TECHNICAL SPECIFICATIONS

NAVAJO TRIBAL UTILITY AUTHORITY
CONSTRUCTION REQUIREMENTS

Reviewed by:
NAVAJO NATION and HIS STANDARDS COMMITTEE

TECHNICAL SPECIFICATIONS
FOR
MATERIALS AND WORKMANSHIP
FOR WATER AND WASTEWATER FACILITIES

Civil Engineering Department
Ft. Defiance, AZ

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TECHNICAL SPECIFICATIONS FOR MATERIAL AND WORKMANSHIP OF WATER AND WASTEWATER FACILITIES

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DEFINITION OF TERMS:

Owner:	The organization or its representative authorizing and administering the construction project.
Contractor:	The organization or its representative performing the construction.
Operating Utility:	The organization or its representative operating the water and wastewater utility affected by the construction.
Roadway Authority:	The authority or agency with jurisdiction over the roadway.
Or Approved Equal (OAE):	A substitute in material that is considered by the **Operating Utility** to be equal to or better than the item listed in the specifications or standards.
NTUA:	The utility owner, **Navajo Tribal Utility Authority**

TECHNICAL PROVISIONS 1.0

TP 1.0 EXCAVATION, TRENCHING, AND BACKFILLING FOR WATER AND WASTEWATER UTILITIES

1.01 Scope of Work

The work covered by this section includes the furnishing of all plant, labor, tools, equipment, and material, and performing all operations in connection with excavating, trenching, and backfilling, for installations of all water/wastewater utility pipelines, related structures, and accessories. This includes the necessary clearing and grubbing, pavement cutting, compaction, pavement restoration, grading, and cleanup, all in accordance with these Technical Provisions and applicable drawings. The final installation also shall meet the requirements of Section 2.0, Water, and Wastewater Line Separation Requirements.

If there is a conflict between these Technical Provisions and any other section of the specifications and/or drawings, then the most stringent, as determined by the Owner and/or NTUA shall apply.

1.02 Layout and Staking

All layout and staking for site work shall be performed by a licensed engineer or land surveyor, approved by the Owner and/or NTUA, who is to be paid by the Contractor, unless other arrangements are negotiated. Copies of survey notes shall be submitted to the Owner and the NTUA, with one or more copies remaining on the job site at all times.

1.03 Protection of Excavations

The Contractor shall provide suitable sheathing, shoring, and bracing to protect all excavations as required, to provide safe working conditions as directed by the NTUA. and in conformance with applicable OSHA and all other safety regulations. The Contractor at his expense shall repair damages resulting from settlements, slides, cave-ins, flooding, pipeline breaks, and other causes. Suitable signs shall be so placed as to show in advance where construction, barricades, or detours exists.

The Contractor shall at all times perform his work to insure the least possible obstruction to traffic, inconveniences to the general public and residents in the vicinity of the work, and to insure the protection of persons and property in a manner satisfactory to the Owner and the NTUA.. No road or street shall be closed to the public except with the permission of the proper authority. Fire hydrants on or adjacent to the work site shall be kept accessible to fire-fighting equipment at all times. Temporary provisions shall be made by the Contractor to insure the use of sidewalks, and the proper functioning of all gutters, sewer inlets,

drainage ditches, and irrigation ditches.

1.04 Protection of Existing Utilities

It shall be the Contractor's responsibility to determine the locations of all known existing underground utilities not shown on the drawings and to confirm the exact locations of those existing utilities shown on the drawings. All existing utilities shall be protected from damage, during excavation and backfilling of trenches and if damaged, shall be repaired at the expense of the Contractor.

1.05 Excavation

1.05.01 General

It is expected that all excavation required for the performance of the work shall be made by open cut methods unless otherwise specified and shown on the drawings or as required by applicable permits.

1.05.02 Grading and Stacking

All grading in the vicinity of the construction shall be controlled to prevent surface water from flowing into the excavation. Any water accumulated in the excavation shall be removed by pumping or other approved method. During excavation, material suitable for embedment and backfilling shall be piled in an orderly manner, a sufficient distance back from the edges of the bank to avoid overloading and to prevent slides or cave-ins. Material unsuitable for backfilling shall be hauled from the job site and disposed of by the Contractor at approved disposal sites.

1.05.03 Pavement Cutting

Where it is necessary to remove sections of asphalt pavement, the asphalt shall be clean-cut with approved equipment in a neat line 6 inches back from the outside edge of the excavation, in order to provide a key when restored.

Where it is necessary to remove sections of concrete pavement, the concrete shall be saw-cut to a depth of not less than 1-1/2-inches with neat vertical lines in such a manner that the adjoining surfaces will not be damaged.

1.05.04 Rock Excavation

If given special consideration, rock is considered to exist when excavation cannot be accomplished using a 790E John Deere Class

track hoe with a rock bucket, without stressing the machine. The NTUA shall be the sole party in determining the existence of rock and the appropriate means of removal. The quantity of rock shall be determined in cubic yards of material removed. All other trenching and excavations, regardless of materials encountered, equipments used, or methods required for excavation, will be unclassified.

1.05.05 Dewatering

The Contractor shall remove and dispose of all water entering the trenches and shall keep the trenches water free until the water or wastewater lines and other appurtenances are in place. In no case shall water, earth, or any foreign materials be allowed to enter the water or wastewater pipelines.

1.05.06 Excavation for Structures

Excavation for appurtenances such as manholes, valves, foundations, catch basins, culverts, subterranean formwork, and other structures shall be to the necessary depth and sufficient width to leave at least 12-inches of space between the structure's outer surface and the embankment or shoring used to stabilize the banks.

1.05.07 Over-Excavation

Whenever solid or loose rock, rocky soil with rocks larger than 3/4-inches in their largest dimension, or otherwise unsuitable soils which are incapable of properly supporting the pipe or structure are encountered in the trench bottom, all unsuitable material, as determined by the Owner and NTUA, shall be over-excavated to a minimum depth of 6-inches below the pipe or structure and removed.

Except at locations where over-excavation is required, care shall be exercised not to excavate below the depths indicated. In the event of accidental over-excavation, the trench bottom grade will be restored in the same manner as areas specified to be over-excavated.

1.05.08 Trench Excavation

The sides of all trenches for the installation of utility piping system shall be as nearly vertical as soil conditions will allow from ground level to the pipe. Except for the trenching of 1-inch water service lines, the width of the trench shall be a minimum of 16-inches and a maximum of 30-inches wider than the outside diameter of the pipe. Trench excavation shall be centered on pipe alignment such that a minimum clearance of 8-inches is provided on each side of the pipe. Trench width

above the level of the top of the pipe may be as wide as necessary for shoring or sheathing and for proper installation of the work.

The depth of all trenches shall be as indicated on the drawings. If not otherwise specified, the depth of all trenches shall be in accordance with the specifications for the installation of waterlines and wastewater lines.

Unless otherwise required by applicable permits, the maximum length of trench that may be left open at any one time shall not exceed 500 feet.

1.06 Placement and Compaction of Pipe Embedment and Backfill Material

1.06.01 Pipe Embedment

Pipe embedment: Pipe embedment is defined as that material required to bring the trench bottom up to surface grade and that material placed alongside and above the pipe to a level of at least 6-inches over the top of the pipe. Pipe embedment shall be selected earth or sand, which contain no stones, dry or frozen lumps greater than 3/4-inch in diameter, or other unsuitable material as defined by the NTUA. Embedment and the first 6-inches of backfill, above the top of the pipe in rock excavation shall be done in the presence of the NTUA. Any backfilling, done in violation of this provision shall be cause for removal and replacement of the embedment, at the expense of the Contractor even though the work is found to be in accordance with these specifications.

Bedding: Bedding is that portion of pipe embedment zone beneath the pipe. If the native soil is suitable for bedding, the bottom of the trench shall be accurately shaped to provide uniform bearing and support for the entire length of the pipe. Bell holes shall be excavated to provide minimum clearances of 2-inches below the couplings or bells. Imported bedding material shall likewise be placed to provide uniform and adequate longitudinal support under the pipe. Bedding material shall be placed and compacted in lifts not to exceed 6-inches in loose measure.

Haunching: Haunching is that portion of the pipe embedment zone from the bottom of the pipe to the spring line of the pipe. Haunching material shall be placed and hand tamped to provide adequate side support to the pipe while avoiding both vertical and lateral displacement of the pipe from proper alignment.

Initial Backfill: Initial backfill is that portion of the pipe embedment zone from the spring line of the pipe to a minimum of 6-inches above the top of the pipe. Initial backfill material shall be placed and compacted in lifts not to exceed 6-inches in loose measure. Compaction shall be performed in such a manner so as to avoid damage and

disturbance of the embedded pipe.

Final Backfill: Final backfill is defined as that material used in the area between the initial backfill and the existing ground surface. Material shall be placed and compacted in lifts not to exceed 6-inches in loose measure except as otherwise specified.

1.06.02 Compaction Requirements

Unless otherwise specified by permit issued by the roadway authority or by special arrangement between the NTUA, bedding, haunching, initial backfill, final backfill, and gravel resurfacing shall be compacted to the following percentages of the maximum density as determined by ASTM D1557. (If using Standard Proctor ASTM D-698, add 5% to all compaction requirements listed in the table below). In-place densities of materials shall be determined by the sand-cone method, ASTM D1556 or by the nuclear method, ASTM D2922.

Percent of Maximum Density - D1557

Backfill Location	Bedding Backfill	Haunching Backfill	Initial Backfill	Final Backfill
Roadway Rights-of-Way Within Roadway Prism	95% *	95%	95%	95%
Roadway Rights-of-Way Outside of Roadway Prism	90% *	90%	90%	95%
All Other Conditions	90%	90%	90%	90%

* or the existing condition within the undisturbed bottom of the trench.

1.06.03 Water Jetting

The introduction of water to the pipe embedment or final backfill material shall not be permitted as a means of compaction.

1.07 Imported Backfill

1.07.01 Imported Pipe Embedment

If the native soil is unsuitable, the Contractor shall import suitable pipe embedment material. Pipe embedment shall be select earth or sand which contains no stones, dry lumps, or frozen lumps greater than 3/4-inches in diameter and shall be defined as 100% passing 3/4-inches, 40-99% passing # 4 sieve and 30% or less passing # 200 sieve. Unsuitable material is defined as solid or loose rock, soils with rocks larger than 3/4-inches in their largest dimension, or other unsuitable

soils which are, as determined by the NTUA, incapable of properly supporting the pipe.

1.07.02 Imported Final Backfill

If the native soil is unsuitable for use as final backfill, the Contractor shall import suitable final backfill. Imported final backfill may be any material, which is locally available and is capable of being compacted to the required density. This material shall be free of boulders and rocks larger than 6-inches in their smallest dimension, frozen clumps of dirt, organic material, or rubble, which could damage the pipe.

1.08 Bedding and Backfill for Structures

1.08.01 Bedding

Bedding material for structures is defined as that material beneath the structure. This material shall be as specified in the standard detail for each structure.

1.08.02 Backfill

Backfill for structures is defined as that material from the bottom of the structure to the existing ground surface. This material and the required compaction of such shall be the same as that specified for in the final backfill on pipelines, or as specified in the drawings.

1.09 Settlement of Adjacent Structures

Throughout the 1-year warranty period, the Contractor shall be required to fill and compact any areas where settlement has taken place and shall also be responsible for the settlement of any adjacent structure or object caused by any excavation performed under his contract.

1.10 Surface Restoration and Resurfacing

1.10.01 Surface Restoration

The following requirements shall be followed unless alternative specifications are set forth by the roadway or other rights-of-way crossing permits, or as arranged between the NTUA and the NMDOT.

After the piping and structures have been installed and all backfilling completed, areas, which were disturbed, shall be brought to true grades. All slopes shall be trimmed and dressed, and all surface graded to maintain existing drainages. All streets, alleys, driveways, sidewalks,

curbs, or other surfaces, which have been disturbed or damaged, shall be resurfaced or replaced. The Contractor shall properly dispose of all excess excavated materials.

As required by the operating utility, the contractor shall install the utility brand Carsonite markers at all road crossings, water valves, fittings, junctions, connections, points of intersection, or at a minimum, every 1500 feet. Naturally, this would apply only within the rural areas, along stretches of roadways, or as requested by the operating utility. This is also a requirement for marking sewer manholes, cleanouts, and service connections.

1.10.02 Roadway Patching

Whenever existing roadways are disturbed during the course of construction, the Contractor shall restore the roadways to their original condition.

For ease of compaction, the Contractor may use well-graded gravel, crushed stone, or flowable fill as backfill, from a Ready Mix plant as approved by the appropriate roadway agency. The material shall be clean, varying in size from 3/8-inches to 1-1/4-inches, with not more than 10 percent of the material less than 3/8-inches in size and shall be compacted in 6-inch layers or as directed by the NMDOT. Flowable fill is defined as one bag concrete, with gradations of 100% passing the 3/8 sieve, and less than 25% passing the #200 sieve. The slump should be between 5-inches and 8-inches, and the 28-day strength should be between 50 and 150-PSI.

Surfacing shall be replaced where the roadway has gravel, crushed stone, asphaltic, or concrete surfacing. Gravel or crushed stone shall be replaced in quantities and locations as directed by or as required by the roadway permitting authority. Asphalt mix or concrete surfacing shall be replaced, in the case of asphalt, appropriately compacted in roadways to a depth equal to existing roadway surface but not less than 2-inches in asphalt or 6-inches in concrete. A compacted stabilized gravel or crushed stone base 6-inches in depth shall be placed in the roadway at all locations where surfacing is required prior to placement of the bituminous or concrete wear course, unless other requirements are stipulated by the roadway authority.

The Contractor shall obtain any and all necessary written permissions, easements, and permits from federal, state, and county agencies prior to beginning any roadway excavation.

TECHNICAL PROVISIONS 2.0

TP 2.0 WATER AND WASTEWATER LINE SEPARATION REQUIREMENTS

2.01 General

Water lines located near wastewater facilities present conditions for serious potential cross contamination. Protection from cross contamination can be provided by separation of the facilities and use of special piping materials. For measuring separation between pipes, all measurements shall be the clearances between pipes. (Pipe O.D. to pipe O.D.).

2.02 Horizontal Separation of Water and Wastewater Lines

When water and wastewater lines are laid parallel to each other, the horizontal distance between the water and wastewater lines shall not be less than 10 feet. Each line shall be laid in separate trenches. The requirements for this separation shall apply to all other buried utilities, except the distance may be reduced to 5 feet for secondary electric and gas distribution lines less than 60-PSIG; however, all stipulations of the electric, gas, or other sub-surface utilities shall be met.

When physical conditions such as an existing obstruction, will not allow the required 10-foot horizontal separation, the water and wastewater mains may be laid closer than 10 feet if the bottom of the water main is a minimum of 12 inches above the top of the wastewater main and prior written approval is granted by the NTUA.

2.03 Vertical Separation of Water and Wastewater Lines

2.03.01 Water Above Wastewater

When waterlines cross wastewater lines, the waterline shall cross above the wastewater line with a minimum vertical separation of 12 inches. If necessary, the depth of bury for the waterline may be reduced to 36 inches (normally 42 inches) at the crossing to maintain the 12-inch vertical separation. No joints in new waterlines shall be permitted within 10 feet of crossing a wastewater line.

2.03.02 Wastewater Above Water

When a waterline must cross below a wastewater line, the minimum vertical separation between the lines is 12 inches. Backfill of the trenches shall be compacted to provide adequate support to prevent settling of the wastewater line and damaging the water line.

For new water construction, the waterline shall be normal PVC water pipes with 20-foot pipe sections centered on the wastewater crossing.

No joints of new waterline construction shall be permitted within 10 feet of crossing a wastewater line. While it is desirable to have all crossings perpendicular or normal, new waterlines (centered on the crossing) may cross under a wastewater line at a maximum of 25° from perpendicular.

For new wastewater construction, the wastewater line shall be ductile iron pipe with gasketed joints, or approved equal (OAE), with an 18-foot section centered on the crossing. No joints in new wastewater line construction shall be permitted within 9 feet of crossing a water line.

For water and wastewater lines crossing electric, gas, or other buried facilities; the standards established by that other specific utility must be met.

2.04 Water Main Separation from Wastewater Manholes

No waterline pipe shall pass through, under, or come into contact with any part of a wastewater manhole.

2.05 Water and Wastewater Service Line Separation Within 5 feet of the House

This section shall apply to that portion of water and wastewater service lines located within 5 feet of the house. All lines within 5 feet of the house will be considered as part of the house plumbing. For new construction, all service lines shall have a 10-foot minimum horizontal separation. This can be accomplished by having the water and wastewater service lines exit the house 10 feet apart or from different sides. If the 10-foot separation cannot be maintained and prior written approval is obtained from the NTUA, the service lines can be laid closer than 10 feet, if the bottom of the water service line is at least 12-inches above the top of the wastewater service line; and the water service line is continuous with no joints until the separation requirement is met.

2.06 Separations Between Waterlines and Components of the Wastewater Disposal System

Waterlines shall not be installed within 10 feet of a septic tank, within 25 feet of a drain field, or 50 feet from an outhouse. Also, waterlines shall not be installed within 100 feet of the perimeter fence of an **individual** lagoon, or within 500 feet of the perimeter fence of a **community** lagoon.

2.07 Separation Between Residences and Wastewater Lagoons

No permanent residence shall be within 1000 feet from the perimeter fence line of a **community** sewer lagoon, or within 300 feet from the perimeter fence line of an **individual** sewer lagoon without written consideration of the Operating Utility.

TECHNICAL PROVISIONS 3.0

TP 3.0 WATER MAINS, WATER SERVICE LINES, AND APPURTENANCES

3.01 Scope of Work

The work covered by this section includes the furnishing of all labor, equipment and tools, and material; performing all operations in connection with the construction of water mains, including the placing of all necessary valves, hydrants, fittings, and appurtenances, and the construction of water service lines and appurtenances, in accordance with these technical provisions and applicable drawings.

3.02 Water Mains

3.02.01 Polyvinyl Chloride (PVC) Pipe and Fittings

Fittings for PVC pipe 4-inch and larger shall be Class 350 SSB mechanical joint, ductile iron conforming to AWWA C153 and shall be cement mortar-lined conforming to AWWA C104 or if shown on the plans, may be Class 200 PVC Bell and Gasket, conforming to ASTM D3139 and D1784, Type 1, Grade 1, and ASTM D2241.

PVC pipe shall conform to ASTM D2241 and the pipe shall be PVC 1120, SDR 21 and 200-PSI pressure rating or SDR 26 and 160-PSI, as specified on the plans. All PVC pipe joints shall be rubber compression ring type gaskets conforming to ASTM D3139 - Rieber type or equal. Special piping provisions are required when higher pressures are encountered.

Plastic pipe with scratches, gouges, or grooves deeper than one-tenth (0.10) of the wall thickness shall be rejected. Damaged sections of pipe shall be completely destroyed or immediately removed from the job site.

Ductile Iron pipe of specific class and type as shown on the plans may be required under certain circumstances. The pipe may require polyethylene encasement. In cases where the soil environment is corrosive -the soil resistivity is less than 1000 ohm-cm, the PH is less than 4 or greater than 8.5, or sulfides or high moisture content exist in the soil, etc. -the Contractor shall be required to wrap all mechanical joint fittings and all Ductile Iron pipe with 9 mill polyethylene film per AWWA C105/A21.5.

3.02.02 Water Main Installation

Pipe and fittings shall be installed generally in accordance with the manufacturer's printed instructions and specifications, to the standards of the AWWA for installing the type of pipe used, and in accordance with the NTUA Technical Provisions. Minimum bury depth shall be 42-inches, unless otherwise specified, with a maximum depth of 72-inches, unless specifically exempted by the NTUA Engineer.

Pipe and fittings shall be carefully handled to avoid damage. Dirt or other foreign material shall be prevented from entering the pipe or pipe joint during handling or laying operations and any pipe or fitting that has been installed with dirt or foreign material shall be removed, cleaned, and re-laid. When pipe installation is not in progress, the open ends of the pipe shall be closed with a watertight plug.

Long radius curves, either horizontal or vertical, may be installed with standard pipe by deflecting at the joints. The amount of deflection at each pipe joint shall not exceed the manufacturer's printed recommended deflections. When rubber gasket pipe is laid on a curve, the pipe shall be jointed in a straight alignment and then deflected to the curved alignment. Trenches shall be excavated wider on curves for this purpose.

3.02.03 Connections to Existing Mains

A permission to tap permit shall be obtained from the local NTUA office by the Contractor and all work shall be in conformance with said tapping permit.

Connections to existing mains shall be dry connections, made in a neat and workmanlike manner, unless otherwise permitted by the NTUA. Each connection to an existing waterline shall be made at a time and under conditions which will least interfere with water services to customers affected thereby, or as authorized by the NTUA and as evidenced by an approved tapping permit. Such connections shall be made to the satisfaction of the NTUA. Proper tools and fittings to suit actual conditions encountered in the field in each case shall be utilized. The cutting of pipe for inserting fittings or closure pieces shall be done in strict accordance with the recommendations of the pipe manufacturer, without damage to the pipe, or coating, and so as to leave a smooth end at right angle to the axis of the pipe.

Great care shall be taken to prevent pipeline contamination when cutting into and making connections with existing pipelines used for the conveyance or distribution of water for domestic or public use. The

Contractor shall coordinate and cooperate with the NTUA, in locating services and shall conduct his operations in such a manner that trench water, mud, or other contaminations are not allowed to enter the connected line or lines, at any time during the progress of the work. The interior of all pipe, fittings, and valves installed in such connections shall be thoroughly cleaned and then swabbed with or dipped in strong chlorine solution having a chlorine content of 200 parts per million (PPM).

3.03 Valves For Water Mains

3.03.01 Gate Valves

All gate valves shall conform to AWWA Specification C509, iron body, epoxy coated, bronze mounted, resilient wedge, counter clockwise opening, inside screw, non-rising stem with O-ring seals, and a 2-inch square wrench nut. Valve working pressure rating shall be 200-PSI minimum. The valves shall be Mueller, Kennedy, Waterous, Dresser M & H, Clow, or an approved equal (OAE) with mechanical joints as specified on the plans with appropriate transition gaskets. For operating pressures greater than 200-PSI, special considerations shall be followed.

3.03.02 Valve Boxes

Valve boxes shall be installed on all buried valves and shall be 5-1/4-inch nominal diameter shaft, two-piece adjustable screw type equal to Tyler No. 6850 Series. The length of the box shall be sufficient to permit access to the valve at the specified depth of bury. Tyler Series extensions will be utilized to extend the valve box where required. The word "Water" shall be cast onto the lid.

3.03.03 Valve Installation

Before installing the valve, care shall be taken to see that all foreign material and objects are removed from the interior of the valve. The valve shall be opened and closed to see that all moving parts are in working order, prior to installation.

All valves shall be set and jointed to the pipe in the manner as set forth in the AWWA Standards for the type of connecting ends furnished. All valves shall be set in and tied to poured in-place concrete support blocks as per the NTUA standard detail. Valves and valve boxes shall be set plumb. The cast iron valve boxes shall be placed over valves in such a manner that the valve boxes do not transmit shock or stress to the valve. The valve box cover shall be set flush with, or slightly above the

finished grade, as shown per the NTUA standard detail. A 2-foot square by 4-inch deep reinforced concrete pad shall be poured around each valve box. Before the concrete hardens, the Contractor shall neatly scribe in the concrete pad, the valve and pipe size and type, and a line indicating the direction of flow of water through the valve.

3.04 Fire Hydrant Assembly

3.04.01 Fire Hydrant

Fire hydrants shall be of standard manufacture with the name of the manufacturer and direction of opening cast on the hydrant top. Fire hydrants shall conform to AWWA C502. The end connections shall be mechanical joint. The hydrants shall be equipped with a breakaway safety flange and safety stem coupling at or near the bury line such that a heavy impact would minimize breakage of hydrant parts. The hydrants shall open counter clockwise, have a 5 1/4-inch or larger main valve opening, 6-inch inlet, 1 1/2-inch tapered pentagonal operating nut, 2 hose nozzles 2 1/2-inches in diameter, and a 4 1/2-inch pumper nozzle, all with National Standard hose threads. The hydrant shall be Mueller A423, Kennedy K81A, or an approved equal OAE.

3.04.02 Hydrant Connections and Auxiliary Gate Valves

An auxiliary gate valve and valve box shall be installed adjacent to each fire hydrant per the standard detail or as specified on the plans. The pipe between the fire hydrant and the auxiliary gate valve and between the auxiliary gate valve and the main shall be 6-inch minimum.

3.04.03 Fire Hydrant and Guard Installation

Before installing any hydrant, care shall be taken to see that all foreign materials and objects are removed from the interior of the barrel. The hydrant shall be opened and closed to see that all moving parts are in working order.

Hydrants shall be installed plumb with the pumper nozzle toward the street. The hydrant shall be set per the standard detail for the hydrant and guard.

3.05 Thrust Blocking

Thrust blocking as detailed in the standard drawings shall be placed at all bends, caps, tees, crosses, and fire hydrants. Blocking shall be concrete mix poured in place. Concrete blocking shall bear against solid undisturbed earth at the sides and bottom of the trench excavation and shall be shaped so as not to block weep

holes or obstruct access to the joints of the pipes or fittings. The concrete shall not cover nuts and bolts of joints or fittings. Ductile Iron Joint Restraints used in conjunction with Mechanical Joint fittings may be used as a substitute for concrete blocking.

3.06 Water Main Crossings

3.06.01 Wash Crossings

Water mains shall be installed as shown on the plans. The Contractor shall divert surface flows, conduct dewatering, and perform all steps necessary to maintain proper bedding conditions and alignment. A minimum 6-foot depth of bury is required at the centerline of all wash crossings.

3.06.02 Road Crossings

In lieu of boring, roads may be open cut for water line and casing installation. The original surface pavement on all open cut roadways shall be either cut square or sawed straight. As with open cut, if boring is required the steel conduit shall be extended from right-of-way to right-of-way. The Contractor shall obtain written permission from the appropriate agency prior to beginning any roadway excavation. Backfill within the limits of a roadway prism may require special compaction in accordance with the requirements of the roadway crossing permits.

Surfacing shall be replaced where the roadway has gravel, concrete, or asphaltic paving in the same thickness as were removed, or as specified by the roadway agency, and completed as soon as possible following backfilling.

Ductile iron pipes resting on the bells within the steel casing shall be used as the carrier pipes. PVC waterline road crossings may also be installed within the steel casing on approved casing chocks or redwood skids secured to the pipe with stainless steel straps. The casing ends shall be sealed with an approved rubber boot or 9-mil plastic sheeting with stainless steel clamps. Casing pipe shall be straight welded Schedule 10 steel pipe, .25-inch wall thickness, unless otherwise specified. An alternate method for roadway crossing is to install ductile iron pipe, Class 52, bell and spigot, direct bury by open cut excavation from right of way to right of way. This would be considered when crossing minor roads or trails, or for congested area within an urban setting.

For pressure testing purposes, gate valves will be required on the up

stream and downstream side of roadway crossings.

3.07 Water Service Connections Material

3.07.01 Polyethylene (PE) Pipe

Polyethylene (PE) pipe shall be 1-inch IPS, 200 psi, SIDR 7 in conformance with ASTM D2239. The pipe shall be produced from a high density ultra-high molecular weight PE pipe compound, PE 3406 or PE 3408 which conforms to the latest revision of ASTM D1248. The pipe shall be equal to Driscopipe 5100 Ultral-line or Yardley Ultra-high Molecular Weight PE. The designation PE 3406 or PE 3408 shall be stamped on the pipe.

3.07.02 Service Line Fittings and Connections

Fittings and connections for PE pipe shall be made with non-flare compression connections and shall be Mueller Insta-Tite H-15426, or approved equal. All threaded connections from the water main to and including the inlet of the domestic stop shall be standard iron pipe (I.P.) threads.

3.07.03 Saddles

Saddles shall be specific for the type, size, and pressure rating of the mainline as recommended by the saddle manufacturer. Saddles shall be double strapped, double banded, or of the contoured band type. Saddles and saddle components shall be brass, bronze, or stainless steel. Tap threads shall be FIP. Acceptable saddles include Ford S71 and Mueller H-13478 for IPS PVC O.D. pipe, or Ford 202B or approved equal for DI and AC O.D. pipe.

3.07.04 Corporation Stops

Corporation stops shall be bronze alloy with MIP threads inlet by FIP threads outlet. They shall be equal to Mueller H-10046 corporation stops or Ford Type FB1700.

3.07.05 Curb Stops

Curb stops shall be 1-inch bronze alloy, quarter turn check, FIPT x FIPT end connections, with tee head and 30-inch (approx.) stationary operating rod. Curb stops shall be Minneapolis pattern top threads with resilient O-rings seals and equal to the Mueller B-20287, or Ford B11-444M or AY McDonald 6105.

3.07.06 Curb Stop Boxes

Curb stop boxes shall be the extension type, cast iron with 1 1/2-inch upper section. Curb box lid shall be cast iron and have a countersunk brass pentagon head plug. The curb stop boxes shall be Minneapolis pattern 2-inch base bushed to 1 1/2-inch and equal to Mueller H-10302 or Ford Type PXL. The finished elevation of the plug shall be such that it extends just slightly above the ground surface. The stationary rod shall be sized so that the top extends 2 to 4inches below the top of the curb box. An 18-inch by 18-inch by 4-inch depth reinforced concrete collar shall be poured around each curb box.

3.07.07 Water Meters

Water meters shall be of cast bronze construction with magnetic drive and a hermetically sealed register which reads in gallons. The meter shall accurately record flows from 1/4 to 20 gpm and shall be a 5/8-inch by 3/4-inch Sensus SR model with frost plate. The Sensus SR II model is not acceptable.

3.07.08 Meter Yokes/Coppersetters

Yokes or coppersetters for water meters shall have 3/4-inch ID x 12-inch riser, with a ball valve with padlock wing angle on the inlet, with a meter nut on the outlet side, and in the base, a 1-inch double purpose union swivel inlet and outlet connection. Yokes shall have an eye for the insertion of a cross brace and equal to Ford VB 72-12W-11-44 or AY McDonald 20-212WX-DD-44. The cross brace shall be a 1/2-inch OD PVC pipe or # 4 rebar 18-inches in length. The tandem coppersetter shall have an "S" tube with two bronze adapters, iron thread by meter nut, for the pressure regulators. The PRV shall be Watts Series 25AUB or approved equal.

3.07.09 Meter Boxes

Meter boxes shall be 20-inches diameter, 30-inches high nonmetallic by DFW or approved equal and shall be extended a minimum of 1-inch below the service line. The meter box lid shall be a cast iron, double lid cover with 11-1/2-inches lid opening, plastic or aluminum inner lid, and locking outer lid with pentagon head worm type lock. The meter box cover shall be equal to Castings model M 70.

3.07.10 Domestic Stops (Not part of the NTUA's facilities)

Domestic stops shall be a 1-inch bronze alloy, quarter turn check, FIPT x FIPT end connections, with tee head and 39-inch stationary operating

rod. They shall have resilient O-rings seals and equal to the Ford B11-444 or AY McDonald 610.

3.07.11 Domestic Stop Valve Boxes (Not part of the NTUA's facilities)

The domestic stop valve box shall consist of 3-inch diameter PVC-DWV pipe with a 3-inch hub by FIP threaded adapter with a 3-inch MIP threaded plug for the lid. The finished elevation of the plug shall be such that the stationary rod is located immediately below or within the plug so that the rod can be operated with an adjustable wrench from ground surface with the plug removed. The 3inch diameter PVC-DWV pipe shall be cut so that the top of the adapter extends 3 to 6-inches above ground surface.

3.08 Water Service Line Installation

Water service lines and appurtenances shall be installed in accordance with TP 1.0, Excavation, Trenching, and Backfilling for Water and Sewer Utilities, and TP 2.0, Water and Sewer Line Separation Requirements. A minimum of 3 feet of cover is required for water service lines.

Service lines shall be cut using tools specifically designed to leave a smooth, even, and square end on the pipe. The cut ends shall be reamed to the full inside diameter of the pipe. Pipe ends are to be connected using fittings which seal to the outside surface of the pipe which shall be cleaned to a sound smooth finish before installation. Splices shall be kept to a minimum and no splices shall be made within 10 feet of any sewer line.

All 1-inch service connections to water mains 4-inches or larger shall be made using saddles (tap tees are permitted for new construction). Service connections to 2-inch pipe shall be made using tees. Particular care shall be exercised to assure that the main is not damaged by the installation of the saddle. The saddle shall be aligned on the water main so that it is at a 45 degree angle above the springline of the pipe. The hole drilled into the pipe through the saddle shall be no smaller than 1/8-inch less than the size of the saddle.

Where required, the Contractor shall reconnect existing water service connections to the new water mains using materials specified herein. Individual pressure reducing valves, where required, shall be installed on a tandem meter yoke as shown on the standard detail. Prior to installation of the meter and connection to the building or house, the entire water service line and appurtenances shall be flushed.

3.09 Pressure Tests

Where any section of a waterline is provided with concrete thrust blocking for fittings or hydrants, the pressure tests shall not be conducted until at least 48 hours after installation of the concrete thrust blocking, unless otherwise specified.

3.09.01 Pressure Test

All labor, test equipment, water for testing; appurtenances and material, and performance of all operations in accordance with the specifications, are the responsibility of the Contractor.

All pipelines shall be tested for water tightness up to the individual service meter or domestic stop. The test equipment will not be provided, but is subject to inspection by the NTUA. Arrangements for water used in pipeline testing and payment for the water shall be coordinated with the local NTUA office. Pressure gauges used for pressure testing, shall be graduated at a maximum of 5-PSI increments. Two gauges will be used simultaneously for verification of the gauges functionality. Prior to the actual test, the pipeline shall be pressured to 10-PSI above the test pressure. The pressure will then be decreased to the test pressure, after the required time, so that gauge responsiveness can be observed.

The minimum test pressure shall be at least 160-PSI, measured at the lowest point of elevation in the test section. No section shall be tested that is greater than one mile in length or that has greater than 25-PSI pressure change, due to elevation. The test shall be conducted in such a manner that existing mains, services lines, and service user's plumbing are not damaged. Damage caused by testing shall be corrected at the expense of the Contractor. All connections, valves, blow-offs, hydrants, and house services up to the meter yoke shall be tested with the main, as far as are practicable. When testing piping systems designed to operate above 160-PSI, it will be tested as if it were rated at 160-PSI.

No air testing shall be allowed.

The test section shall be filled slowly with potable water and all air shall be vented from the line. The test shall not begin until the pipe has been filled with water for at least 24 hours to allow for absorption. The test shall have a minimum duration of two hours with the two-hour period beginning when the test pressure is attained and the pump ceases operation.

No pipe installed shall be accepted if the leakage is greater than that determined by the following formula:

$$Q = \frac{N*D*(P)^{1/2}}{7400}$$

in which,

Q = Allowable leakage in gallons per hour

N = Number of joints in the pipeline being tested, this "N" being the standard length of pipe furnished divided into the length being tested with no allowance for double gasket joint caused by use of couplings instead of integral bell pipe or for joints at branches, blow-offs, fittings, etc.

D = Nominal diameter of pipe in inches

P = The test pressure in PSI gauge as discussed in the third paragraph of this procedure.

During the test, the test pressure should not lose more than 5-PSIG without being pumped back up to the test pressure. The total of the gallons of water required to hold the test pressure during the two hours plus the amount of water required to return the line to the test pressure at the end of the two-hour test period is the total leakage. If the total leakage is less than the allowable leakage, the line can be accepted. All visible leaks will be repaired, regardless of the amount of leakage. Should the test on any section of the pipeline show leakage greater than the allowable leakage, the Contractor shall locate and repair the defective pipe, fitting, or joint until the leakage is within the allowable leakage for the two-hour test duration.

3.09.02 Observation of Tests

The NTUA shall witness the pressure testing of waterlines. Prior to the actual test, the Contractor shall have all equipment set up completely, ready for operation and shall have previously successfully performed the test to verify that the test section will pass. The Contractor shall notify both the NTUA and the NMDOT a minimum of three working days in advance of the date that the Contractor plans to perform the pressure tests.

The NTUA shall observe the testing to verify that the testing was performed according to the specifications and that the test data were properly and accurately recorded. The Contractor shall complete the required certification forms and submit them to the NTUA for approval. A letter of approval or disapproval of the test results will be sent from the Operating Utility to the Contractor.

3.10 Disinfection

A liquid chlorine solution shall be introduced continuously into one end of the system and allowed to flow along and through all lines and appurtenances to be disinfected until a minimum of 50-PPM of chlorine is detected at representative points throughout the line. A contact period of 24 hours shall be maintained before the system is flushed out with clean water until a maximum of 0.4-PPM chlorine residual is attained. All valves shall be operated several times during the 24-hour contact period.

After disinfection, the Contractor shall collect bacteriological samples for testing at his expense. A laboratory certified by the State Health Department or the U.S. Environmental Protection Agency shall perform the analysis. If an unsatisfactory bacteriological test result (positive result) is obtained, the system shall be disinfected and re-tested by the Contractor. This shall be repeated until a satisfactory bacteriological test (negative result) is obtained. Disinfection by introducing granular or tablet chlorine compounds in each pipe length is not an acceptable method of disinfection and will not be allowed.

EXHIBIT A OF TP-3
WATER LINE PRESSURE TEST CERTIFICATION

LOCATION OF LINE TESTED:_____
Include Project Name & Number

DATE(S) TEST WAS CONDUCTED: _____

GAUGES MANUFACTURER AND MODEL: 1) _____

2) _____

STANDARD LENGTH OF PIPE IN TEST SECTION: _____ FEET.

TEST SECTION:_____
(Sta.-Sta., Line No., etc.)

Length (Sta.-Sta.) Time-Start/End	Line Size/Type (Inch)	Pipe Pressure Rating (PSI)	Test Pressures (PSIG)	Observed Pressure Range (PSIG)	Total Leakage (Gal./2hrs.)	Allowable Leakage (Gal./2hrs.)

THE TEST AND ATTACHED INFORMATION IS CERTIFIED BY:

Signature/Printed Name: _____

Organization/Address: _____

Address: _____

Telephone Number: _____

TEST RESULTS CHECKED AND APPROVED ON: _____
Date

BY: _____ PASSED _____ FAILED _____
NTUA Representative

COPY OF APPROVAL OF TEST SENT TO: _____
Project Agency Involved

ON_____ BY_____
Date NTUA

EXHIBIT B OF TP-3

WATER LINE PRESSURE TEST WORKSHEET 1

Allowable Leakage: $Q=\frac{ND(P)^{1/2}}{7400}$

Q = Gallon per Hour

N = Total Length of Line Being Tested (ft) / Standard Length of Pipe (ft) = _____ = _____

D = Nominal Diameter of Pipe (inches) = _____

P = Test Pressure (psig) = _____

Allowable Leakage (2 Hour Test) = $2Q = \frac{ND\sqrt{(P)}}{7400}$ X 2 = _____ (Gals.)

Are the pressure gauges graduated at a maximum of 5-PSI increments? _____

Was the line pressured to 10 PSI above the test pressure so that the gauge responsiveness could be observed? _____

Is the length of the test section less than one mile? _____

Is the elevation difference between the highest and lowest points in the test section less than 57 feet? _____

Are the pipes in the test section the same pressure rating? _____

Description of Activity: Time:	Gauge Readings:	Amount of Water Added:
Total Time: Hrs.		Total: Gals.

Verified By: _____

NTUA Representative/Date

_____

Print Name/Title

EXHIBIT C OF TP-3

WATER LINE PRESSURE TEST WORKSHEET 2

Test Section: _____
(Sta-Sta, Line No., Etc.)

Length (Sta.-Sta.) Time: Start & End	Line Size & Type (Inch)	Pipe Pressure Rating (PSI)	Test Pressure (PSIG)	Observed Pressure Range (PSIG)	Total Leakage (Gal./2hrs.)	Allowable Leakage (Gal./2hrs.)

TECHNICAL PROVISIONS 4.0

TP 4.0 WASTEWATER MAINS AND APPURTENANCES

4.01 Scope of Work

The work covered by this section includes the furnishing of all labor, equipment, and material; performing all operations in connection with the construction of gravity wastewater mains and service lines, including manholes and other appurtenances, in accordance with these technical provisions and applicable drawings.

4.02 General

The wastewater line shall be constructed in the location and to the grade and size shown on the drawings or as directed in writing by the NTUA. Excavation, trenching, and backfilling shall be in accordance with TP 1.0 of these specifications. Inspection of wastewater lines and manhole connections shall be accomplished before backfilling, but work covered by this section will not be accepted until backfilling has been completed satisfactorily. Any section of wastewater that is found defective in material, alignment, and/or grade shall be corrected to the satisfaction of the NTUA and the NMDOT.

4.03 Materials

4.03.01 Polyvinyl Chloride (PVC) Wastewater Pipe

Except for extensions to dead ends of 400 feet or less where 6-inch is permitted, minimum wastewater main pipe size and slope, shall be 8-inch nominal diameter at 0.4% slope; and minimum wastewater service pipe size shall be 4-inch nominal diameter at 2.0% slope. All PVC wastewater pipe shall be made of materials conforming to the requirements of ASTM-D1784, Type I, Grade I for Rigid Polyvinyl Chloride compounds. The PVC wastewater pipe shall be SDR 35, Type PSM, with elastomeric gasket joints and shall meet the requirements of ASTM-D3034. The pipe shall have an integral bell with a solid cross section rubber ring, which has been factory assembled and securely locked in place to prevent displacement. Standard lengths shall be 20 feet.

4.03.02 Polyvinyl Chloride (PVC) Wastewater Pipe Fittings

All PVC wastewater pipe fittings shall be SDR 35, Type PSM, with elastomeric gasket joints and shall meet the requirements of ASTM D-3034. Service connections to new wastewater mains shall be wye fittings. Connections to existing wastewater mains may be wye saddles.

4.03.03 Ductile Iron Wastewater Pipe

Ductile Iron Pipe shall meet the requirements of AWWA C151, with either mechanical or push-on joints, with an interior lining of 40-mil polyurethane or ceramic epoxy and an exterior of standard bituminous coating. Thickness shall be Class 52 in all sizes.

4.03.04 Ductile Iron Wastewater Pipe Fittings

Service connections to ductile iron pipe shall be via saddle-type fittings equal to the " or AOE. Connections between wastewater PVC pipe and ductile iron pipe shall be via the appropriate size Calder coupling; however, the ductile iron pipe should be extended from manhole to manhole to minimize the use of adapters.

4.03.05 Pre-cast Concrete Manhole Sections

Manhole sections shall conform to ASTM C 478. A polyisoprene rubber connector meeting the material and performance requirements of ASTM C-923 and equal to the "A-Lok" Connector as manufactured by A-Lok Products Inc., Trenton, N.J., shall be used to seal between the pre-cast manhole and the sewer pipe. "Ram-Nek" flexible gasket or the "Butyl-Lok" preformed sealant tape by A-Lok Products, Inc., or an approved equal shall be used to seal between manhole sections, grade rings, and cover ring. Bottom manhole sections shall have integral pre-cast base or reinforced concrete floor slabs.

4.03.06 Manhole Covers and Frames

The frames and covers shall be cast iron, equivalent to a Deeter 1257, 330 pounds, with a Type C surface pick slot. The cover minimum opening shall be 24-inches in diameter with a 6-inch high ring. The lid shall not have any holes including pick holes, which penetrate the entire thickness of the lid. A ¾"-inch by 2-inch by 2-inch recessed slot with a ½-inch diameter pin, crossing the small dimension and centered along the long dimension, shall be provided in the lid, in lieu of a pick hole.

4.03.07 Manhole Steps

Manhole steps shall be made of ½-inch steel rod encapsulated with copolymer polypropylene or approved equal and shall conform to ASTM C478. The ALCO 12653A aluminum step is also acceptable. Steps shall have minimum projections of 4-inches, spaced no more than 16-inches apart, minimum overall widths of 14-inches, and thoroughly anchored into the walls.

4.03.08 Concrete

All concrete in addition to the concrete used in precast sections shall have a compressive strength of not less than 3,000 pounds per square inch at 28 days of age. The aggregates, Portland cement, and concrete shall comply with the provisions of ASTM C144 and C33, ASTM C150, Type II. The concrete mix shall be approved by the Owner and shall include no less than 5-1/2 bags of Portland cement per cubic yard. When directed by the Owner, the Contractor shall have compressive strength tests made of the concrete in accordance with ASTM Standard Specifications.

4.03.09 Wastewater Cleanout and Frame

Where required on the plans, a Neenah R1791A or approved equal cast iron cleanout cover and frame shall be used on all 8-inch wastewater cleanouts.

4.04 Installation of Wastewater Pipe

4.04.01 Pipe Laying

All trenching, excavation, and backfilling shall be performed in accordance with TP 1.0 of these specifications. The bottom of the trench shall be shaped to give substantial uniform bearing and support for each section for the entire length of the pipe. Bell holes shall be excavated to provide a minimum clearance of 2 inches below the coupling or bell. Pipe laying shall proceed upgrade, with the spigot end pointing in the direction of the flow. Each pipe shall be laid true to line and grade and in such manner as to form a close concentric joint with the adjoining pipe. As the work progresses, the interior of the sewer shall be cleared of all dirt and superfluous materials of every description. If the maximum width of the trench at the top of the pipe specified in TP 1.0 of these specifications is exceeded for any reason other than by direction, the Contractor shall install such concrete cradling, encasement, gravel base or other bedding as may be required to satisfactorily support the added load of the backfill.

Trenches shall be kept free from water and the pipe shall not be laid when conditions of the trench or the weather are unsuitable for such work. At all times when work is not in progress, all open ends of pipe and fittings shall be securely closed so that no trench water, earth, or other substances will enter the pipe.

4.04.02 Depth of Bury

All sewage collection lines shall be ductile iron if less than 3 feet of cover is provided within streets and less than 2 feet of cover is provided in all other areas.

4.04.03 Installation of Service Connections

Wye fittings shall be provided and installed for sewer service connections to new sewer mains. Service saddles are not appropriate for service connections to newly constructed sewer mains but may be used for connections to existing sewer mains. The wye shall be installed such that it is at about a 45-degree angle with the vertical.

4.05 Manhole Installation

4.05.01 General

Manholes shall be installed in the locations shown on the plans and shall be constructed in accordance with the standard details. Manholes shall be spaced no more than 400 feet apart, and shall be installed at every change in grade, pipe size, or direction.

The invert channel shall be smooth and U-shaped. The lower portion shall conform to the inside of the adjacent sewer section and the upper portion shall be greater in height than the diameter of the largest pipe. A minimum invert elevation drop of 1/10 of a foot from the entrance to the outlet shall be provided in all manholes where there is a change in direction or grade. Changes in size and grade of the channel shall be made gradually and evenly. The invert channel may be formed directly in the concrete, or where there is no change in grade or direction between incoming and outgoing sewers, may be constructed by laying a full section of sewer pipe through the manhole and cutting out the top half after the surrounding concrete has hardened.

The floor of the manhole outside the channel shall be smooth and shall slope toward the channel not less than one inch per foot and not more than 2-inches per foot. Drop inside the manhole shall not exceed 2 feet, measured from the invert of the inlet pipe to the invert of its corresponding channel. If the drop exceeds 2 feet, then a drop manhole shall be installed. A channel must be formed in the concrete of an ogee shape so there is no free drop. Joints between manhole sections, adjustment rings, and cover rings shall be sealed with Ram-Nek flexible gasket or approved equal; and a concrete collar shall be installed in accordance with the standard details.

All sewers extending from manholes shall be supported with compacted gravel from where the sewer pipe leaves the manhole to where the pipe is supported by undisturbed soil.

4.05.02 Connection to Existing Manhole

The Contractor shall obtain a tapping permit from the NTUA prior to making connections to existing manholes. The connection to the existing manhole shall be made in accordance with the approved plans. Care should be exercised when connecting to the existing manhole so that limited fracture and cracking will occur on the existing manhole. Also, placement of the new wastewater main should be correctly aligned to the invert elevation so as to allow for proper flow of sewage through the manhole. Excessive damage to the existing manhole or improper installation of the new wastewater main, as determined by the NTUA, shall be cause for replacement of the existing facilities within the construction area by the Contractor. This replacement shall be done to the satisfaction of the NTUA and NMDOT.

4.06 Wastewater Main Crossings

4.06.01 Wash Crossings

Wastewater mains shall be installed as shown on the approved plans. The Contractor shall divert surface flows, conduct dewatering, and perform all steps necessary to maintain proper bedding conditions and alignment.

4.06.02 Road Crossings

In lieu of boring, the roadway may be open cut for sewer line within casing installation. The original surface pavement on all open cut roadways shall be either cut square or sawed straight. As with open cut, if boring is required, the steel casing shall be extended from right of way to right of way. The Contractor shall obtain written permission from the appropriate agency prior to beginning any roadway excavation. Backfill within the limits of a roadway prism may require special compaction in accordance with the roadway crossing permits.

Surfacing shall be replaced where the roadway has gravel, concrete, or asphaltic paving in the same thicknesses as were removed, or as specified by the Owner, and completed as soon as possible following backfilling.

PVC wastewater line road crossings shall be installed within steel casing on acceptable casing chocks or redwood skids secured to the pipe

with stainless steel straps. Ductile Iron pipe resting on the bells also may be used as the carrier pipes. The casing ends shall be sealed with an approved rubber boot or 9 mil plastic sheeting with stainless steel clamps. Casing pipe shall be straight welded SCH 10 steel pipe ¼" wall unless otherwise specified. An alternative method for roadway crossing is to install ductile iron pipe, Class 52, bell and spigot, direct bury by open cut excavation from right of way to right of way. This would be considered when crossing minor roads or trails, or for congested area within an urban setting.

A manhole shall be installed on each side of the roadway right of way, unless specified otherwise. The minimum grade of all road crossings should be 1.0% unless exempted by the NTUA and the NMDOT.

4.07 Sewer Service Line Installations (Not part of the Utility company's facilities)

4.07.01 General

All trenching, excavating, and backfilling should be performed in accordance with TP 1.0 and TP 2.0 of these specifications. All new construction shall provide a minimum slope of 1/4-inch per foot (2%) and maintain at least 2 feet of cover over the line. Clean outs should be placed at the house, at any in-line bend greater than 45 degree, and at 100-feet intervals. Bends greater than 45 degrees are discouraged. Services should not enter a manhole but should enter the main line at least 10 feet either side of the manhole.

4.07.02 Connection to Wyes or Main

Sewer service lines should be connected to the sewer wyes provided with the new sewer main. If connecting to an existing main without existing wyes, the connections shall be made with wye saddles. The Contractor shall obtain from the Operating Utility tapping permits before making sewer service connections to existing sewer mains. The saddle shall be aligned on the sewer main such that it is at about a 45 degree angle with vertical and in no case shall deviate, by more than 15 degrees from either side of 45 degrees without prior approval. During the installation of the sewer saddle, the Contractor shall not allow the pipe cutout or other foreign objects to enter the sewage collection system.

4.08 Wastewater Line Testing

4.08.01 Alignment Test

The Contractor shall notify the NTUA two working days in advance of

the date that the Contractor is ready for inspection of sewer alignment. The wastewater main shall be checked by the Contractor and verified by the NTUA, to determine whether any displacement of the pipe has occurred, after the trench has been backfilled to 2 feet above the pipe and tamped as specified. The test shall be made as follows: A light shall be flashed between ends of line by means of a flash light or reflected light. Any deviation from true line or grade, causing less than a full lamped circle, may be cause for rejection. Any ponding of water in the wastewater line may be cause for rejection. A full lamp circle is when a full circle of light is seen from any position around the pipe perimeter.

4.08.02 Deflection Test

The maximum allowable deflection (reduction in vertical inside diameter) for PVC pipe shall be five percent. Deflection testing may not be required in all cases; however, the NTUA reserves the right to require the Contractor to perform random deflection tests. If three successive tests are determined to be unsatisfactory, the Contractor shall perform deflection tests on the entire project. All locations with excessive deflection shall be excavated and repaired by re-bedding or replacement of pipe. Acceptable methods of deflection testing include use of properly sized go-no-go mandrels or other proposals suitable to the operating utility.

4.08.03 Ex-filtration Test

The Contractor shall conduct an ex-filtration test on each section of wastewater mains between manholes. The Contractor shall provide at his own expense all necessary equipment and materials required for the tests. One of the following testing methods shall be used.

Air Testing: Testing equipment shall be equal to the "Air-Loc" low pressure air testing system manufactured by Cherne Industrial, Inc. of Edina Minnesota. The gauge used for the air test shall have a minimum division of 0.10-PSI.

Testing shall be conducted in accordance with ASTM C924 (Testing Sewer Lines by the Low-Pressure Air Test Method), except as modified herein. Air testing shall be done between consecutive manholes throughout the entire length of the installed line. Air shall be added to the plugged test section until the internal air pressure reaches 4.0 psig. At least two minutes shall be allowed for the air pressure to stabilize. The air supply shall then be disconnected and the time required for the pressure to drop from 3.5 to 3.0 psig shall be measured with a stopwatch. No one shall enter a manhole when a line into it is

pressurized. If the groundwater level is above any portion of the test section, the test pressure shall be increased, by an amount equal to the average hydrostatic pressure of the groundwater.

The test section will be accepted if the time required for the pressure to decrease from 3.5 to 3.0 PSIG is equal to or greater than the time in the following table. The pipe diameter shall be based on the nominal size of the sewer main. If the time measured is less than the time specified in the table, the Contractor shall locate and repair any leaks and retest the sewer until it is acceptable.

Minimum Duration for Pressure Drop (400 feet Max.)	
Pipe Diameter (Inches)	Time (Minutes)
4	2.5
6	4.0
8	5.0
10	6.5
12	7.5

The following formula should be utilized to determine the minimum duration for pressure drop for test sections greater than 400 feet or pipe sizes greater than 12 inches.

$$T = 0.000371 \cdot D^{2} \cdot L \div 2$$

Where: T = Time in Minutes
D = Nominal Diameter in Inches
L = Pipe Length in Feet

Water Testing: One gallon of water may be lost in 2 hours, per each section between manholes, when testing any size main up to 12-inches. The line shall not be tested with the manhole. At least 4 feet of head shall be used for the test. Service lines need not be tested, but they must be plugged to conduct the test of the main. If any leakage in excess of the allowable occurs in any section of the sewerline, that section(s) shall be repaired and re-tested after the leaks are located.

4.08.04 Groundwater Infiltration

Infiltration of groundwater in excess of 200 gallons per day per inch diameter per mile of wastewater line indicates that the line is not

watertight. Infiltration less than this amount does not relieve the Contractor of the requirement to perform ex-filtration testing. If excess infiltration is noted after ex-filtration tests have been completed, it shall be considered as evidence that the original test was in error or that subsequent failure of the pipeline has occurred.

4.09 Manhole Testing

Manholes shall be tested for water tightness. Each manhole shall be tested by itself. All lift holes shall be plugged with an approved non-shrink grout. All mains into and out of the manhole shall be plugged with a suitable device. If the manhole fails the initial test, necessary repairs shall be made and the manhole shall be retested. One of the following methods shall be used.

Vacuum Testing: Vacuum testing should be conducted, in accordance with ASTM C1244 (Vacuum Test for Concrete Manholes), except as modified below. The vacuum test head shall be placed inside the top section and the seal inflated in accordance with the manufacturers' recommendations. A vacuum of 10-inches of mercury shall be drawn and the vacuum pump shut off. With the valves closed, the time shall be measured for the vacuum to drop to 9-inches. The manhole shall pass if the time is greater than 60 seconds for 48-inches diameter, 75 seconds for 60-inches, and 90 seconds for 72-inches diameter manholes.

Hydrostatic Testing: Hydrostatic testing shall be conducted in accordance with ASTM C969, except as modified below. The manhole shall be filled with water to the ring. The maximum loss shall be 5 gallons in a 2-hour test regardless of the manhole depth. The amount of loss shall be determined by measuring the volume of water required to maintain the water level in the manhole within 2-inches of the top of the cone or flat top throughout the entire duration of the 2-hour test.

4.10 Observation of Pressure Tests

The NTUA is to witness the pressure testing of wastewater lines and manholes. Prior to the test, the Contractor shall have all equipment set up, completely ready for operation and shall have previously successfully performed the test to verify that the test section or manhole will pass. The Contractor shall notify both the NTUA and the NMDOT, a minimum of two working days in advance of the date that the Contractor plans to perform the pressure tests. The Contractor will complete the required certification forms and submit them to the NTUA for approval. A copy of the approval or disapproval of the test results will be sent from the NTUA to the Contractor (see "Exhibit A & C of TP-4).

EXHIBIT A OF TP 4.0

WASTEWATER MAINLINE/MANHOLE WATER TEST 1 CERTIFICATION

LOCATION OF LINE TESTED: _____
Include Project's Name & Number

DATE(S) TEST WAS CONDUCTED: _____

STANDARD LENGTH OF PIPE IN TEST SECTION: _____ FEET.

THE TEST AND INFORMATION IS CERTIFIED BY:

Signature/Printed Name: _____

Organization/Address: _____

Address: _____

Telephone Number: _____

WASTEWATER TEST 1 RESULTS CHECKED AND APPROVED ON: _____
Date

BY:_____
NTUA Representative

PASSED _____ FAILED _____

COPY OF APPROVAL OF THE TEST SENT TO: _____
Project Agency Involved

ON_____ BY_____
Date NTUA

EXHIBIT B OF TP 4.0

WASTEWATER MAINLINE/MANHOLE WATER TEST 1-WORKSHEET

LOCATION OF LINE TESTED: _____
Include Project Name & Number

DATE(S) TEST WAS CONDUCTED: _____

(Allowable Leakage: 1 gal/section/2 hrs. for 8" PVC to 12" PVC, regardless of length, using 4-feet of head test pressure.)

SEWER MAIN

Sewer Main (MH# to MH#)	Size (in)	Length (ft.)	Actual Leakage (gal.)	Pass/Fail (P or F)	Remarks

Verified By: _____
NTUA Representative/Date

_____
Print Name/Title

(Allowable Ex-filtration: 5 gal./MH/2 hrs. regardless of height. Lamp testing shall be conducted at completion of final grading.)

SEWER MANHOLE

Manhole No.	Station	Actual Leakage (gal.)	Pass/Fail (P or F)	Remarks

Verified By: _____
NTUA Representative/Date

_____
Print Name/Title

EXHIBIT C OF TP 4.0

WASTEWATER MAINLINE/MANHOLE AIR/VACUUM TEST 2 CERTIFICATION

LOCATION OF LINE TESTED:_____
Include Project Name & Number

DATE(S) TEST WAS CONDUCTED: _____

THE GAUGE USED FOR TESTING SHALL HAVE MIN. DIVISION OF 0.10 PSI.

STANDARD LENGTH OF PIPE USED ON THIS PROJECT IS _____ FEET.

THE TEST AND ATTACHED INFORMATION IS CERTIFIED BY:

Signature/Printed Name: _____

Organization/Address: _____

Address: _____

Telephone Number: _____

WASTEWATER TEST 2 RESULTS CHECKED AND APPROVED ON: _____
Date

BY:_____
NTUA Representative

PASSED _____ FAILED _____

COPY OF APPROVAL OF THE TEST SENT TO: _____
Project Agency Involved

ON_____ BY_____
Date NTUA

EXHIBIT D OF TP 4.0

WASTEWATER MAINLINE/MANHOLE AIR/VACUUM TEST 2 WORKSHEET

LOCATION OF LINE TESTED: _____
Include Project's Name & Number

DATE(S) TEST WAS CONDUCTED: _____

Air testing shall be conducted between consecutive manholes. The test section shall be acceptable if the time required for the pressure to drop from 3.5 to 3.0 PSIG is greater than or equal to the time in the "Minimum Duration for Pressure Drop" table of TP-4.08.03.

SEWER MAIN AIR TEST

Sewer Main MH# to MH#	Size (in.)	Length (ft.)	Start Test Pressure (Psig)	Stop Test Pressure (Psig)	Elapsed Time (Min/Sec.)	Pass/Fail (P or F)	Remarks

Verified By: _____ Date: _____

Title/Company: _____

Manhole shall pass if time is greater than 60 seconds for 48" Dia. MH, 75 seconds for 60" Dia. MH, and 90 seconds for 72" Dia. MH.

MANHOLE VACUUM TEST

Manhole No.	Station	Start Vacuum of 10" of Mercury (Inch)	Stop Vacuum (Inch)	Elapsed Time (Min/Sec.)	Pass/Fail (P or F)	Remarks

Verified By: _____ Date: _____

Title/Company: _____

* Lamp test shall be conducted after completion of street construction and final grading.

TP 4.11 Individual Subsurface Disposal Systems (Not part of the Utility Company's Facilities)

4.11.01 General

The Contractor shall install individual subsurface disposal systems at the locations shown on the plans. The work shall consist of furnishing and installing a double compartment 1,000-gallon or larger septic tank, 4-inch sewer pipe, and leachfield system in accordance with these technical provisions and applicable drawings. All construction will be done in a workmanlike manner. All sites will be left with a neat appearance.

4.11.02 Septic Tanks

4.11.02.01 General

All septic tanks shall have a minimum liquid capacity of 1,000 gallons and double compartment. Liquid capacity shall be split with two-thirds in the first compartment and one-third in the second compartment. The liquid depth of the septic tanks shall be at least 4 feet but not more than 5 feet.

The inlet and outlet on all tanks shall be provided with vertical tee fittings of cast iron or PVC plastic. In concrete tanks, oval box shaped or slab type baffles of pre-cast reinforced concrete with a minimum thickness of 2-inches may be used. The inlet baffle or tee must penetrate at least 5-inches below the liquid level but in no case shall it be greater than the penetration of the outlet baffle or tee. Both inlet and outlet baffles or tees shall extend 6-inches or more above the liquid level and end 1-inch from the underside of the tank top to allow gases to escape. The outlet baffle or tee shall extend below liquid level 40 percent of the liquid depth for rectangular tanks and 35 percent for circular tanks. The common wall passage shall also be located at the 40 percent liquid level depth. The inlet invert should be at least 2-inches above the liquid level in the septic tank. Four copies of drawings indicating pertinent dimensions, type, and location of steel reinforcing in concrete tanks, and important details shall be submitted by the Contractor for approval by the Owner prior to the installation of any septic tank.

4.11.02.02 Concrete Tanks

Concrete septic tanks shall be of pre-cast, mechanically vibrated, 4,000 psi minimum strength, watertight concrete containing adequate steel reinforcement to facilitate handling. Minimum wall thickness shall be 3-inches. The top and bottom shall have a minimum

thickness of 4-inches. Minimum steel reinforcement will be No. 3 reinforcing bars spaced 2 feet on centers in both directions in the top, bottom, and sides. The equivalent shall be used around manhole inspection ports and construction joints. Minimum steel reinforcement of the access cover or lid shall be No. 4 rebars spaced 6-inches on center in both direction or equivalent. The manhole and inspection opening covers shall be provided with steel lifting handles of No. 3 or No. 4 rebar.

Tanks shall be free of cracks from casting or handling (including placement). No wire mesh or rebar shall be exposed at any point on the tank interior or exterior.

Adequate access shall be provided into the septic tank either through a removable section or manhole with a minimum of 20-inches in the least dimension. The access manhole may be placed partially over the inlet to serve as an inspection hole; otherwise, inspection openings with a minimum of 7inches in the least dimension shall be provided above the inlet, outlet, and the inter-compartment piping. The access manhole shall be provided with a 6-inch PVC coupling that extends through the center. A 6-inch diameter inspection pipe shall be installed so that it is connected to the access manhole coupling and extends to a point 12-inches above the ground surface. The pipe shall be 160 psi, SDR 26, PVC, shall terminate above ground surface with a 6-inch slip joint PVC cap, and shall be painted red on those portions above the ground surface.

4.11.03 Septic Tank Installation

Excavation shall be approximately 1 foot wider and longer than the tank. All tanks shall be set on a smooth level surface. The septic tank shall be placed plumb and true so that the inlet and outlet are at the highest possible elevations and so that the outlet pipe is not less than 2-inches nor more than 5-inches below the inlet pipe. The minimum bury for the septic tank inlet pipe shall be 18-inches. The maximum dirt cover for the septic tank shall be 36-inches. Where over excavation occurs, the bottom shall be raised to final elevation in 6-inch compacted lifts. Any water in the excavation must be removed and elevations checked before setting the tank. After setting the tank, it shall be filled with water to prevent floating. Both the septic tank inlet and outlet lines shall be grouted to the septic tank. Backfill around the tank shall be compacted and shall be sufficient to allow for no settlement.

4.11.04 Sewer Pipe and Fittings

All 4-inch pipe and fittings, except clean out tees, risers, hub adapters, and plugs, shall be PVC, SDR 35, solvent-weld joints and shall comply with ASTM

Specifications D-3033 and D-3034. All PVC shall be Type 1, Grade 1, PVC 1140 conforming to ASTM Specification D-1784.

Cleanout tees, risers, hub adapters, and plugs shall be PVC/DWV and comply with ASTM Specification D-2665.

4.11.05 Sewer Pipe Installation

All trenching, excavating, and backfilling shall be performed in accordance with TP 1.0 of these specifications. All construction shall provide a slope of 1/4" per foot (2%) and maintain at least 18-inches of cover over the line between the house and the septic tank. A minimum cover of 12-inches is required between the septic tank and drainfield system. Cleanout tees shall be two-way, 4" x 4" x 4", all solvent-weld hubs, PVC/DWV fittings. Cleanout risers for DWV cleanout shall be 4-inch PVC/DWV and shall terminate 3 to 6-inches above the ground surface with a PVC/DWV 4-inch hub adapter (solvent-weld hub by FIPT) and MIPT plug. Cleanout shall be placed at the house and at any in-line bends greater than 45 degree (bends greater than 45 degrees are discouraged) and at 100 feet intervals.

4.11.06 Drainfield Materials

4.11.06.01 Gravel

Drainfield gravel shall comply with the requirements for coarse aggregate under Federal Specification SS-A-281b, "Aggregate; (for) Portland-Cement-Concrete", and shall be Size 3 (2" to 1" nominal size). The amount of deleterious substances in the coarse aggregate shall not exceed the limits given in Section 3.2.3 of Federal Specification SS-A-281b.

4.11.06.02 Pipe and Fittings

All PVC shall be Type 1, Grade 1, PVC 1140 conforming to ASTM Specification D-1784. All 4-inch solid PVC pipe and fittings shall be PVC, SDR 35, solvent-weld joints and shall comply with ASTM Specifications D-3033 and D-3034. All 4-inch perforated PVC pipe shall be solvent-weld joints and shall comply with ASTM Specification D-2729 or D-3033 and D-3034. Perforations shall be ½ to 5/8 inch diameter holes on 5-inch centers in two rows spaced 90 to 120 degrees apart.

4.11.06.03 Drainage Fabric

The drainfield fabric shall be non-woven and composed of polypropylene filaments and shall be inert to biological degradation

and naturally encountered chemicals, alkalies, and acids. The fabric shall have a minimum average grab tensile strength of 120 pounds, a minimum average burst strength of 285 psi, a minimum average coefficient of permeability of 0.3 cm/sec, and a minimum thickness of 60 mils. The drainage fabric shall be equal to the Mirafi 140N non-woven fabric as manufactured by Mirafi, Inc., P.O. Box 240967, Charlotte, North Carolina.

4.11.07 Drainfield Installation

The trench width in the drainfield shall normally be 24-inches and shall not exceed 36-inches nor be less than 12-inches without the consent of the Owner. Trench bottoms shall be smooth and level from beginning of trench to end. All smeared or compacted surfaces of the trenches or bed shall be raked to expose the natural texture of the soil. All loose material shall be removed from the trench before the gravel is placed. The drainfield trench shall be kept as shallow as possible but with a minimum depth of 24-inches and a maximum depth of 60-inches. Drainfields shall be built so that all lines are looped. Where rock, clay, or ground water are encountered, the Contractor shall immediately notify the Owner and shall cease work on the drainfield installation. The bottom of the trench shall be covered with a 6-inch minimum depth lift of gravel. The lift shall be leveled (but not compacted) by hand to within $\pm$ 1-inch throughout the entire length of the trench. The 4-inch perforated plastic pipe shall then be laid level $\pm$ 1- inch by hand and centered in the trench. After the pipe has been laid, a second 6-inch lift of gravel shall be placed by hand and not compacted. The gravel shall be placed so that it extends 2-inches above the pipe. A layer of synthetic drainage fabric then shall be placed over the gravel and folded up the sides of the trench to prevent backfill soil from coming in contact with the gravel.

The trench shall then be backfilled and not compacted. The top shall then be mounded with a 8 to 12-inch crown and shall not be compacted. No mechanical or vehicular traffic shall be used to compact the trench. Backhoes shall not be allowed on trenches during or after the backfilling operation.

Four, red T-type, steel posts shall be placed at the outside corners of the drainfield. The post shall be driven a minimum of 14-inches into the ground and shall extend a minimum of 36-inches above the ground. The Contractor shall leave the premises in a neat and orderly condition. Excess dirt shall be spread evenly over the ground in the immediate area or disposed of in a manner approved by the Owner.

4.11.08 Gravel-less Drainfield Materials

The gravel-less drainfield shall consists of interlocking leaching chamber units, opened end plates, and closed end plates constructed from molded high density polyethylene. Gravel- less drainfield components shall be equal to the Infiltrator

as manufactured by Infiltrator Systems Inc., P.O. Box 768, Old Saybrook, CT 06475, or an approved equal.

4.11.09 Gravel-less Drainfield Installation

In place of perforated pipe and gravel for distribution and storage of waste water, leaching chambers or gravel-less drainfield systems can be employed.
The trench width for a gravel-less drainfield shall normally be 36-inches or as specified by the supplier of system. Trench bottoms shall be smooth and level from beginning of trench to end. All smeared or compacted surfaces of the trenches or bed shall be raked to expose the natural texture of the soil. All loose material shall be removed from the trench before the chamber units are installed. The trench shall be kept as shallow as possible but with a minimum depth of 24-inches and a maximum depth of 36-inches.

The installation of the gravel-less system shall be per the manufacturer's recommendations. Where rock, clay, or ground water are encountered, the Contractor shall immediately notify the Owner and shall cease work on the drainfield installation. The area between the leach chamber and trench wall shall be backfilled and compacted. The minimum cover for the gravel- less drainfield is 12-inches. The top shall then be mounded with an 8 to 12-inch crown and shall not be compacted. No mechanical or vehicular traffic shall be used to compact the trench. Backhoes shall not be allowed on trenches during or after the backfilling operation.

A 4-inch solid sewer PVC-DWV inspection port with adapter hub and plug shall be installed at the end of each line. The Contractor shall leave the premises in a neat and orderly condition. Excess dirt shall be spread evenly over the ground in the immediate area or disposed of in a manner approved by the Owner.

TECHNICAL PROVISIONS 5.0

TP 5.0 FINAL SITE UTILITY INSPECTION REQUIREMENTS

5.01 Final Inspection Package

The Contractor shall submit a complete site utility inspection package, which shall include the following items; all copies of which shall be legible.

5.01.01 As-Built Drawings

Four (4) sets of Size D "as-built" drawings which contain:

A. Cover Sheet
B. Rights of Way Plat Sheets
C. Utility Plan View Sheets
D. Water/Wastewater Plan and Profile Construction Sheets
E. Details Sheets - Standard and Specific Drawings

5.01.02 As-Built Notebook

Four (4) three ring, loose-leaf binders, containing the following information:

A. Water Pressure Test Certification and Test Results Approved by the NTUA. See "Exhibit A" of TP-3.
B. Wastewater Main and Manhole Test Certifications and Test Results Approved by the NTUA. See "Exhibit A" or "Exhibit C" of TP-4
C. Executed Transfer Agreement with Cost of Plant attached. See Exhibit "A" and "B" of TP-5.
D. Water Meter Serial Number Listing and Current Meter Readings.
E. Approved Tapping Permits.
F. Approved Water/Wastewater Material Submittals.
G. A set of plans on CD in the AutoCAD version specified.

5.02 Scheduling Final Inspection

The scheduling for the final inspection shall be coordinated with the NTUA by the Contractor. A complete as-built package is to be provided to the NTUA for review, a minimum of 21 calendar days prior to the scheduled inspection.

5.03 As-Built Drawing Requirements

Each project site that contains utilities to be transferred to the NTUA must be submitted with the following requirements and sheets.

5.03.01 General Requirements for All Sheets

5.03.01.01 Each sheet must be stamped by an A/E* and prominently labeled, signed, and dated by the Contractor (excepting cover and rights of way sheets):

AS BUILT _____
(Name) (Date)

"I certify that I have constructed this project following the standards set forth in TPs 1 - 4, and I have complied with all vertical and horizontal pipeline separation requirements."

5.03.01.02 All facilities shall be shown as constructed and references to "proposed" or "future" deleted.

5.03.01.03 Where appropriate, each sheet must have a north arrow. Whenever possible, the arrow shall be up or to the right of the sheet.

5.03.01.04 Where appropriate, each sheet must have a standard legend and bar scale. All existing mains must be solid lines and sewer manholes must be solid circles.

5.03.01.05 All sheets must be numbered sequentially beginning with "Sheet 1 of (Total) Sheets."

5.03.02 Cover Sheet

5.03.02.01 Since drawings occasionally cover several project sites, the location for each as-built site must be prominently identified by project number and project site location.

5.03.02.02 A map of the Navajo Nation that shows the project location, a vicinity map with a scale of 1" = 2 miles, and a north arrow is to be provided. These maps may be on a separate sheet or on the topographic boundary sheet.

5.03.02.03 The project site location, with the project number(s), should be shown on both the Navajo Nation and vicinity maps.

5.03.03 Plat Sheet

5.03.03.01 Show site boundaries with bearings and distances, complete with ties to permanent state plane markers (Section Corners, established monuments, etc.) and bearing references. All bearings shall be in the appropriate State Plane System in NAD 83 if possible; all distances shall be ground distances. Indicate basis of bearing.

5.03.03.02 Show and describe location of elevation and vertical datum references. A broken line may be utilized if the benchmark is not within the drawing scope or scale.

5.03.03.03 Show each lot and street boundary defined with bearings and distances, if appropriate. Show street centerline bearing, distance, and curve data.

5.03.03.04 Provide statements "Street Rights of Way are Dedicated to the Common Use of Utilities" if appropriate, and "the operating utility is not responsible for the repair or replacements of improvements in utility easements disturbed during operation and maintenance activities."

5.03.03.05 Show minimum 20-foot wide easements for each utility (electric, natural gas, water, sewers, telephones, cable) not located within the street right of way. Add an additional 10-foot width for each additional parallel utility. The NTUA will provide to the Contractor as-built drawings of utilities not constructed by the Contractor.

5.03.03.06 Utility or street rights of way may require expansion in localized areas to include all utility appurtenances (e.g., fire hydrant guards), which are not within the normal easement.

5.03.03.07 Provide a narrative legal description of the site boundary.

5.03.04 Utility Plan View Sheet(s)

5.03.04.01 On a sheet with a scale between 1"=20' and 1"=50', provide a plan view of the site that shows all utilities (e.g., propane, water, sewers, electric, natural gas, telephones, cable).

5.03.04.02 Show all lot, street, and easement boundary lines without bearing and distances.

5.03.04.03 Label all houses with final house numbers. Numbers must be

consistent with a swing tie table.

5.03.04.04 Provide a legend, north arrow, and bar scale.

5.03.04.05 Show as-built routing of all water and sewer mains and service lines. Emphasize water and sewer mains by using bolder lines. Use a smaller but bold line for service lines. Reference the standard NTUA legend.

5.03.04.06 Label water mains with size, type of material, pressure rating, and length of pipe from P.I. to P.I. Example: 6" PVC, SDR 21, 232.00'.

5.03.04.07 Label wastewater mains with size, type of material, and distances between manholes. Example: 8" PVC, SDR 35, 389.00'.

5.03.04.08 Label water and wastewater main tap points, to previous projects with previous project number and as-built sheet number. Contractor shall contact the Operating Utility to determine this information.

Examples:	White Cone Composite	Red Water Housing
	IHS NA 88-114	NHA AZ 12-106
	Sheet 15 of 43	Sheet C-8

5.03.04.09 Show and label depth of bury at all locations where water main varies from the standard depth of bury of 42 inches.

5.03.04.10 For fire hydrants, gate valves, tees, bends, water meters, curb stops, and saddles state the manufacturer model number and type of joint for the actual item used. As an option this information can be shown on the standard detail sheet next to the appropriate detail, or include submittals.

5.03.04.11 Show and label all water main fittings actually used. G.V., 6" DI TEE, 6" DI 45o BEND. Examples: 6” G.V., 6” DI TEE, 6” DI 45° BEND.

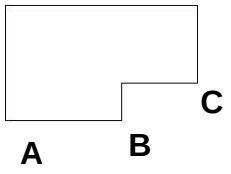
5.03.04.12 Provide swing ties in table format for all gate valves, water meters, domestic stops, curb stops, water main taps, manholes, main line clean out, yard clean outs, and sewer wyes. Swing ties shall be measured from building corners or other permanent structures.

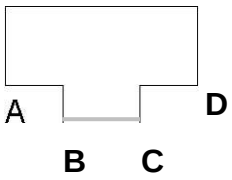
SWING TIES (Examples)

House No.	Domestic Stop		Water Meter		Curb Stop		Water Main Tap		Yard Clean out		Sewer Wye	
	A	B	A	B	A	B	A	C	A	B	A	C
1	31.6	3.8	34.8	32.9	36.7	35.8	42.0	65.0	22.4	11.6	57.0	73.0

Item	House No.		Distance
		A	B
MH 11A-3	3	56.2	68.4
		A	B
GV-1	5	43.4	63.6
		A	B
GV-2	5	43.6	61.6
		B	C
MH 11A-1-2	15	93.4	73.0
		B	C
CO-2	14	64.8	61.5

5.03.04.13 Label corners of each building or structure, as necessary, to provide references for swing tie tables.





5.03.04.14.1 Provide pipe information for each size and type of pipe in a table with the following format:

Use	Size (in)	Type of Material	Joint Type	SDR	Pressure Rating PSI	Dimensions (in)			ASTM No.
						O.D.	I.D.	Wall Thick	
Water	6	PVC	Slip	21	200	6.625	5.993	0.316	D2241
Water	1	PE	Stab	7	200	1.349	1.049	0.150	D2239

Sewer	8	PVC	Slip	35	N/A	8.400	7.920	0.240	D3034
Sewer	4	PVC	Slip	35	N/A	4.215	3.975	0.120	D3034

PIPE DIMENSIONAL DATA 5.03.05

5.03.05 Water/Wastewater Plan and Profile Sheet(s)

5.03.05.01 Plan View

Provide all items from the utility plan view sheet requirements on the Utility Plan View Sheets portion; TP 5.03.04.

5.03.05.02 Profile View

5.03.05.02.01 Label all manholes and wastewater main clean-outs with manholes and clean-out numbers. Provide rim elevations with inlet and outlet invert elevations. The manhole numbers must conform to the existing manhole numbering system. Station all manholes and connections.

5.03.05.02.02 Label all wastewater mains with size, type of material, slope, and distance. Distance shall be the actual distance of the pipeline. (O.D. of manholes to O.D. of manholes).

5.03.05.02.03 Show all water mains that cross the sewer main and dimension Pipe O.D. to Pipe O.D. the vertical separation. Station all water mains and appurtenances.

SECTION 01 00 00

BASIC REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Summary:
- 1.2: Contract description.
- 1.3: Special considerations.
- 1.4: Work by Owner.
- 1.5: Contractor's use of premises.
- 1.6: Specification conventions.
- 1.7: Minimum wage rate determination.

B. Price and Payment Procedures:
- 1.8: Testing and inspection allowances.
- 1.9: Schedule of values.
- 1.10: Applications for payment.
- 1.11: Change procedures.
- 1.12: Unit prices.
- 1.13: Alternates.

C. Administrative Requirements:
- 1.14: Coordination.
- 1.15: Suspension of Work.
- 1.16: Field engineering.
- 1.17: Pre-Construction Conference.
- 1.18: Progress meetings.
- 1.19: Cutting and patching.

D. Submittals:
- 1.20: Submittal procedures.
- 1.21: Construction progress schedules.
- 1.22: Proposed products list.
- 1.23: Product data.
- 1.24: Shop drawings.
- 1.25: Test reports.
- 1.26: Manufacturer's instructions and certificates.

E. Quality Requirements:
- 1.27: Quality control.
- 1.28: Tolerances.
- 1.29: References.
- 1.30: Manufacturer's field services and reports.
- 1.31: Examination.

F. Temporary Facilities and Controls:
- 1.32: Temporary services.
- 1.33: Access roads.
- 1.34: Progress cleaning and waste removal.
- 1.35: Project identification.
- 1.36: Barriers and fencing.
- 1.37: Protection of installed work.
- 1.38: Security.
- 1.39: Water control.
- 1.40: Pollution and environmental control.
- 1.41: Removal of utilities, facilities, and controls.

G. Product Requirements:
- 1.42: Products.
- 1.43: Delivery, handling, storage, and protection.
- 1.44: Substitutions.

H. Execution Requirements:
- 1.45: Closeout procedures.
- 1.46: Final cleaning.
- 1.47: Starting of systems.
- 1.48: Demonstration and instructions.
- 1.49: Testing, adjusting and balancing.
- 1.50: Protecting installed construction.
- 1.51: Project record documents.
- 1.52: Operation and maintenance data.
- 1.53: Spare parts and maintenance materials.
- 1.54: Warranties and product registration.

1.2 CONTRACT DESCRIPTION

A. Work of the Project includes the replacement of two pressure reducing valves, well fencing, storage tank rehabilitation, replacement of gate valves, installation of new gate valves, and replacement of air release valves.

B. Perform Work of Contract under a stipulated price basis with Owner in accordance with Conditions of Contract.

1.3 SPECIAL CONSIDERATIONS

A. Contractor is responsible for restoring the site to original or better condition at the Contractor's expense. Site restoration including temporary erosion control provisions is a prerequisite for periodic and final payment.

B. The allowable length of trench left open overnight is limited per Section 31 23 17 - Trenching. Contractor shall abide by all specified requirements included therein either directly or by reference.

C. Contractor must provide water for construction at the Contractor's expense.

D. The contractor is advised that a Water Import Permit is required for any construction water brought onto the Navajo Nation. The water import permit can be acquired from the Navajo Nation Water Code Administration. The import permit fee is a one-time cost of $25.00. The permit will typically take one day to process.

E. Contractor must coordinate use of Lybrook MDWCA potable water for filling and flushing the pipeline, with Lybrook MDWCA and Engineer at least 2 weeks prior to using Lybrook MDWCA water. Contractor must provide Lybrook MDWCA and Engineer with key information, such as desired maximum instantaneous flow rate (gpm), desired maximum daily flow rate (gpd), desired schedule of water use, and other information as required by Lybrook MDWCA.

F. Contractor may use the flush valves designed in the proposed pipeline, as well as tank floor drains, to flush water out of the system. Flushed water may be disposed of in the natural waterways adjacent to the flush valves and drains, provided the rate of flushing does not damage the surrounding environment (i.e. by flooding, erosion, etc.). Water chlorinated to levels above those normally associated with drinking water shall be neutralized prior to discharge.

1. Contractor shall obtain Clean Water Act 402 permits from U.S. EPA, as required, and shall abide by all stipulations of said permits.

G. Archaeological Discovery: If, in its operations, the contractor discovers any previously unidentified historic or prehistoric cultural resources, then all work within 100 feet of the discovery will be suspended and the discovery promptly reported to the Engineer. The BLM (for non-Indian lands) or Navajo Nation Historic Preservation Department (for Navajo lands) will then specify what action is to be taken. If the discovery is evaluated as being significant, treatment of the discovery may be required prior to allowing the project to proceed. Further damage to significant cultural resources will not be allowed until any required treatment is completed.

H. No reports or drawings relating to Hazardous Environmental Conditions at the site are known to the Owner.

I. Contractor is responsible for providing schedule and plans with locations for lane and shoulder closures to the Engineer, San Juan, Sandoval and Rio Arriba Counties and BIA-NRO Department of Transportation prior to starting work. Contractor shall obtain any required supplemental permits from the relevant agencies.

J. Contractor shall submit a Testing and Disinfection schedule to the Engineer for approval prior to performing the respective activities. Hydrostatic testing of the waterline, disinfection and bacteriological testing shall follow specifications outlined in Section 33 11 00 Water Utility Distribution Piping, 33 13 00 Disinfection of Water Distribution, AWWA C600, AWWA C605, AWWA C651 and New Mexico Standard Specifications for Public Works Construction.

K. Prior to beginning construction activities, the Contractor must furnish full-coverage video documentation of the entire construction site, per SC-2.05.B of the EJCDC C-800 Supplementary Conditions. The video must include coverage of all areas and adjacent features that may potentially be impacted by the impending construction work. Contractor

must submit two (2) copies of the video documentation on DVD format as part of the submittal process.

L. Contractor shall coordinate with Owner for tie-in to existing infrastructure. Contractor shall notify Engineer prior to performing the respective activities.

M. Contractor must maintain a full set of Drawings and Technical Specifications at the construction site at all times throughout the construction process. All subcontractors must possess at least all Drawings and Technical Specifications pertaining to their portion of the work while on the construction site at all times.

N. Contractor shall be responsible for notifying residents of construction. Access to driveways must be maintained at all times.

O. Construction work will generally not be permitted on the following Federal-recognized holidays: New Year's Day, Martin Luther King, Jr.'s Birthday, President's Day, Memorial Day, Independence Day, Labor Day, Veterans' Day, Thanksgiving Day, and Christmas Day. When any of the above holidays fall on a Saturday and the preceding Friday is established as a holiday for Government employees, or when any of the above holidays fall on a Sunday and the Monday following that day is established as a holiday for Government employees, no construction will be permitted on those days. However, the Owner, when in his/her opinion it is justified, may grant the Contractor permission to work on any of the above days upon advance written request by the Contractor.

P. Upon completion of the Work, ground surfaces will be restored to their original condition by grading, and seeding with native plant species.

Q. Contractor shall confine operations to the construction site. Contractor shall be responsible for obtaining permission for any activity outside of the established and approved construction areas.

R. Contractor shall propose and get approval from Owner of an area to store construction debris including unsuitable material from site grading and/or excavation where it will not be a nuisance. All debris shall be contained in such a manner that will prevent scattering. All debris, including trees and undergrowth, shall be disposed of properly within a properly permitted landfill. All debris shall be removed from the site prior to substantial completion. The handling, storage, and disposal of debris is incidental to the project.

S. Contractor shall implement the necessary site erosion control devices for inhibiting dust, wind, and air sediment movement offsite throughout construction in accordance with NPDES Best Management Practices and in accordance with the project SWPPP, if applicable.

T. Contractor is advised that if there is subsurface rock present requiring specialized equipment to remove, as defined in Section 31 23 18 - Rock Removal, Contractor shall notify Engineer prior to commencement of rock removal work each time such rock is encountered, and await approval from Engineer before proceeding. Furthermore, the Contractor and Engineer must agree on rock quantity at the end of each work day, and both parties much sign off on the quantity of rock in the corresponding Engineer's

(RPR's) daily field report, and Contractor will be compensated for such work per Article 1.2 of Section 31 23 18, which establishes the basis of measurement and payment for rock removal.

1.4 WORK BY OWNER

A. Not applicable.

1.5 CONTRACTOR'S USE OF PREMISES

A. No work shall be done before 7:00 A.M. or after 7:00 P.M., local time on a working day, on Sundays, or on legal holidays, except as necessary for the proper care and protection of work already performed, or during emergencies. For work on Saturdays, Contractor must request permission from the Engineer at least a week in advance.

B. The Contractor shall make every effort to minimize noise caused by his operations. Equipment shall be equipped with silencers or mufflers designed to operate with the least possible noise.

C. The Contractor shall restrict his operations as nearly as possible to the immediate site. Unnecessary cutting of vegetation adjacent to the site is prohibited. Every effort shall be made to minimize erosion during and after construction and the site shall be returned to its original condition, except where improvements are indicated or required.

D. The Contractor shall take affirmative action to prevent the misuse of the natural environment, wasting of natural resources, or destruction of natural values.

E. The Contractor shall conform to all requirements set forth in the latest edition of the Navajo Tribal Utility Authority Construction Requirements Technical Specifications for Materials and Workmanship for Water and Wastewater Facilities, 2008 revision; New Mexico Standard Specifications for Public Works Construction with latest revision; and Occupational Safety and Health Administration Regulations for trenching, shoring and excavation, and all other activities where such regulations apply. The Contractor and all subcontractors shall conduct all activities in conformance with federal and state laws and regulations relating to occupational health and safety. Authorized inspectors from NMED's Occupational Health and Safety Bureau shall have unobstructed access to project sites and shall not be impeded in any way from performance of their duties.

1.6 SPECIFICATION CONVENTIONS

A. These specifications are written in imperative mood and streamlined form. This imperative language is directed to the Contractor, unless specifically noted otherwise. The words "shall be" are included by inference where a colon (:) is used within sentences or phrases.

B. The Contractor shall furnish all materials, labor, plant and equipment necessary to complete the contract work as called for by the Technical Specifications and as indicated on the Drawings. Material and work, either expressed or implied, necessary for the satisfactory completion of the contract work shall be considered an integral part thereof.

C. All standards incorporated herein by reference shall be the latest edition, unless otherwise specified. The abbreviations and applicable standards are described below:

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AIA	American Institute of Architects
ANSI	American National Standards Institute, Inc.
ASTM	American Society for Testing and Materials
AWS	American Welding Society
AWWA	American Water Works Association
CID	Construction Industries Division of the NM Regulation and Licensing Department
EJCDC	Engineers Joint Contract Documents Committee
EPA	Environmental Protection Agency
IBC	International Building Code
ISO	International Organization for Standardization
MSJC	Masonry Standards Joint Committee
NACE	National Association of Corrosion Engineers
NMDOT	New Mexico Department of Transportation
NMED	New Mexico Department of Environment
NMSSPWC	New Mexico Standard Specifications for Public Works Construction
NSF	National Sanitation Foundation
OSHA	Occupational Safety and Health Administration
SAE	Society of Automotive Engineers
SSPC	Steel Structure Painting Council
UL	Underwriters Laboratories, Inc.

1.7 MINIMUM WAGE RATE DETERMINATION

A. Article 13-4-11, NMSA, 1978, requires that prevailing local wages be determined by labor category, and that this prevailing wage be the minimum acceptable pay rate. The Public Works Minimum Wage Act covers all public works construction, alteration, demolition, or repair projects when the project cost is $60,000 or more, and when the state or any political subdivision is a party. The wage rate determination provided by the New Mexico Department of Workforce Solutions for the present project, if applicable, can be found in an appendix to the Contract Documents.

B. The Contractor warrants and agrees that he and all subcontractors shall comply with all applicable provisions of the New Mexico Public Works Minimum Wage Act, if applicable, and other statutes pertaining to public works in New Mexico; and the Federal Wage Rate Determination. The Minimum Wage Rate Determinations can be found in an appendix to the Contract Documents.

C. Applicable federal and state regulations require that the higher of the federal or the state wage rate for each classification must be paid.

1.8 TESTING AND INSPECTION ALLOWANCES

A. Testing Allowance: The bid schedule includes a predetermined sum to cover the cost of testing and inspection services as required in the Contract Documents.

B. Contractor shall submit details regarding the proposed testing laboratory or inspection firm, including a statement of qualifications and a proposed schedule of unit price costs and estimated total cost for testing and inspection to be completed under the allowance. Any additional costs, such as travel time, shall also be detailed for this project on a unit price

basis and as part of the estimated total cost of testing and inspection. Engineer may require the Contractor to solicit additional quotes if the proposed costs are not competitive.

C. Costs Included in Allowance: Cost of engaging testing or inspection firm, execution of tests or inspection, and reporting of results.

D. Costs Not Included in Allowance:
1. Incidental labor and facilities required to assist testing or inspection firm.
2. Cost of disinfection of waterlines, if applicable.
3. Costs of hydrostatic pressure testing or testing of material welds as called for in the Contract Documents.
4. Costs of failed tests.

E. Costs will be drawn from testing allowance and paid based on invoice(s) submitted to Contractor by testing or inspection firm(s), and reimbursed at cost, with no markup by Contractor. Contractor shall submit appropriate NTTC form to testing firm to assure tax is not included on invoices.

1.9 SCHEDULE OF VALUES

A. Submit schedule of values on the Construction Progress sheet within the Progress Estimate sheet within the Application for Payment forms (EJCDC Form C-620 (2013 Edition), or on other form acceptable to the Engineer. Contractor's standard form or electronic media printout will be considered.

B. Base structure of Schedule of Values on Bid Schedule with identical item numbering, quantities, and values.

C. Submit Schedule of Values in duplicate at least 15 days prior to first Progress Meeting.

1.10 APPLICATIONS FOR PAYMENT

A. Application for Payment is synonymous with Partial Payment Estimate.

B. Submit four [4] copies of each application on the Partial Payment Estimate form provided in the Contract Documents, together with updated Schedule of Values identifying fully the list of items in the Application for Payment.

C. The Partial Payment Estimate forms consist of four sections: Cover Sheet, Construction Progress spreadsheet, Materials-On-Hand form, and Monthly Construction Progress Certificate. The purpose of the Monthly Construction Progress Certificate is to provide a complete account of all change orders/claims for the corresponding contract period, and all outstanding change orders/claims from previous contract periods, and waives any rights to further adjustments in contract times or price for any change orders/claims that originated in the current contract period.

D. Payment Period: Monthly, however the present Contract allows the Owner to make payment within forty-five days after submission of an undisputed request for payment.

1.11 CHANGE PROCEDURES

A. All Change Orders shall be prepared on the form provided in these Contract Documents.

B. Unit Price Change Order: For pre-determined unit prices and quantities, Change Order will be executed on fixed unit price basis. For unit costs or quantities of units of work not pre-determined, refer to Article 12 - Change of Contract Price; Change of Contract Times, of the Standard General Conditions (EJCDC C-700 Standard General Conditions of the Construction Contract).

1.12 UNIT PRICES

A. Engineer will take measurements and compute quantities accordingly. The Contractor will assist in taking of measurements and determination of work completed prior to preparation of corresponding Application for Payment.

1.13 ALTERNATES

A. Not applicable.

1.14 COORDINATION

A. Obtain any required business license(s) required by Owner or agency(ies) with jurisdiction prior to commencing construction activities.

B. Coordinate scheduling, submittals, and Work of various sections of specifications to ensure efficient and orderly sequence of installation of interdependent construction elements.

C. Verify utility requirement characteristics of operating equipment are compatible with building utilities.

D. Obtain all applicable permits from the NMDOT before boring under any roadways or working along or across NMDOT rights-of-way, unless the permits have already been obtained by the Engineer. The Contractor is also responsible for obtaining all applicable local, county and state building and development permits not previously obtained by Engineer or Owner. This includes permits from the Construction Industries Division of the Regulation and Licensing Department of the State of New Mexico, and any other regulatory agency having jurisdiction.

E. Contractor shall obtain permits from San Juan, Rio Arriba, and Sandoval Counties and BIA-NRO Department of Transportation prior to encroaching on any county or BIA roads, except for permits already obtained by the Owner or the Engineer.

F. Contractor is responsible for timely scheduling of any pertinent inspections with local, county and state agencies with jurisdiction, and as required by the permits.

G. Coordinate space requirements and installation of mechanical and electrical work indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable.

H. All notices, demands, requests, instructions, approvals, proposals and claims must be in writing.
   1. Any notice to or demand upon the Contractor shall be sufficiently given if delivered at the office of the Contractor stated on the signature page of the Agreement.
   2. All papers required to be delivered to the Owner shall, unless otherwise specified in writing to the Contractor, be delivered to the Owner at the address stated on the signature page of the Agreement.
   3. Any such notice shall be deemed to have been given as of the time of actual delivery, in the case of mailing, when the same should have been received in due course of post, or in the case of telegrams, certified mail, or telephone facsimiles, at the time of actual receipt as the case may be.

1.15 SUSPENSION OF WORK

A. The Owner may order suspension of work due to seasonal or other conditions unsuitable for construction work.

B. Maintenance during suspension: Prior to suspension for any cause, the Contractor shall take necessary precautions to protect the work during the period of suspension from any factors which would contribute to its deterioration.

C. Time elapsed during suspension of the work shall not count as contract time. The Contractor shall make no claim for damages due to delay, additional mobilization charges, nor any additional costs that may be incurred solely due to suspension of work.

D. Requests for additional time to be added after the “contract completion date” due to delays or extra work shall be made to the Owner in writing by the Contractor within ten (10) days after the time of the occurrence of the delay or receipt of a Change Order for extra work. Such requests shall set forth the justification for the additional time.

E. Upon approval, the additional contract time shall then be in full force and effect, the same as though it were the original date for completion, and will be shown as the completion date plus an amount of additional working days. Any time required to complete the work beyond the contract time or additional contract time will result in the assessment of liquidated damages, as specified in the Contract Documents. Failure to make such requests within the above limits will be considered as a waiver on the part of the Contractor as to the need for additional contract time.

1.16 FIELD ENGINEERING

A. Establish elevations, lines, and levels and certify and confirm elevations and locations of the Work, conforming with the Contract Documents, with the Engineer prior to performing any excavation.

B. Verify field measurements are as indicated on shop drawings or as instructed by manufacturer.

C. From the information provided by the Owner, the Contractor shall develop and make all detail surveys needed for construction such as slope stakes, batter boards, easement alignments, stakes for pipe locations and other working points, lines, elevations and cut sheets.

1.17 PRE-CONSTRUCTION CONFERENCE

A. Engineer will schedule Pre-Construction Conference after Notice of Award for affected parties.

B. The Contractor, or his duly authorized representative, and subcontractor representatives will attend the meeting.

1.18 PROGRESS MEETINGS

A. Schedule in coordination with the Engineer at maximum monthly intervals, and attend all Progress Meetings throughout progress of the Work.

B. The purpose of the meetings will be to review the following:
1. Work progress since previous meetings.
2. Field observations, problems, conflicts.
3. Problems which impede construction schedule.
4. Corrective measures and procedures to regain projected schedule.
5. Revisions to construction schedule.
6. Plan progress and schedule during succeeding work period.
7. Coordination of schedules.
8. Off-site fabrication and delivery schedules.
9. Maintenance of quality standards.
10. Proposed changes, construction schedule and completion date.
11. Coordination of separate contracts.
12. Record or “as-built” drawings of completed work.
13. Other business as required.
14. Regulatory requirements including OSHA, New Mexico Board of Labor, and others as applicable.
15. Funding requirements including RUS, NMED, NMFA, DFA, USEPA and others as applicable.

C. During each meeting, the Contractor is required to present any issues which may impact his Work, with a plan to resolve these issues expeditiously.

D. Together with each payment application, Contractor must present the current as-built drawings reflecting all work performed to date.

1.19 CUTTING AND PATCHING

A. Employ skilled and experienced installer to perform cutting and patching new Work; restore Work with new Products.

B. Execute cutting, fitting, and patching, including excavation and fill, to complete Work, and to:
   1. Uncover Work to install or correct ill-timed Work.
   2. Remove and replace defective and non-conforming Work.
   3. Remove samples of installed Work for testing.
   4. Provide openings in elements of Work for penetration of mechanical and electrical Work.

C. Cut masonry and concrete materials using masonry saw or core drill. Restore Work with new Products in accordance with requirements of Contract Documents.

D. Fit Work tight to adjacent elements. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.

E. Refinish surfaces to match adjacent finishes.

1.20 SUBMITTAL PROCEDURES

A. Identify Project, Contractor, subcontractor and supplier; pertinent drawing and detail number, and specification section number, appropriate to submittal.

B. Apply Contractor's stamp, signed or initialed, certifying that review, verification of Products required, field dimensions and elevations, adjacent construction Work, and coordination of information is in accordance with requirements of the Work and Contract Documents.

C. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of completed Work.

D. Revise and resubmit submittals as required by the Engineer; identify changes made since previous submittal.

E. Submit number of copies Contractor requires, plus two copies Engineer will retain, at a minimum, unless otherwise indicated at the Pre-Construction Conference.

F. Transmit each submittal with Engineer accepted form.

G. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report inability to comply with requirements.

H. Prior to commencing construction activities, Contractor shall provide two (2) copies of the corresponding Project safety plan to the Engineer, per SC-7.12.I of EJCDC C-800 Supplementary Conditions.

1.21 CONSTRUCTION PROGRESS SCHEDULES

A. Submit initial progress schedule in duplicate within fifteen [15] days after date of Owner-Contractor Agreement for Engineer review.

B. Submit revised schedules with each Application for Payment, identifying changes since previous version. Indicate estimated percentage of completion for each item of Work at each submission.

C. Distribute copies of reviewed schedules to Project site file, subcontractors, suppliers, and other concerned parties.

D. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate early and late start, early and late finish, float dates, and duration.

E. Indicate delivery dates for Owner furnished products and products identified under Allowances.

1.22 PROPOSED PRODUCTS LIST

A. Unless required as an attachment to Bid, within 15 days after date of Owner-Contractor Agreement, submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

1.23 PRODUCT DATA

A. Product Data: Submit to Engineer for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.

B. Submit copies and distribute in accordance with Submittal Procedures article.

C. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

D. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

1.24 SHOP DRAWINGS

A. Shop Drawings:
   1. Submitted to Engineer for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.
   2. Include detail design calculations, shop drawings, fabrication, and installation drawings, erection drawings, list, graphs, catalog sheets, data sheets, and similar items.
   3. Design calculations shall bear the signature and seal of an engineer registered in the appropriate branch and in the state wherein the project is to be built, unless otherwise directed.
   4. After review, provide copies and distribute in accordance with Submittal Procedures article and for record documents purposes as specified.

5. Except as may otherwise be indicated herein, the Engineer will return copies of each submittal to the Contractor with comments noted thereon, within 30 calendar days following their receipt by the Engineer.

B. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

C. Submit number of opaque reproductions Contractor requires, plus two copies Engineer will retain.

1.25 TEST REPORTS

A. Submit for Engineer's knowledge as contract administrator or for Owner.

B. Submit test reports for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

1.26 MANUFACTURER'S INSTRUCTIONS AND CERTIFICATES

A. When specified in individual specification sections, submit manufacturer printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, to Engineer for delivery to Owner in quantities specified for Product Data.

B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

C. When specified in individual specifications sections, submit certifications by manufacturer to Engineer, in quantities specified for Product Data.

D. Indicate material or Product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

E. Certificates may be recent or previous test results on material or Product, but must be acceptable to Engineer.

1.27 QUALITY CONTROL

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply with manufacturer's instructions.

C. Comply with specified standards as minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

1.28 TOLERANCES

A. Monitor fabrication and installation tolerance control of installed products over suppliers, manufacturers, products, site conditions, and workmanship, to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply fully with manufacturer's tolerances.

1.29 REFERENCES

A. Conform to reference standards by date of issue current as of date of Contract Documents.

B. When specified reference standard conflict with Contract Documents, request clarification from Engineer before proceeding.

1.30 MANUFACTURER'S FIELD SERVICES AND REPORTS

A. When specified in individual specification sections, require material or product suppliers or manufacturers to furnish qualified staff personnel to observe site conditions and to initiate instructions when necessary.

B. Report observations and site decisions or instructions that are supplemental or contrary to manufacturer's written instructions.

1.31 EXAMINATION

A. Verify existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.

B. Verify utility services are available, of correct characteristics, and in correct location.

C. Contractor is solely responsible for utility location, protection and verification. Contractor must notify New Mexico One Call System Inc., at 811, and all local utility providers, three (3) days before starting utility line construction.

D. It shall be the responsibility of the Contractor to become acquainted with the location of all underground structures which may be encountered or which may affect the Work hereunder.

1.32 TEMPORARY SERVICES

A. Provide, maintain and pay for suitable quality water service as required.

B. Maintain uninterrupted water, wastewater, and electric service to all properties adjoining the Work, except where specifically approved by the authority having jurisdiction. Services damaged by the Contractor shall be immediately and permanently repaired or replaced at the expense of the Contractor. Give a minimum of 48-hour advance notice to occupants of adjacent properties before interrupting any service. Any interruption of service shall be kept to the minimum length of time possible and shall not exceed 24 hours.

C. Until final inspection and approval of the Work and issuance of the Certificate of Substantial Completion, the Contractor is responsible for all Work directly or indirectly affected by the Contractor's activities. Such responsibility continues for all Work detailed on the punch list that may accompany the Certificate of Substantial Completion, until satisfactorily completed by the Contractor and approved by the Owner and Engineer.

D. Furnish, install and maintain any temporary water storage structures, electrical connections, meters, wiring, outlets, switches, lamps, etc., as necessary for the work. The Contractor shall provide such temporary heat as may be necessary for the prevention of injury to the work or material through dampness or cold. All temporary connections, installations, facilities and supplies furnished or installed as specified in this paragraph, shall be removed prior to the completion of the Contract, and the premises left perfectly clean and satisfactory to the Owner.

E. Maintain ambient temperature above freezing in enclosed/occupied areas where construction is in progress, unless indicated otherwise in specifications.

F. Provide temporary electricity and power outlets for construction operations, connections, branch wiring, distribution boxes, and flexible power cords as required. Do not disrupt Owner's need for continuous service.

G. Provide and maintain required sanitary facilities and enclosures in clean and sanitary condition.

1.33 ACCESS ROADS

A. Construct and maintain temporary roads accessing public thoroughfares to serve construction area.

B. Existing on-site roads, designated by the Owner, may be used for construction traffic.

1.34 PROGRESS CLEANING AND WASTE REMOVAL

A. Collect and maintain areas free of waste materials, debris, and rubbish. Maintain site in clean and orderly condition.

B. Remove waste and surplus materials, rubbish, and construction facilities from site. Restore all job sites and adjoining areas, including roads and driveways, to a condition equal to or better than the original status. Special attention will be made to not disturb unimproved roads by placing any excavated material to the sides of these roads when waterlines are located along the right-of-way.

C. Brush and trees shall be felled parallel to the right-of-way to minimize damage to trees and structures on adjacent property. All brush, tree tops, stumps and other debris shall be removed from the right-of-way and disposed of by the Contractor, subject to and in conformity with the special provisions applying to the tract of land involved (if any). The Contractor shall not destroy nor remove any trees, shrubbery, nor any other improvements, without permission of the Owner.

D. The Contractor shall not dispose of debris, refuse or sanitary wastes in an open dump or in a natural watercourse, whether on public or private property, or in such places that undesirable wastes can eventually be exposed or carried to a natural watercourse.

1.35 PROJECT IDENTIFICATION

A. No project sign is required.

B. The Contractor shall not erect, or permit the erection of advertising signs. Only minimal identification and direction signs shall be permitted on the site. Unnecessary or obnoxious posters, pictures, signs, symbols, drawings or writing on work, material or equipment, resulting from vandalism or other causes, shall be covered or removed by the Contractor.

1.36 BARRIERS AND FENCING

A. Provide barriers or fencing to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage.

1.37 PROTECTION OF INSTALLED WORK

A. Protect installed Work and provide special protection where specified in individual specification sections.

1.38 SECURITY

A. Provide security and facilities to protect Work and existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.

1.39 WATER CONTROL

A. Provide erosion control.

B. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

C. The project disturbance is estimated to be less than one acre. In the event that one acre of earth or more is disturbed, the Contractor shall submit to the Owner’s Resident Project Representative a Storm Water Pollution Prevention Plan (SWPPP) that will address all construction phases and the proposed pollution prevention and sediment control measures. This shall be done in accordance with the National Pollution Discharge Elimination System (NPDES) general permit requirements for all construction activities, and shall include all required reporting. If the Bid Form does not include an item for preparation and implementation of the SWPPP, the cost thereof will be considered incidental to related work.

D. The Contractor shall conduct his operations to minimize damage to natural watercourses, and shall not permit petroleum products, volatile fluid wastes, or any other wastes which are prohibited by local ordinances, or excessive amounts of silt, clay, or mud to enter any

drainage system. The bed of natural watercourses or man-made irrigation ditches shall be restored to normal gradient and cross-section after being disturbed.

1.40 POLLUTION AND ENVIRONMENTAL CONTROL

A. Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations.

B. Provide dust control, erosion and sediment control, noise control, pest control and rodent control to allow for proper execution of the Work. Short term effects of dust produced by equipment will be mitigated by sprinkling traffic areas with water. Motor equipment shall be kept in repair and equipped with anti-pollution devices, if possible, to cut down on exhaust emissions. Burning as a method of cleaning or disposal will not be permitted without approval of the proper authorities.

C. Comply with all applicable standards, orders, or regulations issued pursuant to the Clean Air Act of 1970 (42 U.S.C. 1251 et seq.) as amended. Violations shall be reported to the New Mexico Environment Department.

D. The Contractor shall be responsible for the reporting and the cleanup of spills associated with project construction and shall report and respond to spills of hazardous materials such as gasoline, diesel, motor oil, solvents, chemicals, toxic and corrosive substances, and other materials which may be a threat to the public health or the environment. The Contractor shall be responsible for reporting past spills encountered during construction and of current spills not associated with construction. Reports shall be made to the New Mexico Environment Department Emergency Response Team at (505) 476-6025 during business hours. If there is no emergency situation the Contractor can leave a message regarding the nature of the spill, location and contact information. For emergencies that require immediate attention and mitigation, and there is no response at the NMED Emergency Response Team number above, call (505) 827-9329. For emergencies that pose immediate danger to public health or property, call 911. For any and all spills, Contractor shall also immediately contact the Owner's Resident Project Representative.

E. The Contractor shall clean up any unreported spills associated with project construction identified after construction.

1.41 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, and materials, prior to Substantial Completion review.

B. Clean and repair damage caused by installation or use of temporary work.

C. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

1.42 PRODUCTS

A. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the Work, but does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work. Products may also include existing materials or components specifically identified for reuse.

B. Do not use materials and equipment removed from existing premises, except as specifically identified or allowed by the Contract Documents.

C. Provide interchangeable components of same manufacturer for components being replaced.

1.43 DELIVERY, HANDLING, STORAGE, AND PROTECTION

A. Deliver, handle, store, and protect Products in accordance with manufacturer's instructions.

1.44 SUBSTITUTIONS

A. Substitutions will only be considered when Product becomes unavailable through no fault of Contractor, or where an “approved equal” is specifically allowed elsewhere in the Technical Specifications or noted on the Drawings. In such cases, the brand name and/or model number of products that have been identified in these Specifications serve as the basis of the design. These products may be substituted with other products that meet the same manufacturing standards, quality, performance and desired characteristics of the Specifications when approved by the Engineer or Owner’s representative.

B. Specific manufacturers may be required for certain items in order to maintain consistency with the Owner’s existing inventory. In such cases, substitutions will not be allowed as indicated in each specification section where applicable.

C. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.

D. Submit three [3] copies of request for Substitution to the Engineer for consideration. Limit each request to one proposed Substitution.

1.45 CLOSEOUT PROCEDURES

A. Submit written certification Contract Documents have been reviewed, Work has been inspected, and Work is complete in accordance with Contract Documents and ready for Engineer's inspection.

B. Submit final Application for Payment identifying total adjusted Contract Price, previous payments, and amount remaining due.

C. Among required closeout submittals include: Release of Liens, Consent of Surety, and Certification of Labor Standards.

1.46 FINAL CLEANING

A. Execute final cleaning prior to final inspection.

B. Upon completion of the work under this contract, thoroughly clean and make any needed repairs caused by damage during construction to any existing utilities or other structures on the site.

C. Notify the Engineer in writing once final cleaning is complete. The final estimate will not be prepared until the Contractor has complied with all requirements set forth and the Engineer has made his final inspection of the entire work and is satisfied that it is properly constructed and the site properly cleaned.

1.47 STARTING OF SYSTEMS

A. Provide seven [7] days notification prior to start-up of each item.

B. Ensure each piece of equipment or system is ready for operation.

C. Execute start-up under supervision of responsible persons in accordance with manufacturer’s instructions.

D. Submit written report stating equipment or system has been properly installed and is functioning correctly.

1.48 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation and maintenance of Products to Owner's personnel two weeks prior to date of Substantial Completion.

B. For equipment or systems requiring seasonal operation, perform demonstration for other season within six [6] months.

C. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed-upon times, at designated location.

1.49 TESTING, ADJUSTING, AND BALANCING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

B. Owner retains the right to appoint, employ, and pay for services of independent firm to perform testing, adjusting, and balancing. Reports will be submitted by independent firm to Engineer indicating observations and results of tests and indicating compliance or non-compliance with specified requirements and with requirements of Contract Documents.

C. Contractor will cooperate with independent firm; furnish assistance as requested.

D. Re-testing required because of non-conformance to specified requirements will be charged to Contractor.

1.50 PROTECTING INSTALLED CONSTRUCTION

A. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

B. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

C. Prohibit traffic or storage upon waterproofed or roofed surfaces. When traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

D. Prohibit traffic from landscaped areas.

1.51 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of Contract Documents to be utilized for record documents.

B. Record actual revisions to the Work. Record information concurrent with construction progress.

C. Specifications: Legibly mark and record at each Product section description of actual Products installed.

D. Record Documents and Shop Drawings (As-Built Drawings): Legibly mark each item to record actual construction. Deliver two (2) sets of As-Built Drawings with redlines to the Owner upon completion of the Project. The As-Built Drawings will be submitted to the Engineer prior to processing of final payment to the Contractor.

E. Submit documents to Engineer together with claim for final Application for Payment.

1.52 OPERATION AND MAINTENANCE DATA

A. Submit 3 sets prior to final inspection, bound in 8-1/2 x 11 inch text pages, three D side ring binders with durable plastic covers.

B. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS" and title of project.

C. Internally subdivide binder contents with permanent page dividers, logically organized.

D. Contents:
   1. Part 1: Directory
      a. List names, addresses, and telephone numbers of Engineer, Contractor, subcontractors, and major equipment suppliers.
   2. Part 2: Operation and maintenance instructions, arranged by system:

a. Equipment summary, operational procedures, preventive maintenance procedures and schedules, parts list, shop drawings, safety issues.

3. Part 3: Project documents and certificates.
   a. All equipment warranties, affidavits, and certifications required by the Technical Specifications shall be placed in this part.

1.53 SPARE PARTS AND MAINTENANCE MATERIALS

A. Provide products, spare parts, maintenance and extra materials in quantities specified in individual specification sections.

B. Deliver to project site and place in location as directed by Engineer; obtain receipt prior to final payment.

1.54 WARRANTIES AND PRODUCT REGISTRATION

A. Execute and assemble transferable warranty documents from subcontractors, suppliers, and manufacturers for all products with extended warranties beyond one (1) year.

B. Execute and assemble product registration documents from suppliers and manufacturers, on Owner's behalf, for all products requiring such registration, for recall or warranty purposes.

C. Submit prior to final Application for Payment.

PART 2 PRODUCTS

2.1 AMERICAN IRON AND STEEL REQUIREMENTS

A. All iron and steel shall for the project comply with the American Iron and Steel provisions of the Consolidated Appropriations Act of 2017.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 03 05 00

BASIC CONCRETE MATERIALS AND METHODS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes formwork, reinforcement, accessories, cast-in-place concrete, transporting, placing, finishing, curing, and other pertinent items of construction.

B. Concrete and Standards - Except as noted or modified in this section, all concrete materials, transporting, placing, finishing, curing, and sealing shall conform to requirements as follows:

1. American Institute of Concrete (ACI)
    a. 301 - Specifications for Structural Concrete.
    b. 302.1R - Guide to Concrete Floor and Slab Construction.
    c. 304R - Guide for Measuring, Mixing, Transporting and Placing Concrete.
    d. 305.1 - Specification for Hot Weather Concreting.
    e. 306.1 - Standard Specification for Cold Weather Concreting.
    f. 308.1 - Standard Specification for Curing Concrete.
    g. 318 - Building Code Requirements for Structural Concrete.
    h. 347R - Guide to Formwork for Concrete.
    i. SP-66 - ACI Detailing Manual.
2. ASTM International (ASTM)
    a. ASTM A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
    b. ASTM A1064 - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
    c. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
    d. ASTM C33 - Specifications for Concrete Aggregates.
    e. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
    f. ASTM C40 - Standard Test Method for Organic Impurities in Fine Aggregates for Concrete.
    g. ASTM C42 - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
    h. ASTM C94 - Specification for Ready-Mixed Concrete.
    i. ASTM C138 - Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete.
    j. ASTM C143 - Standard Test Method for Slump of Hydraulic Cement Concrete.
    k. ASTM C150 - Standard Specification for Portland Cement.
    l. ASTM C156 - Standard Test Method for Water Loss [from a Mortar Specimen] Through Liquid Membrane-Forming Curing Compounds for Concrete.
    m. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.

n. ASTM C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
o. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
p. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
q. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.
r. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
s. ASTM C989 - Standard Specification for Slag Cement for Use in Concrete and Mortars.
t. ASTM C1064 - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
u. ASTM C1116 - Standard Specification for Fiber-Reinforced Concrete.
v. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures.
w. ASTM C1260 - Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method).
x. ASTM C1550 - Standard Test Method for Flexural Toughness of Fiber Reinforced Concrete (Using Centrally Loaded Round Panel).
y. ASTM C1567 - Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method).
z. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.
aa. ASTM C1609 - Standard Test Method for Flexural Performance of Fiber-Reinforced Concrete (Using Beam with Third-Point Loading).
bb. ASTM C1778 - Standard Guide for Reducing the Risk of Deleterious Alkali-Aggregate Reaction in Concrete.

3. American Association of State Highway & Transportation Officials (AASHTO):
   a. PP 65 - Standard Practice for Determining the Reactivity of Concrete Aggregates and Selecting Appropriate Measures for Preventing Deleterious Expansion in New Concrete Construction.

1.2 QUALITY ASSURANCE

A. Inform Engineer at least 48 hours in advance of time at which Contractor intends to place concrete.

B. When required by any applicable permits, such as CID permits, Contractor shall have reinforcement inspected by the agency with jurisdiction prior to placement of concrete.

C. Construct and erect concrete formwork in accordance with ACI 301 and ACI 347R.

D. Concrete tests shall be in accordance with requirements of ACI 301, except as noted or modified in this Section.
   1. Strength test:
      a. Mold and cure 5 cylinders from each sample.

b. Test one at 7 days and one at 14 days for information and two at 28 days for acceptance.

E. Samples:

1. Collect the following minimum samples for each 28-day strength concrete used in the work for each days placing:

Quantity	Number of Samples
50 cubic yards or less	1
50 to 100 cubic yards	2
100 cubic yards or more	2 plus 1 sample for each additional 100 cubic yards

2. Sampling should be in accordance with ASTM C172.
3. Forming cylinders in accordance with ASTM C31.
4. No sample shall be required for thrust blocks nor fence posts.
5. Hold fifth cylinder for future considerations. Deliver to Owner upon determination of substantial completion and prior to final payment.
6. Sample marking.
   a. Mark or tag each sample of compression test cylinders with date and time of day cylinders were made.
   b. Identify location in work where concrete represented by cylinders was placed.
   c. Identify delivery truck or batch number, air content and slump.
7. Slump test:
   a. Conduct test for each strength test sample and whenever consistency of concrete appears to vary, in accordance with ASTM C143.
8. Air content:
   a. Conduct test from 1 of first 3 batches mixed each day and for each strength test sample, in accordance with ASTM C231, 138 or 173.
9. Temperature:
   a. Conduct test in accordance with ASTM C1064.

F. Coordinate concrete placement with the Engineer to ensure proper testing in compliance with the Drawings and Specifications. The cost of all tests shall be covered by the Testing Allowance provided for in the bid schedule, except for failed tests, or new analyses required due to failed tests.

G. The Contractor is free to take additional specimens for his own information, at his own expense, not reimbursable from the Testing Allowance.

H. Acceptance of Concrete: Strength level of concrete will be considered satisfactory so long as average of all sets of 3 consecutive strength test results equal or exceeds specified 28-day strength and no individual strength test result falls below specified strength (***fc′***) by more than 500 psi when specified compressive strength is 5000 psi or less; or by more than **0.10*fc′*** when specified compressive strength is more than 5000 psi.

I. Failure of Test Cylinder Results: Upon failure of test cylinder results, Engineer may require Contractor, at his expense, to test remaining cylinder after curing for a period of time specified by Engineer. If strength level of this cylinder is not greater than specified

28-day strength, Engineer may require Contractor to obtain and test at least three 2-inch diameter cored samples from an area in question.

1. Conform to ASTM C42.
2. Concrete will be considered adequate if average of 3 cores is at least 85 percent of, and if no single core is less than 75 percent of, specified 28-day strength.
3. Upon failure of core test results, Engineer may require Contractor, at his expense, to perform load tests as specified in ACI 318.
4. Fill all core holes as specified for repairing defective concrete.

J. Completed Work

1. Completed concrete work which fails to meet 1 or more requirements, but which has been repaired to bring it into compliance, will be accepted without qualification.
2. Completed concrete work which fails to meet 1 or more requirements and which cannot be brought into compliance shall be rejected as provided in these Contract Documents. In this event, modifications shall be required to assure that concrete work complies with requirements. Modifications, as directed by Engineer, to be made at no additional cost to Owner.

K. Perform concrete reinforcing and cast-in-place concrete work in accordance with ACI 301.

PART 2 PRODUCTS

2.1 AMERICAN IRON AND STEEL REQUIREMENTS

A. All iron and steel shall comply with the American Iron and Steel provisions of the Consolidated Appropriations Act of 2017.

2.2 FORM MATERIALS AND ACCESSORIES

A. Steel Forms: Symons “Steel-Ply”, Simplex “Industrial Steel Frame Forms”, Universal “Uniform”. Forms shall be clean, straight and true, without surface defects.

B. Plywood Forms: Product standard PS-1, waterproof, resin-bonded exterior type Douglas Fir or Larch. Forms shall be clean, straight and true, without surface defects.

C. Lumber: Douglas Fir or Larch, straight, uniform width and thickness, clean and free from offsets, holes, dents and other surface defects.

D. Chamfer Strips: Clean white pine, surface against concrete planed.

E. Form Release Agent: Colorless mineral oil not capable of staining concrete or impairing natural bonding characteristics of coating intended for use on concrete.

2.3 REINFORCEMENT MATERIALS

A. Reinforcing Steel: ASTM A615, deformed. Reinforcement bar, size and spacing as indicated on the Drawings.

B. Welded wire fabric reinforcement shall conform to the requirements of ASTM A1064 and the details shown; provided, that welded wire fabric with longitudinal wire of W4 size wire and smaller shall be either furnished in flat sheets or in rolls with a core diameter of not less than 10 inches; and provided further, that welded wire fabric with longitudinal wires larger than W4 size shall be furnished in flat sheets only.

C. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for support of reinforcing; plastic tipped or non-corroding for supports in slabs where supports are exposed to weather.

D. Concrete blocks used to support and position reinforcement steel, shall have the same or higher compressive strength as specified for the concrete in which it is located. Wire ties shall be embedded in concrete block bar supports.

E. Fabricate concrete reinforcing in accordance with ACI SP-66.

2.4 CONCRETE MATERIALS

A. Cementitious Materials:
1. Portland Cement: ASTM C150 Type I.
2. Fly Ash: ASTM C618, Class F or C.
3. Slag Cement: ASTM C989, Grade 100 or 120.
4. Silica Fume: ASTM C1240.
5. Metakaolin: ASTM C618, Class N.

B. Fine and Coarse Aggregates: ASTM C33.

C. Water: ASTM C1602/C1602M, Clean and not detrimental to concrete.

D. Chemical Admixtures (when applicable): Compatible with each other and free of intentionally-added chlorides.
1. Air Entraining Admixture: ASTM C260.
2. Water-Reducing Admixture: ASTM C494, Type A.
3. Mid-Range Water-Reducing Admixture: ASTM C494, Type A.
4. High-Range Water-Reducing Admixture: ASTM C494, Type F.
5. Accelerating Admixture: ASTM C494, Type C or E.
6. Retarding Admixture: ASTM C494, Type B or D.
7. Workability-Retaining Admixture: ASTM C 494, Type S.
   a. Shall retain concrete workability without affecting time of setting or early-age strength development.
8. Alkali-Silica Reaction Inhibiting Admixture: ASTM C494, Type S
   a. Shall contain a nominal lithium nitrate content of 30 percent.

2.5 CONCRETE MIX

A. Mix and deliver concrete in accordance with ASTM C94.

B. Re-tempering of prepared concrete will not be permitted.

C. Furnish concrete of the following strength:

Type of Work	Min. 28-Day Compressive Strength (psi)	Max. Size Aggregate (in.)	Min. Cement W/C per CY (94# sacks)	Maximum w/cm (by wt.)
Slabs on grade, footings floor slabs, and all other concrete items not specified elsewhere.	4,000	1	6.0	0.50
Site work concrete such as fence posts, thrust blocks, valve collars, etc.	3,000	1	5.0	0.50

D. Proportioning:

1. Proportion ingredients to produce a well-graded mix of high-density maximum workability consistent with approved mix design.
2. Entrained air - all concrete exposed to freeze-thaw cycles under saturated conditions:
   a. Five (5) percent, plus or minus one (1) percent, for concrete in the forms. Concrete samples for air content tests shall be taken at the end of the concrete truck chute or the output of the concrete pump, whichever applies. A reduction in air content of pumped concrete should be expected. Contractor shall be responsible to coordinate with the concrete supplier to provide the specified air content of the in-place concrete.
   b. Refer to ACI 301 for further requirements.
3. Fly ash, silica fume, and slag cement:
   a. Fly ash: The mineral admixture Class F fly ash shall be proportioned by weight of cement to provide a fly ash to portland cement ratio not less than 1:4 and not less than 25 per cent of the total cementitious material. Portland cement concrete submitted under this specification shall be proportioned with Class F fly ash, unless a variance is authorized by the Engineer. Alternatively, lithium-based admixture can be used in lieu of Class F fly ash to mitigate ASR. The Contractor shall provide the Engineer with chemical and physical analysis of the fly ash.
   b. Silica fume: Silica fume may be added to the mix and shall be proportioned by weight of cement to provide a silica fume to Portland cement ratio not less than 1:25 and no greater than 1:7. Portland cement concrete using silica fume shall follow ASTM C1240 standards.
   c. Slag cement: Slag cement may be added to the mix and shall be proportioned by weight of cement to provide a slag cement to Portland cement ratio of no greater than 80 percent. Slag cement can consist of Grade 100 or grade 120. Portland cement concrete using slag cement shall follow ASTM C989 standards.
4. Aggregates supplied under this Specification shall be assumed to be "alkali-silica reactive", ASR. Mitigation measures, such as the use of supplementary cementitious materials or lithium nitrate based admixtures or the combination of both, shall be utilized in the concrete mixtures to mitigate alkali-silica reaction, when the aggregates are known to be alkali-silica reactive. Replacement levels of

supplementary cementitious materials and the dosage of lithium nitrate based admixtures shall be determined in accordance with the performance-based approach provided in ASTM C1778. Variance from this position for a particular aggregate source may be authorized by the Engineer. Application for a variance may be made to the Engineer.

a. Portland cement concrete design mixes using non alkali-silica reactive aggregates will not be required to be proportioned with Class F fly ash.

E. Batching and Mixing Equipment: Conform to ACI 304R.

F. Slump:
1. Keep as low as possible consistent with proper handling and thorough compaction.
2. Shall not exceed 4 inches unless otherwise authorized by Engineer.

2.6 CEMENT GROUT

A. Portland Cement: ASTM C150, Type I and II.

B. Water:
1. Potable; containing no impurities, suspended particles, algae or dissolved natural salts.

C. Fine Aggregate:
1. Washed natural sand.
2. Gradation in accordance with ASTM C33 and represented by smooth granulometric curve within required limits.
3. Free from injurious amounts of organic impurities as determined by ASTM C40.

D. Mix:
1. Portland cement, sand and water. Do not use ferrous aggregate or staining ingredients in grout mixes.
2. Water content shall be such that the grout can be readily spread, yet not wet enough to cause trouble with surface water or laitance, or failure to stay in place after screeding. All grout mixes and mixing procedures shall be submitted in accordance with submittal requirements, and shall be subject to review and approval by the Engineer prior to commencing the grouting operations.

E. The minimum compressive strength at 28 days shall be 4000 psi.

PART 3 EXECUTION

3.1 FORMWORK ERECTION

A. Erect formwork, shoring and bracing to achieve design requirements.

B. Erect forms substantially and sufficiently tight to prevent leakage of mortar and braced or tied to maintain desired position, shape and alignment before, during, and after concrete placement.

C. Carefully remove forms only after concrete is able to support all dead and live loads and curing requirements are met. Apply curing compound to all formed surfaces immediately after form removal.

D. Camber slabs and framing to achieve ACI 301 tolerances.

E. Provide bracing to ensure stability of formwork.

F. Clean forms as erection proceeds, to remove foreign matter.

3.2 INSERTS, EMBEDDED COMPONENTS, AND OPENINGS

A. Provide formed openings where required for work to be embedded in and passing through concrete members.

B. Coordinate work of other sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.

C. Install concrete accessories straight, level, and plumb.

D. Install water stops continuous without displacing reinforcement.

3.3 REINFORCEMENT PLACEMENT

A. Place reinforcement, supported and secured against displacement.

B. Ensure reinforcing is clean, free of loose scale, dirt, or other foreign coatings.

3.4 PLACING CONCRETE

A. Do not place concrete during rain, sleet, or snow unless adequate protection is provided and Construction Observer approval is obtained. Do not allow rainwater to increase mixing water or damage surface finish.

B. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent.

C. Convey concrete from mixer to final position as rapidly as practicable without segregation or loss of material. Limit chute length to less than 20 feet with maximum slope of 1 vertical to 2 horizontal.

D. Maximum height of concrete free fall is 4 feet.

E. Place concrete continuously between predetermined expansion, control and construction joints. Do not break or interrupt successive pours creating cold joints.

F. On large volume pours, concrete shall be placed with the aid of approved mechanical vibrators. Vibration shall be supplemented by manual forking or spading adjacent to the

forms on exposed faced in order to secure smooth dense surfaces. The concrete shall be thoroughly consolidated around reinforcement, pipes or other shapes built into the work.

G. Where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack with non-shrink grout.

H. Screed slabs-on-grade and concrete base for toppings level.

3.5 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.

B. Remove formwork progressively and in accordance with code requirements.

3.6 FLOOR FINISHING

A. Finish concrete floor surfaces in accordance with ACI 301 and ACI 302.1R.

B. Uniformly spread, screed, and float concrete.

C. In areas with floor drains, maintain floor level at walls and slope surfaces uniformly to drains.

D. Provide surface conforming to proper elevation and contour with all aggregates completely embedded in mortar by screening.

E. Provide an initial float as soon as concrete has stiffened sufficiently for proper working.

F. Provide a second floating at time of initial set.

G. Apply a broom finish.

3.7 CURING

A. Immediately after placement, protect concrete from premature drying.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete, for not less than ten (10) days in warm to hot weather (per ACI 305.1), and fourteen (14) days in cold weather (per ACI 306.1) after placing, unless otherwise indicated by the Engineer, in accordance with the methods specified herein for the different parts of the Work.

1. Cold weather is defined as when the temperature reaches or goes below 35 degrees F for one (1) hour during any 24-hour period during the curing period.

C. Use a pre-approved concrete curing method. Acceptable curing methods, as detailed in ACI 308.1, are as follows:
1. Water Curing Methods:

a. Ponding/Immersion.
b. Fogging/Sprinkler.
c. Burlap/Cotton Mats/Absorbent Material.
d. Wet Sand Curing.
e. Straw/Hay.
f. Plastic Film.
g. Reinforced Paper.

2. Liquid Membrane-Forming Compounds.

D. The covering used, if applicable, must be overlapped adequately to ensure 100% coverage, and must not be allowed to become dry at any point during the curing period. Place and anchor covers, mats, and/or sheeting to ensure continuous contact with the concrete surfaces.

E. When using one of the water curing methods, keep the concrete structures thoroughly and continuously moist and covered during the entire curing period.

3.8 FIELD QUALITY CONTROL

A. Three (3) Concrete Test Cylinders: Taken for every 75 or less cubic yards of each class of concrete placed.

B. One (1) Additional Test Cylinder: Taken during cold weather concreting, and cured on job site under same conditions as concrete incorporated into the Work.

C. One (1) Slump Test: Taken for each set of test cylinders taken and whenever consistency of concrete appears to vary.

D. One (1) Air Content Test: Taken for each set of test cylinders taken.

E. One (1) Concrete Temperature Measurement: Taken for each set of test cylinders taken.

F. One (1) Ambient Air Temperature Measurement: Taken for each set of test cylinders taken and at the beginning of each day that concrete is being placed.

3.9 DEFECTIVE CONCRETE

A. Modify or replace concrete not conforming to required lines, details and elevations, as directed by Engineer.

END OF SECTION

SECTION 09 97 15

WATER STORAGE TANK REHABILITATION

PART 1 GENERAL

1.1 SUMMARY

A. The work of this section includes the sand blasting and coating of specified locations within the interior of a steel water storage tank. These locations include the overflow weir, internal ladder, and minor interior ceiling rust spots as depicted in the "CW Divers Tank Report".

B. The bid item related to rehabilitation of elements of the existing tank are for work to be performed as identified as necessary by the tank inspection report. The bid item are intended to set a competitive Lump Sum price for this work based on the inspection report pictures with Engineer notes. The Contractor will be paid lump sum for the items described and additional awarded work, if any, shall be paid for on a change order basis.

C. The work covered by these specifications shall consist of the rehabilitation of specific portions of one 50,000 gallon welded steel water ground storage tanks as awarded by the Owner. The tank is 16 feet tall by 24 feet in diameter. The rehabilitation work shall be sequenced as follows:
   1. Isolate the north tank from service and drain. The south tank is not being rehabbed and shall remain in service for the duration of the work.
   2. Prepare the surfaces of the interior ladder, overflow weir and pipe, and ceiling spot repair locations for coating as indicated in the bid form and as illustrated in the provided tank inspection report as recommended by the Engineer and approved by the Owner.
   3. Coat interior surfaces as needed as specified herein.

D. Related Sections:
   1. Section 33 13 13 - Water Tank Disinfection.

1.2 REFERENCES

A. Without limiting the general aspects of other requirements of these specifications, all surface preparation, coating and painting of interior and exterior surfaces and inspection shall conform to the applicable requirements of the Steel Structures Painting Council, NACE International, ASTM (American Society for Testing and Materials), AWWA and the manufacturer's printed instructions.

B. American Society for Testing and Materials (ASTM) International:
   1. ASTM D520 - Standard Specification for Zinc Dust Pigment
   2. ASTM D4417 - Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel
   3. ASTM E337 - Standard Practice Test Method for Measuring Humidity with a Psychrometer

4. ASTM D2200 - Standard Methods of Evaluating Degree of Rusting on Painted Surfaces

C. American National Standards Institute (ANSI)
1. ANSI/ASC 29.4 - Exhaust Systems Abrasive Blasting Operations - Ventilation and Safe Practice
2. ANSI/NSF Standard 61 - Drinking Water Components

D. American Water Works Association (AWWA)
1. AWWA D100
2. AWWA D102 Coating Steel Water Storage Tanks

E. Consumer Product Safety Act, Part 1303

F. National Association of Corrosion Engineers (NACE) International
1. NACE Publication TPC2 - Coatings and Linings for Immersion Service: Chapter 1 Safety, Chapter Surface Preparation, Chapter 3 Curing, and Chapter 4 Inspection
2. NACE Standard RP0178 - Standard Recommended Practice – Fabrication Details, Surface Finish Requirements and Proper Design Considerations for Tanks and Vessels to be Lined for Immersion Service
3. NACE Standard RP0188 - Standard Recommended Practice – Discontinuity (Holiday) Testing of Protective Coatings
4. NACE Standard RP0287 - Field Measurement of Surface Profile of Abrasive Blast-Cleaned Steel Surfaces Using a Replica Tape
5. NACE Standard RP0288 - Standard Recommended Practice, Inspection of Linings on Steel and Concrete

G. Occupational Safety & Health Administration (OSHA)
1. 1910.146(d)(4)(v) - Lighting
2. 1915.35 - Standards – 29 CFR – Painting

H. Steel Structures Painting Council (SSPC)
1. SSPC-SP2 - Hand Tool Cleaning
2. SSPC-SP3 - Power Tool Cleaning
3. SSPC-PA-1 - Shop, Field and Maintenance Painting
4. SSPC-PA-2 - Measurement of Dry Film Thickness with Magnetic Gages
5. SSPC-PA-3 - Guide to Safety in Paint Application
6. SSPC-Guide 12 - Guide for Illumination of Industrial Painting Project
7. SSPC-VIS 1-89 - Pictorial Surface Preparation Standards for Painting Steel Surfaces
8. SSPC Paint Spec 36 - Two Component Weatherable Aliphatic Polyurethane Topcoat, Performance-Based

I. SSPC/NACE Joint Standards
1. SSPC-SP5/NACE 1 - White Metal Blast Cleaning
2. SSPC-SP6/NACE 3 - Commercial Blast Cleaning
3. SSPC-SP7/NACE 4 - Brush-Off Blast Cleaning
4. SSPC-SP10/NACE 2 - Near-White Metal Blast Cleaning

J. The Engineer's decision shall be final as the interpretation and/or conflict between any of the referenced specifications and standards contained herein.

1.3 CONTRACTOR

A. The Contractor shall have five years of practical experience and successful history in the application of specified product to surfaces of steel water tanks. Upon request, the contractor shall substantiate this requirement by furnishing a list of references and job completions, including dates of application and product.

B. The personnel performing the work shall be knowledgeable and have the required experience and skill to adequately perform the work for this project, in accordance with SSPC-PA1, “Shop, Field and Maintenance Painting”.

1.4 QUALITY ASSURANCE

A. General: Quality assurance procedures and practices shall be utilized to monitor all phases of surface preparation, application and inspection throughout the duration of the project. Procedures or practices not specifically defined herein may be utilized provided they meet recognized and accepted professional standards and are approved by the Engineer.

B. Surface Preparation: Surface preparation will be based upon comparison with: "Pictorial Surface Preparation Standards for Painting Steel Surfaces: SSPC-VIS 1-89”, ASTM D2200-95, "Standard Methods of Evaluating Degree of Rusting on Painted Surfaces”, ASTM D 4417-91, Method A and/or Method C or NACE Standard RP0287-87. In all cases the written standard shall take precedence over the visual standard. In addition, NACE Standard RP0178-91, along with the Visual Comparator, shall be used to verify the surface preparation of welds.

C. Application: No coating or paint shall be applied when: 1) the surrounding air temperature or the temperature of the surface to be coated or painted is below the minimum surface temperature for the products specified herein, 2) rain, snow, fog or mist is present, 3) the surface temperature is less than 5 degrees F above the dew point, 4) the air temperature is expected to drop below the minimum temperature for the products specified within six hours after application of coating. Dewpoint shall be measured by use of an instrument such as a sling psychrometer in conjunction with U.S. Department of Commerce Weather Bureau Psychometric Tables. If any of the above conditions are prevalent, coating or painting shall be delayed or postponed until conditions are favorable. The day's coating or painting shall be completed in time to permit the film sufficient drying time prior to damage by atmospheric conditions.

D. Thickness and Holiday Checking: Thickness of coatings and paint shall be checked with a non-destructive, magnetic-type thickness gauge, as per SSPC-PA 2 “Measurement of Dry Film Thickness with Magnetic Gages”. References in SSPC-PA 2 which allow 80% of the minimum thickness specified are not acceptable. Use an instrument such as a Tooke Gauge if a destructive test is deemed necessary by the Engineer.

E. The integrity of interior coated surfaces shall be checked with a low voltage holiday detector in accordance with NACE Standard SP0188. Non-destructive holiday detector shall not exceed 67.5 volts, nor shall destructive holiday detector exceed the voltage

recommended by the manufacturer of the coating system. A solution of 1-ounce non-sudsing type wetting agent, such as Kodak Photo-Flo, and 1 gallon of tap water shall be used to perform the holiday testing. All pinholes and/or holidays shall be marked and repaired in accordance with the manufacturer's printed recommendations and retested. No pinholes or other irregularities will be permitted in the final coating.

F. Inspection Devices: The Contractor shall furnish, until final acceptance of coating and painting is accepted, inspection devices in good working condition for detection of holidays and measurement of dry film thickness of coating and paint. The Contractor shall also furnish U.S. Department of Commerce, National Bureau of Standards certified thickness calibration plates and/or plastic shims, depending upon the thickness gauge used, to test the accuracy of dry film thickness gauges and certified instrumentation to test the accuracy of holiday detectors. Dry film gauges and holiday detectors shall be made available for the Engineer's use at all times until final acceptance of application. Holiday detection devices shall be operated in the presence of the Engineer.

G. Independent NACE Inspection: Inspection for this project shall consist of inspections conducted by a qualified independent National Association of Corrosion Engineers (NACE) certified inspector with a minimum of five years of experience on similar projects.

1. Contractor shall identify and propose an independent NACE certified inspector, who possesses appropriate professional liability insurance and is completely independent of the tank and coating manufacturers, to inspect the work at Contractor’s expense. Contract shall submit name and qualifications of NACE certified inspector to Engineer and Owner for approval prior to commencing work.
2. The NACE certified inspector will identify the testing and test sequencing requirements prior to commencement of the work. The Contractor shall coordinate activities with the Engineer and NACE certified inspector related to the inspection of surface preparations and coatings as well as a holiday inspection, as required by the NACE certified inspector.
3. At a minimum, the inspector shall inspect the surface prior to abrasive blasting, after abrasive blasting but prior to application of coating materials, and between subsequent coats of material. Final inspection shall take place after all coatings are applied, but prior to placing the tank in service. Contractor will insure that sufficient rigging is in place so that the inspector shall be able to conduct the required inspections.

1.5 WARRANTY INSPECTION

A. Warranty inspection shall be conducted during the eleventh month following acceptance of all coating and painting work. All defective work shall be repaired in accordance with this specification and to the satisfaction of the Engineer and/or Owner.

1. The NACE Certified Inspector will attend the Warranty Inspection, as described below, along with the Contractor, Engineer and Owner Representative, at the Contractor’s expense.

B. Inspection Procedure:
   1. Contractor shall coordinate with Owner, Engineer and NACE Inspector prior to inspection.
   2. Owner shall drain the tank prior to inspection, at Owner's expense.
   3. Contractor shall provide all equipment and support required to give the NACE Inspector safe access to all interior and exterior surfaces. Such equipment and support may include scaffolding, ventilation, or other safety equipment, as needed.
   4. NACE Inspector shall inspect the interior of the tank for visual defects, holidays, and other criteria deemed necessary by the Inspector.
   5. After inspection, Contractor shall immediately repair all defects identified by the Inspector, in accordance with coating manufacturer's recommendations.
      a. In the event that the Contractor is not able to repair all defects immediately and the tank must be refilled prior to repair, Contractor shall be responsible for any subsequent draining and refilling of the tank at Contractor's expense.
   6. After all repairs are completed and accepted by the Owner, Contractor shall disinfect the tank at Contractor's expense, in accordance with Section 33 13 13 – Water Storage Tank Disinfection.
   7. Water to refill the tank one time shall be provided at no expense to the Contractor.
   8. The Contractor may provide inspection of the tank's interior coating by means of a remote or manually operated underwater video camera that will provide good quality picture of all interior surfaces.

C. Repair of Coating Failures:
   1. Documented coating failures shall be repaired by the Contractor in accordance with the coating manufacturer's recommendations.
   2. If the repairs require that the tank be drained, the Contractor shall coordinate the work with the water system operator and provide all equipment, labor and materials, including temporary storage if necessary, to complete the repairs.
   3. Upon completion of the repair work, the tank will be disinfected in accordance with AWWA requirements and placed back into service.

1.6 SAFETY AND HEALTH REQUIREMENTS

A. General: In accordance with requirements set forth by regulatory agencies applicable to the construction industry and manufacturer's printed instructions and appropriate technical bulletins and manuals, the Contractor shall provide and require use of personal protective lifesaving equipment for persons working on or about the project site. The Contractor's work forces should comply with the provisions outlined in SSPC-PA-3 "A Guide to Safety in Paint Application".

B. Head and Face Protection and Respiratory Devices: Equipment shall include protective helmets which shall be worn by all persons while in the vicinity of the work. In addition, workers engaged in or near the work during sandblasting shall wear eye and face protection devices and air purifying half-mask or mouthpiece respirators with appropriate filters. Barrier creams shall be used on any exposed areas of skin.

C. Ventilation: Where ventilation is used to control hazardous exposure, all equipment shall be explosion-proof. Ventilation shall reduce the concentration of air contaminants to a

degree a hazard does not exist. Air circulation and exhausting of solvent vapors shall be continued until coatings have fully cured.

D. Sound Levels: Whenever the occupational noise exposure exceeds maximum allowable sound levels, the Contractor shall provide and require the use of approved ear protection devices.

E. Illumination: Adequate illumination shall be provided while work is in progress, including explosion-proof lights and electrical equipment. Lighting equipment must enable employees to see well enough to work safely and to exit the space quickly in an emergency. Whenever required by the Engineer, the Contractor shall provide additional illumination and necessary supports to cover all areas to be inspected. The level of illumination for inspection purposes shall be determined by the Engineer.

F. Temporary Ladders and Scaffolding: All temporary ladders and scaffolding shall conform to applicable safety requirements. They shall be erected where requested by the Engineer to facilitate inspection and be moved by the Contractor to locations requested by the Engineer.

1.7 PRODUCT DELIVERY, STORAGE & HANDLING

A. All materials shall be brought to the jobsite in original sealed containers. They shall not be used until the Engineer, or Resident Project Representative, has inspected the contents and obtained data from information on containers or label. Materials exceeding storage life recommended by the manufacturer shall be rejected.

B. All coatings and paints shall be stored in enclosed structures to protect them from weather and excessive heat or cold. Flammable coatings and paints must be stored to conform with City, County, State and Federal safety codes for flammable coating or paint materials. At all times coatings and paints shall be protected from freezing.

A. Temperature: Temperatures can range from lows of 51 and highs 81 degrees Fahrenheit during the anticipated project timeframe.

B. Elevation: Approximately 7417 feet above mean sea level.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Coatings:

1. Materials specified are those that have been evaluated for the specific service. Products of the Tnemec Company, Inc. are listed to establish a standard of quality. Equivalent materials of other manufacturer's may be submitted on written approval of the Engineer. As part of the proof of equality, the Engineer will require at the cost of the Contractor, certified test reports from a nationally known, reputable and independent testing laboratory conducting comparative tests as directed by the Engineer between the product specified and the requested substitution.

2. Requests for substitution or equal products shall include manufacturer's literature for each product giving name, product number, generic type, descriptive information, solids by volume, recommended dry film thickness and product data showing it to be equal the performance criteria of the products specified herein.
3. All requests for product substitution shall be made at least 14 days prior to the bid opening date.
4. Manufacturer's color charts shall be submitted to the Engineer at least 14 days prior to coating and/or paint application. General Contractor and Painting Contractor shall coordinate work so as to allow sufficient time (normally seven to ten days) for paint to be delivered to the job site.

2.2 GENERAL REQUIREMENTS

A. All materials shall be lead-free as defined by the Consumer Product Safety Act, Part 1303.

B. All zinc dust pigment contained in any zinc-rich material shall meet the requirements of ASTM D520 Type III with regard to zinc content and purity.

C. All materials for the interior wetted portion of the tank shall meet the requirements of ANSI/NSF Standard 61 for potable water contact.

D. All high gloss clear coat products shall incorporate the use of a fugitive dye to aid in the proper application and coverage of such coats.

E. All catalyzed polyurethane products shall meet the minimum requirements of SSPC Paint Specification Number 36, Level 3 Performance Level.

F. No products containing MOCA shall be allowed.

2.3 MATERIAL PREPARATION

A. Mix and thin materials according to manufacturer's latest printed instructions.

B. Do not use materials beyond manufacturer's recommended shelf life.

C. Do not use mixed materials beyond manufacturer's recommended pot life.

2.4 TANK INTERIOR COATING SYSTEMS

A. Two Coat High-Build Epoxy System:
1. Surface Preparation Prior to Abrasive Blast Cleaning: Weld flux and spatter shall be removed by power tool cleaning. Sharp projections shall be ground to a smooth contour. All welds shall be ground to a smooth contour as per NACE Standard RP0178 and herein.
2. Surface Preparation: SSPC-SP10 Near-White Metal Blast Cleaning. Anchor profile shall be 1.5 to 2.5 mils as per ASTM D4417, Method C or NACE Standard RP0287.
3. Coating System:
   a. Prime Coat: Tnemec Series 91-H20 Hydro-Zinc, or equal, applied at 2.5-3.5 dry mils. Thin only with approved Thinner, Tnemec 41-2 or 41-3 Thinner, or equal.

b. Stripe Coat: Tnemec Series 20 or 20HS Tank White Pota-Pox Plus, or equal, applied by brush and scrubbed into all weld seams. In addition to weld seams, all edges, corners, bolts, rivets, pits shall receive a stripe coat.

c. 2nd Coat: Tnemec Series 20 or 20HS Beige Pota-Pox Plus, or equal, applied at 4.0-6.0 dry mils. Thin only with approved thinner, Tnemec No. 41-4 Thinner, or equal.

d. 3rd Coat: Tnemec Series 20 or 20HS Tank White Pota-Pox Plus, or equal, applied at 4.0-6.0 dry mils. Thin only with approved thinner, Tnemec No. 4 Thinner, or equal.

Total dry film thickness shall be a minimum of 10.5 mils per SSPC-PA 2 dry film inspection standards, with exception as noted in this specification.

For cold weather applications, substitute Tnemec Series 20HS FC, or equal, in lieu of Series 20 or 20HS, and Tnemec Series 44-710 Urethane Accelerator, or equal, may be added to Series 91-H20.

PART 3 EXECUTION

3.1 GENERAL

A. All surface preparation, coating and painting shall conform to applicable standards of the Steel Structures Painting Council, NACE International and the manufacturer's printed instructions. Materials applied to the surface prior to the approval of the Engineer shall be removed and re-applied to the satisfaction of the Engineer at the expense of the Contractor.

B. All work shall be performed by skilled craftsmen qualified to perform the required work in a manner comparable with the best standards of practice. Continuity of personnel shall be coordinated with the Engineer.

C. The Contractor shall provide a supervisor at the work site during cleaning and application operations. The supervisor shall have the authority to sign change orders, coordinate work and make decisions pertaining to the fulfillment of the contract.

D. Dust, dirt, oil, grease or any foreign matter that will affect the adhesion or durability of the coating or paint must be removed by washing with clean rags dipped in an approved cleaning solvent and wiped dry with clean rags.

E. Coating and painting systems include surface preparation, prime coating and finish coatings. Unless otherwise approved in writing by the Engineer, prime coating shall be field applied. Where prime coatings are shop applied, the Contractor shall instruct suppliers to provide the prime coat compatible with the specified finish coat. Any off-site work which does not conform to this specification is subjected to damage during transportation, construction or installation shall be thoroughly cleaned and touched-up in the field as directed by the Engineer. The Contractor shall use repair procedures which insure the complete protection of all adjacent primer. The specified repair method and equipment may include wire-brushing, hand or power tool cleaning, or dry air blast cleaning. In order to prevent injury to surrounding painted surfaces, blast cleaning may require use of lower air pressure, smaller nozzle and/or abrasive blast particles, or shorter blast nozzle distances from surface shielding and masking. If damage is too extensive or

uneconomical to touch-up, the entire item shall be blasted and then coated or painted as directed by the Engineer.

F. The Contractor's coating and painting equipment shall be designed for application of materials specified and shall be maintained in first class working condition. Compressors shall have suitable traps and filters to remove water and oils from the air. Contractor's equipment shall be subject to approval of the Engineer.

G. Application of the first coat shall follow immediately after surface preparation and cleaning and stripe coat, if applicable, before rust bloom occurs or the same day, whichever is less. Any cleaned areas not receiving first coat within this period shall be recleaned prior to application of first coat. Use of dehumidification equipment shall be first reviewed by the Engineer and coatings manufacturer prior to deviating from this provision.

H. Prior to assembly, all surfaces made inaccessible after assembly shall be prepared as specified herein and shall receive the coating or paint system specified.

3.2 SURFACE PREPARATION

A. The latest revision of the following surface preparation specifications of the Steel Structures Painting Council (SSPC) shall form a part of this specification. The summaries listed below are for informational purposes; consult the actual SSPC specification for full detail.

1. Solvent Cleaning (SSPC-SP1): Removal of oil, grease, soil and other contaminants by use of solvents, emulsions, cleaning compounds, steam cleaning or similar materials and methods which involve a solvent or cleaning action.
2. Hand Tool Cleaning (SSPC-SP2): Removal of loose rust, loose mil scale and other detrimental foreign matter to a degree specified by hand chipping, scraping, sanding and wire-brushing.
3. Power Tool Cleaning (SSPC-SP3): Removal of loose rust, loose mil scale and other detrimental foreign matter by power wire-brushing, power impact tools or power sanders.
4. White Metal Blast Cleaning (SSPC-SP5/NACE No. 1): Air blast cleaning to a gray-white uniform metallic color until each element of surface area is free of all visible residues.
5. Commercial Blast Cleaning (SSPC-SP6 NACE No. 3): Air blast cleaning until at least two-thirds of each element of surface area is free of all visible residues.
6. Brush-Off Blast Cleaning (SSPC-SP7 NACE No. 4): Air blast cleaning to remove loose rust, loose mil scale and other detrimental foreign matter to a degree specified.
7. Near-White Metal Blast Cleaning (SSPC-SP10 NACE No. 2): Air blast cleaning until at least 95% of each element of surface area is free of all visible residues.
8. Power Tool Cleaning to Bare Metal (SSPC-SP11): Differs from SSPC-SP3 in that it requires more thorough cleaning and a surface profile not less than 1 mil.

B. Slag, weld metal accumulation and spatters not removed by the Fabricator, Erector or Installer shall be removed by chipping and/or grinding. All sharp edges shall be peened, ground or otherwise blunted as required by the Engineer. All grinding and finishing of welds, edges, etc. shall be performed prior to solvent cleaning and abrasive blasting.

Welds shall be prepared as per NACE Standard RP0178 for all interior and exterior surfaces:

1. Butt Welds: Shall be ground smooth and free of all defects, designation "D".
2. Lap Welds: Shall be ground smooth and blended, designation "D".
3. Fillet Welded Tee Joint: Shall be ground smooth and blended, designation "D".

C. Field blast cleaning for all surfaces shall be by dry method unless otherwise directed. Blast nozzles shall be venturi-type nozzles with a minimum pressure at the nozzle of 90 psi.

D. Particle size of abrasives used in blast cleaning shall be that which will produce a 1.5 - 2.5 mil (37.5 microns - 65.0 microns) surface profile or in accordance with recommendations of the manufacturer of the specified coating or paint system to be applied. If the profile of the blasted steel exceeds the profile specified above, the Contractor shall be required to do one or both of the following:

1. Reblast the surface using a finer aggregate in order to produce the required profile.
2. Apply a thicker prime coat, if possible given the limitations of the products being applied, in order to adequately cover the blast profile.

E. Abrasive used in blast cleaning operations shall be new, washed, graded and free of contaminants that would interfere with adhesion of coating or paint and shall not be reused unless specifically approved in writing by the Engineer.

F. During blast cleaning operations, caution shall be exercised to insure that existing coatings or paint are not exposed to abrasion from blast cleaning.

G. The Contractor shall keep the area of his work and the surrounding environment in a clean condition. He shall not permit blasting materials to accumulate as to constitute a nuisance or hazard to the accomplishment of the work, the operation of the existing facilities or to the surrounding environment.

H. Blast cleaned surfaces shall be cleaned prior to application of specified coatings or paint. All surfaces shall be free of dust, dirt, and other residue resulting from the abrasive blasting operation. No coatings or paint shall be applied over damp or moist surfaces.

I. All welds shall be neutralized with a suitable chemical compatible with the specified coating or paint.

J. Pitted areas on the tank interior shall be repaired by either filling with Tnemec Series 215 Surfacing Epoxy, or approved equal, or by welding. Epoxy filler shall be feathered smooth. Filler shall be applied after the prior to the application of the finish coat. No protrusions or spatter will be allowed. Pits deeper than 1/8" shall be filled by welding.

K. Specific Surface Preparation: Surface preparation for the specific system shall be as noted in Articles 2.4 and 2.5.

3.3 NON-VISIBLE CONTAMINANTS

A. Chloride, sulfate and ferrous ions (Fe^{2+}) tests shall be performed on the interior metal portions of the tank after sandblasting but prior to the application of coatings. The maximum allowable limit of these non-visible contaminants is:

1. The maximum level of chlorides is 30 milligrams per square meter or 3 micrograms per square centimeter.
2. The maximum level of sulfates is 100 milligrams per square meter or 10 micrograms per square centimeter.
3. The maximum level of ferrous ions (Fe^{2+}) is 50 milligrams per square meter or 5 micrograms per square centimeter.

B. If testing shows amounts present in the test solution to be greater than the limits listed herein, the Contractor shall clean the surface of the entire tank interior with a 5,000 psi water blast with fine entrained abrasive until the levels in the test solutions are below the maximum acceptable level. Alternate cleaning methods may be allowed with prior approval of the Engineer. Surface shall be reblasted as specified in Articles 2.4 and 2.5 at no additional cost to the Owner.

C. Contractor shall provide a written statement from paint manufacturer stating that the maximum acceptable levels are not less than those listed herein. Results of the testing shall be provided to the Engineer before any coatings are applied.

D. When exterior coats are to be applied on subsequent days, or when the shroud is dropped between coats, the previously-applied coat of paint shall be thoroughly pressure-washed to remove any fallout and/or salt that may have settled on the surface.

3.4 APPLICATION, GENERAL

A. Coating and paint application shall conform to the requirements of the Steel Structure Painting Council Paint Application Specification SSPC-PA1, current revision, for "Shop, Field and Maintenance Painting".

B. Thinning shall be permitted only as recommended by the manufacturer and approved by the Engineer, and utilizing the thinners stated in Articles 2.4 and 2.5.

C. Each application of coating or paint shall be applied evenly, free of brush marks, sags, runs, with no evidence of poor workmanship. Care shall be exercised to avoid lapping on glass or hardware. Coatings and paints shall be sharply cut to lines. Finished surfaces shall be free from defects or blemishes.

D. Protective coverings or drop cloths shall be used to protect floors, fixtures and equipment. Care shall be exercised to prevent coatings or paints from being spattered onto surfaces which are not to be coated or painted. Report to the Engineer surfaces from which materials cannot be satisfactorily removed.

E. When two coats of coating or paint are specified, where possible, the first coat shall contain sufficient approved color additive to act as an indicator of coverage or the two coats must be of contrasting color.

F. Film thickness per coat as specified in Articles 2.4 and 2.5 are the minimum required. If roller application is deemed necessary, the Contractor shall apply additional coats as to achieve the specified thickness.

G. All material shall be as specified.

3.5 COATING SYSTEMS APPLICATION

A. After completion of surface preparation as specified for the specific system, materials shall be applied as noted in Articles 2.4 and 2.5.

B. Care shall be taken so as to eliminate overspray and dry spray on the tank interior. Where such conditions are encountered, the surface shall be cleaned of all over spray and dry spray prior to the application of the succeeding coat.

C. Areas rendered inaccessible after tank erection such as the spaces between roof plates and rafters shall receive the full coating system prior to erection and/or assembly.

D. Full prime coat may be applied directly over stripe coat while stripe coat is wet.

3.6 DISINFECTION

A. Disinfection of interior surfaces shall be performed in the presence of the Engineer or RPR in accordance with all the requirements of these technical specifications (Section 33 13 13), applicable AWWA Standards and regulatory agencies.

B. Disinfection shall be performed after protective coatings have been applied to the interior surfaces and allowed to thoroughly cure.

C. Prior to disinfecting, the complete interior shall be washed down with clean water and thoroughly flushed out.

D. All interior surfaces shall be thoroughly washed with a solution having a minimum chlorine content of 50 PPM. Chlorine solution accumulated on the bottom shall be drained to waste. Rinsing with clean water is not required.

3.7 SOLVENT VAPOR REMOVAL

A. All solvent vapors shall be completely removed by suction-type exhaust fans and blowers before placing tank in operating service.

B. All solvent vapors will be exhausted both during and after coating application as per AWWA D 102 to allow the proper curing of the coating material.

C. Ventilation shall be continued until such time as the coating has reached “full cure” as specified by the coating manufacturer.

3.8 CLEAN UP

A. Upon completion of the work, all staging, scaffolding and containers shall be removed from the site or destroyed in a manner approved by the Engineer. Coating or paint spots or oil stains upon adjacent surfaces shall be removed and the jobsite cleaned. All damage to surfaces resulting from the work of this section shall be cleaned, repaired or refinished to the satisfaction of the Engineer at no cost to the Owner.

END OF SECTION

SECTION 31 10 00

SITE CLEARING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Removing surface debris.
2. Removing designated paving, curbs, and other obstructions.
3. Removing designated trees, shrubs, and other plant life.
4. Removing abandoned utilities.
5. Excavating topsoil.

B. Related Sections:
1. Section 31 22 13 - Rough Grading.
2. Section 31 23 18 - Rock Removal.

1.2 QUALITY ASSURANCE

A. Perform Work in accordance with the most recent edition of the New Mexico Standard Specifications for Public Works Construction, with latest revisions.

B. Conform to applicable State of New Mexico code for environmental requirements, disposal of debris, burning debris on site, use of herbicides.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 00 00 - Quality Requirements: Examination of existing conditions before starting work.

B. Verify existing plant life designated to remain is tagged or identified.

C. Identify waste area and/or salvage area for placing removed materials.

3.2 PREPARATION

A. Call New Mexico “One Call” at 811 and local utility companies at least three (3) days before performing Work.

1. Request that underground utilities be located and marked within and surrounding construction areas.

3.3 PROTECTION

A. Locate, identify, and protect utilities indicated to remain, from damage.

B. Protect trees, plant growth, and features designated to remain, as final landscaping.

C. Protect benchmarks, survey control points, and existing structures from damage or displacement.

3.4 CLEARING

A. Clear areas required for access to site and execution of Work.

B. Remove trees and shrubs within indicated areas. Remove stumps and surface rock.

C. Clear undergrowth and deadwood, without disturbing subsoil.

D. Apply herbicide to remaining stumps to inhibit growth.

3.5 REMOVAL

A. Remove debris, rock, and extracted plant life from site.

B. Partially remove paving, curbs, and other obstructions as indicated on Drawings. Neatly saw cut edges at right angle to surface.

C. Remove abandoned utilities as directed by Owner and/or Engineer. Indicate removal termination point for underground utilities on Record Documents.

D. Continuously clean up and remove waste materials from site. Do not allow materials to accumulate on site.

E. The Engineer will indicate to the Contractor which obstructions are to be removed, disposed of, or salvaged, and will require special documentation.

F. All existing fences crossed by the Work, or are within the construction area, are to be removed and rebuilt to original condition or better. Fence materials resulting from such removal are to be stored or disposed of as directed by the Engineer. Fence materials suitable for reuse or salvage that are damaged, lost or destroyed due to the Contractor's negligence or carelessness are to be replaced at the Contractor's expense.

G. Do not burn or bury materials on site. Leave site in clean condition.

3.6 TOPSOIL EXCAVATION

A. Excavate topsoil from areas to be further excavated, relandscaped, or regraded, without mixing with foreign materials for use in finish grading.

B. Do not excavate wet topsoil.

C. Stockpile in area designated on site to depth not exceeding 8 feet and protect from erosion. Stockpile material on impervious material and cover over with same material, until disposal.

D. Remove excess topsoil not intended for reuse, from site.

E. All equipment shall be properly maintained and with proper safety devices.

F. Contractor must maintain control of dust and minimize blowing debris.

END OF SECTION

SECTION 31 22 13

ROUGH GRADING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Excavating subsoil.
2. Cutting, grading, filling, rough contouring, and compacting site for site structures and building pads.

B. Related Sections:

1. Section 31 23 17 - Trenching: Trenching and backfilling for utilities.
2. Section 31 23 23 - Backfill: General building area backfilling.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:

1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 10-lb Rammer and an 18-in. Drop.

B. ASTM International:

1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
2. ASTM D422 - Particle -Size Analysis of Soils.
3. ASTM D653 - Terminology Relating to Soil, Rock, and Contained Fluids.
4. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
5. ASTM D1140 - Amount of Material in Soils Finer than the No. 200 Sieve.
6. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.
7. ASTM D1633 - Test Method for Compressive Strength of Molded Soil - Cement Cylinders.
8. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
9. ASTM D2216 - Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.
10. ASTM D2487 - Classifications of Soils for Engineering Purposes (Unified Soil Classification System).
11. ASTM D2488 - Description and Identification of Soils (Visual-Manual Procedure).
12. ASTM D2774 - Standard Practice for Underground Installation of Thermoplastic Pressure Piping.
13. ASTM D2901 - Test Method for Cement Content of Freshly Mixed Soil Cement.

14. ASTM D4253 - Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
15. ASTM D4254 - Minimum Index Density and Unit Weight of Sols and Calculation of Relative Density.
16. ASTM D4318 - Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
17. ASTM D4564 - Density of Soil in Place by the Sleeve Method.
18. ASTM D4643 - Determination of Water (Moisture) Content of Soil by the Microwave Oven Heating.
19. ASTM D4718 - Correction of Unit Weight and Water Content for Soils Containing Oversize Particles.
20. ASTM D4832 - Compressive Strength of Controlled Low Strength Material.
21. ASTM D4914 - Density of Soil and Rock in Place by the Sand Replacement Method in a Test Pit.
22. ASTM D4959 - Determination of Water (Moisture) Content of Soil by Direct Heating.
23. ASTM D5030 - Density of Soil and Rock in Place by the Water Replacement Method in a Test Pit.
24. ASTM D5080 - Rapid Determination of Percent Compaction.
25. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.3 SUBMITTALS

A. Section 01 00 00 - Submittal Procedures.

B. Samples: Submit, in airtight containers, 20 lb sample of each type of fill to testing laboratory.

C. Materials Source: Submit name of imported materials suppliers.

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with ASTM C136, ASTM D2419, and ASTM D2434.

B. Perform Work in accordance with New Mexico Standard Specifications for Public Works Construction and Navajo Tribal Utility Authority’s Navajo Area Standards and Construction Requirements, Technical Specifications for Materials and Workmanship for Water and Wastewater Facilities, whichever is most stringent.

PART 2 PRODUCTS

2.1 MATERIALS

A. As specified in Section 31 23 23 - Backfill.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 00 00 - Quality Requirements: Examination of existing conditions before starting work.

B. Verify survey benchmark and intended elevations for the Work are as indicated on Drawings.

3.2 PREPARATION

A. Call New Mexico "One Call" at 811 and/or local utility companies at least three (3) days before performing Work.

1. Request underground utilities to be located and marked within and surrounding construction areas.

B. Identify required lines, levels, contours, and datum.

C. Notify utility company to remove and relocate utilities.

D. Protect remaining utilities from damage.

E. Protect plant life, lawns, and other features remaining as portion of final landscaping.

F. Protect benchmarks, survey control point, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

3.3 SUBSOIL EXCAVATION

A. Excavate subsoil from areas to be further excavated, relandscaped, or regraded.

B. Do not excavate in rain or snow.

C. Do not excavate frozen materials.

D. Blasting is not allowed.

E. Do not excavate wet subsoil or excavate and process wet material to obtain optimum moisture content.

F. Remove excess subsoil not intended for reuse and dispose of in accordance with these Technical Specifications.

G. Benching Slopes: Horizontally bench existing slopes greater than 4:1 (H:V) to key placed fill material to slope to provide firm bearing.

1. Do not exceed maximum slope of 4:1 (H:V) unless otherwise noted on the Drawings or directed by the Engineer.

H. Stability: Replace damaged or displaced subsoil as specified for fill.

I. Notify Owner of any utility damage at once so emergency measures can be taken. The Contractor will pay for any required repairs.

J. Remove and exclude water, including storm water, groundwater, irrigation water, and/or other waters, from all excavations. Dewatering wells, well-points, sump pumps, or other means shall be used to remove water and continuously maintain groundwater at a level below the bottom of excavations. Water shall be removed and excluded until backfilling is complete and all field soils testing have been completed.

K. Excavation Below Fills and Embankments: The subgrade areas beneath embankments shall be excavated to remove not less than the top 1 foot of native material and, where such sub-grade is

sloped, the native material shall be benched. After the required excavation or over-excavation has been completed, the top 12 inches of material shall be scarified and moisture added or material dried to optimum moisture and the exposed surface shall be proof rolled.

L. Excavation under areas to be paved shall extend to the bottom of the sub-base. After the required excavation has been completed, the area shall be scarified a minimum of 12 inches below the subgrade surface and recompacted prior to the placement of the sub-base aggregate and/or base course aggregate. The finished sub-grade shall be even, self-draining, and in conformance with the slope of the finished pavement. Areas that could accumulate standing water shall be regraded to provide a self-draining subgrade.

M. Damage to existing or new facilities or work caused by the Contractor's operations shall be repaired at no additional cost to the Owner.

N. Material beyond prescribed lines which is loosened by the Contractor's operations shall be removed, replaced and/or compacted, as directed by the Engineer, at no additional cost to the Owner.

3.4 FILLING

A. See Technical Specification 31 23 23 – Backfill.

3.5 DISPOSAL OF EXCAVATED MATERIALS

A. Excess excavated material or excavated material not suitable for backfill may be disposed of on-site, provided that:

1. The finished grade substantially conforms with the drawings, or any deviation therefrom is approved by the Engineer
    a. Blend with natural terrain
    b. Minimum slope: 2%
    c. Maximum slope: 4:1 (H:V)
2. All excess excavated material spread on the right-of-way is compacted to the same specifications as final backfill, as set for in Technical Specification 31 23 23 - Backfill and the Drawings, and
3. All on-site disposal of material is approved by the Engineer.

B. Do not dispose of waste material by dumping from tops of slopes.

C. Do not dispose of excess material within 15 feet of any wash, drainage or waterway.

D. Re-seed waste material areas in accordance with Section 32 92 19 - Seeding.

3.6 TOLERANCES

A. Section 01 00 00 - Quality Requirements: Tolerances.

B. Top Surface of Subgrade: Grade to match adjacent grade maintaining positive drainage.

3.7 FIELD QUALITY CONTROL

A. Section 01 00 00 - Execution Requirements: Testing, adjusting, and balancing.

B. Determine compaction characteristics of materials in accordance with ASTM D698.

C. Classify soils in accordance with ASTM D2487.

D. Field moisture content measured as specified in Section 31 23 23 - Backfill.

E. Unit weight of in-place compacted material shall be measured as specified in Section 31 23 23 - Backfill.

F. Perform in place compaction tests as specified in Section 31 23 23 - Backfill.

3.8 CORRECTION OF SUB-STANDARD WORK

A. Section 31 23 23 – Backfill: Correction of Sub-Standard Work.

END OF SECTION

SECTION 31 23 17

TRENCHING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Excavating trenches for utilities.
2. Sheeting and shoring.
3. Disposal of excavated material.

B. Related Sections:

1. Section 31 22 13 - Rough Grading
2. Section 31 23 23 - Backfill

1.2 REFERENCES

A. NMSSPWC

1. NMSSPWC Sections 701, 801 & 802 “Trenching, Excavation and Backfill”.

B. American Association of State Highway and Transportation Officials:

1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 10-lb Rammer and an 18-in. Drop.

C. ASTM International:

1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
2. ASTM D422 - Particle -Size Analysis of Soils.
3. ASTM D653 - Terminology Relating to Soil, Rock, and Contained Fluids.
4. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
5. ASTM D1140 - Amount of Material in Soils Finer than the No. 200 Sieve.
6. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.
7. ASTM D1633 - Test Method for Compressive Strength of Molded Soil - Cement Cylinders.
8. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
9. ASTM D2216 - Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.
10. ASTM D2487 - Classifications of Soils for Engineering Purposes (Unified Soil Classification System).

11. ASTM D2488 - Description and Identification of Soils (Visual-Manual Procedure).
12. ASTM D2774 - Standard Practice for Underground Installation of Thermoplastic Pressure Piping.
13. ASTM D2901 - Test Method for Cement Content of Freshly Mixed Soil Cement.
14. ASTM D4253 - Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
15. ASTM D4254 - Minimum Index Density and Unit Weight of Sols and Calculation of Relative Density.
16. ASTM D4318 - Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
17. ASTM D4564 - Density of Soil in Place by the Sleeve Method.
18. ASTM D4643 - Determination of Water (Moisture) Content of Soil by the Microwave Oven Heating.
19. ASTM D4718 - Correction of Unit Weight and Water Content for Soils Containing Oversize Particles.
20. ASTM D4832 - Compressive Strength of Controlled Low Strength Material.
21. ASTM D4914 - Density of Soil and Rock in Place by the Sand Replacement Method in a Test Pit.
22. ASTM D4959 - Determination of Water (Moisture) Content of Soil by Direct Heating.
23. ASTM D5030 - Density of Soil and Rock in Place by the Water Replacement Method in a Test Pit.
24. ASTM D5080 - Rapid Determination of Percent Compaction.
25. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.3 SUBMITTALS

A. Section 01 00 00 - Submittal Procedures: Requirements for submittals.

B. Materials Source: Submit name of imported fill materials suppliers.

C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with New Mexico Standard Specifications for Public Works Construction and Navajo Tribal Utility Authority’s Navajo Area Standards and Construction Requirements, Technical Specifications for Materials and Workmanship for Water and Wastewater Facilities, whichever is most stringent.

B. Perform Work in accordance with applicable OSHA trench safety standards.

1.5 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.6 COORDINATION

A. Section 01 00 00 - Administrative Requirements: Coordination and project conditions.

B. Verify Work associated with lower elevation utilities is complete before placing higher elevation utilities.

PART 2 PRODUCTS

2.1 FILL MATERIALS

A. Pipe Bedding and Embedment: As specified in Section 31 23 23 - Backfill.

B. Pipe Backfill: As specified in Section 31 23 23 - Backfill.

C. Structural Fill: As specified in Section 31 23 23 - Backfill.

D. Concrete: Concrete, as specified in Section 03 05 00, with minimum compressive strength of 3,000 psi at 28 days for thrust blocks, fence posts, and valve collars.

PART 3 EXECUTION

3.1 PREPARATION

A. Call New Mexico “One Call” at 811 and local utilities not less than three working days before performing Work.

1. Request underground utilities to be located and marked within and surrounding construction areas.

B. Contractor shall not work in any area outside of Owner right-of-way. Contractor shall not work in any area where the designated work area has not been shown on plans. Contractor shall be wholly liable for any damage caused by working in areas that have not been shown on plans, or by encroaching outside the work area.

C. Identify required lines, levels, contours, and datum locations.

D. Protect plant life, lawns and other features remaining as portion of final landscaping.

E. Protect benchmarks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

F. Maintain and protect above and below grade utilities indicated to remain.

G. Establish temporary traffic control and detours when trenching is performed in public right-of-way. Relocate controls and reroute traffic as required during progress of Work.

3.2 LINES, GRADES AND DIMENSIONS

A. Excavate trench to lines and grades indicated on Drawings.

1. Engineer reserves right to make changes in lines, grades, and depths of utilities when changes are required based on field conditions.

2. Deviations from horizontal and vertical pipe line and grade by Contractor: Contractor shall request approval from Engineer for any proposed deviation.

3. When bottom of trench is rocky, over-excavate and fill as specified in Section 31 23 23 – Backfill.

B. Excavate trench to minimum width as indicated on Drawings.
Increase trench width as required to meet required clearances between pipe and trench wall, to avoid voids in the haunch areas of the pipe and to meet embedment compaction requirements or minimum soil cement slurry layer thickness. Increased trench width, if needed to meet these requirements, shall be provided at no additional cost to the Owner.

3.3 TRENCHING

A. Excavate subsoil required for utilities.

B. Remove top 6 inches of topsoil and stockpile separately. The stockpiled soil shall be free of organic material. This topsoil shall be spread on top of the reclaimed area after backfilling, prior to re-seeding.

C. Remove lumped subsoil, boulders, and rock from bottom of trench.

D. Rock removal requiring specialized equipment or procedures is not anticipated as all work is located in previously disturbed areas. The contractor shall notify the Engineer if field conditions appear to require specialized equipment or procedures.

E. Allowable open trench: Trenches may be opened in advance of pipe placement and backfill operations under the following conditions:

1. Do not leave any section of trench open for more than 24 hours.

2. Do not leave any trench open at the end of the workday within 100 feet of any road, driveway parking lot or other trafficked area, whether said road or driveway is shown on the Drawings or not.

3. Do not block vehicular traffic or impede access to homes or businesses.

4. Temporary fences and animal escape ramps shall be required for all trenches left open when the Contractor is not working on-site. All required temporary fencing shall be provided at no additional cost to the Owner.

5. Contractor is solely responsible for safety of all open trenches and bears sole liability for any incidents or accidents arising from open trenches.

6. The Owner may further restrict the amount of open trench as needed due to safety, land use or environmental considerations.

F. Remove water or materials that interfere with Work. Remove groundwater by pumping to keep excavations dry.

G. Provide uniform and continuous bearing and support for bedding material and pipe.

H. Do not interfere with 45 degree bearing splay of foundations. Any excavation in this area shall be backfilled and compacted using the same materials and methods as structural fill for new buildings. Refer to Section 31 23 23.

I. Slope or shore trench as needed to meet safety requirements. When sidewalls cannot be sloped, provide sheeting and shoring to protect excavation as specified in this section.

J. When subsurface materials at bottom of trench are loose or soft, excavate to greater depth as directed by Engineer until suitable material is encountered. Backfill and compact to reach specified or directed line and grade. Refer to specifications for overexcavation backfill, as set forth in Section 31 23 23.

K. Cut out soft areas of subgrade not capable of compaction in place. Backfill and compact to specified or directed line and grade. Refer to specifications for overexcavation backfill, as set forth in Section 31 23 23.

L. Trim excavation. Hand trim for bell and spigot pipe joints. Remove loose matter.

M. Correct over excavated areas with compacted backfill as specified for authorized excavation or replace with fill concrete as directed by Engineer.

N. Remove excess subsoil not intended for reuse from site.

O. Do not excavate in the rain or snow without approval from the Engineer.

P. Do not excavate in frozen materials without approval from the Engineer.

Q. Blasting is not allowed.

3.4 ADDITIONAL EXCAVATION

A. Perform additional excavation in trench bottom for pipe foundations as show on drawings and other additional excavations beyond specified lines as directed by the Engineer.

3.5 OVEREXCAVATION

A. When foundation material is over-excavated beyond specified or directed lines, fill the over-excavation with embedment or bedding material and compact in accordance with Section 31 23 23 - Backfill.

B. If foundation material is over-excavated by being disturbed or loosened during excavation, compact material in place or remove and replace with embedment or bedding material as determined by the Engineer and compact in accordance with Section 31 23 23 - Backfill.

3.6 SHEETING AND SHORING

A. Sheet, shore, and brace excavations to prevent danger to persons, structures and adjacent properties and to prevent caving, erosion, and loss of surrounding subsoil.

B. Support trenches more than 5 feet deep excavated through unstable, loose, or soft material. Provide sheeting, shoring, bracing, or other protection to maintain stability of excavation.

C. Design sheeting and shoring to be removed at completion of excavation work. If the Engineer orders the sheeting to be left in place for the protection of the work, a payment will be allowed only for the actual cost of the timber left in place.

D. Repair damage caused by failure of the sheeting, shoring, or bracing and for settlement of filled excavations or adjacent soil.

E. Repair damage to new and existing Work from settlement, water or earth pressure or other causes resulting from inadequate sheeting, shoring, or bracing.

3.7 BACKFILLING OF TRENCHES

A. See Section 31 23 23 – Backfill for general backfill requirements, as well as trench backfill, bedding and embedment requirements around pipelines.

3.8 DISPOSAL OF EXCAVATED MATERIALS

A. Excess excavated material or excavated material not suitable for backfill may be disposed of on-site, provided that:

1. The finished grade substantially conforms with the drawings, or any deviation therefrom is approved by the Engineer

a. Blend with natural terrain

b. Minimum slope: 2%

c. Maximum slope: 4:1, unless otherwise noted on Drawings

2. All excess excavated material spread on the right-of-way is compacted to the same specifications as final backfill, as set forth in Section 31 23 23 - Backfill and the Drawings, and

3. All on-site disposal of material is approved by the Engineer.

B. Do not dispose of waste material by dumping from tops of slopes.

C. Do not dispose of excess material within 15 feet of any wash, drainage or waterway.

D. Re-seed waste material areas in accordance with Section 32 92 19 - Seeding.

3.9 TOLERANCES

A. Section 01 00 00 - Quality Requirements: Tolerances.

3.10 FIELD QUALITY CONTROL

A. Section 01 00 00 - Execution Requirements: Testing, adjusting, and balancing.

B. Determine compaction characteristics of materials in accordance with ASTM D698.

C. Classify soils in accordance with ASTM D2487.

D. Field moisture content measured as specified in Section 31 23 23 - Backfill.

E. Unit weight of in-place compacted material shall be measured as specified in Section 31 23 23 - Backfill.

F. Perform in place compaction tests as specified in Section 31 23 23 - Backfill.

G. When tests indicate Work does not meet specified requirements, remove Work, replace, compact, and retest at no additional cost to the Owner.

3.11 PROTECTION OF FINISHED WORK

A. Section 01 00 00 - Execution Requirements: Protecting installed construction.

B. Reshape and re-compact fills subjected to vehicular traffic during construction.

END OF SECTION

SECTION 31 23 18

ROCK REMOVAL

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Removing identified and discovered rock during excavation.
2. Expansive tools and/or Explosives to assist rock removal.

B. Related Sections:
1. Section 31 22 13 - Rough Grading: Disposal of excavated materials.
2. Section 31 23 17 - Trenching: Trenching and backfilling for utilities.
3. Section 31 23 23 - Backfill: Backfill materials.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Site Rock Removal:
1. Basis of Measurement: By cubic yard measured after disintegration.
2. Basis of Payment: Includes preparation of rock for removal, mechanical disintegration of rock, removal from position, loading and removing from site. For over excavation, payment will not be made for over excavated work nor for replacement materials.
3. Contractor shall notify Engineer prior to commencement of rock removal work when rock is encountered and specialized equipment will be required, and await approval from Engineer before proceeding.
4. Contractor and Engineer must agree on rock quantity at the end of each day that such work was completed, and both parties must sign off on the quantity on the corresponding daily field report.

B. Trench Rock Removal:
1. Basis of Measurement: By vertical linear foot (VLF) of trench excavation. Each VLF is measured as horizontal linear foot of trench multiplied by the depth of excavated rock. The depth of the excavated rock may be less than the total trench depth. The width of trench is not a factor in the VLF calculation.
2. Basis of Payment: Includes preparation of rock for removal, mechanical disintegration of rock, removal from position, loading and removing from trench.
   a. Payment will not be made for over-excavated work beyond the required bedding depth below invert elevation of pipe as shown on Drawings, nor for replacement materials.
   b. If native trench rock is processed and used as pipe bedding or backfill material, the cost of such processing will be considered incidental to the cost of trench rock removal.
   c. If trench rock is hauled away from site and replaced with imported material, the costs of rock hauling and disposal, as well as the costs of

obtaining and hauling imported fill material will be considered incidental to the cost of trench rock removal.

d. The cost of placing and compacting embedment and backfill material, regardless of whether it is native or imported, will be considered incidental to pipeline installation.

3. Contractor shall notify Engineer prior to commencement of rock removal work when rock is encountered and specialized equipment will be required, and await approval from Engineer before proceeding.
4. Contractor and Engineer must agree on rock quantity at the end of each day that such work was completed, and both parties must sign off on the quantity on the corresponding daily field report.
5. Where trench rock removal is required, additional pipe bedding material will be needed, as stipulated in Article 3.4 of Section 31 23 23 - Backfill.

1.3 REFERENCES

A. National Fire Protection Association (NFPA):
   1. NFPA 495 - Explosive Materials Code.

1.4 DEFINITIONS

A. Rock: Solid mineral material of size that cannot be removed with conventional equipment.

B. For general excavation, a D-9N Caterpillar tractor with a single shank ripper, or equivalent equipment, is considered conventional equipment, if it can rip at a production rate of at least 300 bank cubic yards per hour.

C. For trench excavation, a 235C Caterpillar excavator with a medium stick and a rock ripping bucket, or equivalent equipment, is considered conventional equipment, if it can excavate at a production rate of at least 30 bank cubic yards per hour.

D. If material cannot be excavated by conventional equipment, the Engineer must be immediately notified. The Contractor shall provide performance tests of the specified conventional or equivalent equipment. If the Engineer confirms in writing that the specified conventional equipment cannot perform at the production rates specified, the excavation shall be considered rock excavation.

1.5 SUBMITTALS

A. Section 01 00 00 - Submittals: Submittal procedures.

B. Submit type of equipment to be used for rock removal and/or processing.

C. If processed native rock is to be used for embedment and backfill, submit sieve analyses and other geotechnical data on the processed material, as required in field by Engineer.
   1. Laboratory costs associated with such testing shall be reimbursable under project testing allowance. Other costs, such as sample collection and transport, are not covered under the allowance.

D. Shop Drawings: Indicate proposed method of blasting, delay pattern, explosive types, type of blasting mat or cover, and intended rock removal method.

E. Survey Report: Submit survey report on conditions of buildings near locations of rock removal.

1.6 QUALITY ASSURANCE

A. Seismic Survey Firm: Licensed company specializing in seismic surveys with a minimum five years of experience.

B. Explosives Firm: Company specializing in explosives for disintegration of rock, with five years experience.

1.7 PROJECT CONDITIONS

A. Conduct survey and document conditions of buildings near locations of rock removal, prior to blasting, if blasting is required, and photograph existing conditions identifying existing irregularities.

B. Advise owners of adjacent buildings or structures in writing, prior to executing seismographic survey. Explain planned blasting and seismic operations.

C. Obtain seismic survey prior to rock excavation to determine maximum charges that can be used at different locations in area of excavation without damaging adjacent properties or other work.

1.8 SCHEDULING

A. Schedule Work to avoid disruption to occupied buildings nearby.

B. Conduct blasting operations between hours of 8:00 a.m. and 5:00 p.m. only.

C. Section 01 00 00 - Administrative Requirements: Coordination.

PART 2 PRODUCTS

2.1 MATERIALS

A. Explosives: Type recommended by explosive firm following seismic survey and required by authorities having jurisdiction.

B. Delay Device: Type recommended by explosives firm.

C. Blast Mat Materials: Type recommended by explosives firm.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 00 00 - Administrative Requirements: Coordination.

B. Verify site conditions and note subsurface irregularities affecting Work of this section.

3.2 PREPARATION

A. Identify required lines, levels, contours, and datum.

3.3 ROCK REMOVAL BY MECHANICAL METHOD

A. Excavate and remove rock by mechanical method.

B. Cut away rock at bottom of excavation to form level bearing.

C. Remove shaled layers to provide sound and unshattered base for footings.

D. For utility trenches, excavate to below invert elevation of pipe as shown on Drawings to ensure adequate bedding below pipe, and provide trench width as shown on Drawings to allow for proper embedment compaction or soil cement placement on sides of pipe. Exceptions to minimum trench width will be considered by Engineer if Contractor can demonstrate proper bedding and compaction are provided.

E. Remove excavated materials from site.

3.4 ROCK REMOVAL BY EXPLOSIVE METHODS

A. When rock is uncovered requiring explosives method for rock disintegration, notify Engineer. Rock removal by explosive methods will require Engineer's approval prior to any blasting.

B. Provide seismographic monitoring during progress of blasting operations.

C. Drill blasting holes within 12 feet of finished slope.

D. Disintegrate rock and remove from excavation.

E. Remove rock at excavation bottom to form level bearing.

F. Remove shaled layers to provide sound and unshattered base for footings.

G. In utility trenches, excavate to 6 inches below invert elevation of pipe and 24 inches wider than pipe diameter.

H. Remove excavated material from site.

3.5 FIELD QUALITY CONTROL

A. Section 01 00 00 - Execution Requirements: Testing, adjusting, and balancing.

B. Request visual inspection of foundation bearing surfaces by Engineer before installing subsequent work.

END OF SECTION

SECTION 31 23 23

BACKFILL

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Backfilling to subgrade elevations.
2. Backfilling site structures to subgrade elevations.
3. Fill under slabs-on-grade.
4. Fill under paving.
5. Fill for over-excavation.
6. Pipe bedding material.

B. Related Sections:

1. Section 31 22 13 - Rough Grading: Site filling.
2. Section 31 23 17 - Trenching: Backfilling of utility trenches.

1.2 REFERENCES

A. New Mexico Standard Specifications for Public Works Construction (NMSSPWC):
1. NMSSPWC Sections 701, 801 & 802 “Trenching, Excavation and Backfill”.

B. American Association of State Highway and Transportation Officials (AASHTO):
1. AASHTO T99 - Standard Method of Test for Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 3050mm (12-in.) Drop.
2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

C. American Society for Testing and Materials International (ASTM):
1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
2. ASTM D422 - Particle -Size Analysis of Soils.
3. ASTM D653 - Terminology Relating to Soil, Rock, and Contained Fluids.
4. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
5. ASTM D1140 - Amount of Material in Soils Finer than the No. 200 Sieve.
6. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.
7. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3, 2,700 kN-m/m3).
8. ASTM D1633 - Test Method for Compressive Strength of Molded Soil - Cement Cylinders.

9. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
10. ASTM D2216 - Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.
11. ASTM D2487 - Classifications of Soils for Engineering Purposes (Unified Soil Classification System).
12. ASTM D2488 - Description and Identification of Soils (Visual-Manual Procedure).
13. ASTM D2774 - Standard Practice for Underground Installation of Thermoplastic Pressure Piping.
14. ASTM D2901 - Test Method for Cement Content of Freshly Mixed Soil Cement.
15. ASTM D4253 - Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
16. ASTM D4254 - Minimum Index Density and Unit Weight of Sols and Calculation of Relative Density.
17. ASTM D4318 - Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
18. ASTM D4564 - Density of Soil in Place by the Sleeve Method.
19. ASTM D4643 - Determination of Water (Moisture) Content of Soil by the Microwave Oven Heating.
20. ASTM D4718 - Correction of Unit Weight and Water Content for Soils Containing Oversize Particles.
21. ASTM D4832 - Compressive Strength of Controlled Low Strength Material.
22. ASTM D4914 - Density of Soil and Rock in Place by the Sand Replacement Method in a Test Pit.
23. ASTM D4959 - Determination of Water (Moisture) Content of Soil by Direct Heating.
24. ASTM D5030 - Density of Soil and Rock in Place by the Water Replacement Method in a Test Pit.
25. ASTM D5080 - Rapid Determination of Percent Compaction.
26. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.3 DEFINITIONS

A. Percentage Compaction: Ratio, expressed as percentage, of actual density of material compared with maximum dry density based on Modified Proctor (ASTM D1557).

B. Optimum Moisture Content: Based on Modified Proctor (ASTM D1557).

C. Unified Soil Classification System: Based on ASTM D2487.

1.4 SUBMITTALS

A. Section 01 00 00 - Submittal Procedures.

B. Submit samples and certified test documentation of all materials to be used.

C. Materials Source: Submit name of imported fill materials suppliers.

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

E. Submit field soil test on material in place as backfill and pipe bedding material.

F. Submit construction drawings with compaction test locations marked and labeled with station, date, test number, depth of test below ground surface, and test result.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with New Mexico Standard Specifications for Public Works Construction and Navajo Tribal Utility Authority's Navajo Area Standards and Construction Requirements, Technical Specifications for Materials and Workmanship for Water and Wastewater Facilities, whichever is most stringent.

PART 2 PRODUCTS

2.1 FILL MATERIALS

A. Suitable materials may be processed on-site, or may be imported. If imported materials are required to meet the quantity requirements of the project, it will be provided at no additional expense to the Owner, unless a unit price item is included for imported materials on the Bid Form. The following types of materials are defined as suitable where scheduled:

1. Type A (three-quarter inch minus aggregate backfill): Crushed rock or gravel, and sand with the gradation requirements below.

Sieve Size	Percentage Passing
3/4-inch	100
No. 4	30 – 50
No.200	0 – 12

2. Type B (Class I rounded stone): ¾" Naturally rounded rock with the following gradation requirements.

Sieve Size	Percentage Passing
3/4-inch	100
1/2-inch	25 – 30
3/8-inch	1 – 3
No. 4	0 – 1

3. Type C (sand backfill): Sand with 100 percent passing a 3/8-inch sieve, at least 90 percent passing a No. 4 sieve, and a sand equivalent value not less than 30.

   a. This material to be used only when approved by Engineer.

4. Type D: (pipe bedding material): Crushed rock or gravel with 100 percent passing a 1/2-inch sieve and not more than 3 to 5 percent passing a No. 10 sieve and 1 to 2 percent passing a No. 200 sieve.

5. Type E (pea gravel backfill): Crushed rock or gravel with 100 percent passing a 1/2-inch sieve and not more than 10 percent passing a No. 4 sieve.

6. Type F (coarse drain rock): Crushed rock or gravel meeting the following gradation requirements:

Sieve Size	Percentage Passing
2-inch	100
1-1/2-inch	90- 100
1-inch	20 – 55
3/4-inch	0 – 15
No. 200	0 – 3

7. Type G (aggregate base, base course) as follows:

Sieve Size	Percentage Passing
1-inch	100
3/4 inch	80-100
No.4	30-60
No.10	20-45
No. 200	3-10

8. Type H (graded drain rock): Drain rock shall be crushed rock or gravel, durable and free from slaking or decomposition under the action of alternate wetting or drying. The material shall be uniformly graded and shall meet the following gradation requirements.

Sieve Size	Percentage Passing
1-inch	100
3/4-inch	90 - 100
3/8-inch	40 - 100
No. 4	25 – 40
No. 8	18 – 33
No. 30	5 – 15
No. 50	0 – 7
No. 200	0 – 3

9. Type I: Not Used

10. Type J (cement-treated backfill): Material which consists of Type H material, or any mixture of Types B, C, G, and H materials which has been cement-treated so that the cement content of the material is not less than 5 percent by weight when tested in accordance with ASTM D2901 - Test Method for Cement Content of Freshly Mixed Soil Cement. The ultimate compressive strength at 28 days shall be not less than 400 psi when tested in accordance with ASTM D1633 - Test Method for Compressive Strength of Molded Soil - Cement Cylinders.

11. Type K (topsoil): Stockpiled topsoil material which has been obtained at the site by removing soil to a depth not exceeding 2 feet. Removal of the topsoil shall be done after the area has been stripped of vegetation and debris.

12. Type M (aggregate sub-base, structural fill). Well-graded crushed rock or natural gravel meeting the following gradation requirements:

Sieve Size	Percentage Passing
4-inch	100
3-inch	95 100
No. 200	3 - 15

B. Where these Specifications conflict with the requirements of any local agency having jurisdiction or with the requirements of a pipe material manufacturer, the Engineer shall be immediately notified. In case of conflict between types of pipe embedment backfills, the Contractor is to use the agency-specified backfill material if that material provides a greater degree of structural support to the pipe, as determined by the Engineer. In case of conflict between types of trench or final backfill types, the Contractor shall use the agency-specified backfill material if that material provides the greater in-place density after compaction.

C. Fill and backfill types, including use of native soil, shall be used in accordance with the following provisions. Native soil used for fill and backfill must meet the requirements of the type of material specified below and as shown for the corresponding type of material shown in 2.1.A above.

1. Embankment fills shall be constructed of Type M material, as defined herein, or other material approved by the Project Engineer. Drainage structures embankments shall be backfilled with materials used in original construction.
2. Pipe zone backfill (zone within 4 inches of the pipe wall in any direction) shall consist of the following materials for each pipe material listed below. All pipe bedding material shall receive prior approval by the Engineer before use.
    a. Plastic pipe shall be provided Type D bedding and embedment zone material, or native material that meets the criteria described below, and is acceptable to the Engineer.
        1) In trenches where dewatering is required, the pipe bedding material and embankment backfill shall be Type A as directed by the Engineer.
    b. Excavated native material will be allowed, provided that it is free draining and contains no organic materials, no rocks larger than 3/4-inch, clods or frozen lumps. A proctor of this material shall be submitted to the Engineer for review and approval before use. If native backfill material is approved, on-site screening may be required by Engineer to remove any rock material larger than 3/4-inch at no additional expense to the Owner. The location of such sites must be coordinated with the Owner.
3. Trench zone backfill (zone more than 4 inches from the pipe wall in any direction) for pipelines shall be any of Types A through H backfill materials or any mixture thereof.
4. Final backfill material for pipelines under paved areas shall be Type G backfill material.
5. Final backfill under areas not paved shall be the same material as that used for trench backfill, unless otherwise indicated.
6. Trench backfill and final backfill for pipelines under structures shall be the same material as used in the pipe zone, except where concrete encasement is required by the Contract Documents.
7. Aggregate base materials under pavements, curb and gutter, and sidewalk shall be Type G material constructed to the thickness indicated.
8. Aggregate sub-base shall be Type M material.
9. Backfill around structures shall be Types A through Type H materials, or any mixture thereof.

10. Backfill used to replace pipeline trench over-excavation shall be a layer of Type F material with a 6-inch top filter layer of Type E material or filter fabric to prevent migration of fines for wet trench conditions or the same material as used for the pipe zone backfill if the trench conditions are not wet.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 00 00 - Administrative Requirements: Coordination and project conditions.

B. Verify subdrainage, dampproofing, or waterproofing installation has been inspected.

C. Verify underground tanks are anchored to their own foundations to avoid flotation after backfilling.

D. Verify structural ability of unsupported walls to support loads imposed by fill.

3.2 PREPARATION

A. Compact subgrade to density requirements for subsequent backfill materials.

B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with structural fill and compact to density equal to or greater than requirements for subsequent fill material.

C. Scarify subgrade surface to depth of 8 inches.

D. Proof roll to identify soft spots; fill and compact to density equal to or greater than requirements for subsequent fill material.

3.3 BACKFILLING FOR STRUCTURES, SITE WORK AND APPURTENANCES

A. Backfill areas to contours and elevations with unfrozen materials as indicated on the Drawings or as directed by the Engineer.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.

C. Each layer shall be thoroughly mixed as necessary to promote uniformity of material in each layer.

D. Place material in continuous layers as follows:

1. Subsoil Fill: Maximum 6 inches loose depth.

2. Structural Fill: Maximum 6 inches loose depth.

3. Granular Fill: Maximum 6 inches loose depth.

E. Employ placement method that does not disturb or damage other work.

F. Maintain optimum moisture content of backfill materials to attain required compaction density.

G. Slope grade away from building minimum 6 inches in 10 ft, unless noted otherwise.

H. Make gradual grade changes. Blend slope into level areas.

I. Shape and drain embankments and excavations, maintain ditches and drains to provide drainage at all times. Protect graded areas against action of elements prior to acceptance of work, and reestablish grade where settlement or erosion occurs.

J. Bench hillside slopes or fills to key the embankment. Remove and re-compact a minimum of 12 inches normal to the slope of the hillside or fill as the embankment or fill is brought up in layers.

K. Under surfaced or paved roads, driveways or parking areas, apply base course at uppermost layer of backfill to same thickness as existing driving surface, or 6 inches, whichever is greater. If paved, apply pavement patch to thickness equal to or greater than existing pavement.

L. Remove surplus backfill materials from site.

M. Leave fill material stockpile areas free of excess fill materials.

N. Repair or replace remaining items damaged by excavation or filling.

3.4 BACKFILLING OF TRENCHES

A. Place a minimum of 6 inches of bedding material in pipe trenches to lines and grades indicated on Drawings or as directed by Engineer and compact before pipe is laid. Grade bedding material parallel to bottom of pipe.

B. Do not place material when either the material or the surface upon which it is to be placed is frozen.

C. Pipe zone backfill materials shall be manually spread around the pipe so that, when compacted, the pipe zone backfill will provide uniform bearing and side support.

1. Exercise care not to damage pipe or appurtenances when placing embedment material.

2. Maintain optimum moisture content of fill materials to attain required compaction density.

3. Ensure material is placed to equal height on both sides of pipe to avoid unequal loading and possible lateral displacement of the pipe. Elevation difference of embedment between each side of pipe shall not exceed 6 inches.

4. Place material in uniform layers.

5. Work material into pipe haunches using hand tamping to prevent voids and achieve specified compaction under the haunches.

6. No backfilling by machine methods permitted until a minimum of one foot of material has been placed by hand over the top of the pipe.

7. Place material to a compacted depth of 12 inches over the top of the pipe, 15 inches of compacted depth over the top of the pipe in paved or traffic areas, and compacted by hand held compacting tools before other backfilling is done.

D. If pipe laying operations are interrupted for more than 24 hours, cover pipe laid in the trench with backfill.

E. When the bottom of the trench is unstable, an additional 4 inches shall be over-excavated and filled with bedding material before pipe is laid.

F. Where rock is present and where there is concern that settling rocks in the surrounding material may rupture the pipeline, the amount of bedding material below and above the pipe shall be increased. In these cases there will be 8 inches of bedding material below the pipe and 15 inches above, as directed by the Engineer.

G. When using free-draining crushed rock or gravel for embedment on stretches longer than 300 feet, install trench plugs composed of silty, non-plastic material at 300 foot intervals to impede flow of trench water through the embedment.

H. Under surfaced or paved roads, driveways or parking areas, apply base course at uppermost layer of backfill to same thickness as existing driving surface, or 6 inches, whichever is greater. If paved, apply pavement patch to thickness equal to or greater than existing pavement.

3.5 COMPACTION

A. Do not place and compact soil under the following conditions:

1. Ambient air temperature below freezing.
2. Rain that creates puddles in clayey or silty materials.
3. Ice or snow pockets visible in material being placed.

B. Surface Preparation:

1. Prepare surface so that first compacted lift will be placed on firm, stable base. Compact surface to specified percent compaction, if necessary.
2. For water-retaining compacted fill, scarify and moisten surface to provide satisfactory bonding surface before placing first layer of material to be compacted.
3. Do not place material to be compacted on frozen surface.

C. Compact material in trenches in layers having approximately the same top elevation on both sides of the pipeline to avoid unequal loading and displacement of the pipe.

D. Placement:

1. Place soil to be compacted in horizontal layers not to exceed 6-inches in loose measure except as otherwise specified.
2. Blend materials as needed to ensure compacted fill is homogenous and free from lenses, pockets, streaks, voids, laminations and other imperfections.

E. Compaction Procedures:

1. Silty or Clayey Material:
   a. Compact with mechanical impact tampers, tamping rollers, vibrating pad foot rollers, rubber tire rollers or other suitable compaction equipment.
   b. Uniformly distribute equipment passes.
   c. Compact in horizontal layers to compacted thickness of 6 inches or less.

2. Cohesionless Free-Draining Material: Compact in horizontal layers to maximum compacted thickness of:
    a. Tampers and rollers: 6 inches
    b. Crawler-type tractors, vibrating drum rollers, surface vibrators or similar equipment: 12 inches
    c. Saturation and internal vibration: Penetrating depth of vibrator.
3. When compacting pipe embedment material, exercise care not to damage the pipe or appurtenances with compaction equipment. Do not apply compaction equipment directly above the pipe.
4. Demonstration: Lift thicknesses may vary depending on equipment and methods. Field adjustments to the specified lift thicknesses may be allowed or required. Contractor shall demonstrate that proposed equipment and methods will meet required compaction for the proposed lift thickness.
5. Flooding and jetting is not allowed unless specifically approved by the Engineer.

F. Moisture Content:

1. Optimum moisture content for each soil type, whether native soil or imported material, shall be determined by the Modified Proctor method, ASTM D1557.
2. Moisture content during compaction shall be no more than 2 percentage points wet or dry of optimum moisture content.
3. Moisten or aerate material, as necessary, to provide specified moisture content. Add water to soil in increments that will permit moisture content to be uniform and homogenous through each layer after mixing.
4. Add no more than 2 percent water to fill by sprinkling just prior to compaction when fill is clayey and contains dry clods of clay.
    a. If clayey soil is more than 2 percent below optimum moisture, pre-conditioning and curing may be required to obtain uniform and homogenous distribution of moisture in clods.
    b. Use of disks, harrows or rakes may be required to blend moisture prior to placement and compaction.
5. For cohesionless soils, add water as necessary during compaction, as these soils are free-draining.

G. Minimum Percent Compaction:

1. Over-excavation: Backfill of over-excavation to specified or directed lines shall be compacted to same percent compaction as embedment material or undisturbed foundation material, whichever is greater. If the in-place compaction of the undisturbed foundation material is greater than 95%, the over-excavation backfill may be compacted to 95%.
2. Pipe Bedding Material: Place and compact pipe bedding material as indicated on Drawings for given soil classification, pipe wall thickness, and depth of cover. If native material meets grading requirements and is used, for trenches outside of roads, driveways, parking areas or wash crossings, compact to 90%, or to a

density equal to that of the adjacent undisturbed soil, as directed by the Engineer. For trenches within the driving surfaces of roads, driveways or parking areas (both paved and unpaved) or within wash crossings, compact to 95%.

3. Haunching and Initial Backfill: For trenches outside of roads, driveways, parking areas or wash crossings, compact to 90%, or to a density equal to that of the adjacent undisturbed soil, as directed by the Engineer. For trenches within the driving surfaces of roads, driveways or parking areas (both paved and unpaved) or within wash crossings, compact to 95%.

4. Final Backfill: For trenches outside of roadway rights-of-way, roads, driveways, parking areas or wash crossings, compact to 90%, or to a density equal to that of the adjacent undisturbed soil, as directed by the Engineer. For trenches within the roadway rights-of-way, driving surfaces of roads, driveways or parking areas (both paved and unpaved) or within wash crossings, compact to 95%.

5. Embankments: Compact to same requirements as Final Backfill.

6. Under buildings, tanks, slabs and other structures: Compact to 95%.

7. Note that all Percent Compaction values in these Technical Specifications and Drawings are based on Modified Proctor, ASTM D1557, unless otherwise noted.

H. Soil Cement Slurry may be used in trenches, at Contractor's option and expense, to replace bedding, embedment or backfill materials where it is not practical to reach minimum compaction requirements using select material.

1. If soil cement slurry is to be used in lieu of embedment material, soil cement slurry shall also replace the bedding material. Do not use soil cement slurry for embedment on top of select material bedding.

3.6 TOLERANCES

A. Section 01 00 00 - Quality Requirements: Tolerances.

B. Top Surface of Backfilling within Building Areas: Plus or minus 1 inch from required elevations.

C. Top Surface of Backfilling under Paved Areas: Plus or minus 1 inch from required elevations.

D. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

E. Percent Compaction: Shall meet minimum required compaction as set forth in these specifications

F. Moisture Content: As set forth in these specifications.

3.7 FIELD QUALITY CONTROL

A. Section 01 00 00 - Execution Requirements: Testing, Adjusting, and Balancing.

B. Perform laboratory material tests in accordance with ASTM D1557.

C. Perform in place compaction tests in accordance with the following:

1. Density Tests: ASTM D1556, ASTM D2167, or ASTM D6938.

2. Moisture Tests: ASTM D6938.

D. When tests indicate Work does not meet specified requirements, remove material, replace, compact, and retest.

E. Provide test trenches and excavations including excavation, trench support, and groundwater removal for the soils testing operations, at the locations and depths required. The cost of all work associated with accessing, preparing, or time delays for testing to be included in the unit price of the applicable pay item being tested.

F. Compaction testing shall be done to the extent such that the Owner and Engineer can be reasonably assured that the backfill has been placed in accordance with the requirements of the Contract Documents, or as required by the utility for which the trenching is being provided, whichever is the more stringent. When a testing allowance is established on the Bid Form, the Owner and Engineer will determine the testing frequency to be used throughout the project. The frequency of testing shall be at least once per PRV subgrade lift and at least once per lift in connecting pipeline trenches. The frequency of testing shall be at least once per service line connection. The frequency of testing shall be at least once per 1000 SF for tank backfill. Should unexpected breaks occur in pipes connecting to the PRV vaults, a test shall be performed every lift every 400 linear feet of trenching.

G. Correction of Substandard Work: All fill and backfill represented by tests that fail to meet compaction, moisture content, soil classification or other specifications shall be uncovered as needed, replaced as needed, re-compacted and re-tested until all specifications are met, at no additional expense to the Owner.

1. Elevations, lines and grades of replaced material, as well as of pipe and other structures resting against such material, shall be re-surveyed at the direction of the Engineer. Contractor shall correct elevations, lines and grades as needed, at no additional expense to the Owner.

3.8 PROTECTION OF FINISHED WORK

A. Section 01 00 00 - Execution Requirements: Protecting Installed Construction.

B. Reshape and re-compact fills subjected to vehicular traffic.

3.9 SCHEDULE

A. Water Storage Tank Site Backfill:
1. Fill type G, thickness as required to match existing grade and provide positive drainage away from tank, compacted to 90 percent.

B. Weep Hole Backfill
1. Fill type H, compacted to 90 percent

C. PRV Vault Bedding Backfill
1. Fill type H, compacted to 95 percent

D. Trench Backfill
1. See Section 2.1.C.

END OF SECTION

SECTION 32 31 13

CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fence framework, fabric, and accessories.
2. Excavation for post bases.
3. Concrete foundation for posts.
4. Manual gates and related hardware.
5. Removal, relocation, salvage, and/or reconstruction of existing fence.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Fencing:

1. Basis of Measurement: By linear foot to fence height specified, based on specified post spacing.
2. Basis of Payment: Includes, posts, rails, tension wire, barbed wire, fabric, hardware, accessories, attachments, excavation, rock removal, backfill, and concrete.

B. Gates:

1. Basis of Measurement: By each item installed.
2. Basis of Payment: Includes gate, railings, tension wire, barbed wire, fabric, hardware, accessories, attachments, excavation, rock removal, backfill, and concrete.

1.3 REFERENCES

A. ASTM International:

1. ASTM A121 - Standard Specification for Zinc-Coated (Galvanized) Steel Barbed Wire.
2. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
3. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
4. ASTM A392 - Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric.
5. ASTM A491 - Standard Specification for Aluminum-Coated Steel Chain-Link Fence Fabric.
6. ASTM A585 - Standard Specification for Aluminum-Coated Steel Barbed Wire.

7. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
8. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
9. ASTM B429 - Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
10. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
11. ASTM F567 - Standard Practice for Installation of Chain-Link Fence.
12. ASTM F668 - Standard Specification for Poly (Vinyl Chloride) (PVC)-Coated Steel Chain Link Fence Fabric.
13. ASTM F900 - Standard Specification for Industrial and Commercial Swing Gates.
14. ASTM F934 - Standard Specification for Standard Colors for Polymer-Coated Chain Link Fence Materials.
15. ASTM F1043 - Standard Specification for Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework.
16. ASTM F1083 - Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.
17. ASTM F1184 - Standard Specification for Industrial and Commercial Horizontal Slide Gates.

B. Chain Link Fence Manufacturers Institute:

1. CLFMI - Product Manual.

1.4 SYSTEM DESCRIPTION

A. Fence Height: 6 feet nominal.

B. Line Post Spacing: At intervals not exceeding 10 feet.

C. Personnel Gates: Not used.

D. Vehicle Gates: 12 ft double-swing, consisting of two (2) 6 ft swinging sections.

1.5 SUBMITTALS

A. Section 01 00 00 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, gates, and schedule of components.

C. Product Data: Submit data on fabric, posts, accessories, fittings and hardware.

1.6 CLOSEOUT SUBMITTALS

A. Section 01 00 00 - Execution Requirements: Closeout procedures.

B. Project Record Documents: Accurately record actual locations of property perimeter posts relative to property lines and easements.

C. Operation and Maintenance Data: Procedures for submittals.

1.7 QUALITY ASSURANCE

A. Supply material in accordance with CLFMI - Product Manual.

B. Perform installation in accordance with ASTM F567.

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing work of this section with minimum three years documented experience.

1.9 DELIVERY, STORAGE AND HANDLING

A. Section 01 00 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Deliver fence fabric and accessories in packed cartons or firmly tied rolls.

C. Identify each package with manufacturer's name.

D. Store fence fabric and accessories in secure and dry place.

PART 2 PRODUCTS

2.1 AMERICAN IRON AND STEEL REQUIREMENTS

A. All iron and steel shall comply with the American Iron and Steel provisions of the Consolidated Appropriations Act of 2017.

2.2 MATERIALS

A. Framing Steel: ASTM F1083 Schedule 40 galvanized steel pipe, welded construction; coating conforming to ASTM F1043 Type A on pipe exterior and interior.

B. Fabric Wire Steel: ASTM A392 zinc coated wire fabric.

C. Barbed Wire: ASTM A121 galvanized steel or ASTM A585 aluminum coated steel; 12 gage thick wire, 3 strands, and 4-point 14 gage barbs at approximately 5 inches on-center.

D. Concrete: 3,000 psi concrete.

2.3 COMPONENTS

A. Diameters listed below are nominal diameters for Schedule 40 galvanized steel pipe.

B. Line Posts: 2-inch diameter x 10' long.

C. Braces: 2-inch diameter.

D. Corner and Terminal Posts: 3-inch diameter x 10.5' long.

E. Gate Posts: 3 1/2-inch diameter x 10.5' long.

F. Horizontal Rail: 1 1/4-inch diameter, plain end, sleeve coupled.

G. Gate Frame: 1 1/4-inch diameter for fittings and truss rod fabrication.

H. Fabric: 2-inch diamond-mesh interwoven wire, 9-gauge thick, top salvage twisted tight, bottom selvage knuckle end closed.

I. Tension Wire: 7- gauge thick steel, single strand, galvanized.

J. Tie Wire: Aluminum alloy steel wire.

2.4 ACCESSORIES

A. Caps: Cast steel, pressed steel, or malleable iron; galvanized, sized to post diameter, set screw retainer.

B. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings; galvanized steel.

C. Extension Arms: Galvanized cast steel or pressed steel, to accommodate 3 strands of barbed wire, single arm, sloped to 45 degrees.

D. Gate Hardware: Center gate stop and drop rod; two 180-degree gate hinges for each leaf.

2.5 GATES

A. General:

1. Gate Types, Opening Widths and Directions of Operation: 12 ft double-swing, consisting of two (2) 6 ft swinging sections.

2. Factory-assembled gates.

3. Design gates for operation by one person.

B. Swing Gates:

1. Factory-assembled gates 12 ft double-swing, consisting of two (2) 6 ft swinging sections to permit 180-degree swing.

2. Gates Construction: ASTM F900 with welded corners. Use of corner fittings is not permitted.

3. Locking mechanism: 1 3/8” galvanized iron heavy-duty drop rod gate latch, padlockable

4. Gate center stop: 2” diameter galvanized iron center stop, 18” long, anchored in concrete per Drawings.

2.6 FINISHES

A. Components and Fabric: Galvanized to ASTM A123/A123M; ASTM A153/A153M for components; ASTM A392 for fabric; 2.0 oz/sq ft coating.

B. Hardware: Galvanized to ASTM A153/A153M, 2.0 oz/sq ft coating.

C. Accessories: Same finish as framing.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install framework, fabric, accessories and gates in accordance with ASTM F567.

B. Set intermediate, terminal, and gateposts plumb, in concrete footings with top of footing 1 inch above finish grade. Slope top of concrete for water runoff.

C. Line Post Footing Depth below Finish Grade: ASTM F567.

D. Corner, Gate and Terminal Post Footing Depth below Finish Grade: ASTM F567.

E. Brace each gate and corner post to adjacent line post with horizontal center brace rail and diagonal truss rods. Install brace rail one bay from end and gateposts.

F. Install top rail through line post tops and splice with 6-inch long rail sleeves.

G. Install center and bottom brace rail on corner gate leaves.

H. Place fabric on outside of posts and rails.

I. Do not stretch fabric until concrete foundation has cured 7 days.

J. Stretch fabric between terminal posts or at intervals of 100 feet maximum, whichever is less.

K. Position bottom of fabric 1 inch above finished grade.

L. Fasten fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 15 inches on centers.

M. Attach fabric to end, corner, and gateposts with tension bars and tension bar clips.

N. Install bottom tension wire stretched taut between terminal posts.

O. Install support arms sloped outward and attach barbed wire; tension and secure, with barbed wire installed with lowest strand not less than 8 feet from ground level.

P. Support gates from gateposts. Do not attach hinged side of gate from building wall.

Q. Install gate with fabric and barbed wire overhang to match fence. Install three hinges on each gate leaf.

R. Provide concrete center drop to footing depth and drop rod retainers at center of double gate openings, if double gates are called for on the Drawings.

1. Use heavy duty drop rod gate latch with gate center stop set in concrete.

S. Install posts with 6 inches maximum clear opening from end posts to buildings, fences and other structures.

T. Excavate holes for posts to diameter and spacing indicated on IHS Standard Drawing W-34 without disturbing underlying materials.

U. Center and align posts. Place concrete around posts and vibrate or tamp for consolidation. Verify vertical and top alignment of posts and make necessary corrections.

V. Extend concrete footings 1 inch above grade, and trowel, forming crown to shed water.

W. Allow footings to cure minimum 7 days before installing fabric and other materials attached to posts.

3.2 ERECTION TOLERANCES

A. Section 01 00 00 - Quality Requirements: Tolerances.

B. Maximum Variation From Plumb: 1/4 inch.

C. Maximum Offset From Indicated Position: 1 inch.

D. Minimum distance from property line: 12 inches.

END OF SECTION

SECTION 32 92 19
SEEDING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Preparation of subsoil.
2. Placing topsoil.
3. Seeding, Hydroseeding, Seed Drilling.
4. Seed Protection, Mulching
5. Maintenance.

B. Related Sections:

1. Section 31 22 13 - Rough Grading: Rough grading of site.
2. Section 31 23 17 - Trenching: Rough grading over cut.
3. Section 31 23 23 - Backfill

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Grassed Areas:

1. Basis of Measurement and Payment: Seeding of disturbed areas within the project is incidental to the work and separate measurement or payment shall be paid. Includes preparation of subsoil, topsoil, placing topsoil, seeding, watering and maintenance to specified time limit.

1.3 REFERENCES

A. Federal Specifications:

1. OF-241 - Fertilizers, Mixed, Commercial.

B. ASTM International:

1. ASTM C602 - Standard Specification for Agricultural Liming Materials.

1.4 DEFINITIONS

A. Weeds: Vegetative species other than specified species to be established in given area.

B. NNDA: Navajo Nation Department of Agriculture

1.5 SUBMITTALS

A. Section 01 00 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data for seed mix, fertilizer, and other accessories.

1.6 QUALITY ASSURANCE

A. Provide seed mixture in containers showing percentage of seed mix, germination percentage, inert matter percentage, weed percentage, year of production, net weight, date of packaging, and location of packaging.

B. Perform Work in accordance with Navajo Nation Department of Agriculture standards.

C. Seed mixtures must be certified. There shall be no primary or secondary noxious weeds in the seed mixtures.

D. Temporary Best Management Practices (BMPs) must be installed along areas where sediment is being transported out of the construction area. Fiber rolls (mulch socks) rip rap blankets, rip rap check dams, soil cement, soil berms, surface roughening, or other appropriate BMPs shall be used in these areas. Such BMPs shall be included in the Storm Water Pollution Prevention Plan (SWPPP) provided and implemented by the Contractor, if required.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Product storage and handling requirements shall be as specified in applicable sections of these Specifications and in accordance with recommendations of the supplier.

B. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.

C. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

1.8 COORDINATION

A. Section 01 00 00 - Administrative Requirements: Requirements for coordination.

B. Do not commence seeding until all work that could require ground disturbance has been completed, tested, and approved.

C. Contractor is advised that there are three (3) Navajo Nation Department of Agriculture (NNDA) seed mixtures. Selection of specific mixture will depend on existing vegetation and soil type at each location. Contractor shall coordinate with Engineer prior to purchasing seed to determine exactly where to use each seed mixture.

D. Contractor shall coordinate seeding dates to coincide with the dates stipulated in the NNDA re-vegetation requirements and stipulations.

1. Contractor shall indicate exact proposed re-seeding dates in project schedule, and shall notify the Engineer as early as possible of any deviations from this proposed seeding schedule.

1.9 MAINTENANCE SERVICE

A. Section 01 00 00 - Execution Requirements: Requirements for maintenance service.

B. The cover will be maintained by occasional mowing and reseeding weak areas. Maintain seeded areas for three months from Date of Substantial Completion. Maintenance shall include weekly watering.

C. After the first full season of growth (not the first year) the cover should be mowed or grazed to control annual weeds to encourage good growth. Timing of mowing should avoid nesting times of birds.

PART 2 PRODUCTS

2.1 SEED MIXTURE

A. Furnish materials in accordance with Navajo Nation Department of Agriculture standards. Refer to seed mixtures following this specification.

B. Engineer, in consultation with NNDA, shall determine which seed mixture applies at each location within the project. Contractor is responsible to coordinate with Engineer to determine proper seed mix prior to purchasing seed.

C. In developing seed mixtures, the percentage of each included species should first be determined. This percentage, which should total 100, is then multiplied by the recommended seeding rate for the concerned species. This will give the required pounds PLS for that species in the mix.

2.2 SOIL MATERIALS

A. Topsoil: Excavated from site and free of weeds.

2.3 ACCESSORIES

A. Water: Clean, fresh and free of substances or matter capable of inhibiting vigorous growth of grass.

B. Erosion Fabric: Jute matting, open weave.

C. Herbicide: If required, Owner and Engineer’s approval must be obtained prior to use.

D. Stakes: Softwood lumber, chisel pointed.

E. String: Inorganic fiber.

F. Mulch:

1. Mulch of any kind shall not be used.

PART 3 EXECUTION

3.1 GENERAL

A. Prepare and restore site per applicable NNDA Revegetation Plan, included as an attachment to this specification.

B. Seed and reclaim all disturbed areas, including temporary construction easements and any areas disturbed by construction traffic.

C. Temporary fence gates along the pipeline alignment must be kept closed to manage the livestock in the pipeline area.

3.2 EXAMINATION

A. Verify prepared soil base is ready to receive the Work of this section.

3.3 PREPARATION OF SUBSOIL

A. Prepare sub-soil to eliminate uneven areas and low spots. Maintain lines, levels, profiles and contours. Make changes in grade gradual. Blend slopes into level areas. The heel of a boot should not sink in more than ½ to 1 inch.

B. Remove foreign materials, weeds and undesirable plants and their roots. Remove contaminated sub-soil.

C. Topsoil removed from the right-of-way must not be mixed with sagebrush debris which may impede seed germination during the revegetation process.

D. In areas needing reseeding, the top layer of soil shall be softened by ripping and disking prior to seeding to create the soil structure necessary to allow for seed germination.

E. Scarify subsoil to depth of 6 inches where topsoil is to be placed. Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compacted sub-soil.

3.4 PLACING TOPSOIL

A. Spread topsoil to minimum depth of 6 inches over area to be seeded. Rake until smooth.

B. Place topsoil during dry weather and on dry unfrozen subgrade.

C. Remove vegetable matter and foreign non-organic material from topsoil while spreading.

D. Grade topsoil to eliminate rough, low or soft areas, and to ensure positive drainage.

3.5 SEEDING

A. Use seed mixture indicated by Engineer, based on land ownership and native vegetation.

B. Apply seed at rates specified by NNDA for their respective seed mixtures. Use seed drill followed by drag packer over area to incorporate seed approximately ½ inch deep.

C. Planting Season: See Article 1.8. of this Section.

D. Do not sow immediately following rain, when ground is too dry, or when winds are over 12 mph.

E. Seed placement rows on steep slopes should not be placed parallel to the down slope, but at angles to the down slope to prevent the formation of gullies and rills.

F. A seed drill followed by a drag packer shall be required unless specific exceptions are authorized in writing by the Engineer.

G. Some hand seeding may be needed along steep slopes where equipment is difficult to use.

H. Apply water with a fine spray immediately after each area has been seeded. Saturate to 4 inches of soil.

3.6 HYDROSEEDING

A. Hydroseeding shall only be allowed where it is physically unfeasible to seed drill.

B. Hydroseeding shall not be performed without prior written authorization by the Engineer.

C. Apply fertilizer and seeded slurry with hydraulic seeder at an approved rate evenly in one pass.

D. After application, apply water with fine spray immediately after each area has been hydroseeded. Saturate to 4 inches of soil and maintain moisture levels two to four inches.

E. If hydroseeding is used, the specified rates of seed application shall be doubled.

3.7 SEED PROTECTION

A. Cover seeded slopes where grade is 3:1 or greater with erosion fabric. Roll fabric onto slopes without stretching or pulling.

B. Lay fabric smoothly on surface, bury top end of each section in 6 inch deep excavated topsoil trench. Overlap edges and ends of adjacent rolls minimum 12 inches. Backfill trench and rake smooth, level with adjacent soil.

C. Secure outside edges and overlaps at 36 inch intervals with stakes.

D. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.

E. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 6 inches.

F. Protection of seeded areas from traffic: Contractor shall take measures as required by the Owner, Engineer, and/or land controlling agencies to prevent traffic on re-seeded areas. Such measures may include warning signs, fence post barricades, earthen berms, and/or other measures at intersections of seeded ROW and existing roadways and driveways, and at other locations as directed by Engineer. Earthen berms shall extend the full width of the disturbed area, with dimensions as directed in field by Engineer.

G. All seed protection measures, including traffic prevention, shall be subject to approval of land-controlling agencies.

3.8 MULCHING

A. Do not apply mulch.

3.9 MAINTENANCE

A. Immediately reseed areas showing bare spots.

B. Repair washouts or gullies.

C. Protect seeded areas with warning signs during maintenance period.

3.10 SCHEDULE

A. All utility routes, disturbed areas, vault areas, and non-traveled areas in road rights-of-way to be reseeded when Work is completed in affected areas.

B. PRV #1
   1. Navajo Nation Seed Mix, Site Description #3, Table A-3

C. PRV #2
   1. Navajo Nation Seed Mix, Site Description #3, Table A-3

D. Gate Valve and ARV replacements
   1. Consult with engineer to verify seeding requirements prior to purchasing seed mix.

2. Currently identified replacement locations require Navajo Nation Seed Mix, Site Description #3, Table A-3

END OF SECTION

Navajo Department of Agriculture Re-seeding Requirements

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NAVAJO TRIBAL UTILITY AUTHORITY
VEGETATIVE RECLAMATION FOR PIPELINE AND POWERLINE R.O.W.

PIPELINE (GAS, WATER, SEWAGE, ETC.)

Site Description #1

Grasses and Grasslike: Blue Gramma, Western Wheatgrass, Needle and Thread, Bottlebrush Squirreltail, etc.
Shrubs and Trees: Pinyon Pine, Juniper, Sagebrush, Rabbitbrush
Soils: Loam, Clay Loam, Sandy Loam, Sandy Clay Loam

Preparation of Site

Prior to excavation of the pipeline trench, the top 6 inches of topsoil in right of way will be removed and saved for further use to reclaim pipeline right of way. The saved topsoil will be stockpiled far enough away from the trench and line of work so, as not be be damaged. After the topsoil has been stockpiled, trenching, ripping, etc. can begin.

Restoration

Pipeline trench will be filled with excavated material, the impacted of affected area within the right of way will be smoothed evenly with the topography of the land. The saved topsoil will then be placed over smoothed right of way. Right of way will then be reseeded with the following seed mixture; TABLE A-1

TABLE A-1

Species	Cultivar	Lbs PLS/Acre
Western Wheatgrass	Arriba	3.0
Streambank Wheatgrass		2.0
Intermediate Wheatgrass	Oahe	3.0
Indian Rice Grass	Paloma	2.0
Blue Grama		2.0
Sideoats Grama		2.0
Little Bluestem		2.0
Rocky Mountain Penstemon		1.0
TOTAL POUNDS PLS PER ACRE		16.0

* PLS - Pure Live Seed

Site Description #2
Grasses and Grasslike: Western Wheatgrass, Blue Grama
Shrubs and Trees: Ponderosa Pine, Douglas fir, Blue Spruce
Soils: Loam, Clay, Clay Loam

Preparation of Site
Prior to excavation of the pipeline trench, the top 6 inches of topsoil in in right of way will be removed and saved for further use to reclaim pipeline right of way. The saved topsoil will be stockpiled far enough away from the trench and line of work so, as not be be damaged. After the topsoil has been stockpiled, trenching, ripping, etc. can begin.

Restoration
Pipeline trench will be filled with excavated material, right of way will be smoothed evenly with the topography of the land. The saved topsoil will then be placed over smoothed right of way. Right of way will then be reseeded with the following seed mixture; TABLE A-2

TABLE A-2

Species	Cultivar	Lbs PLS/Acre
Western Wheatgrass	Arriba	3.0
Streambank Wheatgrass		2.0
Intermediate Wheatgrass	Oahe	3.0
Indian Rice Grass	Paloma	2.0
Blue Grama		2.0
Sideoats Grama		2.0
Little Bluestem		2.0
Rocky Mountain Penstemon		1.0
TOTAL POUNDS PLS PER ACRE		16.0

Desription #3 (ND-1)
Grasses and Grasslike: Alkali Sacaton, Galleta, Sand Dropseed, Threeawn
Shrubs and Trees: Fourwing Saltbush, Shadscale, Greasewood
Soils: Sand, Sandy Loam

Preparation of Site
Prior to excavation of the pipeline trench, top 6 inches of topsoil in in right of way will be removed and saved for further use to reclaim pipeline right of way. The topsoil will be stockpiled far enough away from the trench and line of work so, as not be be damaged. After the topsoil has been stockpiled, trenching, ripping, etc. can begin.

Restoration
Pipeline trench will be filled with excavated material, right of way will be smoothed evenly with the topography of the land. Topsoil will then be placed

over smoothed right of way. Right of way will then be reseeded with the following seed mixture; TABLE A-3

TABLE A-3

Species	Cultivar	Lbs PLS/Acre
Alkali Sacaton		1.5
Indian Rice Grass	Paloma	2.0
Galleta	Viva	1.5
Sand Dropseed		2.0
Fourwing Saltbush		2.0
Shadscale		2.0
Western Wheatgrass	Arriba	3.0
Penstemon	Bandera	1.0
TOTAL POUNDS PLS PER ACRE		15.0

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@@

Powerline (Electical)

<u>Site Description #1</u>

Grasses and Grasslike: Blue Gramma, Western Wheatgrass, Needle and Thread, Bottlebrush Squirreltail, etc.
Shrubs and Trees: Pinyon Pine, Juniper, Sagebrush, Rabbitbrush
Soils: Loam, Clay Loam, Sandy Loam, Sandy Clay Loam

Preparation of Site (Extensive Impact)
Prior to excavation to install overhead powerlines with utility poles, the top six 6 inches of topsoil in the right of way will be removed and saved for further use to reclaim area. The saved topsoil will be stockpiled at an adequate distance away from worksite, to prevent usage until initial reclamation begins. Stockpiled topsoil will be specifically used for reclamation purposes, at no time will the topsoil be used as fill material to stabilize utility posts/poles.

Restoration
Utility poles with overhead powerlines have been installed, poles have been stabilized securely, area will be smooth to match the surrounding topography. After area has been smoothed, topsoil will be replaced and evenly spread over the right of way. The right of way will then be mechanically drilled seeded or under close supervision an (ATV) All Terrain Vehicles with seeding mount will be used. The right of way will be reseeded with the following seed mixture; TABLE B-1

TABLE B-1

Species		Lbs PLS/1000 sq.ft.
Western Wheatgrass	Arriba	1.0
Streambank Wheatgrass		1.0
Intermediate Wheatgrass	Oahe	1.0
Indian Rice Grass	Paloma	1.0
Blue Grama		1.0
TOTAL POUNDS PLS PER 1000 SQUARE FEET		5.0

Preparation of Site (Minimal Impact)
Prior to excavation and installation of utility posts/poles with overhead powerlines, the top (6) six inches of topsoil around post/pole location will be removed and stockpiled for later use to reclaim area. Stockpiled topsoil will be kept away from worksite, at a distance where it will not be damaged or mixed in with fill material to stabilize utility post/pole. Since reclamation will focus 10 to 30 feet in diameter around the utility post/pole this plan will be used only for minimal impacts, where a the entire right of way is not affected by construction.

Restoration
Upon installation of of the utility post/poles and overhead powerlines the affected area will be smoothed evenly to match the topography of the field. After smoothing the stockpiled topsoil will be placed evenly over affected or impacted area. The area will then hand seeded (Broadcasted) and manually raked into the soil. Do not leave seed without raking into soil, it will blow away, birds will feed on seed, etc. Specify to field staff the importance of manually raking to secure seed into the ground. Do not over rake and deep bury seed, this will result in low or no germination of the seed. Seed needs to be placed in the top one (1) inch of the soil. The following broadcast seed mixture will be used on this area; TABLE B-1

TABLE B-1

Species		Lbs PLS/100 sq.ft.
Western Wheatgrass	Arriba	1.0
Streambank Wheatgrass		1.0
Intermediate Wheatgrass	Oahe	1.0
Indian Rice Grass	Paloma	1.0
Blue Grama		1.0
TOTAL POUNDS PLS PER 1000 SQUARE FEET		5.0

Site Description #2

Grasses and Grasslike: Western Wheatgrass, Blue Grama
Shrubs and Trees: Ponderosa Pine, Douglas fir, Blue Spruce
Soils: Loam, Clay, Clay Loam

Preparation of Site (Extensive Impact)
Prior to excavation to install overhead powerlines with utility poles, the top six (6) inches of topsoil in the right of way will be removed and stockpiled for further use to reclaim area. The topsoil will be stockpiled at an adequate distance away from worksite, to prevent usage until initial reclamation begins. Stockpiled topsoil will be specifically used for reclamation purposes, at no time will the topsoil be used as fill material to stabilize utility posts/poles.

Restoration
Utility poles with overhead powerlines have been installed, poles have been stabilized securely, area will be smooth to match the surrounding topography. After area has been smoothed, topsoil will be replaced and evenly spread over the right of way. The right of way will then be mechanically drilled seeded or under close supervision an (ATV) All Terrain Vehicles with seeding mount will be used. The right of way will be reseeded with the following seed mixture; TABLE B-1

TABLE B-1

Species		Lbs PLS/1000 sq.ft.
Western Wheatgrass	Arriba	1.0
Streambank Wheatgrass		1.0
Intermediate Wheatgrass	Oahe	1.0
Indian Rice Grass	Paloma	1.0
Blue Grama		1.0
TOTAL POUNDS PLS PER 1000 SQUARE FEET		5.0

Preparation of Site (Minimal Impact)
Prior to excavation and installation of utility posts/poles with overhead powerlines, the top (6) six inches of topsoil around post/pole location will be removed and stockpiled for later use to reclaim area. Stockpiled topsoil will be kept away from worksite, at a distance where it will not be damaged or mixed in with fill material to stabilize utility post/pole. Since reclamation will focus 10 to 30 feet in diameter around the utility post/pole this plan will be used only for minimal impacts, where a the entire right of way is not affected by construction.

Restoration
Upon installation of of the utility post/poles and overhead powerlines the affected area will be smoothed evenly to match the topography of the field. After smoothing the stockpiled topsoil will be placed evenly over affected or impacted area. The area will then hand seeded (Broadcasted) and manually raked

into the soil. Do not leave seed without raking into soil, it will blow way, birds will feed on seed, etc. Specify to field staff the importance of manually raking to secure seed into the ground. Do not over rake and bury seed, this will result in low or no germination of the seed. Seed needs to be placed in the top inch of the soil. The following broadcast seed mixture will be used on this area; TABLE B-1

TABLE B-1

Species		Lbs PLS/1000 sq.ft.
Western Wheatgrass	Arriba	1.0
Streambank Wheatgrass	Sodar	1.0
Intermediate Wheatgrass	Oahe	1.0
Indian Rice Grass	Paloma	1.0
Blue Grama		1.0
TOTAL POUNDS PLS PER 1000 SQUARE FEET		5.0

Desription #3

Grasses and Grasslike: Alkali Sacaton, Galleta, Sand Dropseed, Threeawn
Shrubs and Trees: Fourwing Saltbush, Shadscale, Greasewood
Soils: Sand, Sandy Loam

Preparation of Site (Extensive Impact)
Prior to excavation to install overhead powerlines with utility poles, the top six (6) inches of topsoil in the right of way will be removed and stockpiled for further use to reclaim area. The topsoil will be stockpiled at an adequate distance away from worksite, to prevent usage, until initial reclamation begins. Stockpiled topsoil will be specifically used for reclamation purposes, at no time will the topsoil be used as fill material to stabilize utility posts/poles.

Restoration
Utility poles with overhead powerlines have been installed, poles have been stabilized securely, area will be smooth to match the surrounding topography. After area has been smoothed, topsoil will be replaced and evenly spread over the right of way. The right of way will then be mechanically drilled seeded or under close supervision an (ATV) All Terrain Vehicles with seeding mount will be used. The right of way will be reseeded with the following seed mixture; TABLE B-2

TABLE B-2

Species		Lbs PLS/1000 sq.ft.
Alkali Sacaton		1.0
Indian Rice Grass	Paloma	1.0
Galleta	Viva	1.0
Western Wheatgrass	Arriba	2.0
TOTAL POUNDS PLS PER 1000 SQUARE FEET		5.0

Preparation of Site (Minimal Impact)
Prior to excavation and installation of utility posts/poles with overhead powerlines, the top (6) six inches of topsoil around post/pole location will be removed and stockpiled for later use to reclaim area. Stockpiled topsoil will be kept away from worksite, at a distance where it will not be damaged or mixed in with fill material to stabilize utility post/pole. Since reclamation will focus 10 to 30 feet in diameter around the utility post/pole this plan will be used only for minimal impacts, where a the entire right of way is not affected by construction.

Restoration
Upon installation of of the utility post/poles and overhead powerlines the affected area will be smoothed evenly to match the topography of the field. After smoothing the stockpiled topsoil will be placed evenly over affected or imapcted area. The area will then hand seeded (Broadcasted) and manually raked into the soil. Do not leave seed without raking into soil, it will blow way, birds will feed on seed, etc. Specify to field staff the importance of manually raking to secure seed into the ground. Do not over rake and bury seed, this will result in low or no germination of the seed. Seed needs to be placed in the top inch of the soil. The following broadcast seed mixture will be used on this area; TABLE B-2

TABLE B-2

Species		Lbs PLS/1000 sq.ft.
Alkali Sacaton		1.0
Indian Rice Grass	Paloma	1.0
Galleta	Viva	1.0
Western Wheatgrass	Arriba	3.0
TOTAL POUNDS PLS PER 1000 SQUARE FEET		5.0

Special/Other Requirements

Seed

All seed must be certified to ensure viability. Start with quality seed, to acheive quality plantings.

Seeding Dates

Seeding dates in Site Description #1 (WP-1) and Site Description #2 (AN-1) will begin June 15 to August 15. The Navajo Nation in these two sites receives high levels of precipitation after August 15. Our intention is to plant before our monsoon season so, planted seed will receive moisture for proper germination and growth.

Seeding dates for Site Description #3 (ND) will begin November 1 through December 15. Dormant seedings from November to mid December are recommended for Northern Desert, due to the extreme hot temperatures and low precipitation during the summer months. Northern Desert receives most of it's precipitation during the winter in the form of snow.

Mulch

Mulch not recommended, due to the high levels of grazing by livestock. Mulch would attract livestock to the area and possibly cause damage to the reseeding. Mulch is not quality feed for horses and sheep and could also cause them to become ill and die. To avoid livestock fatalities we advise not to mulch.

SECTION 33 11 00

WATER UTILITY DISTRIBUTION PIPING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe and fittings for public line including potable water line.
2. Underground and Aboveground Pipe Markers.
3. Bedding and Cover Materials.

B. Related Sections:

1. Section 31 23 17 - Trenching: Execution requirements for trenching.
2. Section 31 23 23 - Backfill: Requirements for backfill to be placed.
3. Section 33 12 13 - Water Service Connections
4. Section 33 12 16 - Water Utility Distribution Valves.
5. Section 33 13 00 - Disinfection of Water Utility Distribution.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Pipe and Fittings:

1. Basis of Payment: Per bid items, pipe installation is incidental to other work.

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials (AASHTO):

1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. American Society of Mechanical Engineers (ASME):

1. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings.

C. American Society for Testing and Materials International (ASTM):

1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
2. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
3. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
4. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft3 (2,700 kN-m/m3)).
5. ASTM D1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.

6. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
7. ASTM D2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
8. ASTM D2487 - Classifications of Soils for Engineering Purposes (Unified Soil Classification System).
9. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
10. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
11. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

D. American Water Works Association (AWWA):

1. AWWA C110 - ANSI Standard for Ductile-Iron and Gray-Iron Fittings, 3 In. through 48 In. (76 mm through 1,219 mm), for Water.
2. AWWA C111 - ANSI Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
3. AWWA C115 - ANSI Standard for Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
4. AWWA C116 - ANSI Standard for Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings for Water Supply Service.
5. AWWA C151 - ANSI Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids.
6. AWWA C153 - ANSI Standard for Ductile-Iron Compact Fittings for Water Service.
7. AWWA C207 - Steel Pipe Flanges for Waterworks Service - Sizes 4 In. through 144 In. (100 mm through 3,600 mm).
8. AWWA C208 - Dimensions for Fabricated Steel Water Pipe Fittings.
9. AWWA C209 - Cold-Applied Tape Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines.
10. AWWA C605 - Underground Installation of Polyvinyl Chloride PVC Pressure Pipe and Fittings for Water.
11. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 In. through 12 In. (100 mm through 300 mm), for Water Distribution.

E. Manufacturer’s Standardization Society of the Valve and Fittings Industry:

1. MSS SP-60 - Connecting Flange Joint between Tapping Sleeves and Tapping Valves.

F. National Sanitation Foundation (NSF):

1. NSF-14 - Plastics Piping System Components and Related Materials
2. NSF-61 - Drinking Water System Components-Health Effects

G. New Mexico Standard Specifications for Public Works Construction (NMSSPWC):

1. NMSSPWC Sections 701, 801 & 802 “Trenching, Excavation and Backfill”.

1.4 SUBMITTALS

A. Section 01 00 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data on pipe materials, pipe fittings, and accessories.

C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.5 CLOSEOUT SUBMITTALS

A. Section 01 00 00 - Execution Requirements: Requirements for submittals.

B. Project Record Documents: Refer to Sections 01 00 00 – Basic Requirements.

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with New Mexico Standard Specifications for Public Works Construction and Navajo Tribal Utility Authority’s Navajo Area Standards and Construction Requirements, Technical Specifications for Materials and Workmanship for Water and Wastewater Facilities, whichever is most stringent.

B. All piping, fittings, valves, and any other service connection appurtenances shall comply with the “Reduction of Lead in Drinking Water Act”, in effect as of 2014, or any subsequent revision thereof.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Section 01 00 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Block individual and stockpiled pipe lengths to prevent moving.

C. Do not place pipe or pipe materials on private property without prior authorization, or in areas obstructing pedestrian or vehicular traffic.

D. Store PVC materials out of sunlight.

E. Prior to shipment and again prior to installation, all materials shall be visually inspected for damage, including coatings and surfaces. Any damaged materials shall be repaired to original standards or replaced.

1.8 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 AMERICAN IRON AND STEEL REQUIREMENTS

A. All iron and steel shall comply with the American Iron and Steel provisions of the Consolidated Appropriations Act of 2017.

2.2 WATER PIPING AND FITTINGS

A. All piping, fittings, valves, hydrants and any other potable water system appurtenances shall comply with the "Reduction of Lead in Drinking Water Act", in effect as of 2014, or any subsequent revision thereof.

B. Polyvinyl Chloride (PVC):

1. Pipe: 4" diameter and greater - SDR-21 CL 200. Nominal laying length of 20 feet. PVC resin compound shall conform to ASTM D1784.

2. Gaskets:

a. Use rubber gaskets manufactured and tested in accordance with ASTM D1869 and ASTM F477.

b. For all PVC casings at petroleum line crossings or where otherwise indicated on Drawings, use petroleum-resistant gaskets in accordance with ASTM F477.

3. Fittings:

a. Ductile iron, Compact MJ fittings AWWA C153, on all PVC pipe 4" diameter and greater.

1) Interior/Exterior Lining: Bituminous outside coating: AWWA C151, cement-mortar lining: AWWA C104.

2) Pressure rating of at least 250 psi.

3) Marked with pressure rating, nominal diameter of opening, manufacturers' identification, country where cast, and degree of bend.

b. ASTM D1784, CL 200, gasketed, for all PVC pipe less than 4" diameter.

c. Joint restraints: concrete thrust blocking per Drawings unless otherwise specified

d. No glue fittings allowed.

e. Provide adaptors as needed.

4. Joints: ASTM D3139; ASTM F477 PVC flexible elastomeric seals. Solvent-cement couplings are not permitted.

C. Galvanized Pipe and Fittings:

1. Pipe fabrication:

a. General: ASTM A53/A53M Schedule 40, galvanized, threaded ends.

b. Wall thickness as needed to provide required working pressure of 200 psi minimum.

2. Fittings:

a. General: ASTM A234/A234M galvanized carbon steel, threaded.

b. Joints between steel fittings and PVC pipe: Rubber gaskets in accordance with AWWA C219. Joint dimensions and tolerances to match those of PVC pipe manufacturer's joint design.

c. No custom-made fittings shall be used without prior written approval by the Engineer.

3. Field Coatings:
   a. Exterior surfaces of all buried non-stainless steel pipe and welded fittings shall include cold-applied tape coating, manufactured and installed in accordance with AWWA C209, applied with a minimum overlap width of 1-inch and a total coating thickness shall be a minimum of 80 mils.
   b. All buried bolts, other than stainless steel bolts, shall be coated with field-applied coal tar epoxy.

4. Flanges:

   a. Steel: ANSI Class 150 / AWWA C207 Class E / ASME B16.5 Class 150, unless otherwise noted on Drawings.

   b. Ductile or Cast Iron: ANSI Class 125 / AWWA C207 Class E / ASME B16.1 Class 125, unless otherwise noted on Drawings.

   c. Pressure rating of flanges and gaskets shall meet or exceed surge pressure rating of attached pipe.

   d. Gaskets shall be full-face, AWWA C207 Type E with outer diameter equal to that of the flange.

   e. Retainers shall be fabricated of phenolic or other suitable material as recommended by manufacturer and conforming to NSF 61, with minimum thickness of 1/8 inch and minimum dielectric strength of 500 volts/mil.

   f. Nitrile sealing rings.

   g. All bolts shall have isolating sleeves: Sleeves shall be full length, extending halfway into both steel washers when installed, with tube thickness of 1/32-inch. Sleeves shall be composed of mylar or other suitable material recommended by flange manufacturer.

   h. Steel washers shall be 1/8-inch thick, with inner diameter sufficient to fit over bolt isolating sleeve.

   i. Isolating washers shall be 1/8-inch thick, with inner diameter sufficient to fit over bolt isolating sleeve, composed of phenolic or other suitable material with minimum dielectric strength of 500 volts/mil as recommended by flange manufacturer.

   j. Bolts and nuts shall be carbon steel, in accordance with AWWA C207 and ASTM A307, Grade B. Bolt shall be long enough to protrude through the assembled nut at least two threads but not more than ½-inch.

   k. Contractor is responsible to ensure that all pipe flanges that connect to valve body flanges have the same dimensions, drill pattern, bolt hole

diameter and equal or higher pressure rating as the valves to which they are connected.

1) Overdrill bolt holes as necessary, provided such overdrlling is within manufacturer's recommended tolerances.

l. Contractor shall be responsible to verify compatibility of all flange bolt patterns prior to purchasing materials and shall notify the Engineer in the event that alternate bolt patterns are required to mate flanges.

2.3 UNDERGROUND PIPE MARKERS

A. Plastic Ribbon Tape: Bright colored, metallized for detection by above-ground metal detector, continuously printed, minimum 6 inches wide by 4-mil thick, manufactured for direct burial service, imprinted with "BURIED WATER SERVICE" in large letters, on blue tape in conformance with APWA color code specifications for underground tape systems. The tape shall be constructed of material that is impervious to alkalis, acids, chemical reagents, and solvents found in the soils.

2.4 ABOVEGROUND PIPE MARKERS

A. Carsonite marker posts, blue in color. Place markers as specified on the Drawings.

2.5 PIPE SUPPORTS AND ANCHORING

A. Metal for pipe support brackets: ASTM A123/A123M, galvanized structural steel thoroughly coated with bituminous paint.

B. Metal tie rods and clamps or lugs: Galvanized steel sized in accordance with NFPA 24 thoroughly coated with bituminous paint.

2.6 BEDDING AND BACKFILL MATERIALS

A. As specified in Section 31 23 23.

2.7 ACCESSORIES

A. Concrete for collars: Conform to Section 03 30 00 with minimum compressive strength of 3,000 psi.

B. Steel rods, bolt, lugs and brackets:
1. Carbon steel: ASTM A36/A36M or ASTM A307.
2. Stainless steel: ASTM A193, Grade B8M bolts, Grade 8M Nuts.

C. Field-applied Roskote coal tar epoxy coating on all buried carbon steel bolts on all fittings and valves.

2.8 SOURCE QUALITY CONTROL

A. Pipe:

1. Polyvinyl chloride (PVC): Pipe shall conform to ASTM D2241..

B. Fittings:

1. Ductile iron (DI): Factory test in accordance with AWWA C153, AWWA C110, and AWWA C114, as applicable.

C. Cure testing for fusion bonded or liquid epoxy coatings: ASTM D4752 and ASTM D3363, Every 1000 sq.ft. of epoxy coating.

2.9 SOURCE QUALITY ASSURANCE

A. Acceptance of materials will be based on compliance with relevant AWWA, ASTM and other relevant standards. Materials must pass all relevant tests prior to acceptance.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 00 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify existing utility water main size and location are as indicated on Drawings.

3.2 PREPARATION

A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs. Use only equipment specifically designed for pipe cutting. The use of chisels or hand saws will not be permitted. Grind edges smooth with beveled end for push-on connections.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare pipe connections to equipment with flanges or unions.

D. Excavate pipe trench in accordance with Section 31 23 17 for Work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated on Drawings.

3.3 TRENCHING

A. In accordance with Section 31 23 17 - Trenching

3.4 BEDDING

A. In accordance with Section 31 23 23 - Backfill

3.5 INSTALLATION – PIPE

A. Install PVC pipe in accordance with AWWA C605.

1. Use only lubricants supplied by the pipe manufacturer and apply to both bell and spigot ends of the joint, in accordance with manufacturer’s recommendations.

2. Clean the gasket, bell, groove and spigot immediately prior to connecting pipe joints.

3. Do not over-insert pipe joints. Any over-inserted pipe joints shall be removed and the pipe bell and gasket inspected for damage. Any damaged bells or gaskets shall be discarded and replaced.

B. Handle and assemble pipe in accordance with manufacturer's instructions and as indicated on Drawings. Inspect each pipe and fitting prior to lowering into trench to ensure there is no damage to the pipe, fitting or coatings. Repair any damage prior to installation. Clean ends of pipe and remove foreign material from inside of pipe and fittings.

C. For jointed pipe, excavate bell holes in the bottom of the trench to provide a minimum clearance of 2 inches of clearance from the sub-grade.

D. Steel Rods, Bolt, Lugs, and Brackets: Coat buried steel with one coat of Roskote coal tar epoxy coating before backfilling. All exposed bolt heads and threads shall be thoroughly coated.

E. Maintain 10 ft. horizontal and 18 inch vertical separation of water main from sewer piping in accordance with local code. Water shall be over sewer when possible. If necessary, the depth of bury for the waterline may be reduced to 36 inches. Crossing shall be as close to perpendicular as possible and no more than 25° from perpendicular. No joints of new waterline construction shall be permitted within 10 feet of crossing a wastewater line. Pipe joints shall be encased in concrete for locations unable to maintain require separation.

F. Centering and straightness of pipe:

1. Lay PVC pipe in straight line and center pipe within trench. Re-lay pipe that is out of alignment.

2. Ensure that adequate side clearance is provided on both sides of the pipe to allow for placement of soil cement slurry or placement and compaction of embedment material, and to eliminate voids in the pipe haunch area. In the event that minimum side clearances are not met and/or Contractor is unable to achieve required embedment specifications, the Contractor shall either straighten out the pipe and/or widen the trench as necessary to meet embedment specifications at no additional cost to the Owner.

G. Horizontal and vertical pipe bending, angles and joint deflections

1. All mitered bend elbows shall be one of the following standard angles: 11.25, 22.5, 45, 60 or 90 degrees. No other mitered bend angles shall be allowed.

2. PVC pipe deflections shall be minimized as much as possible but may be made either at joints or by pipe bending, as allowed by AWWA C605.

a. Pipe bending shall be minimized, but allowed, provided that such bending complies with AWWA C605 and/or pipe manufacturer's minimum allowable bending radius, whichever is more stringent. Lateral pipe bending force shall be isolated from the fitting.

b. Joint deflection shall not exceed 1 degree per joint.

H. Horizontal and vertical pipe line and grade

1. The horizontal and vertical lines and grades shown on the Drawings indicate the intent of the design. Actual horizontal and vertical lines and grades in the field may deviate from those shown on the Drawings, provided all of the following conditions are met:

a. Actual minimum slope of pipe shall not be less than 0.00100 ft/ft.

b. Direction of pipe slope shall not differ from that shown on Drawings.

c. Minimum pipe cover of 4 feet shall be maintained throughout the project.

d. Maximum pipe cover shall be 6 feet unless approved by Engineer.

e. Additional minimum cover or specific minimum vertical clearances called out on the Drawings at specific locations, such as wash crossings, road crossings or pipeline crossings, shall be maintained.

f. In certain locations, the pipe elevation and/or slope must remain as shown on drawings to facilitate pipe draining, maintain pressures, or other performance criteria. In such cases, deviation from the Drawings may not be allowed.

g. All vertical deviations more than 6 inches and horizontal deviations more than 1 foot from the alignments shown in the Drawings must be documented by the Contractor and approved in advance by the Engineer.

h. All other specifications shall be met.

i. Any exceptions to the foregoing conditions must receive prior written approval by the Engineer.

2. No high points of any magnitude shall be allowed in the pipe without an approved air valve. If unforeseen field conditions arise which necessitate high points not shown on the Drawings, increase pipe bury depth or install additional air valves, as directed by Engineer.

a. Additional air valves required due to unforeseen field conditions not the fault of the Contractor shall be paid for at the prices established in the Bid.

b. Additional air valves required due to high points caused through fault of the Contractor shall be provided at no additional cost to the Owner. This includes failure of Contractor to meet lines and grades set forth in the Drawings or failure to meet minimum pipe slope.

I. Install pipe to bear on the trench bottom along entire length of pipe. Excavate bell holes to permit proper joint installation. Do not lay pipe in wet or frozen trench. Direction of pipe bells may be reversed for ease of installation, provided that all pipe material and installation meets applicable AWWA, ASTM, NTUA and material manufacturer's standards.

1. On grades greater than 10%, install jointed pipe uphill.

J. Do not allow trench water, dirt, debris or other foreign material to enter the pipe during or after installation.

1. Keep pipe ends sealed after joining pipes.

2. Close pipe openings with watertight plugs during work stoppages.

K. Install detectable plastic ribbon tape continuous over top of pipe, buried 18 inches above pipe; coordinate with Section 31 23 17 and 31 23 23.

L. Flanged Joints: Do not use flanges in buried applications unless shown on Drawings.

M. All pipes, fittings and appurtenances must remain within designated permanent rights-of-way. All construction activities must remain within the right-of-way or temporary use areas. Do not encroach on adjacent properties or culturally sensitive areas.

N. Embed pipe within 100 feet behind pipe-laying operations, unless otherwise permitted by the Engineer.

O. Install aboveground utility markers as specified on the Drawings.

3.6 THRUST RESTRAINT

A. Install thrust blocks in accordance with the detail using 3,000 psi concrete. See section 03 05 000.

B. All thrust blocks shall bear against undisturbed earth.

3.7 BACKFILLING

A. In accordance with Section 31 23 23.

3.8 PIPELINE GRADING

A. Establish finished grade to provide a minimum of four (4) foot of cover over the pipe. Measure depth of cover from final surface grade to top of pipe barrel.

1. At certain locations such as wash crossings, road crossings, utility line crossings or to prevent high points, the Drawings indicate greater than 4 ft minimum cover. At such locations, Contractor shall maintain the site-specific minimum cover.

B. Do not place fill material or raise the finished grade above existing grade in the flow lines of washes or surface water drainages, regardless of size.

C. Finished grade along pipeline and temporary use areas shall have a maximum longitudinal slope of 3:1 and maximum side slope of 3:1.

D. The pipeline areas shall be leveled from side-to-side to slow down surface run-off from causing erosion rills perpendicular to the pipeline, as well as to make the project areas accessible to the Owner for future maintenance.

E. All construction activities, including clearing and grading, must remain within the designated project limits. Do not encroach on adjacent properties or culturally sensitive areas.

3.9 TAPPING EXISTING WATER DISTRIBUTION FACILITIES

A. Obtain written permission to tap from Lybrook MDWCA. Contractor shall not connect to existing system without written permission Lybrook MDWCA and the Engineer to proceed with connection to the existing system.

B. Coordinate with Lybrook MDWCA designated representative regarding schedule, means and methods, maximum allowable shut-off time, water usage rates (both gpm and gpd) and other parameters stipulated by Lybrook MDWCA.

C. Minimize shut-off time during connections to existing facilities. Contractor shall have all tools and materials for actual field conditions as well as foreseeable problems on hand in order to minimize shut-off time.

D. Prevent contamination of existing facilities with trench water, mud, debris, chemicals or other substances.

3.10 INITIAL FILLING OF PIPELINE

A. "Initial filling" refers to first introduction of water and evacuation of air in the pipeline.

B. Initial filling of pipeline shall not exceed maximum instantaneous flow rate (in gpm) or maximum daily fill rate (in gpd) set forth by Lybrook MDWCA and the Engineer in the field.

3.11 DISINFECTION OF POTABLE WATER PIPING SYSTEM

A. Flush and disinfect system in accordance with Section 33 13 00.

3.12 FIELD QUALITY CONTROL

A. Section 01 00 00 - Execution Requirements: Field inspecting, testing, adjusting, and balancing.

B. The Contractor shall be required to hydrostatic pressure test all water mains, appurtenances and plumbing trains.

1. Perform testing in accordance with applicable standards:

a. PVC pipe: AWWA C605

2. Hydrostatic pressure testing of main line shall be performed in sections between each pair of adjacent gate valves.

a. Contractor shall fill and test each section as it is constructed, in order to detect leak problems with each section before the remainder of the pipeline installed.

3. Hydrostatic pressure shall be equal to the working pressure rating of the pipe (i.e. 200 psi for SDR 21 CL200, etc.) at the lowest point in the line section being tested. In the event it is not possible to measure the pressure at the lowest point directly, this pressure may be calculated by measuring the pressure elsewhere within the section and calculating the pressure based on elevation difference.

a. The Engineer shall provide a testing schedule to the Contractor.

1) Additional testing access points may be required to be installed by the Contractor, as directed by the Engineer, and such work shall be considered incidental to construction of the pipeline and no additional compensation will be provided.

b. In no case shall the test pressure exceed the manufacturers' recommended maximum safe test pressure for the pipe, fittings or appurtenances.

c. Pressure shall be maintained for time period stipulated in relevant AWWA standard for each pipe material.

d. No observable leakage is allowed. Measurable leakage must be within the maximum allowable limits set forth by applicable AWWA standards.

e. Any leaks detected during testing shall be repaired. After repairs are completed, another full duration test shall be performed on the section of the pipeline to which the repairs were made.

4. Pressure testing with air shall not be allowed.

C. Compaction Testing: Refer to Section 31 23 23 – Backfill.

D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest at no additional cost to the Owner.

3.13 TOLERANCES

A. Line and grade surveying tolerances:

1. Contractor shall follow installation instructions presented herein, including maintenance of horizontal and vertical pipe line and grade as shown in the Drawings.

2. All vertical deviations more than 6 inches and horizontal deviations more than 1 foot from the alignments shown in the Drawings shall be approved in advance by the Engineer and shall be documented by the Contractor and shown with the record as-built drawings.

B. Flange alignment tolerances as specified in AWWA C207 and AWWA M11.

END OF SECTION

SECTION 33 12 13

WATER SERVICE CONNECTIONS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Meter setting equipment.
2. Commercial water meters.
3. Pressure reducing valves.
4. Meter cans and vaults.

B. Related Sections:

1. Section 31 23 17 - Trenching.
2. Section 31 23 23 - Backfill.
3. Section 33 13 00 - Disinfection of Water Utility Distribution.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Commercial Water Meter:

1. Basis of Measurement: By the unit.
2. Basis of Payment: Includes remove and salvage existing meter and meter can lid; install radio-read meter with radio-read meter compatible lid; and disinfection/flushing.

B. Neptune R900 Belt Clip V3 Transceiver:

1. Basis of Measurement: By the unit.
2. Basis of Payment: Includes delivery of R900 Belt Clip V3 Transceiver to Owner.

C. Individual pressure reducing valves:

1. Basis of Measurement: By the unit.
2. Basis of Payment: Includes remove and salvage existing individual PRV; read inlet pressure and record for Owner noting meter number; install new PRV; verify outlet pressure at 50 psi; and disinfection/flushing.

1.3 REFERENCES

A. Navajo Tribal Utility Authority Construction Requirements, Technical Specifications for Materials and Workmanship for Water and Wastewater Facilities, 2008 edition.

B. New Mexico Standard Specification for Pubic Works Construction (NMSSPWC), 1987 edition.

1. NMSSPWC - Section 802 - Installation of Water Service Lines.

2. NMSSPWC - Section 801 - Installation of Water Transmission, Collector, and Distribution Lines.

C. American Association of State Highway and Transportation Officials (AASHTO):

1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

D. American Society of Mechanical Engineers (ASME):

1. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
2. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

E. American Society of Sanitary Engineering (AMSE):

1. ASSE 1012 - Backflow Preventer with Intermediate Atmospheric Vent.
2. ASSE 1013 - Reduced Pressure Principle Backflow Preventers.

F. American Society for Testing and Materials International (ASTM):

1. ASTM A48/A48M - Standard Specification for Gray Iron Castings.
2. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings.
3. ASTM C858 - Standard Specification for Underground Precast Concrete Utility Structures.
4. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
5. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft3 (2,700 kN-m/m3)).
6. ASTM D1785 - Standard Specification for Poly Vinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120.
7. ASTM D2241 - Standard Specification for Poly Vinyl Chloride (PVC) Pressure-Rated Pipe (SDR Series).
8. ASTM D2466 - Standard Specification for Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 40.
9. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
10. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
11. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

G. American Water Works Association (AWWA):

1. AWWA C700 - Cold-Water Meters - Displacement Type, Bronze Main Case.
2. AWWA C706 - Direct-Reading, Remote-Registration Systems for Cold-Water Meters.

3. AWWA C800 - Underground Service Line Valves and Fittings.
4. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 1/2 in. through 3 in., for Water Service.
5. AWWA M6 - Water Meters - Selection, Installation, Testing, and Maintenance.

1.4 SUBMITTALS

A. Section 01 00 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data on pipe materials, pipe fittings, corporation stop assemblies, curb stop assemblies, meter setting and reading equipment, service saddles, backflow preventer, and accessories.

1.5 CLOSEOUT SUBMITTALS

A. Section 01 00 00 - Execution Requirements: Requirements for submittals.

B. Project Record Documents: Record inlet pressure in psi at each individual PRV inlet connection.

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with New Mexico Standard Specifications for Public Works Construction and Navajo Tribal Utility Authority's Navajo Area Standards and Construction Requirements, Technical Specifications for Materials and Workmanship for Water and Wastewater Facilities, whichever is most stringent.

B. All piping, fittings, valves, and any other service connection appurtenances shall comply with the "Reduction of Lead in Drinking Water Act", in effect as of 2014, or any subsequent revision thereof.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Section 01 00 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. During loading, transporting, and unloading of materials and products, exercise care to prevent any damage.

C. Store products and materials off ground and under protective coverings and custody, away from walls and in manner to keep these clean and in good condition until used.

PART 2 PRODUCTS

2.1 AMERICAN IRON AND STEEL REQUIREMENTS

A. All iron and steel shall comply with the American Iron and Steel provisions of the Consolidated Appropriations Act of 2017.

2.2 COMMERCIAL WATER METERS

A. Radio read water meter:
   1. Manufacturers:
      a. 2" Mach10 R900I V4 for use at well house and elementary school.
      b. Substitutions: Not allowed
   2. Contractor shall coordinate submittals on flow meter, AMI/AMR module, and appurtenant equipment with Engineer and receive Engineer's approval prior to ordering materials.
   3. Provide 20' coaxial cable for elementary school meter.

B. Radio-read Meter Can Lid
   1. Shall fit existing meter pit cover
   2. Hole in top of lid for meter reading equipment
   3. Manufacturer:
      a. Castings Inc. Model CI70TLCI
      b. Approved Equal

C. Frost Lid
   1. Manufacturer:
      a. Castings Inc. Model ILCI
      b. Approved Equal

D. Provide Neptune R900 Belt Clip V3 Transceiver

2.3 INDIVIDUAL PRESSURE REDUCING VALVES

A. Manufacturers
   1. Watts Industries Series 25AUB
   2. Zurn Wilkins Model 600XL
   3. Approved Equal

B. 3/4 inch FIPT

C. 25 to 75 psi range

D. Pressure reducing valves shall be installed in each meter can and set to 50 psi.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 00 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. The Owner's Representative will identify location of existing system individual PRVs to be replaced.

3.2 PREPARATION

A. Remove and salvage existing water meters and pressure reducing valves.

B. Where PRVs are removed, record system pressure in PSI including date, time, and meter can number.

3.3 INSTALLATION – COMMERCIAL WATER METERS

A. Install new water meter per manufacturer specifications.

3.4 INSTALLATION – INDIVIDUAL PRESSURE REDUCING VALVES

A. Take pressure reading at PRV inlet connection before installation. Record and note meter number.

B. Install new individual PRV per manufacturer specifications.

C. Setting shall be 50 psi.

3.5 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Flush and disinfect system in accordance with Section 33 13 00.

3.6 FIELD QUALITY CONTROL

A. Section 01 00 00 - Execution Requirements: Field inspecting, testing, adjusting, and balancing.

B. During testing of the materials at the above ambient temperatures, no visual cracking, checking, blistering, surface pitting or deformation shall be noted.

C. Perform pressure test on domestic site water distribution system in accordance with AWWA C600. Compaction Testing for Bedding: In accordance with ASTM D1557.

D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

E. Compaction testing shall be done to the extent such that the Owner and Engineer can be reasonably assured that the backfill has been placed in accordance with the requirements of the Contract. The frequency of testing shall be at least once for each service line trench.

END OF SECTION

SECTION 33 12 16

WATER UTILITY DISTRIBUTION VALVES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Gate Valves
2. Flush Valve Assemblies.
3. Pressure Reducing Valves

B. Related Sections:

1. Section 03 05 00 - Basic Concrete Materials and Methods
2. Section 33 13 00 - Disinfection of Water Utility Distribution

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Gate Valve

1. Measurement and payment: Per gate valve assembly including excavation, backfill, compaction, bedding, thrust block, gate valve, valve box, associated connection fittings, valve tool, and valve concrete collar in accordance with IHS detail W-16, complete in place.
2. Includes removal and disposal where noted in contract documents.

B. Flush Valve

1. Measurement and payment: Per flush valve assembly including excavation, backfill, compaction, bedding, thrust block, filter rock, saddle tee, gate valve assembly, valve collars, 2” galvanized iron pipe and fittings in accordance to IHS detail W-1, complete in place.

C. Air Release Valve

1. Measurement and payment: Per air release valve assembly including excavation, backfill, compaction, bedding, saddle tee, nipples, elbows, 1” curbstop valve, meter box, meter box lid with frost cover, copper vent pipe, air release valve, and fittings in accordance to IHS detail W-2, complete in place.
2. Includes removal and disposal where noted in contract documents.

D. Pressure Reducing Valve:

1. Measurement and Payment: Per Pressure Reducing Valve including excavation removal and disposal of existing PRV vaults and appurtenances, new vault, backfill, gravel bedding, valves, fittings, spools, bore donuts, PRV, strainers, up to 25’ 4” PVC SDR 21 CL200 each side of the vault, reducers to match existing, pressure testing and disinfection. PRVs in accordance with IHS detail W-6, 2”x3/4” PRV, Complete in Place.

1.3 REFERENCES

A. American Water Works Association (AWWA):

1. AWWA C509 - Resilient-Seated Gate Valves for Water Supply Service.
2. AWWA C512 - Air Release, Air/Vacuum, and Combination Air Valves for Water Supply Service
3. AWWA C550 - Protecting Epoxy Interior Coating for Valves and Hydrants.

B. National Sanitation Foundation (NSF):

1. NSF/ANSI Standard 61 - Drinking Water Components - Health Effects.

C. New Mexico Standard Specifications for Public Works Construction (NMSSPWC):

1. 801 - Installation of Water Transmission, Collector, and Distribution Lines.

1.4 SUBMITTALS

A. Design Data: Submit manufacturer's latest published literature. Include illustrations, installation instructions, maintenance instructions and parts lists.

B. Manufacturer’s Certificates: Submit Statement of Compliance, supporting data, from material suppliers attesting that valves and accessories provided meet or exceed AWWA Standards and specification requirements.

1.5 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of all valves.

B. Provide Operation and Maintenance Data for each type of valve installed.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with New Mexico Standard Specifications for Public Works Construction and Navajo Tribal Utility Authority’s Navajo Area Standards and Construction Requirements, Technical Specifications for Materials and Workmanship for Water and Wastewater Facilities, whichever is most stringent.

B. All piping, fittings, valves, and any other service connection appurtenances shall comply with the “Reduction of Lead in Drinking Water Act”, in effect as of 2014, or any subsequent revision thereof.

1.7 DELIVERY, STORAGE AND HANDLING

A. Prepare valves and accessories for shipment per AWWA Standards and seal valve ends to prevent entry of foreign matter into product body.

B. Deliver and store valves in shipping containers with labeling in place.

C. Store products in areas protected from weather, moisture, or possible damage; do not store products directly on ground; handle products to prevent damage to interior or exterior surfaces.

D. Coated valves and appurtenances shall be shipped on bunks and secured with nylon belt tie down straps or padded banding over braces, and shall be stored on padded skids or other suitable means to prevent damage to coating.

E. Coated valves shall be handled with wide belt slings, padded forks or other means to prevent damage to coating. Chains, cables or other equipment likely to damage coating or valves shall not be used.

1.8 COORDINATION

A. Coordinate work with Lybrook MDWCA and utilities within construction area.

1.9 MAINTENANCE MATERIALS

A. Furnish two (2) tee wrenches to Owner (required length) for each valve type.

PART 2 PRODUCTS

2.1 AMERICAN IRON AND STEEL REQUIREMENTS

A. All iron and steel shall comply with the American Iron and Steel provisions of the Consolidated Appropriations Act of 2017.

2.2 RESILIENT WEDGE GATE VALVES

A. Manufacturers:

1. Mueller Company
2. Kennedy
3. Waterous
4. Dresser M & H
5. Clow
6. Approved Equal

B. Resilient Seat Wedge Gate Valves: AWWA C509, NSF 61.

1. Body, Bonnet, Gland Flange and Stuffing Box: Ductile Iron ASTM A536.
2. Stem and Stem Nut: Low Zinc (<15%) Bronze or Stainless Steel.
    a. Stem: Non-rising stem (NRS), Minimum yield strength of 40,000 psi and elongation of 12%.
    b. Stem Nut: Minimum yield strength of 30,000 psi.
3. Wedge: Ductile Iron ASTM A536 fully encapsulated with EPDM rubber.
4. Bolts and Nuts: Stainless Steel.
5. Operating Nut: 2” Square; open counterclockwise unless otherwise indicated.
6. Ends:
    a. 3” and larger: Mechanical joint
    b. 2”, main line: Push-on
    c. 2”, flush valve: Threaded, per IHS Standard Drawing W-1

7. Coating: Fusion bonded epoxy conforming to AWWA C550 with 10 mil or greater thickness; interior/exterior.
8. Working pressure: 250 psi minimum.
9. Thrust block support of made of 3,000 psi concrete beneath the gate valve and valve concrete collar are required.

C. Where waterline is buried at a depth greater than 4 feet, provide valve stem extensions, complete with extension stem stabilizers, until depth of extension nut at least matches depth of operating nuts on valves installed at four-foot depth.

2.3 AIR RELEASE VALVES

A. ½-inch air release valve:

1. Manufacturer:
   a. Val-Matic Valve and Manufacturing Corporation, Model # 15A.3DISVH
   b. Substitutions: Approved Equal
2. Working pressure: 175 psi
3. Outlet: ½" NPT
4. Cast iron or ductile iron body, cover and baffle; stainless steel trim, float, and fasteners.
5. Seat: Resilient Buna N.
6. Internal and external coatings shall be fusion bonded epoxy conforming to NSF-61 requirements.

2.4 METER CANS FOR AIR RELEASE VALVES:

A. Double Lid Meter Cover/Frame
1. For 20 inch diameter meter can, 11 3/8 inch minimum lid opening
2. Manufacturer:
   a. Castings Inc. Model CI7020
   b. Approved Equal

B. Plastic Meter Inner Lid
1. Finish – Plastic Opaque
2. Manufacturer:
   a. Castings Inc. Model INLP2
   b. Approved Equal

C. Meter Can/Pit:
1. 20" Diameter x 36" Height
2. Heavy Duty rated
3. Manufacturer:
   a. DFW – 2036H
   b. Approved Equal

D. Meter can and meter vault specifications:

1. Maximum wall deflection shall not exceed $^1/_8$" at any one point when subtracted from earth pressures or forces created during backfilling.
2. The walls inside and outside of the can shall be reasonably smooth and free of burrs.
3. Cover of the meter can or vault must have a non-skid surface and have "WATER" inscribed on the top.
4. The 11 3/8 inch minimum diameter frost lid (plastic) and outer entrance lid (cast iron) shall be centered in the meter can.
5. Outer lid shall have a pentagon head worm type lock.

2.5 FLUSH VALVE ASSEMBLIES

1. Gate Valve portion of the flush valve assembly shall be in accordance with section 2.1 above.
2. Pipe materials and fittings shall be threaded 2" galvanized iron with the pipe being at least 3' long.
3. Thrust blocks shall be poured with a minimum of 3,000 psi concrete.
4. The vent hole shall be 1/8" on the threaded end cap.
5. Filter rock shall be in accordance with Section 31 23 23 Backfill – Drain Rock.
6. Galvanized pipe shall conform to 33 11 00 Water Utility Distribution Piping Section 2.1.C – Galvanized Pipe and Fittings.
7. Buried galvanized pipe shall be wrapped per 33 11 00 Water Utility Distribution Piping Section 2.1.C.3 – Field Coatings.

2.6 VALVE BOXES

A. Manufacturers:

1. Tyler 6850 Series
2. Approved Equal

B. Domestic cast iron, two-piece, screw type.

C. Where waterline is buried at a depth greater than 4 feet, provide valve box extensions as required.

D. Domestic cast iron lid marked "Water", non-locking

E. All valve boxes and lids shall be extra heavy duty, traffic-rated.

2.7 PRESSURE REDUCING VALVE ASSEMBLY

A. PRV

1. Manufacturer:

a. 2" CLA-VAL PRV Model # 90-01BY with the following features:
   1) Pilot System shall be Stainless Steel.
   2) Trim shall be Stainless Steel
   3) Adjustment range is 15 psi- 75 psi.
   4) B – CK2 Isolation Valve
   5) Y – X43 "Y" Strainer
   6) KC – Epoxy Coating
   7) KD – Dura Kleen Self-cleaning valve stem
   8) KO – Anti-Cavitation Trim

b. ¾" Zurn Wilkins 600XL
   1) Integral Strainer and Bypass
   2) Adjustment Range 25 psi to 75 psi

c. No substitutions.

B. Piping and Fittings

1. See Section 33 11 00 Water Utility Distribution Piping.

C. Gate Valves:

1. Gate valves shall be brass, FIPT, non-rising stem, resilient seat, conforming to AWWA Standard C509. The valve will be clearly marked with the manufacturers name and come with handwheel operator.

D. Pressure Gage:

1. The pressure gauge shall be 4 1/2" diameter face stem mounted type suitable for water 0-200 psi (upstream) and 0-100psi (downstream). The gauge shall be connected to the water line as depicted in Detail A of standard drawing W-6. The gauge shall be an Ashcroft 1010 or equal. The gauges shall be oriented towards the manhole opening such that they can be read without entering the manhole.

E. Hose Bibb:

1. Hose bibb shall be ¾" bronze, with vacuum breaker.

F. Paint:

1. Professional grade exterior semigloss acrylic enamel, blue.

2.8 VALVE VAULTS

A. Concrete manhole sections conforming to ASTM C478.

1. Bell and spigot joints.
2. Symmetrical reinforcement only.
3. Soil-tight gasket conforming to ASTM C-990.
4. Embedded ladder rungs.

B. Concrete shall conform to Section 03 05 00 – Basic Concrete Materials and Methods.

C. Manufactured or cut to lengths shown on Drawings. Precast manhole barrels shall be joined with polybutylene "rubberneck" or "Ram-Nek" to form a watertight seal between barrel sections.

D. "Mouse hole" or circular cut-outs to accommodate main line pipe inside vaults, if needed, shall be pre-cast.

E. Manhole shall be minimum 6 feet deep with 6" reveal above adjacent ground.

F. Steps shall be equally spaced, no more than 16 inches apart, with the first step being placed no more than 18 inches from the top of the manhole ring.

G. The manhole shall have no floor.

H. Manhole opening shall be oriented per the drawing such that the pipe penetrations are at three and nine o'clock and the manhole is at twelve o'clock.

I. Pipe penetrations shall have bore donuts and non-shrink cement grout to create a watertight seal.

J. Pre-fabricated reinforced flat, slab-type lids with hinged, lockable hatches as shown on Drawings.

1. Shallow well manhole covers, where indicated on Drawings, shall be 24" diameter, as provided by Four Corners Precast, OAE. The cover frame shall be cast into the concrete top cover. The manhole cover shall be blue in color.

PART 3 EXECUTION

3.1 EXAMINATION

A. Determine exact location and size of valves from Drawings; obtain clarification and directions from Engineer prior to execution of work.

B. Verify invert elevations prior to excavation and installation of valves.

3.2 PREPARATION

A. Identify required lines, levels, contours and datum locations.

B. Locate, identify, and protect utilities to remain from damage.

C. Perform trench excavation, backfilling and compaction in accordance with Sections 31 23 17 and 31 23 23.

3.3 INSTALLATION

A. Gate Valves:

1. Install valves in conjunction with pipe laying; set valves plumb.

2. Provide buried valves with valve boxes installed flush with finished grade.

3. Install valve stem risers and collars, and valve box extensions as required to match finished grade.

4. All valve boxes must be centered over the operating nut. When valve key in use, key shall be centered in valve box.

5. Valves shall require the same joint restraint lengths as dead-ends of similar size and pipe material.

6. All buried metallic components shall be wrapped in 8-mil polyethylene.

B. Flush Valve Assemblies:

1. Gate Valves shall be set in accordance with 3.3.A above.

2. Install 3,000 psi concrete for block support, thrust blocks, and valve collars.

3. A 1/8" diameter vent hole shall be drilled in the flush valve cap.

4. A 1/8" diameter weep hole shall be drilled in the 45° elbow, oriented down. The weep hole shall drain into a minimum of 1 cubic foot of filter rock as specified in Section 31 23 23 Backfill.

5. Flush valve shall protrude from surface 36" and have formed valve collar around it.

6. Painting exterior of Galvanized Piping above ground:

a. Minimum surface preparation: SSPC-SP1
b. Correct defects and clean surfaces capable of affecting work of this section. Remove or repair existing coatings exhibiting surface defects.
c. Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
d. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
e. Apply each coat to uniform appearance.
f. Schedule:

1) Primer: 1 coat Sherwin Williams Galvite HS, OAE

a) 3.0-4.5 mils dry film thickness

2) Finish: Two coats Sherwin Williams Industrial Enamel (B54 Series), OAE

a) 2.0-4.0 mils dry film thickness

g. Follow all other paint manufacturer recommendations for preparation and application.

7.

C. Pressure Reducing Valve and Vault:

1. The Vault shall be placed on a minimum of 12" level layer of drain rock supported by compacted subgrade in accordance with Section 31 23 23 Backfill. The vault lid shall have a reveal of 6" from adjacent ground. The adjacent ground shall have positive drainage away from the access lid. All vault connections shall be water tight with bitumastic or Ram Nek gasketing. Any penetrations shall have a bore donut and filled with non-shrinking grout to create a watertight seal.

2. The 2" and ¾" PRVs shall be installed plumb and in parallel as shown on the plans. Each valve shall maintain a constant downstream pressure. The

contractor shall provide all taps, connections, and sensing lines necessary for the proper operation of the valves.

a. Pressure Settings shall be set as indicated below. Verify upstream pressures prior to installation. Upstream pressures are indicated next to the PRV name and downstream pressures are identified for each size.

1) PRV #1 (139 psi upstream):

a) 2" – 35 psi

b) ¾" – 40 psi

2) PRV #2 (89 psi upstream):

a) 2" – 35 psi

b) ¾" – 40 psi

3. Painting exterior of Galvanized Piping located inside vault per Drawings:

a. Minimum surface preparation: SSPC-SP1
b. Correct defects and clean surfaces capable of affecting work of this section. Remove or repair existing coatings exhibiting surface defects.
c. Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
d. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
e. Apply each coat to uniform appearance.
f. Schedule:

1) Primer: 1 coat Sherwin Williams Galvite HS, OAE

a) 3.0-4.5 mils dry film thickness

2) Finish: Two coats Sherwin Williams Industrial Enamel (B54 Series), OAE

a) 2.0-4.0 mils dry film thickness

g. Follow all other paint manufacturer recommendations for preparation and application.

3.4 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Flush and disinfect system in accordance with Section 33 13 00.

3.5 FIELD QUALITY CONTROL

A. Section 01 00 00 - Execution Requirements: Field inspecting, testing, adjusting, and balancing.

B. Perform pressure test on domestic site water distribution system in accordance with AWWA C605.

C. All valves, including gate valves, shall be manually actuated through their full cycle to ensure proper operation prior to installation.

D. Flush valves shall be operated for several seconds and then closed. The ability of the discharge pipe to drain through the weep hole within ten minutes of the valve closing shall be verified. Flush valve assemblies unable to drain within ten minutes of the valve closing shall have installation of weep hole verified.

END OF SECTION

SECTION 33 13 00

DISINFECTION OF WATER UTILITY DISTRIBUTION

PART 1 GENERAL

1.1 SUMMARY

A. Section includes disinfection of potable water distribution and transmission system; and testing and reporting results.

B. Related Sections:

1. Section 33 12 13 - Water Service Connections
2. Section 33 12 16 - Water Utility Distribution Valves

1.2 MEASUREMENT AND BASIS OF PAYMENT

A. Basis of Measurement and payment: Disinfection of new valves and PRVs are incidental to the bid item basis of cost, i.e. disinfection of the PRV components is included in the cost of the PRV line item and no separate payment will be made.
1. Disinfection of individual components and valves shall be incidental to that bid item.
2. This includes all costs incidental to disinfection and testing, including chlorination, flushing, water for flushing, de-chlorination, sampling, sample transport, and any other costs incidental to flushing, disinfection, and bacteriological testing activities.
3. Initial laboratory testing fees shall be paid for by the testing allowance. Costs for re-testing due to failed test shall be paid by Contractor.

1.3 REFERENCES

A. American Water Works Association (AWWA):

1. AWWA B300 - Hypochlorites.
2. AWWA B301 - Liquid Chlorine.
3. AWWA B302 - Ammonium Sulfate.
4. AWWA B303 - Sodium Chlorite.
5. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.
6. AWWA C651 - Disinfecting Water Mains.

B. New Mexico Administrative Code (NMAC) - Title 20, Chapter 7, Part 10:

1. Section 201: Application for Public Water System Project Approval.
2. Section 400: General Operating Requirements.

1.4 SUBMITTALS

A. Section 01 00 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit procedures, proposed chemicals, and treatment levels for review.

C. Test Reports: Indicate results comparative to specified requirements.

D. Certificate: Certify cleanliness of water distribution system meets or exceeds specified requirements.

1.5 CLOSEOUT SUBMITTALS

A. Section 01 00 00 - Execution Requirements: Requirements for submittals.

B. Disinfection Report:

1. Type and form of disinfectant used.
2. Date and time of disinfectant injection start and time of completion.
3. Test locations.
4. Name of person collecting samples.
5. Initial and 24-hour disinfectant residuals in treated water in ppm for each outlet tested.
6. Date and time of flushing start and completion.
7. Disinfectant residual after flushing in ppm for each outlet tested.

C. Bacteriological Report:

1. Date issued, project name, and testing laboratory name, address, and telephone number.
2. Time and date of water sample collection.
3. Name of person collecting samples.
4. Test locations.
5. Initial and 24-hour disinfectant residuals in ppm for each outlet tested.
6. Fecal and Total Coliform bacteria test results for each outlet tested.
7. Certify water conforms, or fails to conform, to bacterial standards of authority having jurisdiction.

D. Water Quality Certificate: Certify water conforms to quality standards of authority having jurisdiction, suitable for human consumption.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with AWWA C651.

B. Perform Work in accordance with New Mexico Standard Specifications for Public Works Construction and Navajo Tribal Utility Authority’s Navajo Area Standards and Construction Requirements, Technical Specifications for Materials and Workmanship for Water and Wastewater Facilities, whichever is most stringent.

1.7 QUALIFICATIONS

A. Testing Firm: Company specializing in testing potable water systems, certified by State of New Mexico.

B. Submit bacteriologist's signature and authority associated with testing.

PART 2 PRODUCTS

2.1 DISINFECTION CHEMICALS

A. All products added directly to water for purposes of disinfection shall conform to NSF/ANSI Standard 60.

B. Chemicals: AWWA B300, Hypochlorite, AWWA B301, Liquid Chlorine, AWWA B302, Ammonium Sulfate, and AWWA B303, Sodium Chlorite.

C. Per NMSSPWC Section 801.17.1, “Dry chlorine will not be used for disinfection of waterlines.”

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 00 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify piping system has been cleaned, inspected, and pressure tested.

C. Perform scheduling and disinfecting activity with start-up, water pressure testing, adjusting and balancing, demonstration procedures, including coordination with related systems.

3.2 INSTALLATION

A. Prior to disinfection, thoroughly flush the system with potable, disinfected water. Flushing may be accomplished either by gravity or by pumping, provided the pump is not damaged due to insufficient head. Any damage to the pump during flushing shall be the responsibility of the Contractor and shall be repaired or replaced at no additional expense to the Owner. A minimum flow velocity of 3 feet per second (fps) is required.

B. For the installation of new work that will be connected to the system: Introduce liquid chlorine into the system and perform disinfection in accordance with AWWA C651 using the continuous feed method, with the following modifications:

1. Initial chlorine concentration, as measured by water flowing out of representative points throughout the system, shall be at least 50 ppm.

2. Maintain disinfectant in system for 24 hours, or 48 hours if the temperature is less than 41 degrees Fahrenheit.

3. Upon completion of retention period required for disinfection but prior to collecting bacteriological samples, flush pipeline until chlorine concentration in water leaving pipeline is not more than 0.4 ppm.

C. For replacement or repair of the existing water distribution system or the installation of new valves on the existing water distribution system:
   1. Contractor shall execute work as a controlled pipe repair with depressurization after shutdown as described in Section 4.11.3.2 of AWWA C651.
   2. Disinfection of all new parts to be installed, including fittings, valves, and pipe, and disinfection of the existing pipe where interior surfaces are exposed to the environment shall occur according to Section 4.11.3.2 of AWWA C651.
   3. Follow flushing and sampling as outlined in Section 4.11.3.2 of AWWA C651.

D. Provide and attach required equipment to perform the Work of this section.

E. Flush, circulate, and clean until required cleanliness is achieved; use domestic water.

F. Legally dispose of chlorinated water. When chlorinated discharge may cause damage to environment, apply neutralizing chemical to chlorinated water to neutralize chlorine residual remaining in water.

G. Replace permanent system devices removed for disinfection.

3.3 FIELD QUALITY CONTROL

A. Section 01 00 00 - Execution Requirements: Field inspecting, testing, adjusting, and balancing.

B. Disinfection, Flushing, and Sampling:

   1. After final flushing and before pipeline is connected to existing system, or placed in service, employ an approved independent testing laboratory, approved by the Engineer, to sample, test and certify water quality suitable for human consumption.
   2. Contractor shall be reimbursed for the cost of laboratory tests upon submittal of invoice(s). The laboratory results of all tests shall be submitted directly to the Engineer. Contractor shall pay for all failed tests.
   3. Contractor shall not connect to existing system until all testing and disinfection is complete and shall obtain written permission from the Engineer to proceed with connection to the existing system.

C. Re-Disinfection:

   1. In the event the performed water quality testing fails, the Contractor will disinfect the affected portions of the system again, and the approved testing laboratory shall sample, test and certify water quality as described in these specifications. Re-disinfection shall be performed at no additional cost to the Owner.

END OF SECTION

SECTION 33 13 13

WATER STORAGE TANK DISINFECTION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Water tank disinfection.

2. Bacteriological testing.

B. Related Sections:

1. Section 09 97 15 - Water Storage Tank Rehabilitation.

1.2 REFERENCES

A. American Water Works Association:

1. AWWA C652 - Disinfection of Water Storage Facilities.

1.3 MEASUREMENT AND BASIS OF PAYMENT

A. Basis of Measurement and payment: Disinfection of the water storage tank is considered incidental to repair of the overflow weir, ladder, and ceiling and includes work costs related to disinfection.

B. Initial laboratory testing fees shall be paid for by the testing allowance. Costs for re-testing due to failed test shall be paid by Contractor.

1.4 SUBMITTALS

A. Section 01 00 00 - Submittal procedures.

B. Disinfection Procedure: Submit procedure description including type of disinfectant to and calculations indicating quantities of disinfectants required to produce specified chlorine concentration in accordance with Section 3 and 4 of AWWA C652.

C. Test Reports: Indicate results of bacteriological and residual chlorine laboratory test reports.

D. Manufacturer's Certificate:

1. Certify products meet or exceed specified requirements.

2. Certify disinfectants meet or exceed AWWA Standards requirements.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with AWWA C652.

B. Perform Work in accordance with State of New Mexico Environment Department standards.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store disinfectants in cool, dry place away from combustibles such as wood, rags, oils and grease.

B. Handle disinfectants with caution; protect skin and eyes from contact; avoid breathing vapors; wear gloves, aprons, goggles, and vapor masks.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Furnish personnel working inside tank during disinfection with equipment to comply with Federal and State regulations for work conducted in hazardous atmosphere.

B. Neutralize disinfectant solution before disposal.

C. Legally dispose of disinfection solution off Project site.

D. Repair damage caused by disinfectant solution and disinfection procedures.

PART 2 PRODUCTS

2.1 DISINFECTANTS

A. Chlorine Forms: In accordance with AWWA C652, Section 4.2.

B. All chemicals shall be NSF/ANSI 60 certified disinfection chemicals.

PART 3 EXECUTION

3.1 EXAMINATION

A. Conduct inspection of tank interior before beginning disinfection.

1. Verify tank is clean and free of polluting materials.

2. Verify tank pipe and vent connections are properly made and clear of obstructions.

3. Verify paint is thoroughly cured in accordance with paint manufacturer's instructions.

3.2 PREPARATION

A. Protect aquatic life and vegetation from damage from disinfectant solution purged from tank.

3.3 APPLICATION

A. Use Chlorination Method 2 for disinfecting tank as specified in Section 4.3 of AWWA C652.

3.4 FIELD QUALITY CONTROL

A. Section 01 00 00 - Testing, adjusting and balancing requirements.

B. Collect samples of water from filled tank for bacteriological analysis in accordance with Section 5.1 of AWWA C652; take inlet and outlet water samples.

C. Test water samples for bacterial contamination, residual chlorine, in accordance with State Health Standards for potable water.

D. When water samples fail to meet State Health Standards for potable water perform the following corrective measures until water quality conforms to State Health Standards:

1. Inlet and Outlet Water Sample Failure: Eliminate source of contamination in water supply, repeat disinfection, and retest water quality.

2. Outlet Water Sample Failure: Repeat disinfection, and retest water quality.

END OF SECTION

SECTION 33 16 35

WATER STORAGE TANK MODIFICATIONS

PART 1 GENERAL

1.1 SUMMARY

A. The work covered by this section of the specifications consists of furnishing all plant, labor, equipment and materials in performing all operations in connection with the proposed modifications to each existing steel water storage tank, including replacement of the tank float.

B. It is the Contractor's responsibility to maintain adequate water storage for the Owner during the Work. Contractor is advised that all improvements to each storage tank must be completed and the tank brought back on-line prior to commencing work on the other tanks.

C. Section Includes:
1. Water storage tank modifications.
2. Cathodic protection.

D. Related Sections:
1. Section 09 97 15 - Water Storage Tank Rehabilitation

1.2 REFERENCES

1.3

A. American Water Works Association:
1. AWWA D100 - Welded Steel Tanks for Water Storage.

1.4 DEFINITIONS

A. PURCHASER used in AWWA D100 means Owner.

1.5 SUBMITTALS

A. Section 01001 - Submittal Procedures.

B. Construction shall be governed by the Drawings showing general dimensions and construction details. After approval by the Engineer of detailed erection drawings prepared by the Contractor, there shall be no deviation from these drawings and specifications except upon written order or approval from the Engineer.

C. Shop Drawings: Indicate the following:
1. Tank Shop Drawings:
a. Tank float details.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.6 CLOSEOUT SUBMITTALS

A. Project Record Documents: Provide an affidavit of compliance per AWWA 652 Section 4.4.8

1.7 QUALITY ASSURANCE

A. Perform Work in accordance with AWWA D100.

1.8 QUALIFICATIONS

A. Company specializing in performing work of this section with minimum five years experience.

1.9 COORDINATION

A. Section 01001 - Basic Requirements: Coordination requirements.

B. Coordinate work with connecting to water distribution system.

PART 2 PRODUCTS

2.1 AMERICAN IRON AND STEEL REQUIREMENTS

A. All iron and steel shall comply with the American Iron and Steel provisions of the Consolidated Appropriations Act of 2017.

2.2 WATER STORAGE TANK

A. Furnish materials complying with this specification and standards specified in AWWA D100, Section 1.5.

2.3 TANK CONSTRUCTION

A. In conformance with requirements listed in AWWA D100, Paragraph 111.A.1, pages xiii-xv as noted, supplemented, or modified below:
   1. Tank float: The water storage tank float shall be a PVC float with a weight on top that ensures the float is 2 pounds heavier the target on the outside of the tank. The target weight shall be measured by the Contractor. The target differs from the one shown in the drawings and is made of ½" thick steel and is a triangle 16" high with a 24" wide base. The weight and float shall meet AWWA and NSF standards and shall be disinfected per Section 33 13 13 and all applicable AWWA standards before installation.

2.4 SOURCE QUALITY CONTROL

A. Section 01001 - Quality control requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

3.2 FIELD QUALITY CONTROL

A. Section 01001 - Testing, adjusting and balancing requirements.

3.3 PREPARATION

A. Conduct Pre-job meeting per AWWA 652 Section 4.4.1.

B. Isolate water storage tank per AWWA 652 Section 4.4.2.

C. Cleanse equipment, personnel, hatch, and immediate area around hatch per AWWA 652 Section 4.4.3.

D. Sample chlorine residual and turbidity per AWWA 652 Section 4.4.4.

3.4 INSTALLATION

A. Follow equipment and personnel requirements per AWWA 652 Section 4.4.5.

B. Disinfect equipment and personnel per AWWA 652 Section 4.4.6.

3.5 INSPECTION

A. Perform chlorine residual, turbidity, and bacteriological testing AWWA 652 Section 4.4.7.

B. Do not place water storage tank back into service until Engineer verifies water quality per AWWA 652 Section 5.

C. Provide an affidavit of compliance per AWWA 652 Section 4.4.8.

3.6 GUARANTEE

A. The water storage tank modifications furnished under these specifications shall be guaranteed for a period of one year from the date of final acceptance thereof against defective material, design or workmanship, which guaranty shall include a rust-free condition of the structure for the same period. The labor incidental to repairing damaged portions shall be furnished by the Contractor. The Bidder shall submit with his bid a complete and comprehensive outline of all applicable warranty information for the product they intend to use.

END OF SECTION