

**CHEROKEE NATION
INDIVIDUAL ON-SITE SEWAGE TREATMENT SYSTEMS /
INDIVIDUAL WATER SERVICE LINES
SPECIFICATIONS**

- 01330 Submittal Procedure
- 01430 Quality Assurance
- 01770 Closeout Procedures
- 01780 Closeout Submittals
- 01781 Warranties
- 01785 Operation and Maintenance Manuals
- 02310 Grading
- 02315 Excavation, Trench and Backfill
- 02316 Rock Excavation
- 02511 Water Service
- 02531 Sanitary Sewer Service Lines
- 02532 Sewer Manholes
- 02535 Individual Grinder Pump Station
- 02543 Chambered Absorption Fields
- 02545 Septic Tanks
- 02548 Aerobic Wastewater
- 02920 Topsoiling, Seeding and Fertilizing
- 09312 Conductive Trace Wire

**CHEROKEE NATION
ON-SITE SEWAGE TREATMENT SYSTEMS
SECTION 01330
SUBMITTAL PROCEDURE**

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes submittal procedures

1.02 RELATED SECTIONS

- A. Section 017800 – Closeout Submittals Procedures

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 three copies of each submittal to the Project Inspector.
- 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. Dimensional or shop drawings
 - 4. 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

**CHEROKEE NATION
ON-SITE SEWAGE TREATMENT SYSTEMS
SECTION 01430
QUALITY ASSURANCE**

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Pre-requisites and procedures to assure the quality of construction.

1.02 RELATED SECTIONS

A. Section 01781 – Warranties

1.03 INSTALLER QUALIFICATIONS

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. Septic system installation
3. Rock blasting
4. Electrical work

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION

3.01 CONTROL OF INSTALLATION

- A. Inspect materials for acceptability when delivered to the site.
- B. Store and handle materials to prevent damage.
- C. Perform work in accordance with the specifications.
- D. Comply fully with manufacturers' instructions.
- E. If manufacturers' instructions conflict with contract documents, request clarification from Project Inspector before proceeding.

F. Correct defective work to conform to the applicable specification.

3.02 MANUFACTURER'S FIELD SERVICES

A. Provide reports of observations and documentation of workmanship to the Project Inspector within 30 calendar days after manufacturers' field services are provided.

3.03 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. (SEE OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY (ODEQ) REGULATION 252:641-10-3).

END OF SECTION

**CHEROKEE NATION
ON-SITE SEWAGE TREATMENT SYSTEMS
SECTION 01770
CLOSEOUT PROCEDURES**

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes Information on closeout procedures and site cleanup.

1.01 RELATED SECTIONS

- A. Section 01330 – Submittals

1.02 CLOSEOUT PROCEDURES

- 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.

1.03 FINAL CLEANING

- A. Complete clean up before the Final Inspection.
- B. Remove waste and erosions control devices, surplus materials, rubbish, and construction facilities from the site.
- C. Payment will be held until site is adequately cleaned and dressed as determined by Inspector or Project Manager.

1.04 FINAL INSPECTION

- A. The Project Inspector will schedule the Final Inspection at a day and time convenient to all parties.
- B. Conduct the Final Inspection of the facilities in the presence of the Owner, the Project Inspector, Prime Contractor, and any other parties with an interest in the completed project.
- C. Final Inspection shall include all facilities installed under the Contract.

1.05 PUNCH LIST

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

END OF SECTION

**CHEROKEE NATION
ON-SITE SEWAGE TREATMENT SYSTEMS
SECTION 01780
CLOSEOUT SUBMITTALS**

PART 1 - GENERAL

1.01 SUMMARY

- A. This section describes the requirements for closeout submittals including, record drawings, warranties and general operation and maintenance information.

1.02 RELATED WORK

- A. Section 01770 – Closeout Procedures
- B. Section 01785 – Operation and Maintenance Manuals

1.03 DELIVERY

- A. Provide all closeout submittals meeting these requirements and any specific requirements of each section.
- B. Closeout Submittals must be received before payment is requested for the work that the drawings describe or illustrate.
- C. All closeout submittals must be received in a correct and complete manner before final payment can be made. If material is deficient, the deficiencies will be indicated in punch lists (Section 01770).

1.04 DEFINITIONS

- A. Record Drawing: A drawing showing the actual installation of facilities, showing changes from the plans, and showing detail enough that future persons can readily locate all objects.
- B. Ties: Measurements from permanent easily located objects to an installed object.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.01 RECORD DRAWINGS

- A. Provide record data in one of the following manners:
 - 1. On a set of project drawings, neatly draw tie measurements and changes.
 - 2. On separate 8½ X 11 sheets, neatly draw site sketches, structure sketches, etc., indicating the necessary information.
- B. Provide three (3) swing tie measurements to all buried utility objects that may need to be located in the future, including, but not limited to:
 - 1. Gate valves
 - 2. Corporation stops
 - 3. Curb stops
 - 4. Water main fittings
 - 5. Couplings to existing water systems.
 - 6. Cleanouts
 - 7. Sewer wyes.
 - 8. Utility crossings.
 - 9. Septic tank manholes and access covers.
 - 10. Corners of drainfields
- C. Provide offset measurements for buried utilities (e.g. water main) installed parallel to roads.
- D. Provide as-built elevation data for all items that have elevations shown on the plan drawings, including, but not limited to, the following:
 - 1. Manhole inverts (inlet and outlet)
 - 2. Manhole rims
 - 3. Lift station invert
 - 4. Lift station top
 - 5. Lift station pipe penetrations
 - 6. Float elevations
 - 7. Septic tank elevations
 - 8. Elevations of pipe entering and leaving structures
 - 9. Other elevations indicated on profiles.
- E. Provide installed bid schedule items quantities for individual facilities on 8½ X 11 sheets.

1. Project Engineer may supply standard DEQ forms for use by the contractor.

3.02 WARRANTIES

- A. Submit all warranty information regarding the materials installed.

3.03 OPERATION AND MAINTENANCE INFORMATION

- 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 Section 01785.

END OF SECTION

**CHEROKEE NATION
ON-SITE SEWAGE TREATMENT SYSTEMS
SECTION 01781
WARRANTIES**

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Preparation and submittal
 - 2. Time and schedule of submittals

1.02 RELATED SPECIFICATION

- A. Section 01330 - Submittals
- B. Section 01770 – Closeout Procedures
- C. Section 01780 – 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 01780 – 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

**CHEROKEE NATION
ON-SITE SEWAGE TREATMENT SYSTEMS
SECTION 01785
OPERATION AND MAINTENANCE MANUALS**

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Form of Submittals.
 - 2. Preparation and submittal.
 - 3. Time and schedule of submittals.

1.01 RELATED SPECIFICATION

- A. Section 01330 - Submittals
- B. Section 01780 – Closeout Submittals

PART 2 - PRODUCTS (Not Applicable)

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 01780 – 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

**CHEROKEE NATION
ON-SITE SEWAGE TREATMENT SYSTEMS
SECTION 02310
GRADING**

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Rough and finished site grading of areas disturbed during construction.

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION

3.01 ROUGH GRADING

- A. Grade site to prevent surface water from flowing into excavations and trenches.
- B. Maintain existing drainage.
- C. Remove any water accumulated in the excavation by pumping or other approved method.
- D. If sub-grade is altered, restore to its proper bearing capacity at Contractor's expense.

3.02 FINISH GRADING

- A. Grade after all structures and piping are installed.
- B. Grade site to true grades as shown on the plans.
- C. Ensure that drainage is away from structures.
- D. Dress and trim all slopes for a uniform and smooth appearance.

END OF SECTION

**CHEROKEE NATION
ON-SITE SEWAGE TREATMENT SYSTEMS
SECTION 02315
EXCAVATION, TRENCHING AND BACKFILL**

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Excavation, trenching, and backfill necessary for the construction of the facilities as indicated on the plans including, but not limited to water mains and service lines, sewer mains and service lines, concrete manholes, septic tanks, and other structures.

1.02 REFERENCES

- A. Reference latest manual revision or ASTM standard.
- B. Manual on Uniform Traffic Control Devices.
- C. ASTM D698 – Test Method for Laboratory Compaction Characteristic of Soil Using Standard Effort.
- D. ASTM D1556 – Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
- E. ASTM D1557 – Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.
- F. ASTM D2922 – Test Method for Density of Soil and Soil Aggregate in Place by Nuclear Methods.
- G. ASTM D2487 – Classification of Soils for Engineering.
- H. ASTM D3017 – Test Method for Water Content of Soil and Rock in Place by Nuclear Methods.

1.03 SUBMITTALS (if required)

- A. Barricades and lights
- B. Shoring
- C. Imported bedding material

1.04 DEFINITIONS

- A. Soil Materials as summarized in the following table and defined in ASTM D2321 and ASTM D2487.

Description and Comparison of Soil Material Classifications			
ASTM D2321		ASTM D2487	
Class	Type	USCS Group Symbol	Description
IA	Manufactured aggregates: ¼ to 1 ½ inch open graded, clean.	* None	Closest to “Poorly graded gravel (GP)”
IB	Manufactured aggregates: ¼ to 1 ½ inch dense graded, clean.	* None	Closest to “Poorly graded gravel with sand (GP)”
II	Coarse sands and gravels with maximum particle size of 1 ½ inch clean.	GW	Well-graded gravels and gravel-sand mixtures; little or no fines.
		GP	Poorly graded gravels and gravel sand mixtures little or no fines.
		SW	Well-graded sands and gravelly sands; little or no fines.
		SP	Poorly graded sands and gravelly sands; little or no fines
	Coarse sands and gravels with maximum particle size of 1 ½ inch, borderline clean.	GW-GC SP-SM Etc.	Sands and gravels which are borderline between clean and with fines
III	Fine sand and clayey gravels.	GM	Silty gravels, gravel-sand-silt mixtures.
		GC	Clayey gravels, gravel-sand-clay mixtures
		SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
IV	Fine grained soils (inorganic)	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, silts with slight plasticity
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		CH	Inorganic clays of high plasticity, fat clays.
V	Organic soils	OL	Organic silts and organic silty clays of low plasticity
		OH	Organic clays of medium to high plasticity, organic silts

	PT	Peat and other high organic soils
* USCS system is limited to naturally occurring soils. Manufactured aggregates not covered.		

PART 2 - PRODUCTS

2.01 BEDDING, HAUNCHING AND INITIAL BACKFILL MATERIAL

- A. Class I, Class II or Class III, utilized in accordance with restrictions described in Part 3 - Execution.

PART 3 - EXECUTION

3.01 GENERAL

- A. Conform to recommended safety standards, identified, but not limited to, OSHA 1910 and 1926.
- B. No workers may enter any trench or excavation without the prior approval of the Competent Person on site.
- C. Obtain all permits from appropriate road agency for construction within road right of way.
- D. Repair damage resulting from settlement, slides, cave-ins, water pressure, and other causes.
- E. Provide adequate signs, barricades, fences, and amber lights and take all necessary precautions to protect the work and the safety of the public in all construction areas.
 - 1. Placement of construction signs and barricades shall conform to the “Manual on Uniform Traffic Control Devices.”
 - 2. Protect barricades and obstructions at night by amber signal lights that burn from sunset to sunrise.
 - 3. Barricades
 - a. White or with reflective paint to increase their visibility at night.
 - b. Commercial grade.
 - 4. Minimize obstruction to traffic and inconvenience to the public and residents near the work.
- F. Road, Driveway, and Sidewalk Crossing:

1. Comply with all construction and material requirements of roadway authorities having jurisdiction.
2. Maintain one open lane of traffic at all times.

3.02 PREPARATION

A. Layout and Staking:

1. Lines and building location sites established and staked by the Project Officer.
2. Notify the Project Inspector at least three business days in advance of the times and places that stakes and benchmarks will be required.
3. Preserve stakes and benchmarks when set. Re-staking for disturbed or displaced stakes shall be at the Contractor's expense.

B. Close no road or street without permission of the proper authority.

C. Keep fire hydrants accessible.

D. Insure that gutters, sewer inlets, drainage, and irrigation ditches are kept functional.

3.03 PROTECTION OF EXCAVATION

A. Provide suitable sheathing, shoring, and/or bracing to:

1. Prevent excavation from caving.
2. Provide safe working conditions to protect workers and property.

B. Repair damage resulting from settlement, slides, cave-ins, and water infiltration at Contractor's expense.

3.04 GENERAL EXCAVATION

A. Excavate by open cut method unless otherwise approved by the Project Inspector or as required by applicable encroachment permits.

B. Remove trees and stumps from excavation and site according to Section 02230 – Clearing and Grubbing.

C. Remove and stockpile existing topsoil and suitable backfill.

D. Dispose of unsuitable backfill at the location shown in the Drawings or as approved by the Project Inspector.

- E. Dispose of excess material, including rock, broken concrete and bituminous materials, debris, at the location shown in the Drawings or as approved by the Project Inspector.

3.05 PIPE LINE EXCAVATION

- A. Install facilities as staked unless otherwise approved by Project Inspector.
- B. Maintain surface drainage away from trenching or excavation.

3.06 STRUCTURE EXCAVATION

- A. Install facilities as staked unless otherwise approved by Project Inspector.
- B. Maintain surface drainage away from excavation.
- C. Maintain a minimum 1-foot clearance between outer surface of structure being installed and wall of excavation unless concrete for walls, floors, and footings are authorized to be placed directly against excavated surfaces.
- D. Restore unauthorized over excavation at Contractor's expense.
 - 1. Restore to proper elevation by filling with approved granular bedding material.
- E. Conform to paragraph 3.08 for backfill around structures unless requirements that are more stringent are indicated in other sections of the specifications.
- F. Compact in 12-inch, loose measure lifts, to a density not less than the density of the surrounding undisturbed soil unless more stringent requirements are indicated in other sections of the specifications.

3.07 TRENCHING

- A. Bottom width: No less than 12 inches or more than 24 inches wider than the outside diameter of the pipe.
- B. Remove large stones, ledge rock, and boulders to provide a 4-inch minimum clearance for all pipe.
- C. Keep walls as nearly vertical as soil conditions permit below the top of pipe.
- D. Trench width above pipe may be as wide as required for shoring and sheeting, and proper installation of work.
- E. Ensure trench is on proper alignment and center pipe within the trench.

- F. Depth: Provide minimum cover identified in the specifications, or to depths shown on plans.
- G. Accurately shape bottom of trench to provide uniform bearing and support for pipe.
- H. Excavate bell holes and depressions for joints after bottom of trench is graded.
 - 1. Excavate bell holes and depressions to the minimum length, depth, and width required to make the particular joint.

3.08 BEDDING

- A. If existing soil cannot provide uniform, stable bearing support, over-excavate 4 inches below bottom of pipe or structure.
- B. Embedment and the backfill up to 6 inches above the pipe crown shall be done in the presence of the Project Officer or his/her representative.
 - 1. Violation of this provision will require the removal and replacement of the backfill at Contractor's expense, even if backfill was correctly placed and compacted.
- C. Compact in lifts not to exceed 6 inches in loose measure.
- D. Utilize Class I, II, or III materials as appropriate for bedding as listed in the following table.

Use of Soils and Aggregate for Bedding				
	Class IA	Class IB	Class II	Class III
General	Excellent pipe support. Excellent drainage.	Excellent pipe support. Good drainage. Minimizes migration of adjacent material.	Good pipe support. Fair drainage.	Reasonable pipe support. Poor drainage
Compaction	Not required	Not required	Required 85% of Standard Proctor.	Required 90% of Standard Proctor.
Wet Conditions (below current or future water table). Rock Cuts	Acceptable. Must use same material for Haunching.	Acceptable. Must use same material for Haunching.	Acceptable. Clean groups only suitable for drainage blanket.	Not- Acceptable
Dry Conditions	Acceptable	Acceptable	Acceptable	Acceptable

3.09 HAUNCHING AND INITIAL BACKFILL

A. General

1. Provide imported backfill if native soil is unsuitable for haunching and initial backfill.
 - a. Unsuitable native soil is defined as solid or loose rock, dry or frozen lumps greater than ¾ inches in diameter (in any dimension), or containing organic material, or any other material that could damage the pipe.
2. Provide complete and uniform bearing and support for the pipe, including allowance for bell holes, or structure.
3. Work material under and around the pipe to ensure full pipe support.
4. Hand-tamp to prevent movement of the pipe during placement of material.
5. Compact in lifts not to exceed 6 inches in loose measure.
6. Avoid contact between the pipe and compaction equipment.

B. Utilize Class I, II, or III materials as appropriate for haunching and initial backfill as listed in the following table. No frozen materials or frozen clods will be permitted.

Use of Soils and Aggregate for Haunching and Initial Backfill				
	Class IA	Class IB	Class II	Class III
General	Excellent pipe support. Excellent drainage. Install to a minimum of 6" above the pipe crown.	Excellent pipe support. Good drainage. Minimizes migration of adjacent material. Install to a minimum of 6" above the pipe crown.	Good pipe support. Fair drainage. Install and compact to a minimum of 6" above the pipe crown.	Reasonable pipe support. Poor drainage. Install and compact to a minimum of 6" above the pipe crown.
Compaction	Not required	Not required	Required 85% of Standard Proctor. 6-inch maximum lifts.	Required 90% of Standard Proctor. 6-inch maximum lifts.
Wet Conditions (below current or future water table). Rock Cuts	Acceptable. Must use same material for Bedding. Extend Haunching to the top crown of the	Acceptable. Must use same material for Bedding. Extend Haunching to the top crown of the pipe.	Acceptable. Clean groups only suitable for drainage.	Not- Acceptable

	pipe.			
Dry Conditions	Acceptable	Acceptable	Acceptable	Acceptable

3.10 FINAL BACKFILL

- A. Provide imported backfill if native soil is unsuitable for final backfill.
 - 1. Unsuitable native soil is defined as solid or loose rock, dry or frozen lumps greater than 6 inches in diameter (in any dimension) or containing organic material, or any other material that could damage the pipe.
- B. Backfill remainder of excavation with native material, free from large clods, large stones, organic material or frost chunks.
- C. Compact in 12-inch, loose measure, lifts to a density not less than the density of the surrounding undisturbed soil.
 - 1. Provide 3 feet minimum of backfill over the pipe before wheel loading the trench.
 - 2. Wheel roll and mound except as otherwise required by the applicable roadway authority or permits.
- D. Backfill and compact around manholes, valve boxes, and other appurtenances in 12-inch, loose measure lifts.
 - 1. Compact with a mechanical tamper to a density not less than 90% of the maximum dry density, determined by ASTM D 698.
- E. Backfill around septic tanks in 18-inch lifts.
 - 1. Compact in a manner that will not produce undue strain on the tank.
 - 2. Compaction may be accomplished with the use of water, provided the material is thoroughly wetted from the bottom up, and the tank is filled with water to prevent floating.
- F. Repair any trenches improperly backfilled or where settlement occurs, then refill and compact.
- G. Restore surface to the required grade and compaction. Conform to Section 02310 – Grading.
- H. Remove all surplus backfill materials to the location shown in the Drawings or as approved by the Project Inspector.

3.11 REMOVAL OF NUISANCE WATER

- A. Remove nuisance water entering the trenches. Nuisance water that can be removed through the use of sump or trash pumps is not considered dewatering.
- B. Keep trenches free from water until the facilities are in place, sealed against the entrance of water, and backfill has been placed and compacted above the water level.

3.12 LOCATE EXISTING UTILITIES

- A. Field locate all existing underground utilities.
 - 1. Utilize state “dig-safe,” “OKIE” or “one-call” hotlines.
 - 2. Contact all other utility owners not covered by the state “dig safe” hotlines.

3.13 UTILITY CONFLICTS

- A. Protect existing utilities from damage during excavation and backfilling operations.
- B. Provide temporary support for existing water, gas, telephone, power, or other utility services that cross the trench, until backfilling operations have reached the elevation of the utility being crossed.
 - 1. Compact backfill to 95% of Standard Proctor Density under disturbed utilities.
 - 2. Repair or replace any damaged existing utilities at Contractor’s expense.
- C. Pipe separation.
 - 1. Horizontal Separation from existing or proposed mains:
 - a. Maintain a 10-foot horizontal separation (O.D. to O.D.) for the following:
 - (1) Water mains
 - (2) Sewer mains
 - (3) Storm sewers
 - (4) Raw water lines
 - (5) Oil and gas lines
 - (6) Buried electric cables
 - b. Maintain a 15-foot horizontal separation for the following:
 - (1) All parts of septic tanks
 - (2) Absorption fields
 - (3) Any other sewage treatment and disposal systems.
 - c. Maintain a 50-foot horizontal separation from any gas storage tank.

- d. Any deviation must be approved in advance by the Project Officer and permitting authority.

2. Vertical Separation

- a. Vertical crossing with the water main above the sewer main:
 - (1) Maintain a minimum 24-inch vertical separation (O.D. to O.D.) for crossing mains.
 - (2) Lay pipe with joints equidistant from the point of crossing.
- b. Vertical crossing with the water main below the sewer main.
 - (1) Maintain a minimum 24-inch vertical separation (O.D. to O.D.) for crossing mains.
 - (2) No sewer line joint closer than 9 feet from the water line.
 - (3) Provide adequate support to prevent damage to the water main.
- c. If it is impossible to meet any of the above separation distances and deviations, the following method shall be adhered to:
 - (1) Sewer main shall be constructed to water main pressure pipe standards, and successfully pass a 150-psi pressure test prior to backfilling.

D. Water and sewer service crossing and parallel installation.

- 1. Maintain a 30-inch horizontal separation from water and sewer services.
- 2. Maintain a 12-inch vertical separation for crossing water and sewer services.
- 3. Water service line splices or joints will not be permitted within 10 feet of a sewer line crossing.

3.14 MOVING FENCES AND MINOR STRUCTURES

- A. Remove and reset culverts, drainage pipes, or other minor structures that fall within the alignment of the new construction. Restore to their original location and grade.
- B. Visit the project site and determine actual conditions with regard to the existence of old car bodies, abandoned houses, fences, driveways, trees, stumps, brush, sidewalks, approaches, and other miscellaneous obstacles to construction.

1. No separate payment will be made for the removal or replacement of these items.

END OF SECTION

**CHEROKEE NATION
ON-SITE SEWAGE TREATMENT SYSTEMS
SECTION 02316
ROCK EXCAVATION**

PART 1 - GENERAL

1.01 SUMMARY

- A. This section pertains to the rock excavation necessary for the construction of the facilities as indicated on the plans including:

1.02 RELATED WORK

- A. Section 01330 – Submittal Procedures
- B. Section 02315 – Excavation, Trenching and Backfill

1.03 SUBMITTALS

- A. Contractors blasting license and/ or blasting permit (if applicable).

1.04 DEFINITION

- A. Solid Rock
 - 1. Large masses of rock which, in the opinion of the Project Inspector, cannot be excavated without drilling, blasting, ripping equipment or other specialized equipment.
- B. Loose Rock
 - 1. Boulders and other detached stones each having a volume of 1-cubic yard or more.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.01 METHODS OF EXCAVATION

- A. Rock excavation may be accomplished by any or all of the following methods depending on the rock type:
 - 1. Excavation with earthmoving equipment including ripping with a dozer.
 - 2. Jack-hammering

3. Blasting

3.02 RESPONSIBILITIES

- A. Comply with laws, ordinances, applicable safety code requirements, and regulations relative to the handling, storage, and use of explosives.
- B. Current Oklahoma blasting license required.
- C. Secure necessary permits and submit to Project Inspector.
- D. Protect adjacent utilities lines, property, and structures from blasting operation.
- E. Repair damage caused by rock excavation operations.
- F. Remove excavated rock from site unless otherwise directed by the Project Engineer.

3.03 ROCK MEASUREMENT

- A. Determine rock profile by one of three methods:
 - 1. Excavating and exposing the rock, prior to blasting.
 - 2. Drilling prior to excavating and blasting.
 - 3. Blasting and excavating, then measuring rock. Note: 20% reduction in rock volume shall be factored in to account for expansion.
 - 4. Measure solid rock to the nearest 0.1 foot from the surface and no less than every ten feet along the rock profile.
- B. Trenches
 - 1. Take measurements from the top of the rock to a point 6 inches below the invert of the pipe and 12 inches from each side of the pipe or appurtenance with a maximum 30-inch trench width allowed.
- C. Structures
 - 1. Take measurements starting at 24 inches from the edge of the structure.
 - 2. Measure quantity of loose rock in cubic yards.

3.04 EXCAVATION AND JACK-HAMMERING

- A. Excavate a minimum 4 inches deeper than the pipe invert.
- B. Refill trench to the required elevation with material in accordance with Section 02315
– Excavation, Trenching, and Backfill.

3.05 BLASTING

- A. Blast in accordance with OSHA guidelines.
- B. Comply with conditions of blasting permit.

END OF SECTION

**CHEROKEE NATION
WATERLINE CONSTRUCTION SPECIFICATIONS
SECTION 02511
WATER SERVICE LINES**

PART 1 - GENERAL

1.01 SUMMARY

- A. This section includes the installation of water service lines complete with corporation stops, water meters, water meter boxes, yard hydrants and other appurtenances for community water service connections systems.

1.02 RELATED WORK

- A. Section 01339 – Submittal Procedures
- B. Section 02315 – Excavation, Trenching and Backfill
- C. Section 02920 – Topsoiling, Seeding, Fertilizing, and Mulch

1.03 REFERENCES

- A. AWWA C901 – Polyethylene (PE) Pressure Pipe and Tubing, 1/2 Inch through 3 Inch, For Water Service.

1.04 SUBMITTALS

- A. Submit in accordance with Section 01330 – Submittal Procedures
- B. Water Service Line
- C. Fittings
- D. Corporation Stops
- E. Saddles, Tees or Tapped Couplings
- F. Water meters and Boxes
- G. Freezeless Yard Hydrant

PART 2 - PRODUCTS

2.01 WATER SERVICE LINE AND APPURTENANCES

- A. Polyethylene Pipe
 - 1. IPS or CTS size pipe with a minimum pressure rating of 160 psi. Pipe shall conform to AWWA C901.
 - 2. CTS size pipe: DR 9 or DR 7.

3. PS size pipe: IDR 7.
4. High density, ultra high molecular weight polyethylene pipe compound PE-3408 or 3406.
5. Stainless steel stiffeners on compression couplings made for DR 9 pipe.
6. Equal to Dripscope Ultra-Line water service pipe or Excel.

B. Saddles

1. PVC ASTM D2241 Pipe: Stainless steel double bolt saddle clamps equal to Cascade style CSC2 or Ford style FS202.
2. PVC C900 Pipe: Stainless steel single bolt saddle clamps equal to Ford style FS101.

C. Corporation Stops

1. Brass, with compression connection, unless otherwise specified.
2. IPS plastic pipe: A.Y. MacDonald 4704 – 33 or Mueller H-15029 with nonflare connections.
3. CTS plastic pipe: A.Y. McDonald 4704 – 22 or Mueller H-15028.
4. Copper service line: A.Y. McDonald 4704 – 22, Ford F1100, Mueller H – 15028, or equal with a nonflare connection for copper pipe.

D. Water Meter, Meter Setter and Box

1. Conform to the requirements of the rural water district or community standards.

E. Freeze-less Yard Hydrant (where required)

1. 3/4-inch, non-freezing, 3-foot bury, Woodford Iowa or approved equal.
2. Vacuum breaker, Watts NF8 for yard hydrant, or approved equal.

F. Shut-off Valves

1. All Shut-off Valves shall be 1-inch, Brass Ball Valve Type manufactured by Watts, Crane, SharkBite® or approved equal.

PART 3 - EXECUTION

3.01 WATER SERVICE LINE AND APPURTENANCES

- A. Install water service line of the size and material indicated on the Bid Schedule and/or drawings.
- B. Install at the locations shown on the drawings or as directed by the Project Officer.
 - 1. Install to within 5 feet of the house or to house water line if present.
 - a. Connect to house water line if present.
 - b. Cap and mark with 2-inch by 4-inch wood post if house water line is not present.
- C. Refer to Section 02315 for excavation, trenching, backfilling, compaction, and separation distance.
- D. Minimum bury depth: 30 inches.
- E. Splices are not allowed in the service line without the written permission of the Project Officer.
- F. Use compression couplings for all connections.
- G. Install saddle at each corporation stop tapping location.
 - 1. All connections shall be live tapped through the corporation stop with an approved tapping machine.
- H. Water Meters and Boxes
 - 1. Install at the location shown on the drawings.
- I. 2. Conductive Trace Wire: refer to Section 09312. Tracer wire shall be buried with all service lines.

3.02 UTILITY CONFLICTS

- A. Refer to Section 02315 – Excavation, Trenching and Backfill.

3.03 TESTING

- A. Turn on each corporation stop and apply main pressure to the service line in the presence of a Cherokee Nation representative before backfilling.

- B. Repair all visible leaks and retest the line until test is successfully completed at no cost to the owner.

3.04 BACTERIOLOGICAL SAMPLE

- A. Provide bacteriological sample for each service line after the line has been installed and flushed.
- B. No payment will be made for water lines until a negative bacteriological sample has been received.

3.05 CLEAN UP

- A. Refer to Section 02310 - Grading.

3.06 SEEDING

- A. Refer to Section 02920 – Topsoiling, Seeding, Fertilizing, and Mulching.

3.07 RECORD DRAWINGS

- A. Provide as-built information on each.

END OF SECTION

CHEROKEE NATION
SANITARY SEWER CONSTRUCTION SPECIFICATIONS
SECTION 02531
SANITARY SEWER SERVICE LINES

PART 1 -GENERAL

1.01 SUMMARY

- A. This section includes sewer service lines, connection to sewer mains, wyes, cleanouts, and appurtenances.

1.02 RELATED WORK

- A. Section 01330 – Submittal Procedures
- B. Section 01770 – Closeout Procedures
- C. Section 01780 – Closeout Submittals
- D. Section 02230 - Clearing And Grubbing
- E. Section 02310 – Grading
- F. Section 02315 – Excavation, Trenching and Backfill
- G. Section 02531 – Sewer Service Lines
- H. Section 02532 – Sanitary Sewer Manholes
- I. Section 02920 – Topsoiling, Seeding, Fertilizing, and Mulching

1.03 REFERENCES

- A. ANSI/AWWA C110 / A21.10 – Ductile-Iron and Gray-Iron Fittings, 3 Inch Through 48 Inch, for Water and Other Liquids
- B. ANSI / AWWA C111 / A21.11 – Rubber Gasket Joints for Ductile Iron and Gray-Iron Pressure Pipe and Fittings
- C. ANSI / AWWA C151 / A21.51 – Ductile Iron Pipe, Centrifugally Cast, for Water or Other Liquids
- D. ASTM D 1248 – Polyethylene Plastics Molding and Extrusion Materials
- E. ASTM D 2321 – Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications

- F. ASTM D2487 – Classification of Soils for Engineering
- G. ASTM D 3034 – Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings
- H. ASTM D 3212 – Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
- I. ASTM F 477 – Elastomeric Seals (Gaskets) for Joining Plastic Pipe
- J. ASTM F1336 – PVC Gasketed Sewer Fittings
- K. ASTM F 1417 – Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air
- L. Oklahoma Department of Environmental Quality 252-656-5 Sanitary Sewer Standards

1.04 SUBMITTALS

- A. Submit in accordance with Section 01330 – Submittal Procedures
- B. Pipe
- C. Fittings
- D. Sewer Wyes
- E. Saddles
- F. Service Line Cleanout Plugs

PART 2 - PRODUCTS

2.01 SEWER SERVICE LINE MATERIALS

- A. Polyvinyl Chloride (PVC) Pipe and Fittings
- B. Conform to ASTM D 3034
- C. Pipe Class: SDR 35 or Schedule 40
- D. Bell ended joints conforming to ASTM D 3212
- E. Elastomeric gaskets conforming to ASTM F 477

- F. Material: 4-inch nominal diameter unless otherwise indicated except as follows:
 - 1. As required by the roadway authority or permit.
- G. Each length of pipe shall be clearly marked with the following:
 - 1. Manufacturer
 - 2. Nominal Pipe Size
 - 3. The PVC Cell Classification
 - 4. Type PSM PVC Sewer Pipe
 - 5. ASTM Designation
 - 6. Pipe Class
- H. Ductile Iron Sewer Pipe and Fittings
 - 1. Conform to AWWA C151.
 - 2. Pipe Thickness Class: 52
 - 3. Exterior Coating: asphaltic coating, 1 mil thick, minimum
 - 4. Rubber gasket, push on joints conforming to ASTM C111
 - 5. Interior Lining: Polyethylene meeting ASTM D 1248, fusion bonded
 - 6. Each length of pipe shall be clearly marked with the following:
 - a. Manufacturer
 - b. Nominal Pipe Size
 - c. ASTM Designation
 - d. Pipe Class
- I. Service Line Cleanout Plug: Cast iron or PVC as shown on the Drawings.
- J. Sewer Wyes
 - 1. Connection to New Sewers
 - a. In-line fittings conforming to ASTM F1336.

2. Connection to Existing Sewers

a. PVC Sewer Mains

- (1) PVC conforming to ASTM 3034, watertight with gasket.
- (2) Two stainless steel bands and connectors for securing to the main.
- (3) GPK Products, Fargo, ND, or approved equal.

b. Asbestos-Cement, Concrete, or Vitrified Clay Sewers

- (1) Neoprene rubber boot with stainless steel bands for concrete, asbestos-cement or vitrified clay sewer main.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that all products are in new condition.
- B. Inspect pipe and fittings for defects.
- C. Remove materials from the site that are defective, damaged, used, unsound, or that otherwise do not meet the specifications.

3.02 PERMITS

- A. Provide permits for roadway crossing, connections to existing sewer mains, construction, or any other permit or fee required to complete the service line unless otherwise directed, in writing, by the Project Inspector.
- B. Notify the Project Inspector if this specification does not conform to the permit requirements.
- C. Follow the requirements of the permit if they differ from this specification.

3.03 UTILITY CONFLICTS

- A. Refer to Section 02315 – Excavation, Trenching and Backfill.

3.04 SEPARATION DISTANCE

- A. Vertical: refer to Section 02315 – Excavation, Trenching and Backfill.
- B. Horizontal

1. Water lines: Refer to Section 02315 – Excavation, Trenching and Backfill.
2. Public water supply wells: 300 feet.
3. Private water wells: 50 feet.
4. Oil tanks: 50 feet.
5. Petroleum and electrical lines 5 feet.

3.05 PIPE LENGTH

- A. Use the longest standard pipe length available.

3.06 PIPE BEDDING

- A. Refer to Section 02315 – Excavation, Trenching and Backfill.

3.07 COMPACTION

- A. Refer to Section 02315 – Excavation, Trenching and Backfill.

3.08 SEWER SERVICE LINE INSTALLATION

A. Saddles

1. Install saddle wyes at the locations indicated by the Drawings or by the Project Officer.
2. Repair damage caused during the tapping process at no additional cost.
3. Rotate the branch or wye of the saddle no more than 45 degrees from horizontal.

B. Risers

1. Construct as shown on the standard details.
2. Extend riser from sanitary wye to an elevation that will allow a service line to be laid at specified grades.
3. Install riser at an angle equal to or less than 45 degrees measured from horizontal.
4. Risers in Rock Trenches
 - a. Install riser pipe in the sewer trench.
 - b. Install riser pipe approximately vertical.

5. Encase the bottom of riser, wye, and 45 degree bend in crushed rock or sand.
6. Extend bedding the full width of the trench as excavated and not less than 18 inches in length from either side of the center of the riser.
7. Place bedding material to a point 12 inches above centerline of the sewer main at the location of the wye.
8. No separate payment will be made for risers.

3.09 SERVICE LINES

- A. Furnish and install sewer service lines at the locations on the Drawings or as directed by the Project Officer.
 1. Connect to the existing home sewer stub out if present.
 2. Cap sewer service, and stake if no connection is made.
 - a. Properly reference, record and stake wye locations to permit ready relocation, in accordance with Section 01780 – Closeout Submittals.
- B. Follow general pipe installations requirements of Section 02315 – Excavation, Trenching and Backfill.
- C. Minimum slope for sewer service lines is 1/8-inch per foot (1%).
- D. Maximum slope for sewer service lines is 1/2-inch per foot (4%).
- E. Ninety-degree bends are not allowed between the house and the sewer main.

3.10 CONNECTION OF SEWER SERVICE LINES TO MANHOLES

- A. Connect to manholes only where permitted and approved by the Project Officer.
- B. Conform to Section 02532 – Sanitary Sewer Manholes, concerning channel shape and radius.

3.11 SEWER SERVICE LINE CLEANOUTS

- A. Construct as shown on the standard details.
- B. Two-Way Cleanouts
 1. Install two-way cleanouts at a spacing not to exceed 200 feet.

2. Install two-way cleanouts so that the service can be rodded or snaked in either direction.
- C. One-Way Cleanouts
1. Install one-way cleanouts at a spacing not to exceed 100 feet.
 2. Install one-way cleanouts so that the service can be rodded or snaked in the direction of flow.
- D. Install a 4-inch sewer wye in the sewer service line and connect risers of the same material from the wye to the ground surface.
- E. Attach a schedule 40 PVC adapter and threaded plug to the end of the riser.
- F. The Project Inspector may specify that cleanouts be buried 3 to 6 inches below grade and be fit with a threaded cast iron plug.
- G. Provide a 12-inch by 12-inch by 4-inch thick concrete pad for each PVC threaded plug.
1. Concrete to conform to Section 03300 – Cast-in-place Concrete (Non-Structural).
 2. Provide wood or other forms for concrete placement.
 3. Set top of pad to finished grade.
 4. Provide a hard smooth finish to top of pad.
 5. Remove forms after concrete has cured enough to retain its shape.

3.12 TESTING

- A. Connection to new sewer main installation
1. Pressure test with sewer main, under provisions of Section 02530 – Sanitary Sewer.
- B. Connection to existing sewer main
1. Visual inspect each joint for leakage.
 2. Repair all leaks before backfilling.

3.13 SITE RESTORATION

- A. Restore site to original condition.

- B. Finish grade site in conformance with Section 02310 – Grading
- C. Restore roadways in conformance with Section 02705 – Road Restoration.
- D. Reseed the trench in conformance with Section 02920 – Topsoiling, Seeding, Fertilizing, and Mulching.

3.14 RECORD DRAWINGS

- A. Provide as-built information on each system in accordance with Section 01780 – Closeout Submittals.

END OF SECTION

**CHEROKEE NATION
ON-SITE SEWAGE TREATMENT SYSTEMS
SECTION 02532
SANITARY SEWER MANHOLES**

PART 1 - GENERAL

1.01 SUMMARY

- A. Work covered by this section includes standard and shallow concrete manholes, standard manholes, drop manholes, adjustment rings, frames and covers for community wastewater collection systems.

1.02 RELATED WORK

- A. Section 01330 – Submittal Procedures
- B. Section 01770 – Closeout Procedures
- C. Section 01780 – Closeout Submittals
- D. Section 02310 - Grading
- E. Section 02315 – Excavation, Trenching and Backfill
- F. Section 02530 – Sanitary Sewer

1.03 REFERENCES

- A. ASTM C 443 – Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
- B. ASTM C 478 – Precast Reinforced Concrete Manhole Sections
- C. ASTM C 923 – Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes
- D. ASTM C 990 – Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
- E. Oklahoma Department of Environmental Quality 252-656-5 Sanitary Sewer Standards

1.04 SUBMITTALS

- A. Manhole frame and cover
- B. Manhole steps
- C. Precast manhole sections
- D. Joint sealing material
- E. Precast manhole base section
- F. Pipe to manhole connections

1.05 DEFINITIONS

A. Shallow Manhole

1. Manholes with a depth from rim to outlet pipe invert equal to 5-feet or less, and with a conical or flat top.
2. Additional Depth: distance from the outlet invert to the rim minus 5 feet.

B. Standard Manhole

1. Manholes with a depth from rim to outlet pipe invert equal to or greater than 7-feet, and with a conical top section.
2. Additional Depth: depth from the outlet invert to the rim minus 7 feet.

PART 2 - PRODUCTS

2.01 MANHOLES

A. Design and fabricate reinforced concrete manholes to conform to ASTM C 478.

B. Base Section:

1. Precast integral concrete bottom section and base.

C. Channel (or invert) shape:

1. Smooth
2. Semicircular
3. Same diameter as adjoining sewer pipe
4. Ogee shaped, so there is no free drop.

D. Drop:

1. Minimum: 0.10 feet through manholes measured from any invert in to the invert out unless otherwise shown on the drawings.
2. Maximum: 2 feet through manholes measured from any invert in to the invert out.

E. Changes in Pipe Size or Grade: Make changes in size and grade of channels gradually and evenly.

- F. Changes in Direction: Smooth curve of as large a radius as the size of the manhole will permit with the intersection of the lines occurring at the center of the manhole.
- G. Benches: Construct the manhole floor, outside of the channel, smooth and slope toward the channel not less than 1-inch per 10 inches.
- H. Barrel Sections:
 - 1. 48-Inch inside diameter.
- I. Cone Sections:
 - 1. Eccentric Cone Sections
- J. Top Slab Sections:
 - 1. Provide manhole opening eccentrically located to allow positioning over the outlet.
 - 2. Manhole Steps:
 - a. Cast and anchor steps in concrete sections, aligned to form a continuous ladder.
 - b. Install steps so they are horizontal, protruding 5-inches, minimum.
 - c. Material: 1/2-inch steel steps encased in neoprene or polypropylene.
 - d. Width: 12-inches, minimum.
 - e. Space rungs 16-inches apart maximum.
 - f. Maximum spacing from the top of the cone to the first rung shall be 6-inches.
 - g. Center steps over the manhole outlet.
- K. Manhole Adjustment Rings:
 - 1. Concrete rings.
- L. Sewer Pipe Connection:
 - 1. Watertight gasket precast into the manhole wall conforming to ASTM C 923.
 - 2. Acceptable Products:

- a. PSX Seal Gasket or approved equal.
- b. A-Lok (Tullytown, Pennsylvania)
- c. Kor-N-Seal (NPC, Incorporated, Milford, New Hampshire)
- d. or approved equal.

M. Joints:

1. Conform to ASTM C 443.
2. Joint Sealant:
 - a. Conform to ASTM C 990.
 - b. Rub-R-Nek (Henry Group, Houston, Texas)
 - c. Con-Seal (Concrete Sealants, Incorporated, New Carlisle, Ohio)
 - d. or approved equal.

N. FRAMES AND COVERS

1. Fabricate from cast iron.
2. Clean and smooth.
3. Free from distortion, shrinkage or other defects
4. Combined Weight: 300 pounds, minimum.
5. Conform to detail drawings.
6. Frame:
 - a. Designed for use with covers without open pick holes
 - b. Machined, horizontal bearing surfaces
7. Cover:
 - a. Machined horizontal bearing surfaces.
 - b. Neoprene ring gasket

- c. Non-rocking traffic cover
 - d. Solid cover with concealed pick hole
 - e. **Top of Cover to say “Sanitary Sewer”**
8. Materials
- a. Neenah R-1550, Municipal Castings frame #301-7 and cover #301A
 - b. or approved equal with provisions to meet the specifications.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Construct manholes at the locations and elevations shown on the plans or as directed by the Project Engineer.
- B. Refer to section 02315 – Excavation, Trenching and Backfill for excavation and backfill requirements.
- C. Install manholes so the walls are vertically plumb.
- D. Bed precast manhole bases in a minimum of 8 inches of compacted clean sand or crushed rock.
- E. Back fill with gravel or other native material not affected by frost.
- F. Seal all lifting holes with quick set mortar.

3.02 CONSTRUCTION OF INVERT

- A. PVC Pipe Invert Channel:
 - 1. Install a full length of pipe through the manhole.
 - 2. Form a concrete bench up to the spring-line of the pipe.
 - 3. Slope the concrete bench toward the channel at 1-inch per 10 inches, minimum.
 - 4. Cut the top hemisphere of the pipe off for the entire length of the pipe through the manhole.
- B. Formed Concrete Channel:

1. Form a channel that meets the requirements outlined in 2.01 B.
2. Ensure that the channel is smooth and free of rough patches.
3. Connection of Sewer Main Pipe:
 - a. Install sanitary sewer main according to pipe to manhole gasket manufacturer's recommendations.

3.03 OUTSIDE DROP CONSTRUCTION

- A. Install an outside manhole drop where the invert of the inlet pipe is more than 24 inches higher than the invert of the outlet pipe.
- B. Use the same material used for the sewer main pipe to construct the drop.
- C. Encase entire outside drop in concrete.
- D. Construct according to the detail drawings.

3.04 TOP SLAB SECTION INSTALLATION

- A. Install with the opening over the outlet of the manhole.
- B. Use on shallow manholes if required.

3.05 ECCENTRIC CONICAL SECTION INSTALLATION

- A. Install with the opening over the outlet of the manhole.
- B. Install manhole section with cylindrical configuration before installing a conical section.
- C. Use on standard manholes and shallow manholes greater than 4 feet in depth.

3.06 JOINT SEALANTS

- A. Install joint sealants around entire circumference of each manhole joint.
- B. Place sealant on the lower horizontal surface of the joint.
- C. Ensure that a watertight seal is provided at the joint.
- D. Grout joints on outside and inside.

3.07 ADJUSTMENT RINGS

- A. Required when the cover is set at or below with final grade.
- B. Group adjustment rings in place when the manhole is constructed.
- C. Install at least one adjustment ring, and no more than 12-inches of adjustment rings.
- D. Discard all cracked adjustment rings.
- E. Grout manhole rings on outside and inside.

3.08 FRAME AND COVER

- A. If a road finish grade exists, set manhole frames and covers to the finish grade of the road.
- B. If plans indicate rim elevations, set manhole frames and covers to the elevation indicated on the plans and adjust the elevation of the frame and cover to meet field requirements as determined by the Project Engineer.
- C. Refer to Section 02310 – Grading for finish grading requirements.

3.09 TESTING

- A. Exfiltration Testing
 - 1. Inspect for visible leakage or seepage.
 - 2. Plug inlet and outlet piping.
 - 3. Plug lift holes
 - 4. Fill manhole with clean water to top of casting.
 - 5. Allow 4 hours (minimum) for concrete to absorb water.
 - 6. Refill manhole to top of casing.
 - 7. Allowable leakage: 1.25 inches per hour.
 - 8. Length of test: 2 hours minimum.
 - 9. Repair all leakage or seepage that appears during the Warranty period in a Project Engineer approved method.
- B. Vacuum Testing

1. Inspect for visible leakage or seepage.
2. Plug inlet and outlet piping.
3. Plug lift holes.
4. Place test head at the top of the manhole in accordance with the manufacturer's recommendations.
5. Draw a vacuum of 10 inches of Hg (mercury).
6. Shut valve on the vacuum line of the test head and shut off the vacuum pump.
7. Record the time it takes for the vacuum pressure to drop from 10 inches to 9 inches of Hg.
8. If the time recorded exceeds the values of table 1, the manhole passed the test.

Depth (ft)	Inside Diameter (in)								
	30	33	36	42	48	54	60	66	72
Time (sec)									
8	11	12	14	17	20	23	26	29	33
10	14	15	18	21	25	29	33	36	41
12	17	18	21	25	30	35	39	43	49
14	20	21	25	30	35	41	46	51	57
16	22	24	29	34	40	46	52	58	67
18	25	27	32	38	45	52	59	65	73
20	28	30	35	42	50	53	65	72	81
22	31	33	39	46	55	64	72	79	89
24	33	36	42	51	59	68	78	87	97
26	36	39	46	55	64	75	85	94	105
28	39	42	49	59	69	81	91	101	113
30	42	45	53	63	74	87	98	108	121

9. Repair all leakage or seepage that appears during the Warranty period in a Project Engineer approved method.

3.10 SITE RESTORATION

C. Restore site to original condition.

D. Finish grade site in conformance with Section 02310 – Grading

3.11 RECORD DRAWINGS

E. Provide as-built information on each system in accordance with Section 01780.

A. END OF SECTION

**SECTION 02535
INDIVIDUAL GRINDER PUMP STATIONS**

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION

- A. The Contractor shall furnish and install a complete factory-built and tested simplex Grinder Pump Station(s) and connect unit to the septic tank and household plumbing. Each pump station shall consist of: submersible grinder pump suitably mounted in a vented, covered basin with a shut-off valve and check valve all assembled within the basin; a control panel with alarm, and all necessary wiring, piping and controls to form a complete package system. For ease of serviceability, all residential grinder pump units shall be of like type and horsepower throughout the system.
- B. The Contractor shall install grinder pump stations in the yard of those houses designated by the Project Engineer as requiring a grinder pump station.
- C. The Contractor shall coordinate with the Project Engineer and the representative from the municipality on the location of the installation.

1.02 SUBMITTALS

- A. Force Main Pipe and Fittings
- B. Grinder Pump Station Package including the following: pump curve, pump basin with fittings, level controls, electrical controls, and alarms.
- C. Valves

1.03 SHOP DRAWINGS

- A. After receipt of notice to proceed, the Manufacturer shall furnish the Project Engineer a minimum of three (3) sets of shop drawings detailing the equipment to be furnished including dimensional data and materials of construction. The Project Engineer shall promptly review this data, and return two (2) copies to the Manufacturer as approved, or approved as noted. Upon receipt of accepted shop drawings, the Manufacturer shall proceed with fabrication of the equipment.

1.04 OPERATING CONDITIONS

- A. The pumps shall be capable of delivering 20 GPM against a total dynamic head of 85 feet and 40 GPM against a total dynamic head of 65 feet. Grinder

pumps must be capable of handling materials commonly found in domestic sewage.

1.05 WARRANTY

- A. The pump station Manufacturer shall provide a parts and labor warranty on the complete station and accessories for a period of twelve (12) months after notice of Owner's acceptance but no longer than twenty-four (24) months after shipment. The Owner will return any defective materials found during the warranty period to the Manufacturer.
- B. The Contractor shall provide a warranty covering defects in the workmanship for a period of twelve (12) months after notice of Owner's acceptance. The Contractor upon written notice from the Project Engineer will rectify defects in the workmanship found during the warranty period.

PART 2 - PRODUCT

2.01 ACCEPTABLE MANUFACTURERS

- A. Grinder Pump Station: Shea Concrete Products 1,000 gallon pump chamber with simplex pump package, or pre-approved equal.
- B. Piping: Cresline Plastic Pipe Co., Charlotte Pipe and Foundry Co., Bristolpipe Co., M.L. Sheldon Plastics Corporation, or pre-approved equal.
- C. Fittings: Tyler Pipe Co., or pre-approved equal.
- D. Valves: Chemtrol Inc., Asahi/America, Omni, Duobloc, or pre-approved equal.

2.02 GRINDER PUMP

- A. The pump shall be manufactured in the United States and shall be suited for domestic wastewater service. The volute, seal plates and motor housing shall be constructed of ASTM Class 25 cast iron. The pumps shall be painted with air dry enamel. All exposed hardware shall be 300 series stainless steel and all elastomer parts shall be Buna-N. The discharge connection shall be a standard 1 1/4-inch NPT in the vertical position.
- B. The pump impeller shall be of the recessed, vortex design. The impeller shall be an investment cast stainless steel impeller, with pump out vanes on the back shroud to keep debris away from the seal area. It shall be keyed and bolted to the motor shaft. The impeller shall be capable of being trimmed to meet specific performance characteristics.

- C. An upper radial and lower thrust bearing shall be required. The upper bearing shall be a single ball / race type bearing. The lower bearing shall be an angular contact heavy duty ball / race type bearing, designed to handle axial grinder pump thrust loads. Both bearings shall be permanently lubricated by the oil which fills the motor housing. The bearing system shall be designed to enable proper cutter alignment from shut off head to maximum load at 10' of TDH. The motor shaft shall be made of 300 or 400 series stainless steel and have a minimum diameter .670".
- D. Equal to a 2 HP submersible Barnes grinder pump.

2.03 ELECTRIC MOTOR

- A. The motor shall be 2 HP, 3450 RPM, 230 volt and single phase with a capacitor start. The motor shall meet the performance requirements of a NEMA B speed-torque curve. The motor shall be constructed with the open windings operating in a sealed housing containing clean dielectric oil for heat dissipation from the windings and for lubrication of the bearings. Oil used must be able to be disposed of as non-hazardous waste. Air-filled motors shall not be acceptable.
- B. Protection against excessive temperature shall be provided by a heat sensor thermostat attached to the stator windings and connected in series with the contactor coil in the control panel.
- C. The pump shall have a minimum cord length of 15 feet of type SJOOW power cable, capable of continued exposure to the pumped liquid. The power cord shall be sized for the rated full load amps of the pump in accordance with the NEC. The power cable shall not enter the motor housing directly, but will conduct electricity to the motor by means of a water tight compression fitting cord plate assembly with molded pins to conduct electricity.
- D. Motors shall be equipped with double shaft seals to prevent leakage between the motor and pump.

2.04 CHECK VALVE

- A. The pump discharge shall be equipped with factory installed, gravity-operated, ball-type integral check valve built into the discharge pipe. This valve will provide a full-ported passageway when open, and shall introduce a friction loss of less than 6 inches of water at maximum rated flow. Working parts will be made of a 300 series stainless steel, PVC, or a fabric reinforced synthetic elastomer to ensure corrosion resistance, dimensional stability, and fatigue strength. The valve operation shall provide maximum seating capability, even at a very low back-pressure. The valve body shall be a high gloss injection molded part made of PVC type I-II or cast iron.

2.05 SHUT-OFF VALVE

- A. The pump discharge shall be equipped with a factory installed, true union, manual ball valve. Ball valves shall be full ported, constructed of stainless steel, cast iron, or PVC, with a rated pressure of 100 PSI.

2.06 DISCHARGE PIPING

- A. Discharge piping shall be 2-inch pipe with a minimum standard pressure rating of 100 PSI. Either PVC Sch. 40 pipe conforming to ASTM D 2665 and ASTM D 1785, or high density polyethylene (HDPE) pipe conforming to PE 3408 with a minimum SIDR of 11 is acceptable.

2.07 BASIN ASSEMBLY

- A. Pre-cast Septic Tank Requirements
 - 1. Monolithically poured and mechanically vibrated.
 - 2. Min. reinforced concrete wall thickness 3 inches
 - 3. Min. bottom thickness 4 inches
 - 4. Min. cover thickness 5 inches
- B. Minimum capacity below outlet: 1000 gallons for up to and including 4 bedrooms plus 250 gallons for each additional bedroom or as indicated in the bid schedule.
- C. Minimum liquid depth: 3 feet
- D. Maximum liquid depth: 6 1/2 feet
- E. Minimum air space above liquid level: 8 inches
- F. Two compartment tanks
 - 1. Influent chamber not less than $\frac{1}{2}$ or greater than $\frac{2}{3}$ of the tanks' total liquid capacity.
 - 2. Passage in the common wall between chambers located below the liquid level between 20% and 40% of liquid depth.
 - 3. Minimum 4-inch diameter vent between chambers.

- G. Concrete compressive strength: 3000 psi at 28 days
- H. Rectangular tanks shall have a minimum width of 36 inches and be constructed with the longest dimension parallel to the direction of flow.
- I. Reinforcement
 - 1. Sides and bottom: 6-inch x 6-inch – 10/10 welded wire mesh.
 - 2. Top and Access hole cover: 6-inch x 6-inch – 10/10 welded wire mesh and No. 15 rebar spaced 2-foot on center in both directions.
 - 3. Fiber mesh may be used in addition to the wire mesh but may not replace the wire mesh.
- J. Joints below the liquid level shall be of monolithic construction or have interlocking V-notch, shiplap or tongue and groove joints.
 - 1. Joint Sealant
 - a. Koppers' bitumastic sealing compound
 - b. Ram-Nek flexible gasket as manufactured by the Henry Group (formerly K.T. Snyder Company Inc.), Houston, Texas
 - c. Or approved equal
- K. Access holes:
 - 1. Cast-in-place
 - 2. Min. of one access hole per compartment.
 - 3. Min. diameter of 24 inches.

2.08 LEVEL DETECTION

- A. Wastewater level detection for controlling pump and alarm operation shall be accomplished by use of a non-fouling detection mechanism specifically designed for use in wastewater. Switches utilized in the system shall be magnetic reed switches, hermetically sealed within a watertight protective PVC casing. Level detection mechanism must be designed to provide protection from solids, greases, oils, and fats via specific grease isolator. Level detection, grease control, and solids isolation device(s) shall not require any regular,

preventive maintenance. A separate switch shall be used for each function (e.g. High water alarm, On, & Off functions). The control assembly shall be specifically approved by a Nationally Recognized Testing Laboratory as conforming to U.L. 1951. Conventional mercury, mechanical, or swing arm floats will not be acceptable.

2.09 ELECTRICAL CONTROL PANEL

- A. Each pump station control panel shall be certified to U.L. 508 by a Nationally Recognized Testing Laboratory (NRTL). Each panel shall have a NEMA Type 2 enclosure. It shall include circuit breakers and all necessary components to accomplish proper pump operation. Each control panel shall include both a visual and audible alarm with a silence button. The visual alarm shall be a red fluted lens mounted on top of the control panel enclosure. The audio alarm device shall be capable of being silenced by means of a switch mounted on the exterior of the enclosure.

2.10 CORROSION PROTECTION

- A. All materials exposed to wastewater shall have inherent corrosion protection: i.e., cast iron, fiberglass, stainless steel, PVC, or other material regularly used in wastewater applications.

2.11 SAFETY

- A. The grinder pump station shall be free from electrical and fire hazards as required in a residential environment. As evidence of compliance with this requirement, the completely assembled and wired Grinder Pump Station shall be listed by Underwriters Laboratories, Inc. to be safe and appropriate for the intended use.
- B. The installed grinder pump station shall meet accepted standards for plumbing equipment intended for use in or near residences, shall be free from noise, odor, or health hazards, and shall have been certified by an independent laboratory to perform as specified in residential sewage applications. As evidence of compliance with this requirement, the grinder pump station shall bear the seal of NSF International, or other nationally recognized certification body.

PART 3 - EXECUTION

3.01 FACTORY TESTING

- A. Each pump shall be submerged, operated, and tested for performance compliance to its respective curve. All control panels shall be factory

performance tested by running a pump of like type and verifying proper operation of all functions prior to shipment. The Manufacturer shall certify in writing that factory testing has been performed on each unit prior to shipment.

3.02 INSTALLATION

- A. Operating instructions MUST be given to the HOMEOWNERS.
- B. Assemble and install the Grinder Pump Station with controls and alarms on site per the Manufacturer's instructions. The outlet piping and valves shall be installed as shown on the plans and on the Manufacturer's shop drawings.
- C. The basin cover shall be gasketed and bolted to the basin top lip using stainless steel hardware. The junction box (when required) shall be NEMA 4x enclosure mounted on the underside of the cover.
- D. Each basin cover must be boldly labeled: "GRINDER PUMP STATION".
- E. The basin will be supplied with a standard 4-inch inlet grommet (4.50-inch OD) for connecting the incoming sewer line. Appropriate inlet piping must be used. The basin may not be dropped, rolled or laid on its side for any reason prior to installation.
- F. The pump shall be mounted within the basin on a 300 series stainless steel ring base.
- G. The basin shall be vented by means of a 2-inch pipe connected to the house plumbing exhaust pipe. Each pump station must be properly vented to assure correct operation of the pump. The Contractor shall furnish and install the 2-inch pipe and fittings required for venting.
- H. The annular space around all piping and wiring exiting the pump basin shall be sealed to prevent the inflow of groundwater.
- I. The discharge piping shall connect the pump station to the septic tank and shall be located as shown on the plans. Installation of the discharge piping shall conform to Section 02315.
- J. The shut-off valve shall be installed in the pump basin on the discharge piping after the check valve, but above the High Water Alarm level.
- K. The control panel enclosure and alarm shall be mounted on the basement wall nearest the pump basin at approximately shoulder height.
- L. The Contractor shall install the control panel and alarm in accordance with national and local electrical codes and per the Manufacturer's instructions.

The electrical control panel and alarm must be installed by a licensed electrician. The power and alarm circuits must be on separate power circuits.

3.03 START-UP AND FIELD TESTING

- A. The Manufacturer shall provide the services of qualified factory trained technician(s) who, upon the request of the Project Engineer, shall inspect the placement and wiring of each pump station. These factory technicians shall perform field tests as needed and instruct the Owner's personnel in the operation and maintenance of the equipment before the stations are accepted by the Owner. The Contractor shall coordinate the inspection with the Manufacturer, Project Engineer, and Owner.
- B. Provision of all equipment and materials necessary to perform testing shall be the responsibility of the Contractor. This will include, at a minimum, a portable generator (if temporary power is required) and water in each pump basin.
- C. Upon completion of the installation, the Project Engineer, Contractor, and Owner will perform the following test on each station:
 - 1. Make certain the discharge shut-off valve is fully open. This valve must not be closed when the pump is operating.
 - 2. Turn ON the alarm power circuit.
 - 3. Fill the wet well with water to a depth sufficient to verify the high level alarm is operating. Shut off water.
 - 4. Turn ON pump power circuit. Initiate pump operation to verify automatic "On/Off" controls are operational. Pump should immediately turn ON. Within one (1) minute alarm light will turn OFF. Within three (3) minutes the pump will turn OFF.

3.04 OPERATION AND MAINTENANCE

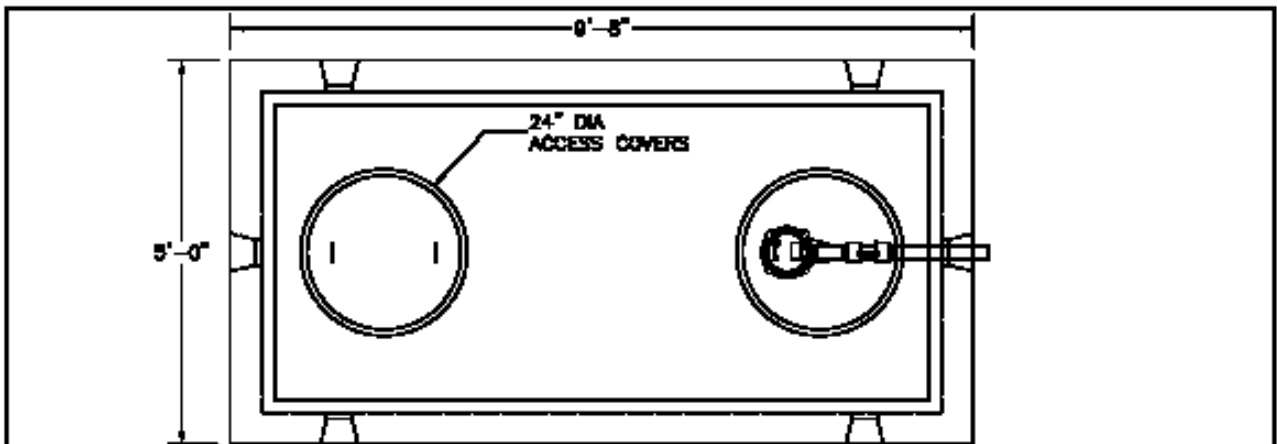
A. MANUALS

- 1. The Manufacturer shall supply three (3) copies of Operation and Maintenance Manuals to the Project Engineer.

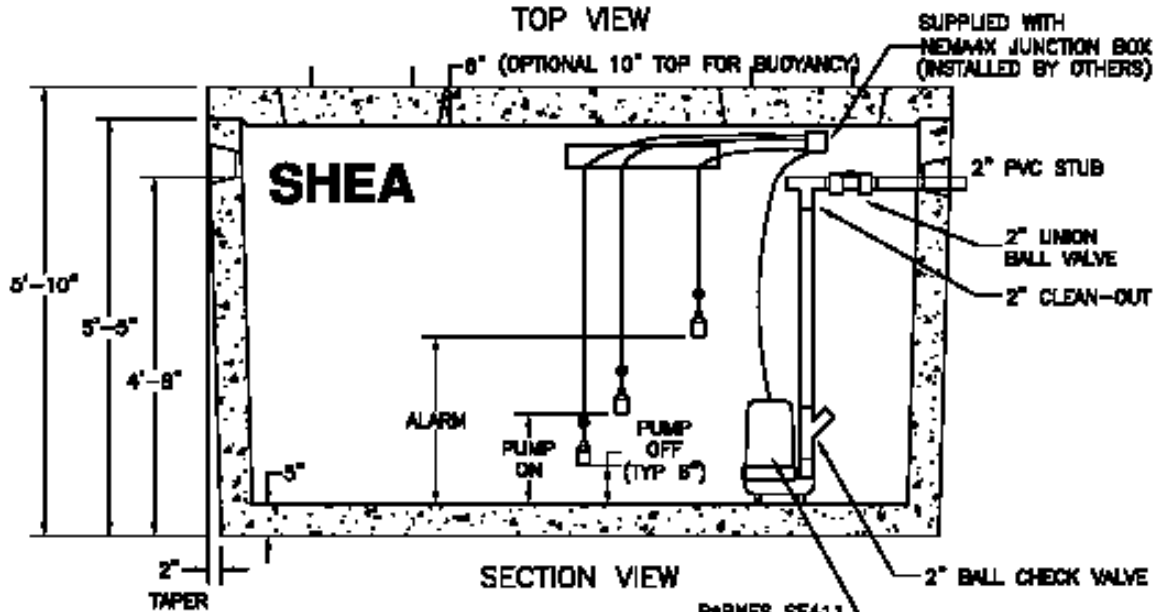
B. TRAINING

- 1. Tribe shall provide on-site training for HOMEOWNERS covering operation and maintenance of domestic sewage pump stations.

END OF SECTION



TOP VIEW



SECTION VIEW

NOTES:

1. CONCRETE: 4,000 PSI MINIMUM AFTER 28 DAYS.
2. CONSTRUCTION OF PUMP CHAMBER CONFORMS WITH DEP TITLE 6 REGS, 310 CMR, SECTION 15.228.
3. ALL REINFORCEMENT PER ASTM C1227.
4. JOINT SEALED WITH BUTYL RESIN.
5. DESIGNED FOR H-20 LOADING.
6. PUMPS, FLOATS AND PIPE INSTALLED IN CHAMBER. FLOAT ELEVATIONS SET UPON REQUEST.
7. SUPPLIED WITH PUMP CONTROL PANEL W/ALARM.
8. ADDITIONAL PUMPS & DUPLEX CONFIGURATION AVAILABLE.

WEIGHT:
 BOTTOM = 11,250
 10" TOP = 5,980
 6" TOP = 3,575

ITEM NO.	PC1000P45(D)	SE411
	PC1000PS(D)	SE31



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Specifications subject to change without notice

**CHEROKEE NATION
ON-SITE SEWAGE TREATMENT SYSTEMS
SECTION 02543
CHAMBERED ABSORPTION FIELDS**

PART 1 - GENERAL

1.01 SUMMARY

- A. This section includes construction of absorption fields for on-site disposal of wastewater utilizing Chambered Sections.

1.02 RELATED WORK

- A. Section 01330 – Submittals
- B. Section 01770 – Closeout Procedures
- C. Section 02310 – Grading
- D. Section 02315 – Excavation, Trenching and Backfill

1.03 REFERENCES

- A. ASTM D 3034 – Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings
- B. Oklahoma Department of Environmental Quality (DEQ), Title 252, Chapter 641
- C. AASHTO – Polyethylene Chamber

1.04 SUBMITTALS

- A. Solid PVC Pipe
- B. Polyethylene Chamber
- C. Distribution Boxes (if required)
- D. Retention Structures (if required)

1.05 QUALITY ASSURANCE

- A. Contractor shall have a current Oklahoma Department of Environmental Quality (ODEQ) Contractor certification Class “A,” “B,” or “C.”
- B. Excavation or construction of drainfields will not be allowed when the moisture content of the soil is greater than the plastic limit or when the occurrence of rain, snow, or frost is such that the quality of construction may be impaired.

- C. Drainfield materials shall meet minimum requirements of the appropriate state agency regulating onsite septic systems.

1.06 PERMITS (if required)

- A. Provide authorizations and permits DEQ form 641-575.
- B. Provide copies of authorization and permit to the Project Engineer before construction begins.

PART 2 - PRODUCTS

2.01 SOLID SEWER PIPE AND FITTINGS

- A. SDR 35 PVC pipe and fittings shall conform to ASTM D 3034.

2.02 CHAMBER

- A. Chamber sections will be constructed of high –density PolyTuff Polyethylene. Chamber sections will meet the minimum requirement of AASHTO-H-10 for wheel load protection. Standard chamber sections will be a minimum 36 inches (36”) in width, 75 inches (75”) in length and 12 inches (12”) in height. DEQ approved EQ-36 chambers, will be a minimum 22 inches (22”) in width, 100 inches (100”) in length and 12 inches (12”) in height. EQ-24 chambers will not be allowed.
- B. Endplates for the chamber sections will be constructed of the same material as the chamber. Open endplates will provide an opening to accommodate 4-inch PVC SDR 35 pipe. Closed endplates will have no opening.

2.03 DISTRIBUTION BOXES

- A. Construct distribution boxes and lids of concrete or injection molded HDPE.
 - 1. Honeycombed concrete boxes and lids will be rejected and replaced at Contractor’s expense
- B. All Box inlets and outlets will be 4-inches.
- C. All outlets will be one-inch lower than the inlet.

2.04 RETENTION STRUCTURES

- A. Construct retention boxes and lids of concrete or injection molded HDPE.

1. Honeycombed concrete boxes and lids will be rejected and replaced at Contractor's expense

B. All Box inlets and outlets will be 4-inch

C. All outlets will be seven inches (minimum) higher than the inlet.

2.05 INSPECTION PORTS

- A. All inspection ports shall be constructed with 4" PVC w/ slotted perforations. (SEE DRAWING AT END OF SECTION).

PART 3 - EXECUTION

3.01 GENERAL

- A. Construct chambered drainfield in accordance with Project Engineer's design or DEQ Authorization/permit.

1. Variations from the design are not permitted unless approved in writing by the Project Engineer.

2. All work required bringing the system into compliance with the design or authorization/permit shall be at the Contractor's expense.

- B. Construct the chamber drainfield in accordance with the drawings and DEQ regulations.

- C. Distribution piping to and between chamber trenches will be connected in accordance with the chamber manufacturer's recommendations. Backfill material shall be hand selected to be free of organic and other potentially clogging material and hand-placed to a point 3 inches above the highest chamber perforation. The remaining backfill material above that indicated above may be mechanically placed.

3.02 SOLID SEWER PIPE

- A. Install ASTM 3034, SDR 35 solid sewer pipe from the Schedule 40 PVC outlet stub at the septic tank to the beginning of the drainfield.

1. Minimum cover over solid sewer pipe is 10 inches.

2. Minimum distance from septic to drainfield is five feet.

3. Solid sewer pipe from septic tank outlet to drainfield will have a minimum drop of 2 inches or 1/8-inch per foot slope for 4-inch diameter pipe and 1/16-inch per foot for 6-inch diameter pipe, whichever is greater.
4. Solvent weld all joint connections.

3.03 CHAMBER TRENCH

- A. Maximum trench depth: 30 inches
- B. Minimum depth: 20 inches
- C. Trench width will be a minimum 36 inches for standard chamber and 22 inches for EQ-36 Chamber
- D. Maximum trench length: 150 feet of chamber section in any given path.
- E. The top of the louver in the highest absorption line will be a minimum two inches lower than the invert on the septic tank outlet.
- F. Minimum distance between trenches: 8 feet center to center
- G. Minimum depth of backfill above chamber section: 8 inches.
- H. Trench backfill material shall be mounded 6 inches (6") above the natural ground surface to allow for settlement.
- I. Rake to a depth of 1-inch all smeared or compacted surfaces of sidewalls and bottom and remove loose material before chamber section is placed.
- J. Leave each premise in a neat and orderly condition, restoring it as near as possible to its original condition and to the approval of the Project Inspector.
- K. Trenches left open and exposed to rainfall (>1/4"), are subject to rejection by the Project Inspector.

3.04 DISTRIBUTION BOXES

- A. Install drop boxes in locations where steep slopes require that the drainfield laterals be terraced and as directed by the Project Engineer.

3.05 DROP BOXES

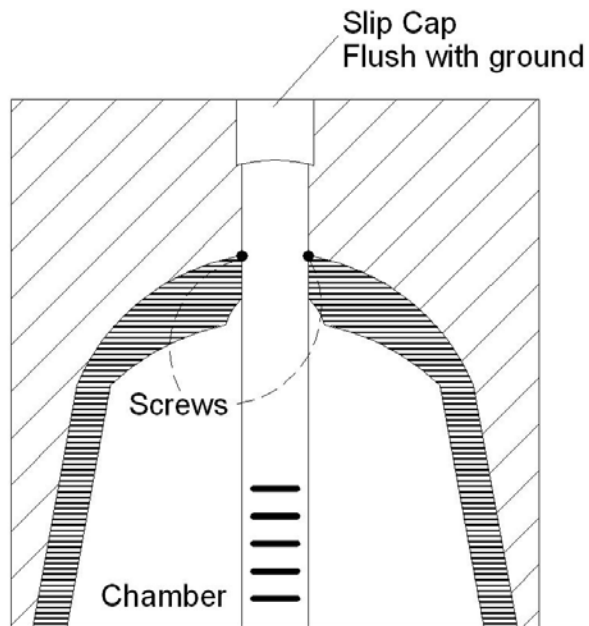
- A. Install drop boxes in locations where steep slopes require that the drainfield laterals be terraced and as directed by the Project Engineer.

3.06 INSPECTION PORTS

- A. Inspection ports shall be installed at the end of the last section of every row of chambers.
- B. Top of inspection port shall be cut off flush with the top of grade and a 4" PVC slip cap shall be installed.

3.06 AS-BUILTS

- A. Provide as-built information on each system in accordance with Section 01780 and DEQ form 641-576A.



END OF SECTION

**CHEROKEE NATION
ON-SITE SEWAGE TREATMENT SYSTEMS
SECTION 02545
CONCRETE SEPTIC TANK AND PIPING**

PART 1 - GENERAL

1.01 SUMMARY

- A. This section covers single and multiple compartments, rectangular and cylindrical precast septic tanks. Also included is the piping from the home to the septic tanks along with two-way cleanouts and septic tank abandonment.

1.02 RELATED WORK

- A. Section 01330 – Submittals
- B. Section 01770 – Closeout Procedures
- C. Section 01780 – Closeout Submittals
- D. Section 02310 – Grading
- E. Section 02315 – Excavation, Trenching and Backfill
- F. Section 02316 – Rock Excavation
- G. Section 02441 – Chamber Absorption Fields 02543
- H. Section 02920 – Topsoiling, Seeding, Fertilizing, and Mulching
- I. Section 03200 – Concrete Reinforcement.
- J. Section 03300 - Cast-In-Place Concrete (Non-Structural)

1.03 REFERENCES

- A. ASTM D 3034 – Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings.
- B. Oklahoma Department of Environmental Quality, Title 252, Chapter 641

1.04 SUBMITTALS

- A. Septic tank (including reinforcement details.)
- B. Septic tank riser and cover.
- C. Effluent Filter (if required.)
- D. Solid sewer pipe and fittings
- E. Two-way Cleanout and Inspection plug

1.05 QUALITY ASSURANCE

- A. Septic tanks and other materials shall meet minimum requirements of the appropriate state agency regulating onsite septic systems.

PART 2 - PRODUCTS

2.01 SEPTIC TANKS

A. Pre-cast Septic Tank Requirements

1. Monolithically poured and mechanically vibrated.
2. Min. reinforced concrete wall thickness 2 1/2 inches
3. Min. bottom thickness 3 inches
4. Min. cover thickness 3 1/2 inches

B. Cast-in-place Septic Tank Requirements

1. Monolithically poured and mechanically vibrated.
2. Min. reinforced concrete wall thickness 6 inches
3. Min. bottom thickness 3 inches
4. Min. cover thickness 4 inches

- C. Minimum capacity below outlet: 1000 gallons for up to and including 4 bedrooms plus 250 gallons for each additional bedroom or as indicated in the bid schedule.

- D. Minimum liquid depth: 3 feet

- E. Maximum liquid depth: 6 1/2 feet

- F. Minimum air space above liquid level: 8 inches

G. Two compartment tanks

1. Influent chamber not less than 1/2 or greater than 2/3 of the tanks' total liquid capacity.
2. Passage in the common wall between chambers located below the liquid level between 20% and 40% of liquid depth.
3. Minimum 4-inch diameter vent between chambers.

- H. Concrete compressive strength: 3000 psi at 28 days
- I. Rectangular tanks shall have a minimum width of 36 inches and be constructed with the longest dimension parallel to the direction of flow.
- J. Reinforcement
 - 1. Sides and bottom: 6-inch x 6-inch – 10/10 welded wire mesh.
 - 2. Top and Access hole cover: 6-inch x 6-inch – 10/10 welded wire mesh and No. 15 rebar spaced 2-foot on center in both directions.
 - 3. Fiber mesh may be used in addition to the wire mesh but may not replace the wire mesh.
- K. Joints below the liquid level shall be of monolithic construction or have interlocking V-notch, shiplap or tongue and groove joints.
 - 1. Joint Sealant
 - a. Koppers' bitumastic sealing compound
 - b. Ram-Nek flexible gasket as manufactured by the Henry Group (formerly K.T. Snyder Company Inc.), Houston, Texas
 - c. Or approved equal
- L. Access holes:
 - 1. Cast-in-place
 - 2. Min. of one access hole per compartment.
 - 3. Min. diameter of 24 inches.
- M. Quality
 - 1. Tanks with exposed reinforcement will be rejected and replaced at the Contractor's expense.
 - 2. Tanks with cracks from casting or handling, including placement will be rejected and replaced at the Contractor's expense.
 - 3. All tanks will be cured for a minimum of 28 days. "Green" tanks will be rejected and replaced at the Contractor's expense.

2.02 INLET AND OUTLET BAFFLES

1. Provide tanks with inlet and outlet connections for 4-inch PVC pipe.
2. Provide vertical SDR 35, ASTM 3034 PVC sanitary tee.
3. Provide at 2 inches of clear space below the top of the tank and top of vertical tee.
4. Extend inlet tee to a depth of 6 inches below the liquid level.
5. Extend the outlet tee to 20 to 40% of the liquid depth below the liquid level.
6. The bottom of the outlet opening shall be at least 2 inches lower than the bottom of the inlet.

2.03 ACCESS HOLE RISERS AND COVERS

1. Manhole riser shall be cast-in-place concrete or polyethylene pipe with gasketed connections.
2. Covers shall be of the same material as the riser, with a warning label, printed with information regarding the hazards present when entering a septic tank affixed or supplied by the manufacturer.
3. Provide cast-in-place or integral lifting handles for each cover.

2.04 INSPECTION PORTS

- A. Provide an airtight inspection opening consisting of SDR 35, ASTM 3034 PVC at least 8 inches in diameter, over the inlet and outlet baffles.
 1. The upper end of the pipe shall terminate 6 inches above final grade and be securely capped.

2.03 EFFLUENT FILTER (if required)

- A. Rated for 3,000-gpd flow rate.
- B. Maximum filter opening, 1/16 inch.
- C. Provide a lifting handle for the filter that extends to within 2 inches of the top of the inspection port.
- D. Zabel A100, Zoeller 170-0023, Zoeller 170-0058, or approved equal.

2.05 SOLID PIPING AND FITTINGS

- A. SDR 35, ASTM 3034 PVC

PART 3 -EXECUTION

3.01 SOLID SEWER PIPE

- A. Install solid sewer pipe from the house to the septic tank.
 - 1. Connect to the existing home sewer stub out if present underground outside the home.
 - 2. Cap sewer service, and stake if no connection is made.
 - 3. Use the same diameter pipe as the house plumbing pipe.
- B. Minimum cover over solid sewer pipe is 12-inches.
- C. Minimum slope between the house and the septic tank:
 - 1. 1/8-inch per foot for 3 and 4-inch pipe.
 - 2. 1/16-inch per foot for 6-inch and above pipe.
- D. Maximum degree of bend in any fitting: 45 degrees.
- E. Minimum distance between fittings: 6 inches.
- F. Solvent weld all joint connections.

3.02 CLEANOUTS

- A. Install two-way cleanouts:
 - 1. Within 5 feet from the outside wall of each home or mobile home.
 - 2. Within 5 feet of every 45 degrees of bend.
 - 3. Every 100 feet minimum.
- B. Cleanout shall allow rodding the sewer line both towards the home and towards the septic tank.
- C. Fit cleanout with a threaded plug.

- D. Install cleanout so the top is flush with the ground or as specified by the Project Engineer.
- E. Properly seal pipe connections to tanks to prevent groundwater infiltration.
- F. Solvent weld all joint connections.

3.03 TANK INSTALLATION

- A. Place tanks in excavations at the locations and elevations designated on the plans or by the Project Engineer.
- B. Place tank on undisturbed earth.
 - 1. Bring over excavated areas up to proper grade in 6 inch compacted lifts or with clean gravel.
- C. Remove any water from excavation and check grade before setting tank.
- D. Backfill and compact uniformly around the tank.
 - 1. Compact to the density of the surrounding undisturbed earth.
- E. Refer to Section 02315 for excavation, backfill, and grading requirements.
- F. Place tanks level.
- G. Install tanks in accordance with manufacturer's recommendations.
- H. Seal joints when the tank is set with an epoxy based sealing compound or Rub-R-Nek flexible gasket, as manufactured by the, or equal.
- I. Seal inlet and outlet with temporary plugs until connections are made to the inlet and outlet lines.
- J. Set the top of the tank a minimum of 6-inches below finished grade. Do not exceed 24-inch cover depth unless tank is designed for deeper bury depth and Project Engineer approves.
 - 1. Install manhole risers, and terminate access cover below-ground, no deeper than 6 – 12 inches, or
 - 2. Install manhole risers and terminate access cover flush with the ground. Provide suitable locking screws or locking device that meets with Project Inspector's approval.

3. Where manhole risers are required more than 24 inches in height, risers and manhole shall be made of concrete with approved watertight seals.
 4. Seal access hole risers, covers, and inspection ports.
- K. Do not drive over the tank during and after construction.
 - L. Backfill and compact piping from the house to the tank.
 - M. Finish grade excavated areas in conformance with Section 02310 – Grading
 - N. Seed disturbed areas in conformance with Section 02920 – Topsoiling, Seeding, Fertilizing, and Mulching.

3.04 INSPECTION AND TESTING

- A. Notify the Project Inspector two full business days before testing begins.
- B. Before backfilling, fill the septic tank with potable water to the outlet liquid level and let stand for 2 hours.
- C. Refill tank to the liquid level and let stand for 24 hours without adding additional water
- D. The allowable leakage is 5% of the total tank liquid volume.

3.05 EFFLUENT FILTER

- A. Center filter under the outlet inspection port.
- B. Solvent weld to 4-inch SDR 35 outlet pipe.
- C. Install lifting handle extension to within 2 inches of the top of the inspection port.
- D. Conform to manufacturers installation instructions.

3.06 EXISTING SEPTIC TANK ABANDONMENT

- A. Abandon existing septic tanks and/or wet wells where directed by the Project Inspector.
- B. Pump tanks prior to abandonment. Dispose the contents in accordance with state and federal requirements.
- C. Remove and dispose of any interior pipes, plumbing, or pumps.

- D. Remove and dispose of concrete tank cover, risers, and inspection pipes.
- E. Crush the tank and backfill interior of the tank with suitable, compactable soil material.
- F. Finish grade excavated areas in conformance with Section 02310 – Grading
- G. Seed disturbed areas in conformance with Section 02920 – Topsoiling, Seeding, Fertilizing, and Mulching.
- H. Locate abandoned septic tanks on the as-built drawing.

3.07 DISPOSAL OF EXCESS MATERIAL

- A. Dispose of excess material including rock, broken concrete, bituminous materials, debris, or other materials not suitable for backfill at the location designated by the Project Engineer.
- B. Other disposal sites may be used if approved in advance by the Project Inspector.
- C. The cost to dispose of the material is considered as subsidiary to and part of the cost for the septic tank bid item.

3.08 AS-BUILTS

- A. Provide as-built information on each system in accordance with Section 01780 – Closeout Submittals and as-built detail drawings.

END OF SECTION

**SECTION 02548
AEROBIC WASTEWATER SYSTEM**

PART 1 - GENERAL

1.01 SUMMARY

- A. This section covers the provision and installation of Aerobic Wastewater Systems. Also included is the electrical wiring to the aeration and pumping components, a two-year service agreement between the homeowner and contractor, required annual water tests over the two year service agreement, provision of system operation manuals and instructions and training in the systems operation and maintenance.
- B. Contractor must be a current Licensed Installer registered with the Oklahoma Department of Environmental Quality (ODEQ), in conformance with Section 1.03 - References.

1.02 RELATED WORK

- A. Section 01330 – Submittals
- B. Section 01430 – Quality Assurance
- C. Section 01770 – Closeout Procedures
- D. Section 01780 – Closeout Submittals
- E. Section 01781 – Warranties
- F. Section 02310 – Grading
- G. Section 02315 – Excavation, Trenching and Backfill
- H. Section 02316 – Rock Excavation

1.03 REFERENCES

- A. Oklahoma Department of Environmental Quality (DEQ), Title 252, Chapter 641, Subchapter 13

1.04 SUBMITTALS

- A. Aerobic tank (including reinforcement details if applicable).
- B. Aerator
- C. Effluent Pump
- D. Effluent solid sewer pipe and fittings
- E. Freeze Drains

F. Sprinkler Heads

1.05 QUALITY ASSURANCE

- A. Aerobic tanks and other materials shall meet minimum requirements of the appropriate state agency regulating onsite septic systems.

1.06 PERMITS

- A. Obtain authorizations and permits DEQ form 641-575.
- B. Provide copies of authorization and permit to the Project Engineer before construction begins.
- C. Notify DEQ prior to start of construction.
- D. Submit completed DEQ form 641-576A to DEQ and provide a copy to the Project Engineer within 10 working days after the work has been completed.

PART 2 - PRODUCTS

2.01 EQUILIZATION TANKS

- A. Pre-cast Concrete Tank Requirements
 - 1. Monolithically poured and mechanically vibrated.
 - 2. Min. 28 day compressive strength of 3000 psi
 - 3. Min. reinforced concrete wall thickness - 2 1/2 inches
 - 4. Min. bottom thickness - 3 inches
 - 5. Min. cover thickness - 3 1/2 inches
- B. Fiberglass/Plastic Tank Requirements
 - 1. Tanks will meet IAPMO standard PS-1-99 or CSA B66-00 and will be installed to manufactures recommendations
- C. Minimum capacity 300 gallons

2.02 AEROBIC TREATMENT UNIT

- A. NuWater BNR or Approved Equal

- B. Treatment Unit will meet the most recent ANSI/NSF Standard 40 & 245

2.03 PUMP TANK

- A. Pump Tank will meet the requirements of ANSI/NSF or DEQ 252:641-7-2.
- B. Have a minimum capacity of seven hundred (700) gallons or, for systems with an average daily flow over 350 gallons, tanks will have a capacity twice the average daily flow.
- C. Tank will have a sampling port at the pump tank discharge outlet or, in the treated sewage line following the tank.
- D. Tank will be equipped with a float to ensure the tank is never more than ½ full
- E. Tank will have a high water alarm set to activate if the tank becomes more than ½ full.

2.04 SPRINKLER SYSTEM

- A. Sprinkler heads and piping will apply properly treated effluent water onto the surface of the ground. Distribution piping, sprinklers and other application devices will be installed according to the IHS OEH-8 Proposed Site Drawing and will provide a uniform distribution of treated effluent. Each sprinkler head will have a freeze drain installed below it to allow wastewater to drain below frost level.
- B. Sprinkler system will have an alarm, which will alert the owner/operator of a system failure.
- C. Sprinkler system application surfaces will be landscaped or terraced to prevent runoff from the site.
- D. Sprinkler systems will be designed using as the ODEQ, Title 252, Chapter 641, Subchapter 13-4, Appendix H, Figures 5 and 6 as a minimum guideline. The sprinkler system shall be installed according to the IHS OEH-8 Proposed Site Drawing.
- E. Application of effluent by sprinkler heads will be at the design radius and must cover the design area without misting or overlapping of coverage areas. Nozzles will have a 13 degree (13°) or less trajectory to keep spray stream low to the ground surface.
- F. Application will be controlled by a timing device and will take place daily between 1:00 a.m. and 6:00 a.m., not to exceed three (3) hours per day.

- G. Electrical power for the system aeration, effluent pump and controls will meet all manufactures recommendations and will meet, or exceed all applicable state and federal electrical codes. The system installer will provide power from the point indicated on the proposed drawing to the aerobic unit.

2.05 DISENFECTION

- A. Treated effluent will be disinfected prior to surface application and will meet the requirements of ODEQ 252:641-13-4, part c

2.06 SERVICE AGREEMENT

- A. The system installer will provide to the homeowner, a two-year maintenance contract for the aerobic system installed. This contract will provide for the required bi-annual inspection of the system to ensure proper operation of all components and controls, **including sprinkler heads and distribution system**. In addition, the following tests / inspection shall be performed and the specified criteria met, as an ongoing part of the two-year maintenance contract:

REQUIRED TEST / INSPECTION	MIN STANDARD
Free Chlorine or Fecal Coliform	1 PPM or Absent
Control Box Structure / Functions	Good Shape / Operational
Aerator Pump	Operational
Clear Water Pump	Free of Debris & Operational
Sprinklers (installed)	Free of Debris & Operational
Sludge Level	Reported
Chlorine Level	Reported

Copies of the test results and report shall be submitted to the Cherokee Nation SFC office and the homeowner.

The two-year maintenance contract shall include all items in part 2.06 A., and shall be performed at the contractor’s expense, to be included in the system pricing.

- B. The system installer will provide to the homeowner all applicable system operation manuals and training in the proper operation and maintenance of the aerobic system, including the addition of chlorine tablets. The training will be provided immediately after installation of the system and during the initial startup of the system. Costs of the training are to be included in the system pricing.
- C. For each required bi-annual service, the system installer shall notify CN-SFC office and the homeowner the day it will be performed to allow for inspection.

- D. The installer will warrant all materials and installation for the entire system for a minimum of one year.
- E. The installer will provide a signed "Initial Service Policy" to the CN-SFC office and the homeowner.

PART 3 - EXECUTION

3.01 SOLID SEWER PIPE

- A. Install solid sewer pipe from the house to the system.
 - 1. Connect to the existing home sewer stub out if present underground outside the home.
 - 2. Use 4" PVC SDR 35.
- B. Minimum cover over solid sewer pipe is 12-inches.
- C. Minimum slope between the house and the septic tank:
 - 1. 1/8-inch per foot for 3 and 4-inch pipe.
 - 2. 1/16-inch per foot for 6-inch and above pipe.
- D. Maximum degree of bend in any fitting: 45 degrees.
- E. Minimum distance between fittings: 6 inches.
- F. Solvent weld all joint connections.

3.02 TANK INSTALLATION

- A. Place tanks in excavations at the locations and elevations designated on the plans or by the Project Engineer.
- B. Place tank on level base.
 - 1. Use a transit or four (4) foot level.
 - 2. Bring over excavated areas up to proper grade in 6 inch compacted lifts or with clean gravel.
 - 3. If rock or uneven surfaces are encountered, use four (4) inches of sand or fine-grained gradable material in the bottom of the excavation to provide a

solid flat base. Suitable on-site material may be used if approved by the Project Engineer.

4. Remove any water from excavation, and make sure bottom of excavation is to grade, smooth, tamped and level before setting tank.
- C. Place all tanks level using a transit or four (4) foot level.
 - D. Once all tanks are level and positioned, fill to overflow with clean water, checking for leaks and making sure tanks remain level before backfilling.
 - E. Backfill and compact uniformly around the tank.
 1. Backfill using a material that will settle well around the tanks.
 2. Do not use large rocks or heavy clay.
 3. Place the material around the tanks in layers, tamping and watering each layer.
 - F. Refer to Section 02315 for excavation, backfill, and grading requirements.
 - G. Install tanks in accordance with manufacturer's recommendations.
 - H. The connector pipe between any and all tanks and plant should be between level and one-eighth (1/8) inch per foot grade toward plant outlet.
 - I. Install access covers so that access will be above grade. Provide suitable locking screws or locking device that meets with Project Engineer's approval.
 - J. Do not drive over the tank during and after construction.
 - K. Backfill and compact piping from the house to the tank.
 - L. Finish grade excavated areas in conformance with Section 02310 – Grading

3.03 SPRINKLER SYSTEM

- A. Place sprinkler heads at the locations designated on the plans or by the Project Engineer.
- B. Set each sprinkler's radius at length designated on the plans or by the Project Engineer.
- C. Set each sprinkler's arc adjustment to a 360° full circle unless otherwise designated on the plans or by the Project Engineer.

- D. Set each sprinkler so it is flush with existing ground or concrete pad when closed. If using a concrete pad, set pad flush with existing ground.
- E. Crushed stone shall be placed under, around, and above freeze drains, and up to the concrete collar, as shown in Detail Drawing 02548-Sprinkler Head -1 or 02548-Sprinkler Head -2.
- F. Sprinkler head piping shall be rigid PVC as shown in Detail Drawing 02548-Sprinkler Head -1 or 02548-Sprinkler Head -2.

3.04 INSPECTION AND TESTING

- A. Each system will be completely operational at final inspection, where the pump tank will be filled with water, and the entire unit tested to ensure proper operation of all components and controls, including the sprinkler heads.
- B. Each sprinkler head shall be turned on to check for correct radius, arc, spacing, and surface application area.

3.05 DISPOSAL OF EXCESS MATERIAL

- A. Dispose of excess material including rock, broken concrete, bituminous materials, debris, or other materials not suitable for backfill at the location designated by the Project Engineer.
- B. The cost to dispose of the material is considered as subsidiary to and part of the cost for the aerobic system bid item.

3.06 EXISTING SEPTIC TANK ABANDONMENT

- A. Abandon existing septic tanks and/or wet wells where and when designated on the plans.
- B. Pump tanks prior to abandonment. Dispose the contents in accordance with state and federal requirements.
- C. Remove and dispose of any interior pipes, plumbing, risers, inspection ports, or pumps.
- D. Crush the tank and backfill interior of the tank with suitable, compactable soil material.
- E. Finish grade excavated areas in conformance with Section 02310 – Grading
- F. Locate abandoned septic tanks on the as-built drawing.

3.07 AS-BUILTS

- A. Provide as-built information on each system in accordance with Section 01780
– Closeout Submittals and as-built detail drawings.

END OF SECTION

**CHEROKEE NATION
ON-SITE SEWAGE TREATMENT SYSTEMS
SECTION 02920
TOPSOILING, SEEDING, FERTILIZING, AND MULCHING**

PART 1 - GENERAL

1.01 SUMMARY

- A. This section includes topsoiling, seeding, fertilizing, and mulching areas disturbed by construction activities.

1.02 RELATED WORK

- A. Section 02310 – Grading
- B. Section 02315 – Excavation, Trenching, and Backfill

1.03 REFERENCES

- A. U.S. Department of Agriculture Rules and Regulations under the Federal Seed Act.

1.04 SUBMITTALS

- A. Conform to the Section 01330 – Submittal Procedure.
- B. Seed Mixture
- C. Fertilizer

PART 2 - PRODUCTS

2.01 TOPSOIL

- A. Natural loam, sandy loam, silt loam, silty clay loam, or clay loam humus-bearing soils adapted to the sustenance of plant life.
- B. Use previously stockpiled topsoil.

2.02 FERTILIZER

- A. 20-10-10 mixture of 20% Nitrogen, 10% Phosphorous, and 10% Pot Ash.

2.03 SEED MIXTURE

- A. April through June: Bermuda grass seed.
- B. July through March: blend of Kentucky 31, Fescue, and annual rye grass.

2.04 MULCHING MATERIAL

- A. Prairie (native) hay, not more than 2 years old and free of noxious weeds.

PART 3 - EXECUTION

3.01 TOPSOIL

- A. Place a minimum of 4 inches of topsoil over area to be seeded.

3.02 FERTILIZING

- A. Apply using mechanical equipment.
- B. Uniformly distribute.
- C. Incorporate into soil using harrow or other suitable equipment.
- D. Conform to recommendations of local county extension agent.
- E. Fertilize the area at an application rate of 200 pounds per acre.

3.03 SEEDING

- A. Sow seed using either equipment suited to that purpose or scatter seed uniformly over area with hand seeders when the weather is sufficiently quiet to prevent seeds from blowing away.
- B. Plant when soil temperature is 60° F or greater.
- C. Application rate
 - 1. 200 pounds per acre of the Kentucky 31, fescue and rye grass, 100 pounds per acre of the Bermuda seed.
- D. Lightly rake soil to cover the seed with approximately ¼-inch of soil.

3.04 MULCHING

- A. Place hay mulching on seeded area loose enough to allow some sunlight to penetrate and air to circulate but thick enough to shade the ground, conserve soil moisture, and prevent/reduce erosion.
- B. Do not perform mulching activities during periods of excessively high winds, which would preclude the proper placing of the mulch.

- C. Apply straw or hay uniformly over the disturbed area to a loose depth of ½ to 1½ inches using 2 to 2 ½ tons of mulch per acre.
- D. Immediately after spreading, anchor mulch using a mulch tiller consisting of a series of dull flat discs with notched edges or other approved equipment.
- E. Anchor mulch to a depth of approximately 1½ to 2½ inches in the soil.

3.05 WATERING

- A. Follow seed supplier's recommendations.
- B. Water supplied at Contractor's expense.

END OF SECTION

**CHEROKEE NATION
WATERLINE CONSTRUCTION SPECIFICATIONS
SECTION 09312
CONDUCTIVE TRACE WIRE FOR
WATER PIPE INSTALLATION**

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Install electrically continuous trace wire with access points as described herein to be used for locating pipe with an electronic pipe locator after installation.

1.2 MEASUREMENT

- A. There is no separate payment for the supply and installation of tracer wire on any construction or installation of water main by the Contractor. The Contractor shall consider the supply and installation of the tracer wire incidental to all construction of water main.

1.3 SUBMITTALS

- A. Submit manufacturer's data on material furnished that indicate compliance with the specifications regarding material used.
- B. Indicate on plans location of each trace wire test station.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Trace wire to be twelve (12) gauge minimum solid copper with thermoplastic insulation recommended for direct burial. Wire connectors to be 3M DBR, or approved equal, and shall be watertight to provide electrical continuity. Tracer wire shall be brought to the surface at all valve boxes for access points.

2.2 TESTING REQUIREMENTS

- A. Contractor shall perform a continuity test on all trace wire in the presence of the Engineer or the Engineers' representative. If the trace wire is found to be not continuous after testing, Contractor shall repair or replace the failed segment of the wire.

PART 3 – EXECUTION

- A. Trace wire shall be installed on all water mains. The wire shall be installed in such a manner as to be able to properly trace all water mains without loss or deterioration of signal or without the transmitted signal migrating off the tracer wire.
- B. Trace wire shall be installed in the same trench and inside bored holes and casing with pipe during pipe installation. It shall be secured to the pipe as required to insure that the wire remains adjacent to the pipe. The trace wire shall be securely bonded together at all wire joints with an approved watertight connector to provide electrical continuity, and it shall be accessible at all trace wire access points.
- C. Tracer wire shall be laid flat and securely affixed to the pipe at 10 foot intervals. The wire shall be protected from damage during the execution of the works. No breaks or cuts in the tracer wire or tracer wire insulation shall be permitted. At water service saddles, the tracer wire shall not be allowed to be placed between the saddle and the water main.
- D. Except for approved spliced-in connections, tracer wire shall be continuous and without splices from each access point. Where any approved spliced-in connections occur, 3M DBR water tight connectors, or approved equal, shall be used to provide electrical continuity.
- E. At all water main end caps, a minimum of 6 feet of tracer wire shall be extended beyond the end of the pipe, coiled and secured for future connections.
- F. For directional drilling, auguring or boring installations, four #14 tracer wires shall be installed with the pipe and connected to the tracer wire at both ends, or cad welded to the existing iron pipe at both ends.
- G. Spliced connections between the main line tracer wire and branch connection tracer wire shall only be allowed at water main tees, crosses or at iron or copper water services where a portion of the branch connection water main or water service is replaced with a non iron or non copper material. The branch connection tracer wire shall be a single tracer wire properly spliced to the main line tracer wire. Where the existing branch connection is neither iron nor copper, then the new branch connection tracer wire shall be properly spliced to the existing tracer wire on the branch connection.
- H. At all repair location where there is existing tracer wire, the tracer wire shall be properly reconnected and spliced as outlined above.

END OF SECTION