. If directed by the Project Inspector, collect and lay out samples of each stratum encountered during drilling for inspection and verification of the well log.
- 6. Sampling is required when a well screen installation is anticipated.
- 7. Take a representative sample of the aquifer of sufficient volume to be analyzed.
- 8. The manufacturer of the well screen to mechanically analysis the sample to determine the required slot size of the well screen.
- 9. The driller may analysis the sample with the approval of the Project Officer.

1.03 DRILLING

- 1. Drill the annular opening at least 3 inches wider than the outside diameter of the casing to accommodate the sanitary grout seal and/or formation stabilizer.
- 2. Depth of annular space:

- a. From the ground surface a depth of 10 feet, unless additional depth is necessary due to the character of the formation or type of aquifer(s).
 - 1) Project Inspector to approve, in advance, any additional depth.
 - 3. Drill any uncased portions of the well as large as can be reasonably drilled through the steel casing but no less than the diameter needed to install a 4-inch submersible pump.
- B. Test Wells
- 1. Drill 4-inch to 5-inch diameter hole. If sufficient yield is found, ream the test well to the required diameter including annular space.

3.03 FIELD QUALITY CONTROL

- A. WELL LOG
- B. Keep daily log of each hole drilled.
 - 1. Include all items required by the State.
- C. File an official construction report; using state approved form, with the designated state agency within 30 days from when well is completed.
 - 1. Submit a copy to the Project Engineer.
- D. Non-Conforming Work.
 - 1. Unaccepted drilled wells.
 - a. Drilled wells will not be accepted due to insufficient capacity, unsatisfactory chemical or bacteriological quality, poor alignment, and loss of tools or any other cause.
 - b. Obtain Project Engineer's approval prior to abandoning wells.
 - 2. Well abandonment shall be in accordance with Section 33 21 13.002 – Well Abandonment.

3.04 CLOSEOUT ACTIVITIES

- A. Submit well log to the Project Officer and OWRB.

END OF SECTION

SECTION 01 78 36.0000
WARRANTIES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Preparation and submittal.
 - 2. Time and schedule of submittals.
- B. Related Requirements:
 - 1. Section 01 78 00.0000 - Closeout Submittals.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.01 PREPARATION OF SUBMITTALS

- A. Obtain warranties executed in duplicate by responsible subcontractors, suppliers, and manufacturers, within ten business days after completion of the applicable item or work.
- B. Unless otherwise approved, Warranty date is the Date of Substantial Completion.
- C. Verify that documents contain full information required.
- D. Specifically identify the warranty expiration date for each submittal. Retain warranties for the time specified for that submittal.
- E. Submit under provisions of Section 01 78 00 - Closeout Submittals.

3.02 TIME OF SUBMITTAL

- A. For equipment or component parts of equipment put into service during construction submit documents within ten business days after installation and approval by the Project Engineer.
- B. Submit other documents within ten business days after Date of Substantial Completion and prior to final Application for Payment.

- C. For items of work when acceptance is delayed beyond Date of Substantial Completion, submit within ten business days after acceptance, listing the date of acceptance as the beginning of the warranty period.

END OF SECTION

SECTION 01 78 23.0000
OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.01 SUMMARY

A. Section includes:

1. Form of Submittals
2. Preparation and submittal
3. Time and schedule of submittals

B. RELATED Requirements

1. Section 01 78 00.0000 – Closeout Submittals

PART 2 PRODUCTS

2.01 OPERATION AND MAINTENANCE MANUAL

A. Provide:

1. System treatment requirements
2. Description of the operation and control of the water treatment plant
3. Control of unit process.
4. Laboratory testing.
5. Common operating problems.
6. Start-up testing and procedures.
7. Standard operating procedures.
8. Alternative and emergency operations.
9. Emergency shutdown operations and emergency response.
10. Records control and retention.
11. Safety.
12. Public water supply system maintenance records.
13. Stormroom and inventory system.

14. Utilities.

PART 3 EXECUTION

3.01 PREPARATION OF SUBMITTALS

- A. Submit all operation and maintenance information as included in the packaging from the manufacturer regarding the materials installed.
- B. Additional project specific operation and maintenance requirements are listed in individual sections.
- C. Verify that documents contain full information.
- D. Submit under provisions of Section 01 78 00 – Closeout Submittals.

3.02 TIME OF SUBMITTALS

- A. Submit within ten business days after Date of Substantial Completion and prior to final Application for Payment.

END OF SECTION

**SECTION 01 78 00.0000
CLOSEOUT SUBMITTALS**

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. The requirements for closeout submittals including:
 - a. Record drawings (as-builts)
 - b. Warranty information
 - c. General operation and maintenance information (if applicable)
- B. Related Requirements:
 - 1. Section 01 33 00.0000 – Submittal Procedures.
 - 2. Section 01 43 00.0000 - Quality Assurance.
 - 3. Section 01 77 00.0000 – Closeout Procedures.
 - 4. Section 01 78 23.0000 – Operation and Maintenance Data.
 - 5. Section 01 78 36.0000 – Warranties.

1.02 DELIVERY

- A. Provide all closeout submittals meeting this specification and specific requirements of each section.
 - 1. Closeout submittals must be received in required form.
 - 2. Closeout submittals must be received before final payment can be made.

1.03 DEFINITIONS

- A. Record Drawing's drawing showing:
 - 1. The actual installation of facilities.
 - 2. Changes from the plans with enough detail so that the facility can readily be located.
- B. Ties: Measurements from permanent easily located objects to an installed object.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.01 RECORD DOCUMENTATION

- A. Provide record data in the following manner:
 - 1. Provide Test Pump Data Sheet.
 - 2. Provide OWRB Well Record Form.
- B. Provide installed bid schedule items quantities for individual facilities on 8½ X 11 sheets.
 - 1. Project Inspector may supply standard OEH forms for use by the Contractor.

3.02 WARRANTIES

- A. Submit all applicable warranty information regarding the materials installed in conformance with Section 01 78 36.0000 – Warranties.
- B. Minimum warranty information is listed in Section 01 43 00 - Quality Assurance.

3.03 OPERATION AND MAINTENANCE INFORMATION

- A. Submit all operation and maintenance information included in the manufacturer's packaging regarding the materials installed.
- B. Submit any additional Contract specific operation and maintenance requirements are listed in Section 01 78 23.0000 – Operation and Maintenance Data.

END OF SECTION

**SECTION 01 77 00.0000
CLOSEOUT PROCEDURES**

PART 1 GENERAL

1.01 SUMMARY

A. Section includes information on closeout procedures and site cleanup.

B. RELATED REQUIREMENTS

1. Section 01 78 00.0000 – Closeout Submittals.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Submit, to the Project Inspector, written certification that work is complete and ready for Final Inspection.

B. Provide warranties and record documents (e.g. as-built drawings) to Project Inspector within ten business days after date of first beneficial use or at the Final Inspection, which ever occurs first.

C. Final Inspection:

1. The Project Inspector will schedule the Final Inspection at a day and time convenient to all parties.
2. Conduct the Final Inspection in the presence of the Owner, the Project Inspector, Prime Contractor, and any other parties with an interest in the completed project.
3. Include all facilities installed under the Contract.

1.03 SITE CONDITIONS

A. Complete clean up before the Final Inspection.

B. Remove waste and erosion control devices, surplus materials, rubbish, and construction facilities from the site.

C. Punch List:

1. The Project Inspector will provide a letter (punch list) to the Contractor listing the deficiencies noted during the Final Inspection
2. Correct the deficiencies in conformance with the specifications and Contract Drawings.
3. Final payment will be withheld until all deficiencies are corrected.

END OF SECTION

SECTION 01 43 00.0000
QUALITY ASSURANCE

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Pre-requisites and procedures to assure the quality of construction.
- B. Related Requirements:
 - 1. Section 01 78 36.0000 – Warranties.

1.02 QUALITY ASSURANCE

- A. Perform work under the direction of personnel licensed in the state in which construction is located and where licensing of the trade is regulated by the state including, but not limited to:
 - 1. Plumbing.
 - 2. Well drilling.
 - 3. Septic system installation.
 - 4. HVAC.
 - 5. Rock blasting.
 - 6. Electrical work.
- B. Control Of Installation
 - 1. Perform work in accordance with the specifications.
 - 2. Comply fully with manufacturers' instructions.
- C. If manufacturers' instructions conflict with contract documents, request clarification from Project Officer before proceeding.
- D. Correct defective work to conform to the applicable specification.
- E. Manufacturer's Field Services:
 - 1. Provide reports of observations and documentation of workmanship to the Project Officer within 30 calendar days after manufacturers' field services are provided.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Inspect materials for acceptability when delivered to the site.
- B. Store and handle materials to prevent damage.

1.04 WARRANTY

- A. Provide a minimum one-year warranty for all materials and labor, covering defects in the materials or deficiencies resulting from contractor installation.
- B. Provide additional warranties as required by other sections.

END OF SECTION