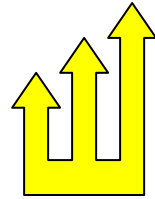


**STANDARD SPECIFICATIONS AND DETAILS
FOR WATER MAIN CONSTRUCTION
2020**

CITY OF VALLEY
CITY OF VALLEY



"A Community
On The Way Up"

DOUGLAS COUNTY, NEBRASKA

December, 2019

OPCE PROJECT NO. 19003-04

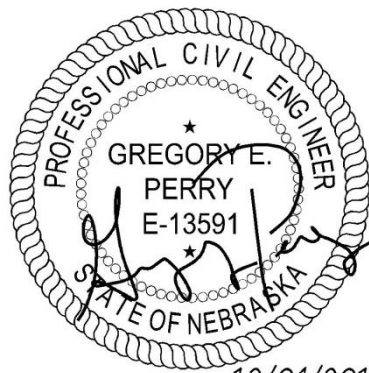
PREPARED BY

**OLMSTED & PERRY
CONSULTING ENGINEERS INC.
OMAHA, NEBRASKA**

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CITY OF VALLEY

DOUGLAS COUNTY, NEBRASKA



12/04/2019

DECEMBER 2019

OPCE PROJECT NO. 19003-04

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PREPARED BY

**OLMSTED & PERRY CONSULTING ENGINEERS INC.
10730 PACIFIC STREET, SUITE 232
OMAHA, NEBRASKA 68114 4700**

**STANDARD SPECIFICATIONS AND DETAILS
FOR WATER MAIN CONSTRUCTION 2020**

CITY OF VALLEY
DOUGLAS COUNTY, NEBRASKA

OPCE PROJECT NO. 19003-04

DECEMBER 2019

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SECTION 02100
SITE PREPARATION

1.0 GENERAL

1.01 DESCRIPTION

1.01.1 RELATED WORK SPECIFIED ELSEWHERE

Clearing and Grubbing	Section 02110
Demolition	Section 02120
Trench Excavation and Backfill	Section 02250
Water Mains and Appurtenances	Section 02600
Pipe Boring and Jacking	Section 02650
Horizontal Directional Drilling	Section 02655
Surface Restoration	Section 02900

2.0 PRODUCTS

NOT USED

3.0 EXECUTION

3.01 GENERAL SITE PREPARATION

3.01.1 KEEP PROJECT SITE free from drainage ponding due to construction operations during progress of Work. Make arrangements for disposal of all water and sewage received on the site from temporary connections or stoppages. Do not discharge any water or sewage onto private property outside the construction right-of-way.

3.01.2 STRIP TOP SOIL and separately store to provide depth of top soil replacement as specified.

3.01.3 REMOVE AND STORE obstructions such as culvert pipe, signs, and fences for replacement upon completion of construction. Provide temporary fencing if necessary to contain livestock or to prevent accidents until permanent fencing is restored.

3.02 EXISTING UTILITIES

3.02.1 CONTRACTOR IS RESPONSIBLE for liaison with utility companies and for repairing utilities and services which are not in direct conflict with line or grade of the new piping systems and is responsible for damage during construction at no expense to the Owner, unless indicated otherwise on the Drawings.

3.02.2 UTILITIES SHOWN ON DRAWINGS, in direct line and grade, which conflict with line or grade of the new piping systems shall be relocated by others at no expense to the Contractor, unless indicated otherwise on the Drawings.

3.02.3 FOR UTILITIES NOT SHOWN on the Drawings and which are in direct conflict with line or grade of the new piping systems the Contractor shall notify the Engineer of the conflict.

3.02.4 UTILITY REMOVAL. Before the Contractor begins Work, he shall confer with the owners of any underground or overhead utilities which may be on or in close proximity to the Work areas and shall arrange for the necessary disconnection of the utilities in accordance with the utility company regulations. The utility company or owner of the utility shall perform the work of removing, repairing, reconditioning, or revising the utility unless otherwise specified or indicated on the Drawings. The Contractor shall cooperate with the utility companies so that the Work can be expedited to the best interests of all concerned.

3.02.5 PROTECTION OF EXISTING SERVICE LINES AND UTILITY STRUCTURES shall be the responsibility of the Contractor. The Contractor shall protect and safeguard existing service lines and utility structures shown or indicated on the Drawings and, if damaged, shall be repaired by the Contractor at his expense. Any existing line or utility structure which is not shown on the Drawings, or the location of which is not known to the Contractor in sufficient time to avoid damage, if inadvertently damaged, shall be repaired by the Contractor and he shall be entitled to payment in accordance with the General Conditions.

3.03 TREE REMOVAL

3.03.1 TREE REMOVAL shall consist of only those shown on the Drawings or as authorized by the Owner and the Engineer. Do not remove any tree not designated for removal.

3.03.2 FELL, CUT, AND REMOVE TREES together with down timber, stumps, roots, and brush. Backfill and dispose of debris.

3.04 PAVEMENT REMOVAL

3.04.1 REMOVE PAVEMENT to a minimum of 1'-0" from edge of trench. No undercutting will be permitted. Remove pavement on straight lines approximately parallel to the center line of the trench. Cut pavement and drives with a concrete saw and provide a minimum vertical cut of one inch (1").

3.04.2 REMOVE ASPHALT PAVEMENT in the same manner as concrete pavement. Cut all edges neatly.

3.04.3 REMOVE SIDEWALK PAVEMENT to the nearest joint beyond a minimum distance of 1'-0" from edge of trench.

3.04.4 REMOVE GRAVEL SURFACES neatly with an excavating machine.

3.05 CONSTRUCTION ALONG OR ACROSS HIGHWAYS AND RAILROADS

3.05.1 MAINTAIN TRAFFIC FLOW on highways and railroads at all times. Obtain a work permit from the appropriate State Highway Official or Railroad Company Official before commencing Work. Follow all detailed Work requirements and procedures of the Highway Department or Railroad Company as may be required by the permit.

3.05.2 PROVIDE WARNING lights, signals, flagmen, or other precautionary measures as required to protect Work and traffic.

3.05.3 BEFORE EXCAVATION OR START OF WORK, check with the Highway Official or Railroad Company Official for location of all buried utilities or cables.

3.05.4 WORK PERFORMED ALONG OR ACROSS RAILROADS may be regulated and inspected by Railroad Company Officials. The railroad shall have the right to regulate and stop Work and correct any error with railroad forces at the Contractor's expense in an emergency or if Contractor refuses to make timely repairs.

3.06 ACCESS TO STREETS AND HIGHWAYS

3.06.1 CONTRACTOR shall maintain a suitable means of access for all traffic abutting streets and highways involved in construction, except as specifically permitted otherwise by the Owner. Notify property owners 24 hours in advance of any street closure.

3.06.2 WHENEVER CONSTRUCTION IS STOPPED due to inclement weather, on weekends and holidays, or for other reasons, suitable access shall be provided for all property owners.

3.07 DISRUPTION OF UTILITY SERVICE

3.07.1 CONTRACTOR shall maintain utility service to all property owners or customers of utilities throughout the construction period unless repairs or improvements are authorized. In the event of repairs, replacements or improvements to utility service lines, the Contractor shall give the property owner or customer 24-hour notice of the upcoming disruption. Disruption of service shall be for as brief a period as possible so as not to cause undue inconvenience to the affected property owner or customer.

3.08 REMOVAL OF EXISTING STRUCTURES

3.08.1 REMOVE STRUCTURES regardless of materials of which they are constructed. Removal shall include masonry walls, footings and foundations, sidewalks, steel, cast iron, concrete, rubbish, junk, wood, and miscellaneous items.

3.09 DISPOSAL OF DEBRIS AND REFUSE

3.09.1 CONTRACTOR shall dispose of surface materials, construction debris and trees in accordance with local ordinances and at a site approved by the Owner. Burning of refuse will not be permitted.

END OF SECTION

SECTION 02110

CLEARING AND GRUBBING

1.0 GENERAL

1.01 DESCRIPTION

1.01.1 RELATED WORK SPECIFIED ELSEWHERE

Site Preparation	Section 02100
Trench Excavation and Backfill	Section 02250
Surface Restoration	Section 02900

1.01.2 WORK COVERED UNDER THIS SECTION shall consist of clearing the site, right-of-way, or roadway to the extent necessary for construction of the project. All stumps, dead trees, logs, down timber, brush, live trees, shrubs, other herbaceous vegetation, and rubbish or trash shall be removed from the limits shown on the Drawings.

1.01.3 DO NOT REMOVE live trees, hedges, shrubs, or grass from beyond the limits of construction, except as shown on the Drawings or designated by the Engineer. Work within the right-of-way and outside the limits of construction shall be performed in a manner as to preclude injury or damage to live trees.

2.0 PRODUCTS

NOT USED

3.0 EXECUTION

3.01 CONSTRUCTION METHODS

3.01.1 CLEARING AND GRUBBING TREES will consist of the removal and disposal of trees over nine inches in diameter, the stumps of such trees, and the large roots.

3.01.2 GRUBBING STUMPS will consist of the removal and disposal of stumps over 12 inches in diameter from which the tree has been removed by others and the large roots of such stumps.

3.01.3 GENERAL CLEARING AND GRUBBING will consist of the removal and disposal of wire/board fences, all trees with diameters of nine inches or less, and stumps with diameters of 12 inches or less and will include the removal and disposal of all other objectionable material, such as logs and down timber, shrubs, hedges, brush, weeds, grass, other herbaceous vegetation, and rubbish or trash encountered within the limits

of the right-of-way, other areas shown on the Drawings or designated by the Engineer. All living trees or shrubs located within the right-of-way, but not within the limits of construction, shall not be removed, injured, or destroyed, except as otherwise shown on the Drawings or designated by the Engineer.

3.01.4 ALL STUMPS AND STUMPS OF TREES removed, including large roots, shall be removed to a depth of at least 12 inches below natural ground or finished grade elevation in cut section as the case may be. An approved mechanical stump chipper may be used for this work.

3.01.5 EXCEPT IN AREAS TO BE EXCAVATED, stump holes and other holes from which obstructions are removed shall be backfilled with suitable material and compacted in accordance with these Specifications.

3.01.6 THE CONTRACTOR MAY LEAVE STUMPS IN PLACE where embankments are in excess of three feet, provided they are cut off within six inches of the original ground elevation.

3.01.7 ALL TREES OR SHRUBS within the limits of the construction which are not to be removed shall be carefully protected.

3.01.8 THE TRIMMING OF TREES AND ROOTS for necessary clearance of the work will not be paid for, unless the work requires in excess of 2 man hours per tree. The Contractor shall obtain the services of a certified Forester to supervise the trimming operation. No extra payment shall be made for such services, but shall be considered subsidiary to the items for which the Contract provides that direct payment will be made.

3.02 REMOVAL AND DISPOSAL OF STRUCTURES AND OBSTRUCTIONS

3.02.1 UNLESS OTHERWISE PROVIDED, existing structures, such as buildings, drainage pipes, bridges, culverts, and fences found within the construction limits and which are not to remain in place shall be removed by the Contractor. Unless structures interfere with the work, they shall not be removed until the new structures replacing them are completed. Material from existing structures which, in the opinion of the Engineer, is fit for use elsewhere, shall remain the property of the Owner. It shall be removed without damage in sections which may be readily transported.

3.02.2 THE OWNER RESERVES THE RIGHT to retain ownership of all surplus materials (i.e., brick, asphalt, cast-iron covers, grates, frames, and other like materials). Retained surplus materials shall be delivered by the Contractor to a designated facility owned by the Owner within a 4-mile radius of the construction area as directed by the Engineer. On construction areas beyond the four-mile radius, the surplus material shall be delivered to a nearby designated location or be loaded by the Contractor into trucks furnished by the Owner.

3.02.3 MINOR OBSTRUCTIONS OR SURPLUS MATERIALS encountered in the roadway shall be removed and transported, as provided in this Section 02110, or disposed of by the Contractor at his expense.

3.02.4 THE CONTRACTOR SHALL REMOVE all discarded materials, rubbish, or debris from the project at his expense and shall dispose of it in a manner satisfactory to the Engineer. Any such material not removed from the project site within 24 hours following notification by the Engineer, shall be removed by the Owner at the expense of the Contractor.

3.02.5 THE CONTRACTOR SHALL, at his own expense, mow all weeds within the construction limits of the project. He shall keep the weeds mowed in conformance with the requirements of applicable city ordinances and state laws.

3.03 DISPOSAL OF MATERIAL

3.03.1 ALL MATERIAL resulting from clearing and grubbing work shall be disposed of by the Contractor in approved landfill areas in conformance with federal, state, and local laws and regulations.

3.03.2 PRIOR TO DISPOSAL, MATERIALS shall not be piled within the area of the flood plain of any channel, unless otherwise shown on the Drawings or authorized in writing by the Engineer.

3.03.3 PRIOR TO DISPOSAL, MATERIALS shall not be piled within the right-of-way of any alley, street, drive, road, walkway, drainage way, or other public property, unless so authorized by the Engineer.

3.03.4 THE CONTRACTOR may enter into agreements with adjacent landowners or other persons for the disposal of trees after they have been cleared. Such agreements shall be subject to the approval of the Engineer. It shall be expressly understood that any such agreement will not in any way relieve the Contractor of full compliance with the conditions established in these Specifications. Disposal shall be in accordance with all federal, state, and local laws and regulations.

END OF SECTION

SECTION 02120

DEMOLITION

1.0 GENERAL

1.01 DESCRIPTION

1.01.1 RELATED WORK SPECIFIED ELSEWHERE

Site Preparation	Section 02100
Clearing and Grubbing	Section 02110
Trench Excavation and Backfill	Section 02250
Surface Restoration	Section 02900

1.01.2 WORK COVERED UNDER THIS SECTION shall consist of all demolition or removal of all construction shown on the Drawings or as directed by the Engineer. Demolition shall consist of the removal of all structures, walls, partitions, utilities, pavements, headers, curb and gutters, guard posts, driveways, sidewalks, steps, fences, manholes, junction boxes, catch basins, and inlets. Work shall also consist of all necessary excavation and backfilling.

2.0 PRODUCTS

NOT USED

3.0 EXECUTION

3.01 SALVAGING OF MATERIALS

3.01.1 ALL MATERIALS which have salvage value shall remain the property of the Owner. The Contractor shall deliver materials of salvage value to the Owner's designated delivery and storage site.

3.01.2 ALL OTHER MATERIALS shall be disposed of by the Contractor in approved landfills in accordance with all Federal, State, and Local laws and regulations.

3.02 DUST CONTROL

3.02.1 DUST RESULTING FROM DEMOLITION WORK shall be controlled to prevent its spread and to avoid creation of a nuisance in surrounding areas. Use of water may be permitted unless it results in, or creates, further hazard, such as ice, flooding, and pollution.

3.03 PROTECTION OF EXISTING WORK

3.03.1 CONTRACTOR SHALL take all necessary precautions to ensure against damage to existing work, which is to remain in place to be reused or to remain the property of the Owner. Repair of any damage to such work shall be the responsibility of the Contractor.

3.03.2 CONTRACTOR SHALL be responsible for protection of all utilities not designated for removal and shall be responsible for all liaison with utility companies which may be affected by demolition work. Verify the location of all underground and aboveground utilities prior to beginning work.

3.03.3 WHEN UTILITY LINES OR STRUCTURES are encountered that are not indicated on the Drawings or which have not been pre-located by utility companies, notify the Engineer immediately.

3.04 CONSTRUCTION METHODS

3.04.1 ALL STRUCTURES that are shown in the Drawings to be removed or that interfere with the new construction shall be taken down and entirely removed within the limits shown, unless otherwise provided. In removing pavement, combination curb and gutter, driveways, curb, gutter, walks and similar items where portions of such items are to be left in place, the removal shall be extended to an existing joint, or to the limits shown in the Drawings. Connecting edges shall be cut and chipped to true lines with vertical faces. All materials having salvage value shall be carefully removed to avoid damage. Pavement and discharge structures, to be removed, shall be broken into pieces having an area of not to exceed 1-1/2 square feet, and any protruding steel cut to within 6 inches of the encasing concrete. The concrete in all other structures shall be broken into pieces not larger than can be handled by two men.

3.04.2 WHEN REMOVING CONCRETE SLABS, foundations, footings, walls, piers, etc., the removal shall be complete. Do not leave pieces or portions of these structures in place. Concrete slabs, foundations, footings, walls, piers, etc., may be left in place only where the Drawings show finished grades to be a minimum of two feet above the top of such structure. However, the Contractor shall be required to break up concrete slabs into pieces not greater than two feet by two feet to allow for soil drainage.

3.04.3 ABANDONING MANHOLES shall consist of removing the cover and top, breaking down the walls to an elevation which is at least 3 feet below the surrounding ground or finished grade elevation, plugging all sewer openings with a concrete plug, breaking up the floor of the structure into pieces measuring not more than 3 feet in any dimension, filling the opening with granular material to an elevation which is 3 feet below the surrounding ground or finished grade elevation, and filling the remaining opening with soil material which is similar to the surrounding material.

3.04.4 WHEN ABANDONING MANHOLES, catch basins and inlets, any functional sewer connected to these appurtenances shall be properly reconnected. Existing pipe connections that are to be abandoned shall be plugged.

3.04.5 WHEN A PORTION OF THE EXISTING STRUCTURE is to be retained, care shall be taken not to impair the value of the retained portion during construction operations. All operations necessary for the removal of any structure which might endanger the new construction shall be completed prior to the construction of the new work.

3.04.6 THE REMOVAL OF DISCHARGE STRUCTURES shall consist of the removing of existing discharge structures, each of which may be composed of a concrete flume, concrete or metal slope drain and a concrete discharge basin, or a metal flume, concrete or metal slope drain and concrete discharge basin, or any combination of these items.

3.05 BACKFILLING

3.05.1 ALL TRENCHES, HOLES, AND PITS resulting from the demolition work shall be backfilled and compacted to 95% of maximum density, as determined by ASTM D 698.

3.06 CLEANUP

3.06.1 CONTRACTOR SHALL remove all loose debris and rubbish from the premises. Care shall be taken to prevent spillage on adjacent streets and areas.

END OF SECTION

SECTION 02250

TRENCH EXCAVATION AND BACKFILL

1.0 GENERAL

1.01 DESCRIPTION

1.01.1 RELATED WORK SPECIFIED ELSEWHERE

Site Preparation	Section 02100
Clearing and Grubbing	Section 02110
Demolition	Section 02120
Water Mains and Appurtenances	Section 02600
Pipe Boring and Jacking	Section 02650
Horizontal Directional Drilling	Section 02655
Surface Restoration	Section 02900

1.02 PROTECTION OF EXISTING UTILITIES

1.02.1 VERIFY THE EXISTENCE AND LOCATION of underground utilities along the entire route of the Work. Omission from, or inclusion of, utility locations on the Drawings is not to be considered as the nonexistence of, or a definite location of, existing underground utilities. Prior to construction operations, locate and mark, or have others locate and mark, all underground and overhead utilities, including, but not limited to, water, sanitary sewer, storm sewer, gas, power, telephone, cable television, etc.

1.02.2 PROTECT EXISTING UTILITIES from damage due to Work operations. The Contractor shall repair any damage to existing utilities caused by his operations.

2.0 PRODUCTS

2.01 TRENCH BOTTOM STABILIZATION MATERIAL

2.01.1 TRENCH BOTTOM STABILIZATION MATERIAL shall consist of clean, coarse, crushed rock of size, as approved by the Engineer.

2.02 BACKFILL MATERIAL

2.02.1 BACKFILL MATERIAL shall consist of earth material from onsite trenching operations including clay, silt, sand, gravel, hardpan, and disintegrated shale. Large rocks and boulders will not be permitted to be used as backfill material.

3.0 EXECUTION

3.01 EXCAVATION AND TRENCHING

3.01.1 PERFORM EXCAVATION AND TRENCHING operations to the depth indicated on the Drawings or as specified.

3.01.2 PILE excavated material suitable for backfill in an orderly manner sufficient distance back from edge of excavation to avoid rollbacks, slides, or cave-ins.

3.01.3 REMOVE soil not suitable for backfill and waste at a disposal area designated by the Engineer.

3.01.4 WHERE NEW CONSTRUCTION crosses or closely parallels existing utilities or utility services, excavate in advance of pipe laying to determine location and crossing arrangement, including exact construction line and grade.

3.01.5 BORE AND JACK beneath existing streets, utilities, and structures, except as noted on the Drawings or as directed by the Engineer.

3.01.6 REFERENCE to percent maximum density shall mean a soil density not less than the stated percent of maximum density for soil, as determined by ASTM D 698, Standard Proctor

3.01.7 KEEP WIDTH OF TRENCH as narrow as possible, but provide adequate room for backfilling and jointing. Keep sides of the trench as nearly vertical as practical within the limits of excavation codes and maintain vertical walls of excavation below top of pipe. Trench widths shall be as follows:

<u>Pipe Size</u>	<u>Trench Width</u>
3/4" to 3"	12"
4" to 8"	24"
10" to 16"	36"
18" to 24"	48"
30" and Greater	Pipe Size Plus 18" Each Side

3.01.8 EXCAVATE to full depth by machine and level trench bottom to provide uniform bearing and support for full length of pipe. Trench bottom shall be continuous, relatively smooth, and free of rocks.

3.01.9 BED TRENCH BOTTOM as shown on the Drawings or as directed by the Engineer.

3.01.10 PROVIDE BELL HOLES at each pipe joint and allow access completely around circumference of pipe for proper jointing operations.

3.01.11 INSTALL PIPE and provide a minimum pipe envelope consisting of compacted backfill completely around the pipe and a distance 12 inches above the top of the pipe.

3.01.12 WHEN UNSTABLE MATERIAL is encountered which may not provide a suitable foundation for pipe, notify the Engineer immediately. If determined by the Engineer upon his investigation that the material is unsuitable for foundations, the Engineer may specify and authorize remedial measures. If removal of unsuitable material is authorized, replace it with a stabilizing material in conformance with Paragraph 2.01. Provide a minimum of four inches (4") of bedding material on top of the stabilizing material to prevent point load.

3.01.13 EXCAVATE BY HAND under and around utilities, where overhead clearance prevents use of machine, and under trees and shrubs where shown on the Drawings.

3.02 SHEETING, SHORING, AND BRACING

3.02.1 CONSTRUCT SHEETING, SHORING, AND BRACING required to hold walls of excavation, to provide safety for workmen, to protect existing utilities or structures, and to permit construction in the dry. If wood sheeting is driven below the level of pipe, it shall be left in place to a level 5 feet below finished grade. Steel sheeting shall be pulled upon completion unless indicated otherwise on the Drawings. When a movable trench shield is used below the spring line of the pipe, it shall be lifted prior to any forward movement to avoid pipe displacement.

3.03 DEWATERING

3.03.1 WHEN DEWATERING IS NECESSARY, obtain the Engineer's approval of proposed methods of dewatering and provide for handling of water encountered during construction. Lay no pipe in and pour no concrete on excessively wet soil. Prevent surface water from flowing into the excavations and remove water as it accumulates. Divert stream flow away from areas of construction. Do not pump water onto adjacent property without approval of Engineer and adjacent property owner. Do not use sanitary sewers for disposal of trench water. The cost of dewatering shall be included in the original Bid Price for construction.

3.04 EXCAVATION FOR STRUCTURES AND APPURTENANCES

3.04.1 EXCAVATE as required for manholes and other appurtenances until firm, undisturbed soil is reached. If excavation is carried below bottom of foundations as shown on the Drawings, fill with 3,000 psi concrete or stabilizing material, as directed by the Engineer, at no expense to Owner.

3.04.2 WHEN UNSTABLE MATERIAL is encountered which will not provide suitable foundation, fill with 3,000 psi concrete or stabilizing material specified herein, or as directed by Engineer. Contractor shall be entitled to payment for this extra work in accordance with the General Conditions.

3.05 BACKFILL FOR TRENCHES

3.05.1 BACKFILL TRENCHES immediately after the location of all lines, connections, and appurtenances are recorded, or at the Engineer's direction.

3.05.2 CONSTRUCT MANHOLES and appurtenances and perform backfilling as Work progresses. Closing of street intersections as the Work progresses shall be subject to the Owner's approval, and in the case of a highway intersection, at the approval of the State Highway Department.

3.05.3 BACKFILL with material removed from excavation except where sand backfill may be specified. Backfill material shall be as specified herein and shall not contain any debris, frozen earth, large clods, stones, or other unsuitable material.

3.05.4 PLACE BACKFILL simultaneously on both sides of the pipe to prevent displacement. Place backfill into the trench at an angle so that the impact on the installed pipe is minimized. Install a cushion of four feet (4') of backfill above the pipe envelope before using heavy compaction equipment.

3.05.5 HAND PLACE BACKFILL in the pipe envelope and compact finely divided material to twelve inches (12") over the top of the pipe. Compact the material to ninety-five percent (95%) of maximum density, as determined by ASTM D 698, Standard Proctor

3.05.6 BACKFILL REMAINDER OF TRENCH with excavated material up to the bottom of the specified surface restoration. Compact to ninety-eight percent (98%) of maximum density under and within two feet (2') of pavement and ninety-five percent (95%) of maximum density in other areas, as determined by ASTM D 698, Standard Proctor

3.05.7 BACKFILL TOP TWELVE INCHES (12") of the trench with soil equivalent to adjacent topsoil.

3.06 BACKFILL FOR STRUCTURES AND APPURTENANCES

3.06.1 BACKFILL after concrete or masonry has cured for seven (7) days and has been inspected and approved by Engineer. Backfill with material removed from excavation except where sand backfill is specified. Backfill material shall be as specified herein and shall not contain any debris, frozen earth, large clods, stones, or other unsuitable material. Backfill simultaneously on all sides of the structure to prevent damage at all times. Brace walls of structures as required.

3.06.2 COMPACT BACKFILL at structures to a density not less than specified for the adjacent trench.

3.06.3 TERMINATE BACKFILL at finish grade as shown on the Drawings and dispose of excess excavation material as directed by the Engineer. Prepare backfill for surface restoration as specified for adjacent trench.

3.07 BACKFILL SETTLEMENT

3.07.1 THE CONTRACTOR shall be responsible, financially or otherwise, for any and all settlement of trench and structures backfill which may occur for a period of one (1) year after Substantial Completion. Contractor shall make all necessary backfill

replacements and repairs or replacements appurtenant thereto within thirty (30) days from and after due notification by the Owner or Engineer of backfill settlement and resulting damage at any designated location or locations.

3.08 TESTING

3.08.1 THE CONTRACTOR shall be responsible for all backfill compaction density testing. Density tests shall be performed by an approved Testing Laboratory. Tests shall be performed in sufficient numbers to insure that the specified density is being obtained, in accordance with the following schedule:

<u>Depth Over Top of Pipe</u>	<u>Location of Test</u>	<u>Frequency of Test</u>
0 - 5 Feet	Surface	300 L.F.
5 - 12 Feet	Surface and 1/2 Depth	300 L.F.
Over 12 Feet	Surface, 1/3 Depth, 2/3 Depth	300 L.F.

The specific locations of each compaction density test shall be determined by the Engineer. Copies of all testing reports shall be furnished to the Engineer in accordance with the General Requirements.

END OF SECTION

SECTION 02410

CONCRETE PAVEMENT RECONSTRUCTION

1.0 GENERAL

1.01 DESCRIPTION

1.01.1 RELATED WORK SPECIFIED ELSEWHERE

Site Preparation	Section 02100
Clearing and Grubbing	Section 02110
Demolition	Section 02120
Trench Excavation and Backfill	Section 02250
Surface Restoration	Section 02900

1.01.2 WORK COVERED UNDER THIS SECTION shall consist of the removal and disposal of existing concrete pavement and the replacement of Portland cement concrete at locations shown on the Drawings and designated by the Engineer. In general, the pavement reconstruction shall be constructed where vertical displacement or failure in the existing pavement has developed or where existing pavement must be removed and replaced to match new grades, alignments, and cross sections. All pavement reconstruction shall be constructed on prepared or reconstructed subgrades in accordance with the requirements of these Specifications.

1.02 QUALITY CONTROL

1.02.1 SUBMIT Portland cement concrete mix design to the Engineer as a shop drawing.

1.02.2 CERTIFIED TEST RESULTS shall be furnished by the Contractor and obtained from the manufacturer or producer of each material used in the concrete mix. In addition, the mix portions of the concrete shall also be certified. Test results shall be required for the following:

- Aggregate
- Air-Entraining Agent
- Admixtures
- Cement
- Curing Compound
- Joint-Sealing Compound

2.0 PRODUCTS

2.01 PORTLAND CEMENT CONCRETE

2.01.1 PORTLAND CEMENT CONCRETE mix shall be as follows:

- .1 Roadways & Streets: L 65 AE
- .2 Sidewalks: SG 65 AE

L = Fractured Limestone Aggregate

SG = Sand Gravel Aggregate

65 = 6-1/2 Sack Cement Mix

AE = Air Entrained

- (a) Type I Portland cement shall be used, unless otherwise noted. Total air content for air-entrained concrete shall be $6.0\% \pm 1.0\%$ by volume.
- (b) Fine aggregate shall consist of a mixture of sand and gravel composed of clean, hard, durable, and uncoated particles.
- (c) Coarse aggregate shall be limestone and shall consist of clean, hard, durable, and uncoated particles.
- (d) Air-entrained admixtures shall meet the requirements of ASTM C 494.
- (e) The strength of concrete shall be considered satisfactory if the 7-day and 28-day compressive strength equals or exceeds 2,600 pounds per square inch and 3,500 pounds per square inch respectively.

2.02 JOINT SEALER

2.02.1 JOINT SEALER shall be of the hot-pour type conforming to ASTM D 6690. The hot-poured joint sealer shall form a resilient and adhesive compound capable of effectively sealing joints and cracks in concrete and asphalt pavements against the infiltration of moisture and foreign material throughout repeated cycles of expansion and contraction with temperature changes. The material shall not flow from the joints or be picked up by vehicle tires.

2.03 PREFORMED JOINT FILLER

2.03.1 PREFORMED JOINT FILLER shall be the nonextruding and resilient bituminous type (Fiber Type) conforming to the requirements of ASTM D 1751. Material shall be furnished in widths equivalent to the pavement thickness and shall be of the thickness specified on the Drawings.

2.04 PAVEMENT MARKINGS

2.04.1 PAINTS for roads, streets, and parking areas shall conform to Federal Specification TT-P-115. Colors shall be white and yellow as indicated. All markings shall be in accordance with the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD).

2.05 REINFORCING STEEL

2.05.1 REINFORCING STEEL (if shown or required) shall be as specified on the Standard Details. Reinforcing Steel shall be ASTM A615, 60 ksi yield grade billet-steel deformed bars with epoxy coat.

2.06 CURING MATERIALS

2.06.1 CURING MATERIALS used to protect and cure freshly-placed concrete shall be one of the following:

- .1 Liquid Membrane-Forming Compounds. Liquid membrane-forming compounds shall be white pigmented and shall conform to one of the following base compounds:

<u>Base Type</u>	<u>Conformance Designation</u>
Wax Base Curing Compound	ASTM C 309 - Type 2 Compound
Resin Base Curing Compound	AASHTO M 148 - Type 2 Compound (Sag Test Requirements Do Not Apply)
Water Soluble/Emulsion Type Linseed Oil Base Curing Compound	ASTM C 309 - Type 2 Compound (Sag Test and Drying Time Requirements Do Not Apply)
Chlorinated Rubber Base	Federal Specification TT-C-00800 (GSA-FSS) - Type II

- .2 Burlap. Burlap shall conform to AASHTO M 182 and shall weigh either 10 or 12 ounces per linear yard (40-inch basis). Burlap shall be furnished in sheets of sufficient width to permit the covering to extend over each side of the pavement for a length equal to the thickness of the pavement.
- .3 White Opaque Polyethylene Film. White opaque polyethylene film shall conform to AASHTO M 171. The reflectance shall be 60 percent minimum.

3.0 EXECUTION

3.01 PAVEMENT RECONSTRUCTION

3.01.1 PAVEMENT RECONSTRUCTION shall consist of individual sections of pavement. Thickness of the concrete reconstruction shall be the original concrete

pavement thickness plus 2 inches, with a minimum of 8 inches on residential streets and 10 inches on major streets.

3.02 CONFIGURATION OF AREAS

3.02.1 ALL PAVEMENT RECONSTRUCTION AREAS shall be rectangular with edges parallel and perpendicular to the existing joint pattern.

3.03 REMOVAL OF EXISTING PAVEMENT

3.03.1 EXISTING PAVEMENT, INCLUDING CURB, shall be removed to the limits shown on the Drawings or as designated by the Engineer.

3.03.2 CONTRACTOR shall not use a drop hammer in removing existing pavement that is to be replaced with concrete pavement reconstruction (small area). Contractor shall use only hand tools, including pneumatic tools, in removing such pavement.

3.03.3 EXISTING PAVEMENT AND CURB shall be saw cut and chipped to true lines with vertical faces. Pavement shall be broken into pieces and shall be loaded, hauled, and disposed of in approved land fill areas.

3.04 SUBGRADE PREPARATION

3.04.1 PREPARE SUBGRADE in accordance with the requirements of Section 02250, Trench Excavation and Backfill. Trim and shape finished subgrade to conform to the grade, lines, and cross sections required for the pavement section. Maintain subgrade in a dry and compacted condition until the concrete has been placed. Dampen subgrade just prior to placing concrete.

3.05 EQUIPMENT

3.05.1 ALL EQUIPMENT, TOOLS, AND MACHINERY shall be adequate for the purpose for which it is to be used and shall be maintained in a satisfactory working condition at all times. The Contractor shall be responsible for furnishing and maintaining all equipment necessary for the job conditions, including trimmers, concrete spreaders, finishing machines, foot bridges, vibrating equipment, joint cutting saws, joint filling machines, and hauling equipment. The use of hauling equipment which exceeds the statutory limitations in dimensions or wheel or axle loads shall not be permitted.

3.06 FORMS

3.06.1 ALL FORMS shall be metal, minimum 10 feet in length, and of the depth equivalent to the design thickness of the pavement at its edge. All forms shall be joined neatly and tightly and securely pinned and staked to line and grade and thoroughly tamped on both sides. Forms shall be cleaned and oiled before concrete is placed against them. Forms shall remain in place for a minimum of 12 hours after placing concrete.

3.07 PLACING CONCRETE

3.07.1 CONCRETE shall be placed only on a subgrade which has been prepared in accordance with the requirements of this Specification and approved by the Engineer. Concrete shall be deposited on the prepared subgrade in a manner which will minimize the disturbance of the steel reinforcement and so that there shall be no separation of the mortar and the aggregate and then shall be spread to the required depth and for the entire width of the pavement by approved methods, struck off, and finished as hereinafter provided. Rakes shall not be used in handling concrete. The concrete shall be deposited on the subgrade between the forms in position and in such quantity as to make a uniform layer about one inch greater than the required finished thickness. After being deposited, the concrete shall be consolidated for its full depth and width and along all joints, except planes of weakness, in accordance with the requirements stipulated elsewhere in these Specifications. The operations of depositing, spreading, and consolidating the concrete shall be conducted so that the concrete shall be smooth and dense, free from honeycomb and free from pockets of segregated aggregate. At the end of the day or in case of an unavoidable interruption of more than 30 minutes, a transverse construction joint shall be placed at the joint of stopping work provided that the section on which the work has been suspended shall not be less than ten feet in length. Sections less than ten feet in length shall be removed.

3.07.2 CONCRETE shall not be placed around manholes or other pavement appurtenances until they have been adjusted to the required grade and alignment.

3.07.3 CONCRETE shall not be placed when stormy or inclement weather prevents good workmanship. Unless authorized in writing by the Engineer, mixing and concreting operations shall be discontinued when a descending air temperature in the shade and away from artificial heat reaches 40-degrees Fahrenheit and shall not begin until an ascending air temperature in the shade and away from artificial heat reaches 35-degrees Fahrenheit. In no case shall concrete be placed upon a frozen subgrade. The pavement shall be protected against freezing as directed by the Engineer. Any concrete showing injury by freezing shall be considered unacceptable. Calcium chloride will not be used in any concrete mix to be placed with reinforcement.

3.07.4 CONCRETE shall not be placed when darkness would prevent good workmanship in placing and finishing operations. Special authorization from the Engineer must be secured if it is desired to place concrete with the aid of artificial light.

3.07.5 HOT WEATHER CONCRETING requires special limits to insure quality control of the finished pavement. Hot weather concreting shall be limited in accordance with the following criteria:

- .1 Concrete shall not be placed when the ambient air temperature exceeds 100-degrees Fahrenheit. No concrete placement may start if the ambient air temperature is 90-degrees Fahrenheit or above.
- .2 If concrete placement has begun and the ambient air temperature rises to

90-degrees Fahrenheit or above during concrete placement or at any time during the day of the placement, the curing compound or other curing method shall be applied immediately after the final finishing of the concrete.

- .3 When the ambient air temperature is between 75-degrees Fahrenheit and 100-degrees Fahrenheit, the maximum allowable temperature for the concrete mixture being placed shall be 90-degrees Fahrenheit, unless otherwise authorized by the Engineer. The Contractor shall take necessary steps to control the temperature of the concrete mix by causing the concrete mix plant to chill the water/aggregate to insure delivery and placement of the concrete at a temperature of 90-degrees Fahrenheit or below.
- .4 In event that humidity and wind conditions are such that the concrete surface may be damaged, the Engineer may halt or prohibit the placement of concrete at any temperature during hot weather.
- .5 Admixtures to retard initial set of the concrete shall be used only if authorized by the Engineer.

3.07.6 CONCRETE HEADERS extending the full depth and width of pavement shall be constructed at locations shown on the Drawings. They shall be of the cross sections and dimensions shown in the Drawings and shall be constructed of the same class of concrete used in the construction of the pavement.

3.07.7 WHEN SHOWN ON THE DRAWINGS, pavement approach slabs shall be constructed in accordance with these Specifications and on conformity with the lines, grades, and typical cross sections shown on the Drawings and shall be constructed of the same class of concrete used in the construction of the pavement.

3.08 REINFORCING STEEL

3.08.1 PLACE REINFORCING STEEL at locations shown or described on the Drawings. Keep all reinforcing steel clean and free from rust, oil, and foreign material. All steel bars shall be tied securely in place and adequately supported to remain in place during the deposition of concrete.

3.09 JOINTS

3.09.1 WHENEVER PLACEMENT OF CONCRETE is suspended for a period of over 30 minutes, a transverse construction joint shall be formed by finishing the concrete to a bulkhead made of at least two-inch material cut to the exact cross section of the pavement slab as shown on the Drawings, placed on the subgrade or foundation course perpendicular to the pavement surface and at right angles to the center line of the roadway. The bulkhead shall be shaped so that its upper edge will conform to the crown shown on the Drawings for pavement surface and placed so as to insure that it will be true to elevation and form the joint as shown on the Drawings. An edging tool

shall be used along the bulkhead to make the construction joint a regular and well-defined line. Construction joints shall not be spaced closer than 15 feet. When the concreting is resumed, the bulkhead shall be removed, care being taken not to disturb any steel or concrete placed. The fresh concrete shall be placed directly against the face of the concrete previously laid. Care shall be taken to see that the joint is well formed and finished and to see that the surfaces of the old and new concrete correspond exactly as to cross sections, grade, and alignment. The joint details shall be as shown on the Drawings. Transverse construction joints shall be cured for 72 hours before sawing the joint sealing reservoir. Immediately after sawing the joint sealing reservoir, the joints shall then be cleaned thoroughly to remove all dirt and loose material. The joints shall then be thoroughly dried and sealed.

3.09.2 WHEN EXPANSION JOINTS are indicated on the Drawings, they shall be constructed in accordance with the Standard Details. The joint material shall extend entirely through the pavement and shall be placed so that the top edge will be 1-inch below the surface of the finished pavement. The length of the expansion joint material shall vary as shown on the Drawings. The expansion joints shall be filled with joint sealing filler (hot-poured type) to within 1/4 inch of the surface of the pavement.

3.09.3 ALL CONTRACTION JOINTS spaced at intervals shown on the Drawings shall be sawed. To prevent uncontrolled cracking, the Engineer may require selected joints to be sawed as soon as the concrete becomes sufficiently hardened to permit the sawing of a clean-cut joint and to preclude the possibility of tearing and raveling. When selected contraction joints have been sawed first, the time and sequence of sawing the remaining contraction joints shall be as determined by the Engineer. The sawing of all contraction joints, regardless of sequence, shall be completed not later than 24 hours after the concrete has been placed.

3.09.4 THE SAWED JOINTS must be to the depth, spacing, and locations as specified on the Drawings. Immediately after the joints have been sawed, they shall be cleaned thoroughly to remove all dirt and loose material. The joints then shall be dried thoroughly and sealed. All joints shall be sealed not later than 120 hours after the concrete has been poured.

3.10 SEALING JOINTS

3.10.1 ALL JOINTS REQUIRED TO BE SEALED shall be filled immediately after the longitudinal and contraction joints have been sawed, cleaned, and dried. They shall be sealed immediately with joint sealing filler (hot-poured type) as specified.

3.10.2 THE JOINT SEALING FILLER shall be poured to seal the joints across the top and down the ends of the joints. A block or form shall be used to hold the poured joint-sealing material in the joint at each end until it has cooled and set.

3.10.3 THE JOINTS TO BE SEALED shall be free of all dirt, spalls, or other materials. If the concrete is cured with impervious membrane compounds, adequate precautions shall be taken to avoid application of the curing material to the surfaces of the concrete

which will be in contact with the joint-sealing filler. In the event that the curing membrane has been permitted to cover or coat any part of the joint surface which will come into contact with the joint-sealing filler, the Contractor shall remove the membrane from the affected areas. Surfaces to be sealed shall be cleaned thoroughly of all loose scale, dirt, and other foreign matter with a jet of compressed air and, if necessary, by flushing with water. If water has been used on the saw blade during the cutting operation, the cleaning shall include flushing with water by use of a high pressure jet and thoroughly drying before pouring the joint-sealing filler. All joints flushed with water shall also be thoroughly dried before pouring the joint-sealing filler.

3.10.4 THE JOINT-SEALING FILLER shall be melted uniformly and with constant stirring in an asphalt kettle of such design that direct flames are not applied to the immediate surfaces of the kettle which are in contact with the joint-sealing filler. When proper pouring consistency is attained, the joints shall be filled as shown on the Drawings through the use of a continuously circulating pressure type applicator of a design approved by the Engineer and equipped with a nozzle which will fit into the joints and fill the joints from the bottom. Precautions shall be taken to prevent spilling material on surfaces of the pavement adjacent to the joint.

3.11 FINISHING CONCRETE PAVEMENT

3.11.1 CONCRETE PAVEMENT shall be finished with the minimum of manipulation possible. Hand finishing shall be employed only on narrow or variable width sections where mechanical methods are impractical.

3.11.2 AFTER THE CONCRETE has been deposited and spread, it shall be struck off in such a manner that the crown elevation shall be 1/4-inch higher than the finished cross section of the pavement at that point and then further consolidated and finished mechanically with a power-driven machine approved by the Engineer. The addition of superficial water to the surface of the concrete to assist in finishing operations will not be permitted. After completion of the mechanical finishing and while the concrete is still plastic, the surface shall be made true and smooth with approved 10-foot straightedges supplemented by such floating as is necessary to eliminate all irregularities. Finishing operations shall not be carried on while free water is present on the surface of the concrete. Straightedges shall be set parallel to centerline and shall be lapped 1/2 their length in each successive position. High areas shall be removed and depressions shall be filled with fresh concrete and consolidated by floating with approved wooden floats not less than 3-feet long and not less than 6-inches wide. Straightedge testing shall be continued as necessary until all irregularities have been satisfactorily corrected.

3.12 PROTECTION AND CURING

3.12.1 PROTECTION AND CURING of finished concrete surfaces shall consist of wet burlap, liquid membrane-forming compounds or polyethylene film. The Contractor's method of protection and curing must be approved by the Engineer prior to start of construction.

3.13 PROVISION FOR TRAFFIC

3.13.1 THE CONTRACTOR SHALL PERFORM THE WORK in such a manner that the roadway or street is kept open to public vehicular traffic at all times while the concrete pavement reconstruction is being performed, unless approved otherwise by the Owner and Engineer. Every possible courtesy shall be shown to the traveling public. The Contractor shall provide and maintain barricades, warning signs, etc., as provided for in Section 01500, Construction Facilities and Temporary Controls.

3.14 OPENING PAVEMENT FOR USE

3.14.1 NO SECTION OF PAVEMENT SHALL BE OPENED TO TRAFFIC until approval has been given by the Engineer. The time for opening pavement will be based on the length of time the pavement is in place and on the strength of the concrete as determined from compressive-strength specimens made during the progress of the work. The Contractor's forces may be allowed on the pavement when the concrete has reached a minimum age of seven days or the concrete has developed a compressive strength of 3,000 pounds per square inch. General traffic may be allowed as soon thereafter as pavement is in condition for safe use.

3.15 QUALITY CONTROL

3.15.1 ALL CONCRETE shall be ready-mixed concrete and shall be mixed and delivered to the job site by truck mixers. Mixing truck drivers shall carry tickets for each load of concrete which shall include the name of the producer, the date, the location of the plant, name of customer, class of concrete, quantity delivered, and the time the truck was charged. The ticket shall be delivered to the Engineer or Job Foreman at the time of arrival at the placement site.

3.15.2 CONCRETE shall be delivered to the job site and discharged completely within 1-1/2 hours after the introduction of mixing water to the cement and aggregates. In hot weather, the time shall be reduced to one hour. In the event these time limits are exceeded, the concrete shall be rejected.

3.15.3 DELIVERED CONCRETE shall be tested in the field for slump, temperature, and entrained air content. The slump requirements shall be 2 inches \pm 1 inch. The air content shall be 6.0 percent \pm 1.0 percent. Concrete which does not meet these requirements shall be rejected.

3.15.4 STRENGTH TEST CYLINDERS shall be taken in the field for later testing by a laboratory. Cylinders shall be made by a testing laboratory, unless otherwise approved by the Engineer. Three cylinders shall be made for each test sample. One cylinder shall be broken at 7 days and a second cylinder shall be broken at 28 days to determine compressive strengths. Samples for strength tests shall be taken for each class of concrete not less than once a day nor less than once for each 100 cubic yards of concrete. Samples may be taken more frequently if determined to be necessary by the Engineer.

3.15.5 THE CONTRACTOR shall be responsible for all concrete samples and tests. All sampling and testing shall be performed by an approved testing laboratory. Copies of all tests shall be furnished to the Engineer in accordance with the General Requirements.

END OF SECTION

SECTION 02510

HOT MIX ASPHALT OVERLAYS AND BASE REPAIR

1.0 GENERAL

1.01 DESCRIPTION

1.01.1 RELATED WORK SPECIFIED ELSEWHERE

Demolition	Section 02120
Trench Excavation and Backfill	Section 02250
Surface Restoration	Section 02900

1.01.2 WORK COVERED UNDER THIS SECTION shall consist of pavement reconstruction and pavement surface overlaying. The work of pavement reconstruction shall consist of removal and disposal of unstable or disintegrated bituminous pavement, correction or repair of faulty subgrade conditions, construct concrete base and the placement and compaction of new hot mixed asphalt (HMA).

1.02 QUALITY CONTROL

1.02.1 SUBMIT hot mix asphalt (HMA) mix design to the Engineer as a Shop Drawing.

1.02.2 CERTIFIED TEST RESULTS shall be furnished by the Contractor and obtained from the manufacturer or producer of each material used in the hot mix asphalt (HMA) mix. In addition, the HMA mix portions shall also be certified.

1.03 QUALITY ASSURANCE

1.03.1 PERFORM WORK in accordance with State of Nebraska Department of Transportation Standards.

1.03.2 MIXING PLANT: Conform to State of Nebraska Department of Transportation Standards.

1.03.3 OBTAIN materials from the same source throughout the project.

1.04 REFERENCES

1.04.1 REFER to State of Nebraska Department of Roads Standard Specifications for Highway Construction latest edition.

1.05 ENVIRONMENTAL REQUIREMENTS

1.05.1 PLACE HOT MIX ASPHALT PAVEMENT when base is dry and free from frost.

1.05.2 DO NOT PLACE hot mix asphalt pavement unless the atmospheric temperature is at least 40 degrees Fahrenheit.

2.0 PRODUCTS

2.01 MATERIALS

2.01.1 ALL MATERIALS shall comply with State of Nebraska Department of Transportation (DOT) Standard Specifications for Highway Construction latest edition.

2.02 HOT MIX ASPHALT (HMA) MIX

2.02.1 HOT MIX ASPHALT (HMA) MIX shall be in accordance with Nebraska Department of Transportation (DOT):

- .1 Location: Major Arterials and as directed by the Engineer
 - (a) Mainline (1/2" Gradation) SPH PG 64-34
 - i Unit weight shall be 143 lbs/ft³
- .2 Location: Residential Roads
 - (a) Mainline (3/8" Gradation) SPR(fine) PG 64-34
 - i Unit weight shall be 145 lbs/ft³

2.03 JOINT SEALER

2.03.1 JOINT SEALER shall be of the hot-pour type conforming to ASTM D 3405. The hot-poured joint sealer shall form a resilient and adhesive compound capable of effectively sealing joints and cracks in asphalt pavements against the infiltration of moisture and foreign materials throughout repeated cycles of expansion and contraction with temperature changes. The material shall not be allowed to flow from the joints or be picked up by vehicle tires.

2.04 TACK COAT

2.04.1 TACK COAT shall be emulsified asphalt, Type CRS-1h. Application of the tack coat shall be at the following rates:

- .1 On paved surfaces prior to overlays - 0.10 to 0.15 gallons per square yard

3.0 EXECUTION

3.01 PAVEMENT BASE RECONSTRUCTION

3.01.1 PAVEMENT BASE RECONSTRUCTION shall consist of the removal of existing pavement, recompacting the subgrade in accordance with Section 02250, the placing and compaction of crushed rock stabilization rock, if required, and the placing and compaction of concrete base. The thickness of the new concrete base repair shall match the existing pavement thickness but shall be no less than 7-inches in residential areas and 9-inches on main arterials. In addition, four inches of stabilization rock may be placed beneath the concrete base repair as shown on the Details.

3.02 HOT MIX ASPHALT OVERLAYS

3.02.1 HOT MIX ASPHALT OVERLAYS shall consist of the placement of one or more courses of hot-mixed asphalt (HMA) on existing prepared surfaces in conformity with the lines, grades, and typical cross sections shown on the Plans or designated by the Engineer.

3.02.2 THE CONTRACTOR SHALL BE REQUIRED to perform all preparatory operations for cleaning the surface of the existing pavement or bituminous mat. The surface of the pavement or bituminous mat shall be cleaned of all dirt, foreign material, loose armor coat, deteriorated asphalt crack filler or joint sealing material, excessive unaerated armor coat, and unaerated bituminous patches.

3.02.3 A TACK COAT shall be applied after the surface of the pavement or bituminous mat is thoroughly cleaned and prepared and immediately prior to the application of the hot mix asphalt overlay. The tack coat shall be applied with a pressure applicator at the temperature specified for the type of asphalt tack coat applied. The tack coat shall be applied only if the moisture content of the surface is such as to permit satisfactory penetration and only if the atmospheric temperature is above 60-degrees Fahrenheit.

3.02.4 IF EMULSIFIED ASPHALT is used for the tack coat, allow the emulsion to "break," or cure, before placing the overlay.

3.03 REMOVAL OF EXISTING PAVEMENT

3.03.1 EXISTING PAVEMENT, INCLUDING CURB, shall be removed to the limits shown on the Drawings, or as designated by the Engineer.

3.03.2 CONTRACTOR shall not use a drop hammer in removing existing pavement that is to be replaced with concrete pavement reconstruction. Contractor shall use only hand tools, including pneumatic tools, in removing such pavement.

3.03.3 EXISTING PAVEMENT AND CURB shall be cut and chipped to true lines with vertical faces. Pavement shall be broken into pieces and shall be loaded, hauled, and disposed of in approved land fill areas.

3.04 SUBGRADE PREPARATION

3.04.1 PREPARE SUBGRADE in accordance with the requirements of Section 02250, Trench Excavation and Backfill. Trim and shape finished subgrade to conform to the grade, lines, and cross sections required for the pavement section. Maintain subgrade in a dry and compacted condition until the asphalt has been placed. Dampen subgrade just prior to placing asphalt.

3.05 EQUIPMENT

3.05.1 ALL EQUIPMENT, TOOLS, AND MACHINERY shall be adequate for the purpose for which it is to be used, and shall be maintained in a satisfactory working condition at all times. The Contractor shall be responsible for furnishing and maintaining all equipment necessary for the job conditions, including trimmers, paving machines, rollers, distributors, hauling equipment, removal equipment, and all hand tools, including tampers, rakes, shovels, and pavement cutters. The use of hauling equipment which exceeds the statutory limitations in dimensions or wheel or axle loads shall not be permitted.

3.06 PLACING ASPHALT

3.06.1 PLACING ASPHALT shall be in a continuous operation. Plant production, equipment, and delivery of material to the construction area shall be scheduled so that uninterrupted and continuous placement of asphalt occurs. At no time shall the thickness of the layers of hot mix asphalt exceed that which the equipment on the project is capable of compacting to the specified density. Unless otherwise directed by the Engineer, the entire width of the lower layer shall be placed on the total project area before any of the upper layer is constructed. In no event shall the upper layer be placed until the lower layer in the adjacent lane has been completed.

3.06.2 PLACE ASPHALT only upon a surface which is dry and free from frost. The minimum atmospheric temperature at which placement of hot mix asphalt will be permitted shall be 50-degrees Fahrenheit, providing that proper spreading, finishing, compacting and bonding is obtained. The minimum placement temperature of hot mix asphalt shall be 250-degrees Fahrenheit. Hot mix asphalt delivered at temperatures below 250-degrees Fahrenheit shall be rejected.

3.06.3 DEPOSIT ASPHALT in approved paving machines. The paving machines shall be operated at proper speed and the mat thickness and crown adjustment shall be set and regulated to produce a well-knit, uniform layer of the required cross section, density and thickness. Prior to rolling, the surface of the placed asphalt shall be checked and all irregularities in thickness and alignment shall be corrected.

3.06.4 PLACE AND FINISH hot mix asphalt by hand methods in deep, irregular or narrow sections, flumes, intersections, turnouts, driveways, etc., where it is impractical to spread and finish by use of a paving machine.

3.07 COMPACTING AND FINISHING

3.07.1 COMPACT HOT MIX ASPHALT thoroughly by rolling immediately after spreading. The number, weight, types of rollers, sequence of rolling operations, and compaction procedures shall be such that the required density and a satisfactory surface are consistently attained while the mixture is in a workable condition. The hot mix asphalt pavements shall be compacted to the minimum in-place density of laboratory Marshall density as shown below:

Base Course	95%
Surface Courses (3/4", 5/8", & 3/8" Aggregates)	98%

A testing laboratory shall cut samples of compacted hot mix asphalt for determination of density and thickness. The cost of testing shall be included in the testing allowance.

3.07.2 ALL ROLLING PROCEDURES shall be performed in accordance with standard practices. All breakdown rolling, intermediate rolling, and finish rolling operations shall be accomplished to provide maximum in-place densities and to provide a smooth surface, free of roller marks. All finished surfaces shall be true to the established crown and grade.

3.08 ACCEPTANCE AND QUALITY CONTROL

3.08.1 THE FINISHED WORK shall be checked for acceptance prior to approval. Acceptance testing shall include laboratory density and thickness tests and straightedge tests. The in-place compacted thickness will not be acceptable if the following tolerances are exceeded:

Surface Courses	±1/8"
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The smoothness of the finished surface shall be tested with a ten-foot long straightedge applied parallel with, and at right angles to, the centerline of the paved area. Surfaces will not be acceptable if the following tolerances for smoothness are exceeded:

Surface Courses	±1/8"
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3.09 PROVISION FOR TRAFFIC

3.09.1 THE CONTRACTOR shall perform the work in such a manner that the roadway or street is kept open to public vehicular traffic at all times, if at all possible. Traffic may be rerouted on detours if approved by the Engineer and Owner. Every possible courtesy shall be shown to the traveling public. The Contractor shall provide and maintain barricades, warning signs, and detour signs as required by the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD), current edition.

END OF SECTION

SECTION 02600

WATER MAINS AND APPURTENANCES

1.0 GENERAL

1.01 DESCRIPTION

1.01.1 RELATED WORK SPECIFIED ELSEWHERE

Site Preparation	Section 02100
Clearing and Grubbing	Section 02110
Pipe Boring and Jacking	Section 02650
Horizontal Directional Drilling	Section 02655
Surface Restoration	Section 02900

1.02 QUALITY ASSURANCE

1.02.1 ALL WATER MAINS AND SYSTEM APPURTANCES shall conform to the following standards:

- .1 RECOMMENDED STANDARDS FOR WATER WORKS, 2012 Edition (Ten State Standards) A Report of the Water Supply Committee of the Great Lakes--Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers.
- .2 TITLE 179 – PUBLIC WATER SYSTEMS Nebraska Department of Health and Human Services (DHHS)

1.03 SUBMITTALS

1.03.1 SHOP DRAWINGS shall be submitted to Engineer. Submittals shall include, but are not limited to, the following:

Piping & Fittings
Valves, Valve Boxes, & Covers
Hydrants
Tracer Wire

2.0 PRODUCTS

2.01 PIPE

2.01.1 DUCTILE IRON PIPE (D.I.P.) shall be pressure class 350 and of the size called for on the Bid Form, and shall conform to the American National Standards Institute (ANSI) and American Water Works Association (AWWA) standards C151/A21.51 and C150/A21.50. Joints for ductile iron pipe shall conform to ANSI/AWWA C111/A21.11.

Ductile iron pipe and fittings shall be cement mortar lined in conformance with ANSI/AWWA C104/A21.4.

.1 MINIMUM PIPE SIZE shall be 6-inches in diameter.

2.01.2 COPPER PIPE shall be soft temper, Type "K", with compression or flared-type joints for water-service lines.

2.02 POLYETHYLENE ENCASEMENT

2.02.1 POLYETHYLENE ENCASEMENT shall be low density, flat tube, virgin polyethylene film provided meets or exceeds the requirements of AWWA/ANSI C105/21.05 on all ductile iron pipe and fittings unless otherwise specified on the drawings. Thickness shall be eight (8) mil minimum.

2.03 FITTINGS

2.03.1 DUCTILE IRON FITTINGS shall be conforming to ANSI/AWWA C153/A21.53, compact size and shall be Class 350 psi working pressure. Fittings shall be equipped with mechanical joint ends. All fittings shall have standard tar coating exterior and cement lined interior.

2.04 RETAINER GLANDS

2.04.1 RETAINER GLANDS shall conform to the requirements of AWWA C111/A21.11 or AWWA C153/A21.53. Restraint devices shall consist of multiple gripping wedges incorporated into a follower gland. Gland body, wedges, and wedge components shall be cast from grade 65-45-12 durable iron material in accordance with ASTM A536.

2.05 DEFECTIVE PIPE AND FITTINGS

2.05.1 ANY PIPE OR ANY FITTING, valve, or special found to be defective in materials or workmanship shall be rejected.

2.06 THRUST BLOCKING

2.06.1 THRUST BLOCKING for unbalanced thrust forces in the piping shall consist of cast-in-place concrete with a compressive strength of 4,000 pounds per square inch at 28 days. Tie rods shall be required and shall be steel and coated to prevent corrosion.

2.07 DISINFECTION

2.07.1 DISINFECTION of piping, fittings, valves, etc., shall be accomplished through the use of Hypochlorites conforming to AWWA B300 or through the use of Chlorine conforming to FS BBC-120. All disinfecting agents to be NSF 60 certified.

2.08 TRACER WIRE

2.08.1 TRACER WIRE shall be #12 AWG solid strand, 250 lb average tensile break load, 30 mil high molecular-high density polyethylene jacket complying with ASTM D-1248. Copperhead Industries 1230-SF or equal.

2.08.2 DIRECTIONAL BORE OR JACKED TRACER WIRE shall be #12 AWG solid strand extra high strength horizontal directional drill wire, 1,000 lb (min.) average tensile break load, 45 mil high molecular-high density polyethylene jacket complying with ASTM D-1248 Copperhead Industries 1245-HS or equal.

2.08.3 TRACER WIRE COLOR coating shall be blue for all potable water construction.

2.08.4 CONNECTORS shall 3M DBR or equal, connect two or more wires, be watertight and provide electrical continuity.

2.09 TRACER WIRE ACCESS BOX

2.09.1 TRACER WIRE ACCESS BOX shall have a cast iron locking lid with a standard pentagon head key wrench with a blue lid and word "WATER." Tracer wire access box tube material shall be high grade ABS in accordance with ASTM D-1788. Tracer wires shall be stripped and attached to the stainless steel screws and mounted to the underside of the lid. Sufficient slack shall be left in wire length so cover can be lifted with wire intact. Tracer wire access box shall be located directly in front of the fire hydrant, main-line valves or where indicated on the drawings and be set to grade in concrete. Tracer wire access box shall be VALVCO TWAB, Light-Duty Copperhead SnakePit or P200NFG, Bingham & Taylor equal.

2.10 VALVES

2.10.1 GATE VALVES shall conform to the requirements of AWWA Standard C509/C515 and ANSI Standard A21.11 and shall be Resilient Seat, iron body with modified wedge disc, NRS type. Valves shall be able to withstand working pressures and test pressures of 200 pounds per square inch and 400 pounds per square inch respectively.

2.10.2 BUTTERFLY VALVES shall conform to the requirements of ANSI / AWWA Standard C504 and ANSI Standard A21.11. Butterfly valve shall be Mueller Linesal III 150B or approved equal. Maximum working pressure shall be 150 pounds per square inch, and hydrostatic test pressure shall be 200 pounds per square inch.

2.11 VALVE BOXES AND COVERS

2.11.1 WATER MAIN VALVE BOXES shall be cast iron, "Buffalo" type, valve boxes. Valve boxes shall have two-piece screw-type extension adjustment sleeve and with flared base for the intended for the size of valve which it is to be used and depth of cover as required. Covers shall have the word "WATER" cast in them. Valve boxes shall be Tyler Union 6850 Series boxes or equal.

2.12 CURB STOP BALL VALVES AND BOXES

2.12.1 CURB STOP BALL VALVES shall be per the size shown on the Drawings (3/4-inch min.) for copper service. Curb Stop shall be Ford Meter Box Co. B44-NL ball valve, A.Y.McDonald Co 76100-22 ball valve; or Mueller Co. 300-N ball valve or equal.

2.12.2 Curb boxes shall be cast-iron extension type with Minneapolis pattern base with 1½-inch inside diameter upper section. Curb box shall be flush with the ground and cast in 12-inch square concrete pad 8 feet from back of curb or cast in the sidewalk.

2.13 CORPORATION STOPS

2.13.1 CORPORATION STOPS shall be per the size shown on the Drawings (3/4-inch min.) for copper service. Corporation stops shall be Ford Meter Box Co. FB1000-NL ball valve; A.Y.McDonald Co. 74701B-22 ball valve; or Mueller Co. 300-N ball valve or equal.

2.14 FIRE HYDRANTS

2.14.1 FIRE HYDRANTS shall conform to the requirements of AWWA Standard C502. Fire hydrants shall be Mueller Company, Super Centurion 250 3-way Fire Hydrant, Catalog No. A-423. The hydrant shall have one pumper nozzle and two hose nozzles.

- .1 FIRE HYDRANTS shall be "RED" in color.
- .2 MINIMUM FIRE HYDRANT LEAD shall be 6-inches in diameter.
- .3 PROVIDE FIRE HYDRANT on all dead end mains for flushing. Alternate flushing appurtenances shall be approved by the City Engineer.

2.14.2 DRAINAGE AGGREGATE shall be 1-inch diameter washed river gravel or approved equal.

2.15 FIRE HYDRANT GUARD

2.15.1 FIRE HYDRANT GUARD shall be Mueller Hydrant Defender Security Device manufactured to fit installed fire hydrants, as specified. FIRE HYDRANT GUARD shall also include lock recommended by manufacturer."

2.16 VALVE MANHOLES

2.16.1 VALVE MANHOLES shall be used for all valves where designated on the Drawings.

2.16.2 MANHOLES shall be 60-inches diameter (minimum), precast, flat-top manhole sections meeting the requirements of ASTM C 478.

2.16.3 MANHOLE FRAME AND COVER shall be as specified on the Drawings.

2.17 AIR RELEASE VALVES

2.17.1 AIR RELEASE VALVES shall be automatic float operated valves designed to exhaust large quantities of air during the filling of a piping system and close upon liquid entry. The valve shall open during draining or if a negative pressure occurs. The valve shall also release accumulated air from a piping system while the system is in operation and under pressure. The valve shall perform the functions of both Air Release and Air/Vacuum Valves and furnished as a single body type.

- .1 Clean water Combination Air Valves shall be Series 200C as manufactured by Val-Matic Valve and Manufacturing Corporation, Elmhurst, IL, USA or approved equal

2.17.2 SINGLE BODY AIR VALVES shall have full size NPT inlets and outlets equal to the nominal valve size. Air valve shall have a maximum working pressure of 200 psi. The valve shall be constructed of ASTM A126 Class B cast iron body and cover, stainless steel trim and float, with a Buna-N seat for positive seating.

2.18 YARD HYDRANT

2.18.1 YARD HYDRANT shall be automatic draining, backflow protected, frost proof yard hydrant with a maximum working pressure of 100 psi. Yard hydrant shall be lever control, galvanized pipe with a 1/8-inch drain hole and have a heavy-duty solid brass 3/4" hose adapter. Yard hydrant shall have a security locking eye for a padlock. Yard hydrant shall be WoodFord Model Y2 or equal.

3.0 EXECUTION

3.01 PIPE AND FITTINGS

3.01.1 INSTALL PIPE, FITTINGS, AND APPURTENANCES in conformance with AWWA Standard C600. Install pipe and fittings in trenches with a minimum cover of five feet over the top of pipe or as otherwise shown on the Drawings or as directed by the Engineer. Pipe shall not be installed in or under water and no pipe or fittings shall be installed when the trench or weather conditions are unfavorable for satisfactory work. Lay pipe in trenches and support each section of pipe by undisturbed earth along the full length of the pipe barrel, with recesses dug to receive bells and other joints. Close the ends of the installed pipe with watertight plugs during nights and non-working days. Joint deflections shall not exceed the pipe manufacturer's maximum pipe deflections and, if necessary, the Contractor shall install special bends. Inspect and clean each pipe section to remove all dirt and foreign material prior to assembly of all joints. Cutting of pipe must be performed according to the recommendations of the pipe manufacturer to insure that all cuts are square and beveled.

3.01.2 PIPE INSTALLATION shall be in accordance with the following standards:

- .1 For ductile iron pipe, AWWA Standard C600-10, Installation of Ductile Iron

Water Mains and Their Appurtenances

3.02 UNDERWATER CROSSINGS

3.02.1 UNDERWATER CROSSINGS shall be constructed in accordance with Section 02655.

3.03 TRACER WIRE

3.03.1 TRACER WIRE shall be installed on all water mains and appurtenances. The wire shall be installed on in such a manner to be able to properly trace all mains without loss or deterioration of signal.

3.03.2 TRACER WIRE shall be laid flat and securely affixed to the pipe at 10 foot intervals. Contractor shall protect wire from damage during execution of work.

3.03.3 DIRECTIONAL BORE TRACER WIRE shall be laid flat and securely affixed to the pipe at 5 foot (min.) intervals.

3.03.4 TRACER WIRE shall be extended a minimum of 6 feet to all appurtenances and water main end caps, coiled and secured to appurtenances for future connections.

3.03.5 TRACER WIRE LOCATOR ACCESS locations shall be installed at the nearest valve box and/or fire hydrant. Access shall not exceed one block or 800 feet. Tracing wire shall be taped to the main during installation to prevent separation in the trench.

3.03.6 TRACER WIRE CONTINUITY TESTING shall be performed by the City's Operator in the presence of the Engineer. If defects are found, Contractor shall repair or replace failed segment of the wire and re-test for continuity.

3.04 POLYETHYLENE ENCASEMENT

3.04.1 Encase all ductile iron pipe in polyethylene. The polyethylene shall be furnished in either tube or sheet form. Installation shall be per the requirements of the American National Standard for Polyethylene Encasement for Ductile Iron Pipe Systems (ANSI/AWWA C105).

3.04.2 All joints and fittings (valves, tees, bends, reducers, offsets, etc.) shall have polyethylene encasement installed per manufacturer's requirements and procedures. The polyethylene encasement shall be installed with a minimum lap of one (1) foot at joints. Tape the polyethylene encasement every three (3) feet and at joints sufficiently to prevent soil from coming into contact with the pipe. Carefully place the polyethylene encasement around the pipe and fittings and carefully backfill to prevent tears and punctures. Promptly repair all tears and punctures in the polyethylene per manufacturer's recommendations.

3.04.3 When connecting to or tapping into an existing or new polyethylene encased pipe, prepare the site per ANSI/AWWA C105 requirements. All cuts and repairs to the

polyethylene wrap shall be per ANSI/AWWA C105. Polyethylene wrap cut away to allow the connection or tap shall be replaced and the repair material shall have the required lap and shall be taped securely to the pipe.

3.05 THRUST BLOCKS

3.05.1 INSTALL THRUST BLOCKS where unbalanced thrust forces occur in the piping system. Locations include, but are not limited to, bends, reducers, tees, valves, wyes, offsets, dead-ends, and hydrants. Concrete-bearing blocks shall be cast-in-place with overall dimensions to be based upon trench size, soil bearing strength, and pressure in the pipe. Placement of the bearing surface shall be against undisturbed soil and concrete shall not be poured on joints.

3.06 RETAINERS

3.06.1 INSTALL RETAINERS in accordance with the manufacturer's instructions as indicated on the drawings.

3.07 PRESSURE TESTS

3.07.1 PIPE, FITTINGS, VALVES, and appurtenances shall be hydrostatically pressure tested by the Contractor. The Engineer shall specify the test pressure, but it shall not be less than 1-1/2 times the normal operation pressure at the lowest elevation in the test section. The test pressure shall be maintained by the Contractor for no less than two hours to permit a complete inspection of the pipe sections and joints for leaks. Should any leaks be detected, the Contractor shall repair the leaks or replace defective pipe, fittings, valves, and appurtenances or defective work. The pressure test shall then be repeated until the pipe section is acceptable to Engineer. Pressure testing shall be in conformance with AWWA C600. The Contractor shall provide a tap and corporation stop on the main to be tested to perform all pressure testing operations.

3.08 PRESSURE AND LEAKAGE TESTS

3.08.1 PRESSURE AND LEAKAGE TESTS shall be performed in accordance with AWWA C600. No pipe shall be accepted until all tests have been run and the results are within tolerances specified in the standard. The hydrostatic test shall be at least two-hour duration.

3.08.2 AFTER PIPE IS LAID, it shall be subjected to a hydrostatic pressure of 1.5 times the working pressure at the lowest elevation in the test section or at a pressure designated by the Engineer. Each valved section of pipe shall be slowly filled with water and the specified test pressure, based on the elevation of the lowest point of the line under test and corrected to the elevation of the test gauge, shall be applied by means of a pump. Stabilize the system at the test pressure before conducting the leakage test.

3.08.3 REMOVE ALL AIR from the section of the line being tested before running the test. If necessary, the Contractor shall install corporation cocks at all necessary points to expel the air as the line is filled with water.

3.08.4 LEAKAGE shall be defined as the maximum quantity of makeup water that must be added into the pipe section to maintain pressure within five pounds per square inch of the specified test pressure after the pipe has been filled with water and the air has been expelled. Leakage shall not be measured by a drop in pressure in the test section over a period of time.

3.08.5 MAXIMUM ALLOWABLE LEAKAGE shall be determined by the following formula:

$$L = \frac{SD\sqrt{P}}{148,000}$$

Where:

- L = Allowable leakage (makeup water), in gallons per hour.
- S = Length of pipe tested, in feet.
- D = Nominal diameter of the pipe, in inches.
- P = Average test pressure during the leakage test, in pounds per square inch (gauge).

- .1 The formula is based upon a testing allowance of 10.49 gallons per day, per mile of pipe, per inch of nominal diameter at a pressure of 150 pounds per square inch.
- .2 No pipe installation shall be accepted if the quantity of makeup water is greater than that determined by the above formula, and/or by values of testing allowance shown in the following table:

ALLOWABLE MAKEUP WATER PER 1,000 FEET OF PIPELINE GALLONS PER HOUR								
Ave. Test Pressure (psi)	Nominal Pipe Diameter (Inches)							
	4	6	8	10	12	14	16	18
200	0.38	0.57	0.76	0.96	1.15	1.34	1.53	1.72
175	0.36	0.54	0.72	0.89	1.07	1.25	1.43	1.61
150	0.33	0.50	0.66	0.83	0.99	1.16	1.32	1.49

125	0.30	0.45	0.60	0.76	0.91	1.06	1.21	1.36
100	0.27	0.41	0.54	0.68	0.81	0.95	1.08	1.22

3.08.6 ACCEPTANCE shall be determined on the basis of allowable leakage. If any test of laid pipe discloses leakage greater than that specified above, the Contractor shall, at his own expense, locate and make approved repairs as necessary until the leakage is within the specified allowance. All visible leaks are to be repaired, regardless of the amount of leakage.

3.09 DISINFECTION

3.09.1 DISINFECTION of water mains, including piping, fittings, valves, and appurtenances shall be in accordance with AWWA C651. Keep piping to be disinfected isolated from lines in service and from points of use. Utilize one of the following methods:

- .1 Continuous-Feed Method (After Water Main Installation)
- .2 Tablet Method (During Water Main Installation)

3.09.2 A MINIMUM OF TWO CONSECUTIVE satisfactory water samples taken at least 24 hours apart for bacteriological quality tests, shall show absence of coliform bacteria for each sample location. Sample locations shall be at the end of each pipe section, at every branch off of the main, and at every 1,200 feet along the pipe section. All water mains shall be disinfected prior to being placed into service. After disinfection, have water samples tested by a state-approved laboratory for bacterial acceptance and submit results to the Engineer. Upon completion of disinfection, flush the new main and discharge all test water from the system.

3.10 FLUSHING

3.10.1 COORDINATE FLUSHING with Water System Operator.

3.10.2 FLUSH MAINS with potable water and obtain a minimum flushing velocity of 3 feet per second. Flush mains until chlorine residual equal that of the existing water supply system.

3.10.3 PROTECT public and private property from damage during flushing operations.

3.11 SEPARATION DISTANCES FROM CONTAMINATION SOURCES

3.11.1 INSTALL WATER MAINS to provide a horizontal and vertical separation from gravity sanitary, storm sewers, force mains, septic tanks, and sewer manholes as specified below. All deviations from the minimum standards shall be reviewed by the Nebraska Department of Health and Human Services (DHHS) and in accordance with DHHS Design and Installation Guide for Water Main and Sanitary/Storm Sewer Separations.

3.11.2 WATER MAINS shall be separated from gravity sewers by a horizontal distance of at least 10 feet. If the required separation distance cannot be met, the Contractor shall notify the Engineer of the condition. The Contractor may proceed with the installation at the direction of the Engineer as follows:

- .1 The water main is placed in a separate trench or in the same trench on a bench of undisturbed earth at a bottom of the water main is a minimum 18-inches above the top of the gravity sewer.
- .2 The sewer must be replaced with water main materials meeting both a minimum pressure rating of 150 pounds per square inch and the requirements of this Section 02600 of the Standard Specifications.

3.11.3 WATER MAINS shall be separated from sewer force mains by a horizontal distance of at least 10 feet and a minimum vertical separation of 18-inches when measured from the outside of the water main to the outside of the sewer force main.

3.11.4 VERTICAL SEPARATION of water mains crossing above and below sewers or force mains should be at least 18 inches when measured from the outside of the water main to the outside of the sewer.

3.11.5 AT CROSSINGS, one full length of water pipe shall be located so both joints are as far from the sewer as possible. The water and sewer pipes must be adequately supported and have watertight joints. A low permeability soil shall be used for backfill material within ten feet of the point of crossing.

3.11.6 NO WATER PIPE shall pass through or come in contact with any part of a sewer manhole or structure.

3.12 CUTS IN PAVEMENTS AND SIDEWALKS

3.12.1 REPLACE, REPAIR, OR PATCH existing slabs, pavements, sidewalks, and all weather surfacing disturbed by the construction activity. The Contractor shall be required to match the existing surfacing unless otherwise directed by the Engineer or indicated on the Drawings.

3.13 SERVICE-LINE TAPS

3.13.1 ALL SERVICE-LINE TAPS shall be performed by the Contractor under the supervision of the City's Water System Operator.

3.14 TESTING

3.14.1 THE CONTRACTOR shall be responsible for all pressure tests, leakage tests, and disinfection tests. If the Contractor does not have the means to perform the tests, they shall be performed by an approved testing laboratory. Copies of all test reports shall be submitted to the City Engineer.

3.15 PLACING WATER MAIN INTO SERVICE

3.15.1 COORDINATE with Water System Operator after receiving approval from the City Engineer to place the completed water main into service.

END OF SECTION

SECTION 02650

BORING AND JACKING

1.0 GENERAL

1.01 DESCRIPTION

1.01.1 WORK COVERED IN THIS SECTION shall consist of furnishing and installing a pipeline by horizontal bores, by cutting, hand mining, or boring an opening in the soils material and simultaneously forcing the casing pipe through it with hydraulic jacks beneath existing railroad tracks and/or paved road surfaces. Boring and Jacking shall be accomplished dry mechanical auger boring method without jetting, sluicing or wet boring.

1.01.2 RELATED WORK SPECIFIED ELSEWHERE:

Site Preparation	Section 02100
Trench Excavation and Backfill	Section 02250
Water Mains and Appurtenances	Section 02600
Horizontal Directional Drilling	Section 02655
Surface Restoration	Section 02900

1.02 SUBMITTALS

1.02.1 SHOP DRAWINGS shall be submitted to the Engineer. Submittals shall include, but are not limited to, the following:

- Casing Pipe
- Carrier Pipe
- Casing Spacers
- Work Plan

1.03 COORDINATION OF THE WORK

1.03.1 NO WORK SHALL COMMENCE until Engineer has obtained all approved permits and required submittals.

1.03.2 CONTRACTOR shall obtain all required protective liability insurance policies as required by the Permitting Agency.

1.03.3 ADVANCE NOTICE shall be given to the respective authority prior to entering the property and performing work.

1.03.4 INSTALL all required safety, precautionary and protective devices as required by the Railroad prior to proceeding with Work.

2.0 PRODUCTS

2.01 CASING PIPE

2.01.1 GENERAL USE CASING PIPE as shown on the Drawings

- .1 CASING PIPE DIAMETER shall be a minimum of one-inch larger than the largest outside diameter of the carrier pipe.

2.01.2 CASING PIPE shall be steel, with a minimum yield strength of 35,000 pounds per square inch and capable of meeting E-80 loadings. Steel casing shall meet the requirements of ASTM A 139/A 139M, Grade B; ASTM A 252, Grade 2. The casing shall be welded or seamless. The casing diameter and wall thickness shall be as indicated below:

Pipe Diameter (")	Casing Diameter (")	Wall Thickness (")	
		Under Highway	Under Railroad
4-6	12	0.188	0.250
8	16	0.188	0.281
10	20	0.250	0.344
12	24	0.281	0.375
14	26	0.281	0.406
16	28	0.312	0.438
18	30	0.312	0.469
20-24	36	0.344	0.531

2.01.3 JOINTS shall be full penetrating welds around the circumference of the pipe conforming to American Welding Society Code D1.1M/D1.1.

2.01.4 Upon approval of the Engineer, an interlocking casing pipe connection system may be used in lieu of field welding the sections of casing pipe.

2.02 WATER MAIN CARRIER PIPE

2.02.1 WATER MAIN CARRIER PIPE shall be Restrained Joint (RJ) Ductile Iron Pipe (D.I.P.) able to withstand 350 PSI hydrostatic pressure and thrust for fittings without thrust blocks and capable of being deflected 4° degrees.

- .1 Approved Products and Manufacturers may include but not limited to the following:
 - (a) "Lok-Ring" and "Flex-Ring" by American Cast Iron Pipe Company
 - (b) "TR Flex" by U.S. Pipe Company
 - (c) "Super-Lock" by Clow Company
 - (d) "Snap-Lok" by Griffin Pipe Company

2.02.2 WATER MAIN CARRIER PIPE shall meet the minimum requirements specified in Section 02600, Water Mains as directed by the City Engineer.

2.03 CASING SPACERS

2.03.1 CASING SPACERS shall be center-restrained Polyvinyl Chloride (PVC) conforming to ASTM D 149 or High Density Polyethylene Pipe (HDPE) conforming to ASTM D 638 and shall be abrasion resistant polymer with a low coefficient of friction. Fasteners shall be Type 304 stainless steel conforming to ASTM A 193.

- .1 CCI Pipeline Systems Model CSP or equal.

2.03.2 Wood skids are not allowed

2.04 CASING END SEAL

2.04.1 CASING END SEAL shall be manufactured synthetic rubber casing end seal with a minimum 1/8-inch thickness with stainless steel bands and fasteners.

- .1 CCI Pipeline Systems Model ESW or equal.
- .2 Advanced Product & Systems, Inc. (APS) Model AW wraparound or equal.

2.04.2 Concrete casing end seals are not allowed.

3.0 EXECUTION

3.01 GENERAL

3.01.1 CONTRACTOR shall take all necessary precautions to ensure against damage to existing railroad property, highway and road surfaces, or other work or facilities which are to remain in place. Repair of any damage shall be the responsibility of the Contractor.

3.01.2 CONTRACTOR shall be responsible for the protection of all utilities in and around the work to take place. Locate and mark, or have the respective utility companies locate and mark, all underground and overhead utilities that might be within 20 feet of the bore path. Contractor shall not commence boring operations until the location of all underground utility within the work area have been verified. The Contractor shall be responsible for repairing all damage to utility lines caused by his operations.

3.02 PREPARATION

3.02.1 CONTRACTOR shall be responsible for laying out and staking all of his work. Exercise care to establish all grades, lines, and levels in accordance with recognized surveying practices prior to digging bore pits and making horizontal bores. Locate all survey control, bench marks, monuments, and other reference points prior to beginning

the work and provide protection throughout the construction period. Replace same if disturbed or destroyed.

3.03 RAILROAD UNDERCROSSING

3.03.1 RAILROAD UNDERCROSSING shall meet the requirements of the Union Pacific Railroad Company (UPRR). The face of the boring pits shall be a minimum of 30 feet from the edge of the nearest track(s) to be bored and cased.

3.04 HIGHWAY UNDERCROSSING

3.04.1 HIGHWAY UNDERCROSSING shall meet the requirements of the Nebraska Department of Roads.

3.05 CONSTRUCTION

3.05.1 EXCAVATE BORE PITS, SHAFTS in locations as shown on the Drawings or as required to complete the Work. Size pits and shaft to safely and properly perform the Work. Grade and shape spoil piles to drain and protect adjacent properties from ponding drainage.

3.05.2 JACK CASING PIPE with an auger rotating within pipe and remove spoils.

3.05.3 MAINTAIN face of cutting head to preclude free flow of soil material.

3.05.4 OVERCUT OF HEAD shall be no more than ½-inch of the outside diameter of the casing pipe to minimize ground settlement.

3.05.5 CONTROL LINE AND GRADE of casing pipe during boring operations.

3.05.6 WELD STEEL PIPE CASING as required herein.

3.05.7 CONTRACTOR shall be solely responsible for successfully completing the boring operation in accordance with the Drawings. If necessary, the Contractor shall withdraw, abandon or restart as required to complete the bore at no additional cost to the Owner.

3.06 INSTALLATION

3.06.1 INSTALLATION OF WATER MAIN CARRIER PIPE shall be as specified in Section 02600, Water Mains and Appurtenances and paragraph 2.02.

3.06.2 INSTALL END SEALS per manufacturers recommendations

3.06.3 SEAL CARRIER PIPE ENDS until they are connected to the remaining piping system.

3.06.4 BACKFILL BORE PITS, SHAFTS in accordance with Section 02250, Trench Excavation and Backfill compaction requirements.

3.07 FIELD QUALITY CONTROL

3.07.1 MAINTAIN LINE AND GRADE following tolerances:

.1 PRESSURIZED PIPE

(a) Horizontal 6"

(b) Vertical 3"

3.07.2 DEVIATION FROM LINE AND GRADE may be cause for rejection. Provide adequate clearances from other utilities or tracks for proper installation of the pipe.

3.08 ACCEPTANCE TESTING

3.08.1 ACCEPTANCE TESTING OF WATER MAIN CARRIER PIPE shall be as specified in Section 02600, Water Mains and Appurtenances.

END OF SECTION

SECTION 02655

HORIZONTAL DIRECTIONAL DRILLING

1.0 GENERAL

1.01 DESCRIPTION

1.01.1 WORK COVERED IN THIS SECTION shall consist of furnishing and installing a pipeline by horizontal directional drilling (HDD), by cutting, hand mining, or boring an opening in the soils material beneath existing paved road surfaces or other locations shown on the drawings.

1.01.2 RELATED WORK SPECIFIED ELSEWHERE

Site Preparation	Section 02100
Trench Excavation and Backfill	Section 02250
Water Mains and Appurtenances	Section 02600
Surface Restoration	Section 02900

1.02 SUBMITTALS

1.02.1 SHOP DRAWINGS shall be submitted to the Engineer. Submittals shall include, but are not limited to, the following:

Work Plan
Equipment
Materials

1.03 COORDINATION OF THE WORK

1.03.1 NO WORK SHALL COMMENCE until Engineer has obtained all approved permits and required submittals.

1.03.2 ADVANCE NOTICE shall be given to the respective authority prior to entering the property and performing work.

1.03.3 INSTALL all required safety, precautionary and protective devices as required by the Railroad prior to proceeding with Work.

2.0 PRODUCTS

2.01 GENERAL

2.01.1 DIRECTIONAL BORING EQUIPMENT shall consist of a directional boring rig of sufficient capacity to perform the bore and pull back the pipe, a boring fluid mixing & delivery system of sufficient capacity to successfully complete the crossing, a guidance

system to accurately guide boring operations and trained and competent personnel to operate the system. All equipment shall be in good, safe operating condition with sufficient supplies, materials and spare parts on hand to maintain the system in good working order for the duration of this project.

2.02 BORING SYSTEM

2.02.1 DIRECTIONAL BORING MACHINE shall consist of a hydraulically powered system to rotate, push and pull hollow drill pipe into the ground at a variable angle while delivering a pressurized fluid mixture to a guidable drill (bore) head. The machine shall be anchored to the ground to withstand the pulling, pushing and rotating pressure required to complete the crossing. The hydraulic power system shall be self-contained with sufficient pressure and volume to power boring operations. Hydraulic system shall be free of leaks. Rig shall have a system to monitor and record maximum pull-back pressure during pull-back operations. The rig shall be grounded during boring and pull-back operations. Sufficient spares shall be kept on hand for any break-downs which can be reasonably anticipated.

2.02.2 BORE HEAD shall be steerable by changing its rotation and shall provide the necessary cutting surfaces and boring fluid jets.

2.02.3 MUD MOTORS (if required) shall be of adequate power to turn the required boring tools.

2.02.4 DRILL PIPE: Shall be constructed of high quality 4130 seamless tubing, grade D or better, with threaded box and pins. Tool joints should be hardened to 32-36 RC.

2.03 GUIDANCE SYSTEM

2.03.1 GUIDANCE SYSTEM shall be of a proven type and shall be setup and operated by personnel trained and experienced with this system. The Operator shall be aware of any magnetic anomalies and shall consider such influences in the operation of the guidance system if using a magnetic system.

2.04 BORING FLUID (MUD) SYSTEM

2.04.1 MIXING SYSTEM: A self-contained, closed, boring fluid mixing system shall be of sufficient size to mix and deliver boring fluid composed of bentonite clay, potable water and appropriate additives. Mixing system shall be able to molecularly shear individual bentonite particles from the dry powder to avoid clumping and ensure thorough mixing. The drilling fluid reservoir tank shall be sized for adequate storage of the mud. Mixing system shall continually agitate the boring fluid during boring operations.

2.04.2 BORING FLUIDS shall be composed of clean water and an appropriate additive. Water shall be from a clean source with a pH of 8.5 - 10. Water of a lower pH or with excessive calcium shall be treated with the appropriate amount of sodium carbonate or

equal. The water and additives shall be mixed thoroughly and be absent of any clumps or clods. No hazardous additives may be used. Boring fluid shall be maintained at a viscosity sufficient to suspend cuttings and maintain the integrity of bore wall.

2.04.3 DELIVERY SYSTEM: The mud pumping system shall have a minimum capacity to supply mud in accordance with the drilling equipment pull-back rating at a constant minimum pressure. The delivery system shall have filters in-line to prevent solids from being pumped into the drill pipe. Connections between the pump and drill pipe shall be relatively leak-free. Used boring fluid and boring fluid spilled during boring operations shall be contained and properly disposed of. A berm, minimum of 12" high, shall be maintained around boring equipment, boring fluid mixing system, entry and exit pits and boring fluid recycling system (if used) to prevent spills into the surrounding environment. Pumps and or vacuum truck(s) of sufficient size shall be in place to convey excess boring fluid from containment areas to storage facilities.

2.05 OTHER EQUIPMENT:

2.05.1 PIPE ROLLERS, if required, shall be of sufficient size to fully support the weight of the pipe while being hydro-tested and during pull-back operations. Sufficient number of rollers shall be used to prevent excess sagging of pipe.

2.05.2 HYDRAULIC OR PNEUMATIC PIPE RAMMERS OR PULLERS may only be used if necessary and with the authorization of Engineer.

2.05.3 OTHER DEVICES OR UTILITY PLACEMENT SYSTEMS for providing horizontal thrust other than those previously defined in the preceding sections shall not be used unless approved by the Engineer prior to commencement of the work. Consideration for approval will be made on an individual basis for each specified location. The proposed device or system will be evaluated prior to approval or rejection on its potential ability to complete the utility placement satisfactorily without undue stoppage and to maintain line and grade within the tolerances prescribed by the particular conditions of the project.

2.06 WATER MAIN PIPE

2.06.1 WATER MAIN PIPE shall be Restrained Joint (RJ) Ductile Iron Pipe (D.I.P.) able to withstand 350 PSI hydrostatic pressure and thrust for fittings without thrust blocks and capable of being deflected 4° degrees.

- .1 Approved Products and Manufacturers may include but not limited to the following: Restrained Joint pipe shall be:
 - (a) "Lok-Ring" and "Flex-Ring" by American Cast Iron Pipe Company
 - (b) "TR Flex" by U.S. Pipe Company
 - (c) "Super-Lock" by Clow Company

(d) "Snap-Lok" by Griffin Pipe Company

2.07 ALTERNATE WATER MAIN PIPE

2.07.1 ALTERNATE WATER MAIN CARRIER PIPE only with written direction by the City Engineer and as indicated on the Bid Form.

2.07.2 WATER MAIN PIPE shall be Restrained Joint (RJ) PVC and shall comply with AWWA C900-07, Pressure Class 305, DR 14. Pipe materials and joints shall be rated for 300 psi or greater.

2.07.3 WATER MAIN PIPE shall meet ASTM D2241 and a minimum cell classification 12454 as defined by ASTM D1784. Pipe, couplings, and locking splines shall be completely non-metallic.

2.07.4 HIGH-STRENGTH, FLEXIBLE THERMOPLASTIC SPLINES shall be inserted into mating, precision-machined grooves in the pipe and coupling to provide full 360° restraint with evenly distributed loading

2.07.5 COUPLINGS shall be designed for use at or above the rated pressures of the pipe with which they are utilized, and shall incorporate twin elastomeric sealing gaskets meeting the requirements of ASTM F477.

2.07.6 APPROVED MANUFACTURER includes C900/RJ PVC Certa-Lok restrained-joint pipe or C900/RJIB PVC restrained-joint pipe from NAPCO Corporation or equal.

2.07.7 WATER MAIN PIPE shall be HIGH DENSITY POLYETHYLENE (HDPE) Ductile Iron Pipe Size (DIPS) pressure class 200 (DR 11) PE3408 for municipal potable water conforming to ASTM D3350 with the cell classification of PE 345464C and is listed with the Plastic Pipe Institute (PPI) TR4 and American Water Works Association (AWWA) C906-07.

3.0 EXECUTION

3.01 GENERAL

3.01.1 ENGINEER must be notified 48 hours in advance of starting work. The Directional Bore shall not begin until the Engineer is present at the job site and agrees that proper preparations for the operation have been made. The Engineer approval for beginning the installation shall in no way relieve the Contractor of the ultimate responsibility for the satisfactory completion of the work as authorized under the Contract. It shall be the responsibility of Engineer to provide inspection personnel at such times as appropriate without causing undue hardship by reason of delay to the Contractor.

3.01.2 CONTRACTOR shall take all necessary precautions to ensure against damage to existing highway and road surfaces, or other work or facilities which are to remain in place. Repair of any damage shall be the responsibility of the Contractor.

3.01.3 CONTRACTOR shall be responsible for the protection of all utilities in and around the work to take place. Locate and mark, or have the respective utility companies locate and mark, all underground and overhead utilities that might be within 20 feet of the bore path. Contractor shall not commence boring operations until the location of all underground utility within the work area have been verified. The Contractor shall be responsible for repairing all damage to utility lines caused by his operations.

3.01.4 CONTRACTOR shall prepare an Emergency Action Plan (EAP) in conformance with USACE requirements. The EAP shall include description of the project, construction requirements including staging area, site access and limitations and survey, Experience and Equipment, Contractor's Emergency Management Plan including procedures to address emergency situations (i.e. flooding) with USACE NRD and City and emergency contact information for all parties involved in the project.

3.02 PREPARATION

3.02.1 CONTRACTOR shall be responsible for laying out and staking all of his work. Exercise care to establish all grades, lines, and levels in accordance with recognized surveying practices prior to digging bore pits and making horizontal bores. Locate all survey control, bench marks, monuments, and other reference points prior to beginning the work and provide protection throughout the construction period. Replace same if disturbed or destroyed.

3.02.2 BORE PATH shall be accurately surveyed with entry and exit stakes placed in the appropriate locations within the areas indicated on drawings. If Contractor is using a magnetic guidance system, drill path will be surveyed for any surface geo-magnetic variations or anomalies.

3.02.3 WHERE DEEPER INSTALLATIONS are shown on the plans or required to avoid existing utilities, the Contractor shall make such adjustments at no additional cost to the Owner. Deviations from the drawings may be only made with the approval of the Engineer.

3.03 ENVIRONMENTAL PROTECTION

3.03.1 ENVIRONMENTAL PROTECTION: Contractor shall place silt fence between all boring operations and any drainage, wetland, waterway or other area designated for such protection by contract documents, state, federal and local regulations. Additional environmental protection necessary to contain any hydraulic or boring fluid spills shall be put in place, including berms, liners, turbidity curtains and other measures. Contractor shall adhere to all applicable environmental regulations. Fuel or oil may not be stored in bulk containers within 200' of any water-body or wetland.

3.03.2 EROSION AND SEDIMENTATION CONTROL measures and on-site containers shall be installed to prevent drilling mud from spilling out of entry and/or exit pits. Drilling mud shall be disposed of off-site by the Contractor in accordance with local, state, and federal requirements and/or permit conditions.

3.04 HIGHWAY UNDERCROSSING

3.04.1 HIGHWAY UNDERCROSSING shall meet the requirements of the Nebraska Department of Roads.

3.05 UNDERWATER CROSSINGS

3.05.1 PROVIDE VALVE AND MANHOLE as specified in Section 02600 on each end of the water undercrossing for segment isolation.

3.05.2 PROVIDE PERMANENT WATER TAP on each end of the water undercrossing to allow for meter and/or leakage gauge reading and for the ability to take a water sample and as shown on Standard Detail W-9 Valve and Manhole.

3.06 PILOT HOLE

3.06.1 PILOT HOLE for water main and sewer force main bores shall be drilled on bore path with no deviations greater than 5% of depth over a length of 100'. In the event that pilot does deviate from bore path more than 5% of depth in 100', Contractor will notify Engineer and Engineer may require Contractor to pull-back and re-drill from the location along bore path before the deviation.

3.06.2 IN THE EVENT THAT A BORING FLUID FRACTURE, inadvertent returns or returns loss occurs during pilot hole boring operations, Contractor shall cease boring, wait at least 30 minutes, inject a quantity of boring fluid with a viscosity exceeding 120 seconds as measured by a March funnel and then wait another 30 minutes. If mud fracture or returns loss continues, contractor will cease operations and notify Engineer. Engineer and Contractor will discuss additional options and work will then proceed accordingly.

3.06.3 CONTRACTOR shall notify Project Representative of a successful pilot prior to proceeding with pre-reaming the bore hole.

3.07 PRE-REAMING

3.07.1 UPON SUCCESSFUL COMPLETION OF PILOT HOLE, Contractor will pre-ream bore hole to a minimum of 25% greater than outside diameter of pipe using the appropriate tools. Contractor shall not attempt to ream at one time more than the boring equipment and mud system are designed to safely handle.

3.07.2 CONTRACTOR shall notify Project Representative of a successful bore hole reaming to prior to proceeding with pipe pull-back.

3.08 PULL-BACK:

3.08.1 AFTER SUCCESSFULLY REAMING BORE HOLE to the required diameter, Contractor will pull the pipe through the bore hole. In front of the pipe will be a swivel. Once pull-back operations have commenced, operations must continue without interruption until pipe is completely pulled into bore hole. During pull-back operations Contractor will not apply more than the maximum safe pipe pull pressure at any time.

3.08.2 IN THE EVENT THAT PIPE BECOMES STUCK, Contractor will cease pulling operations to allow any potential hydro-lock to subside and will commence pulling operations. If pipe remains stuck, Contractor will notify Engineer. Engineer and Contractor will discuss options and then work will proceed accordingly.

3.08.3 CONTRACTOR shall be solely responsible for successfully completing the boring operation in accordance with the Drawings. If necessary, the Contractor shall withdraw, abandon or restart as required to complete the bore at no additional cost to the Owner.

3.09 INSTALLATION

3.09.1 INSTALLATION OF WATER MAIN PIPE shall be as specified in Section 02600, Water Mains and Appurtenances.

3.09.2 SEAL PIPE ENDS until they are connected to the remaining piping system.

3.09.3 BACKFILL EXCAVATIONS in accordance with Section 02250, Trench Excavation and Backfill compaction requirements.

3.10 FIELD QUALITY CONTROL

3.10.1 MAINTAIN LINE AND GRADE following tolerances:

.1 PRESSURIZED PIPE

- | | | |
|-----|------------|----|
| (a) | Horizontal | 6" |
| (b) | Vertical | 3" |

3.10.2 DEVIATION FROM LINE AND GRADE may be cause for rejection. Provide adequate clearances from other utilities or tracks for proper installation of the pipe.

3.11 ACCEPTANCE TESTING

3.11.1 ACCEPTANCE TESTING OF WATER MAIN CARRIER PIPE shall be as specified in Section 02600, Water Mains and Appurtenances.

END OF SECTION

SECTION 02900
SURFACE RESTORATION

1.0 GENERAL

1.01 DESCRIPTION

1.01.1 RELATED WORK SPECIFIED ELSEWHERE

Site Preparation	Section 02100
Clearing and Grubbing	Section 02110
Demolition	Section 02120
Trench Excavation and Backfill	Section 02250
Concrete Pavement Reconstruction	Section 02410
Water Mains and Appurtenances	Section 02600

1.02 SUBMITTALS

1.02.1 SUBMIT the following information to the Engineer as Shop Drawings:

Seed Mixture
Asphalt Mix
Crushed Rock Mix
Sod
Fertilizer

1.03 CERTIFICATES OF COMPLIANCE

1.03.1 CERTIFICATES OF COMPLIANCE shall be submitted prior to product delivery stating that the following products meet the requirements specified:

Sod
Seed Mixture
Fertilizer

1.04 SEEDING SEASON

1.04.1 PERFORM SEEDING OPERATIONS only at times of the year when temperature, moisture, and climatic conditions are correct to promote germination of seed and plant growth. Seeding operations may be accomplished during the following periods of the year:

.1 Spring - From March 1st through May 31st

.2 Fall - From August 10th through September 30th

The Contractor may perform seeding operations at other times of the year provided that approval is given by the Owner and Engineer. However, the Contractor shall not be relieved of his responsibility to assure compliance with these Specifications regarding acceptance and guarantee of seeding operations.

2.0 PRODUCTS

2.01 GRASS SEED

2.01.1 ALL SEEDS shall be furnished and approved for use according to the requirements of this Specification, including specified purity and germination. All seed shall be furnished from an established seed dealer or certified seed grower and shall meet the requirements of the Nebraska Department of Agriculture regulations and shall be labeled in accordance therewith. The test date to determine the percentage of germination requirements shall have been completed within a 9-month period exclusive of the calendar month in which the test was completed. The seed analysis on the label of the seed container shall be mechanically printed.

2.01.2 SEED MIXTURE shall be one of following as directed by the Engineer:

- .1 RESIDENTIAL LAWN GRASS SEED shall be “Super Turf 2” as supplied by United Seeds Inc., Ralston, Nebraska. The seed mixture shall be “certified Blue Tag”, superior quality. Purity of mixture shall be 98.0% and the germination shall be a minimum of 90%.
- .2 RURAL SEED shall be “City County NRD Rural Mixture” as supplied by United Seeds Inc., Ralston, Nebraska. Purity of mixture shall be 96.5% and the germination shall be a minimum of 90%.

2.01.3 ALL SEED specified for the project shall be thoroughly mixed prior to placing the seed in the seed hopper. All seed shall be mixed at the project site.

2.01.4 ACCEPTABLE SEED SUPPLIERS are United Seeds Inc., Ralston, Nebraska, or equal.

2.02 CRUSHED ROCK SURFACING

2.02.1 CRUSHED ROCK SURFACING used for surface restoration shall be crushed limestone meet the following gradation:

Sieve Size	Percent Passing By Weight	
	Target Value	Tolerance
1 Inch	100	None

3/4 Inch	80	±15
3/8 Inch	53	±17
No. 10	20	±10
No. 200	5	±5

2.02.2 CRUSHED ROCK BASE shall be 1-1/2-inch nominal gradation crusher run:

2.03 GRASS SOD

2.03.1 GRASS SOD shall be Certified Turfgrass Sod. It shall be vigorous, well-rooted, healthy, Kentucky bluegrass sod, free from disease, insects, weeds, other grasses, stone, and any other harmful or deleterious matter. Sod shall be machine stripped at a uniform soil thickness of 1 inch ± 1/4 inch. Measurement of thickness shall exclude top growth and thatch.

2.03.2 TOPSOIL shall be placed on all graded or disturbed areas which are to receive sod. Top soil shall be rich, fine, and well-drained material which has previously been stripped and stored on site or which has been hauled on site from other acceptable areas. Six inches of topsoil shall be in place prior to the installation of sod.

2.04 FERTILIZER

2.04.1 FERTILIZER shall be of the grade, type, and form specified and shall comply with the rules of the Nebraska Department of Agriculture and the requirements stated herein.

2.04.2 THE GRADE OF FERTILIZER shall be identified according to the percent nitrogen (N), percent available phosphoric acid (PO), and percent water soluble potassium (KO), in that order.

2.04.3 FERTILIZER FOR SEED BED shall be a commercial product, 16-16-16 formula, chemically combined.

2.05 MULCHING MATERIAL

2.05.1 STRAW MULCH shall be reasonably free from weeds, foreign matter detrimental to plant life, and be in a dry condition. Mulch shall be wheat straw, oats straw, prairie hay, or other approved material.

2.06 EROSION CONTROL FABRIC

2.06.1 EROSION CONTROL FABRIC shall be as noted on the Plans.

3.0 EXECUTION

3.01 GENERAL PROVISIONS

3.01.1 ALL OBSTRUCTIONS to the work removed to facilitate construction or to excavate the trench shall be replaced with equal or better materials. The Contractor is responsible for all damage to items not specified for removal or demolition.

3.02 SEEDING

3.02.1 SEED ALL AREAS as shown on the Drawings or as directed by the Engineer. Apply at a rate of 10 pounds per 1,000 square feet.

3.02.2 PREPARE SEED BED prior to seeding operations. Place 6 inches of topsoil over area to be seeded and grade to provide drainage. In areas where topsoil already exists, disc the upper 3 inches to loosen soil and harrow to provide a smooth seed bed. If weed growth develops sufficiently to interfere with proper seed bed preparation, the Contractor shall mow or dispose of all weed growth at his expense prior to seed bed preparation.

3.02.3 PLANT SEED by using a seed drill to incorporate the seed uniformly over the areas to be seeded and within the seed bed.

3.02.4 MULCH SEEDED AREA with wheat straw, oats straw, or prairie hay, which is free of weed seed, to hold the seed bed against erosion until the grass plants are established.

3.03 FERTILIZATION OF SEED BED

3.03.1 FERTILIZER SHALL BE SPREAD over the areas to be seeded. All fertilizer shall be spread with a mechanical spreader, which will secure a uniform rate of application.

3.03.2 FERTILIZER SHALL BE SPREAD after the seed bed preparation, but prior to the sowing of any seed. The fertilizer shall be disced in and the area rolled prior to the application of permanent seed. If a roller cannot be operated satisfactorily, substitution of harrowing may be permitted by the Engineer.

3.03.3 APPLY FERTILIZER at a rate of 15 pounds per 1,000 square feet.

3.04 GRASS SOD

3.04.1 GRASS SOD ALL AREAS as shown on the Drawings or as directed by the Engineer.

3.04.2 PREPARE SOD BED by tilling the upper 3 inches of topsoil after the topsoil has been placed on the areas to be sodded. If topsoil already exists, till or disc, and harrow the upper 3 inches to loosen the soil. Incorporate the fertilizer uniformly into the top 2

inches of the prepared bed. Harrow or rake the sod bed to provide a uniform and smooth surface that conforms to the indicated grades.

3.04.3 PLANT SOD by laying strips solid. Roll sod to provide a bond with the sod bed. Water the sod completely and sufficiently to thoroughly wet the sod bed to a depth of 2 inches.

3.05 SIDEWALK REPLACEMENT

3.05.1 REPLACE REMOVED SIDEWALKS with new, 4-inch thick, Portland cement concrete. Finish to match existing work and reconstruct joints to match existing work.

3.06 CURB AND GUTTER REPLACEMENT

3.06.1 REPLACE REMOVED CURBS AND GUTTERS with new Portland cement concrete sections to match existing cross section. Finish to match existing work and reconstruct joints to match existing work.

3.07 ASPHALT PAVEMENT REPLACEMENT

3.07.1 REPLACE REMOVED PAVEMENT AND DRIVES with new hot-mix asphaltic concrete equal in thickness and quality to existing pavement. Place and compact in lifts of not more than 3 inches thick.

3.08 CRUSHED ROCK SURFACING REPLACEMENT

3.08.1 REPLACE REMOVED CRUSHED ROCK SURFACING over restoration areas with new crushed rock, spread and compacted to a 4-inch thickness.

3.09 TEMPORARY SURFACE OVER TRENCHES

3.09.1 CONTRACTOR shall provide 6 inches of compacted gravel or crushed rock temporary surfacing over trenches which cross traveled roadways and driveways immediately following satisfactory completion of backfill. Grade temporary surface smooth to meet grade of adjacent undisturbed surface.

3.10 CLEAN-UP

3.10.1 CONTRACTOR shall clean up each portion of construction as it is completed. Clean-up operations in public right-of-way shall be kept within 400 feet of construction operations. Clean up and remove all rubbish, debris, and surplus material. Leave site in neat condition acceptable to Owner and Engineer. Reopen backfilled areas to traffic as soon as practical.

3.11 EROSION CONTROL FABRIC INSTALLATION

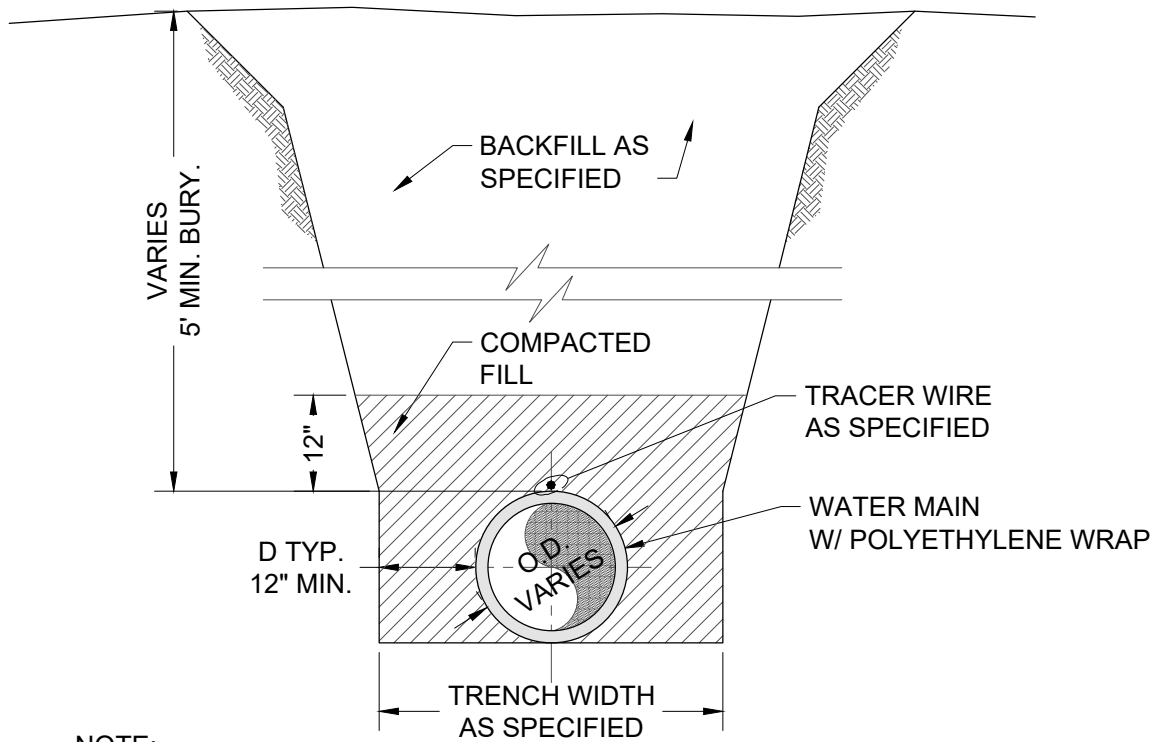
3.11.1 INSTALL EROSION CONTROL FABRIC on highly erosive surfaces as shown on the Drawings and as directed by the Engineer. Installation of fabric shall be in accordance with the manufacturer's recommendations.

3.12 GUARANTEE

3.12.1 THE CONTRACTOR SHALL GUARANTEE that seeded areas will germinate and establish in a uniform manner as determined by the Engineer.

3.12.2 MAINTAIN AND REPAIR seeded areas for a 60-day period after completing the operations. During this period, the seeded areas shall be watered, and any areas damaged due to erosion, trespass, or other cause, shall be repaired and reseeded by the Contractor, as originally specified, at no additional cost to the Owner.

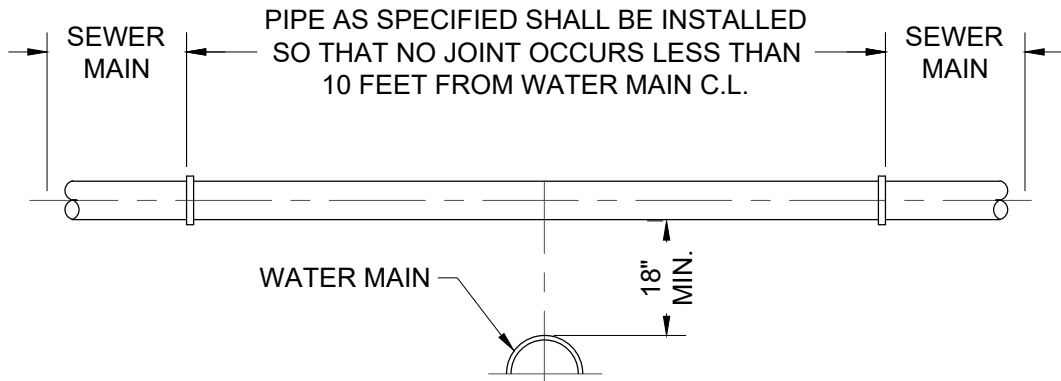
END OF SECTION



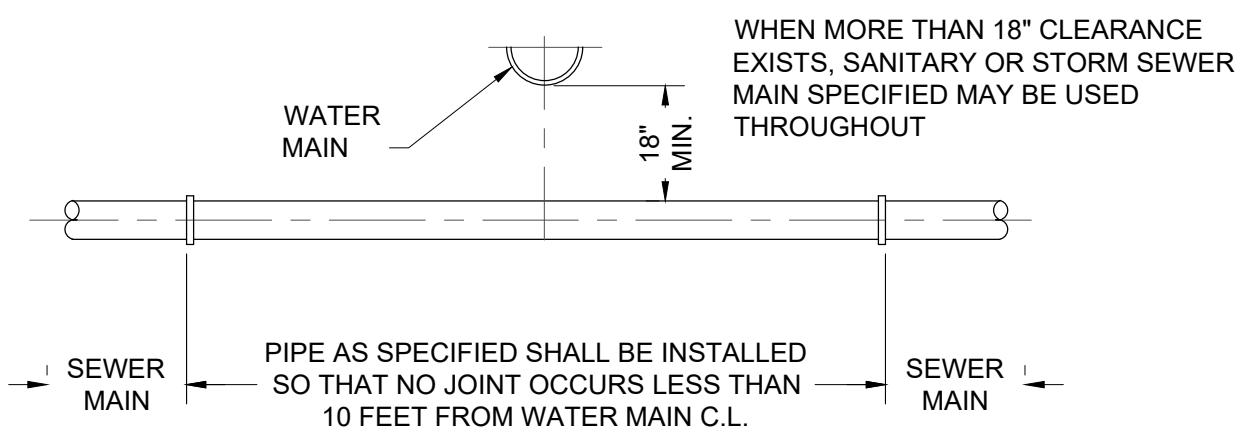
NOTE:

1. TRENCH SHALL BE BRACED, SHEETED OR SLOPED AS NECESSARY FOR THE SAFETY OF THE WORKMAN & PROTECTION OF OTHER UTILITIES IN ACCORDANCE WITH APPLICABLE LOCAL, STATE AND FEDERAL SAFETY REGULATIONS.

CITY OF VALLEY, NEBRASKA	PIPE ENVELOPE - WATER MAIN	DETAIL W-1
OLMSTED & PERRY CONSULTING ENGINEERS INC.		DATE DECEMBER 2019

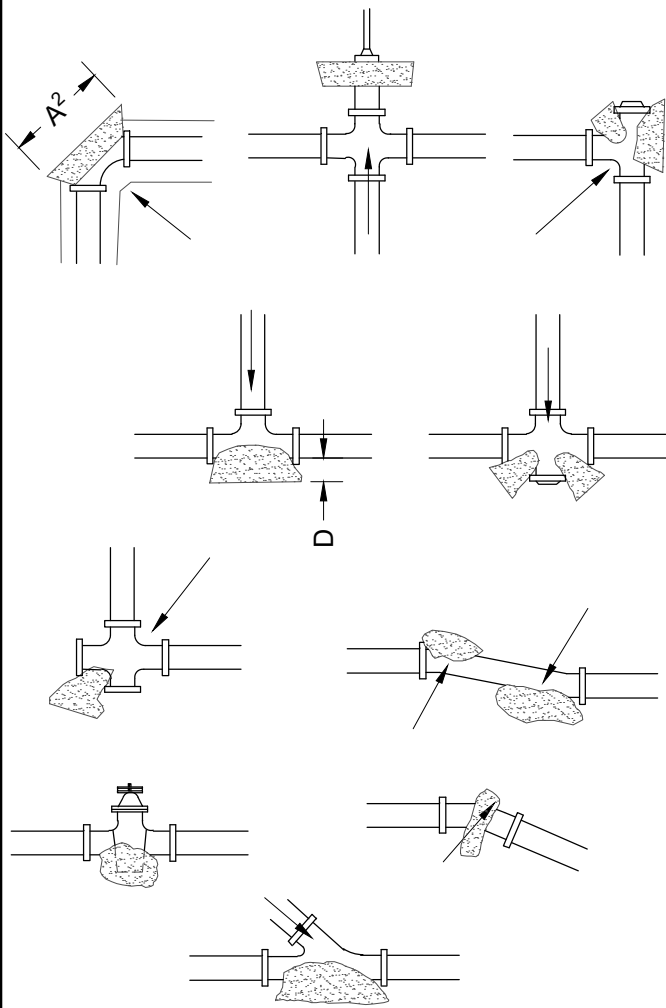


OVER WATER MAIN



UNDER WATER MAIN

CITY OF VALLEY, NEBRASKA	WATER - SEWER PIPE CROSSING	DETAIL W-2
OLMSTED & PERRY CONSULTING ENGINEERS INC.		DATE DECEMBER 2019



BEARING AREA OF BLOCK 'A' SQ. FT

PIPE SIZE	TEE & END	90° BEND	45° BEND	22 1/2° BEND	11 1/4° BEND	DEPTH D (MIN.)
3"	1.5	2.1	1.2	0.6	0.3	16"
4"	2.5	3.5	1.9	1.0	0.5	18"
6"	5.2	7.3	4.0	2.0	1.0	20"
8"	8.9	12.5	6.8	3.5	1.7	22"
10"	13.5	19.1	10.4	5.3	2.7	24"
12"	19.2	27.1	14.7	7.5	3.7	26"
14"	25.8	36.5	19.8	10.1	5.1	29"
16"	33.4	47.3	25.6	13.0	6.6	31"
18"	42.0	59.4	32.2	16.4	8.2	33"

NOTES:

1. BEAR THRUST BLOCKS AGAINST UNDISTURBED EARTH.
2. DO NOT EXTEND CONCRETE BEYOND BELL FITTING.
3. ARROWS INDICATE DIRECTION OF THRUST.
4. ALL CONCRETE SHALL HAVE A COMPRESSIVE STRENGTH OF 4,000 PSI AT 28 DAYS.
5. REQUIRED THRUST BLOCK AREAS "A" ARE BASED ON A SOIL BEARING PRESSURE OF 2,000 PSF AND A DESIGN PRESSURE OF 250 PSI WITH A 1.25 SAFETY FACTOR.

CITY OF VALLEY, NEBRASKA

DETAIL

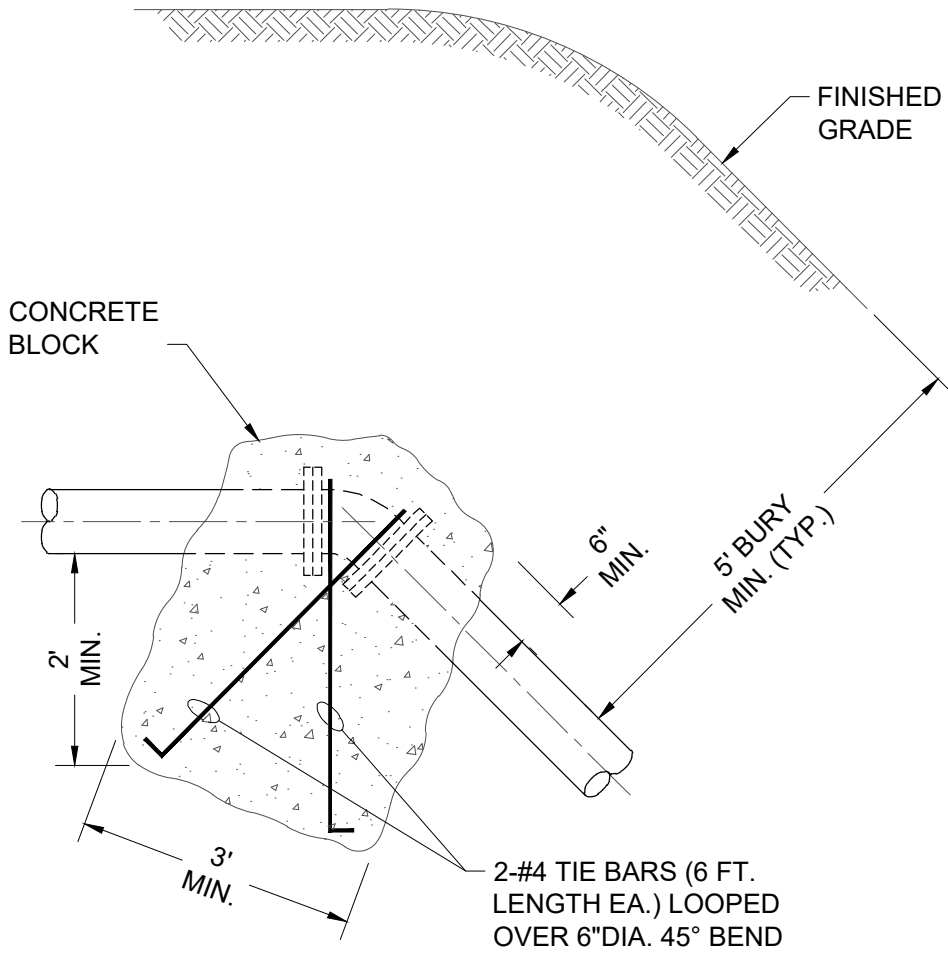
W-3

OLMSTED & PERRY
CONSULTING ENGINEERS INC.

TYPICAL THRUST BLOCK
PLACEMENT

DATE

DECEMBER 2019



CITY OF VALLEY, NEBRASKA

PIPE BEND ANCHOR

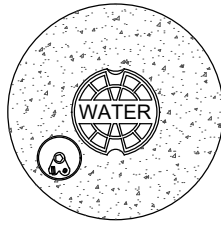
DETAIL

W-4

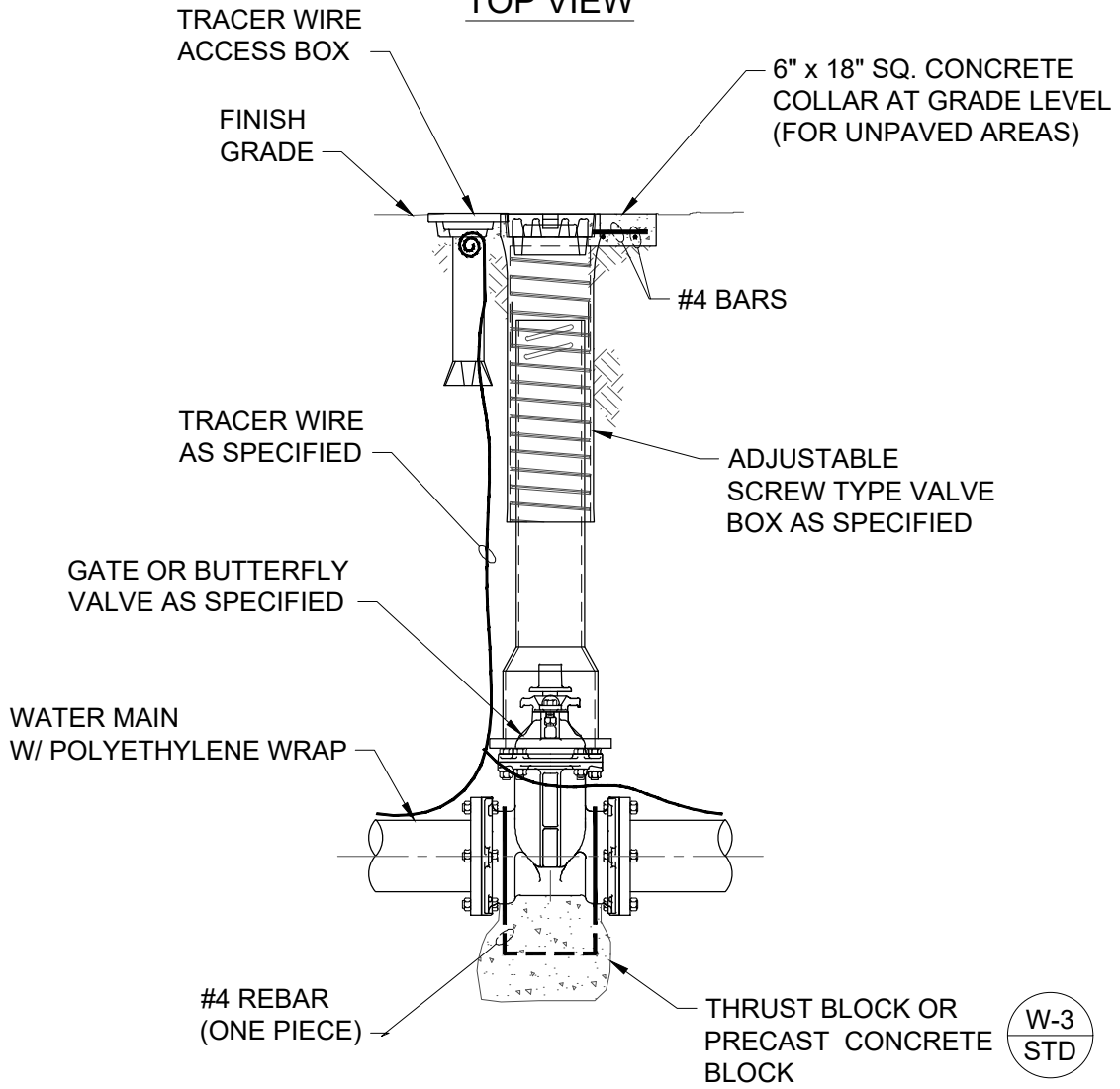
OLMSTED & PERRY
CONSULTING ENGINEERS INC.

DATE

DECEMBER 2019



TOP VIEW



SIDE VIEW

W-3
STD

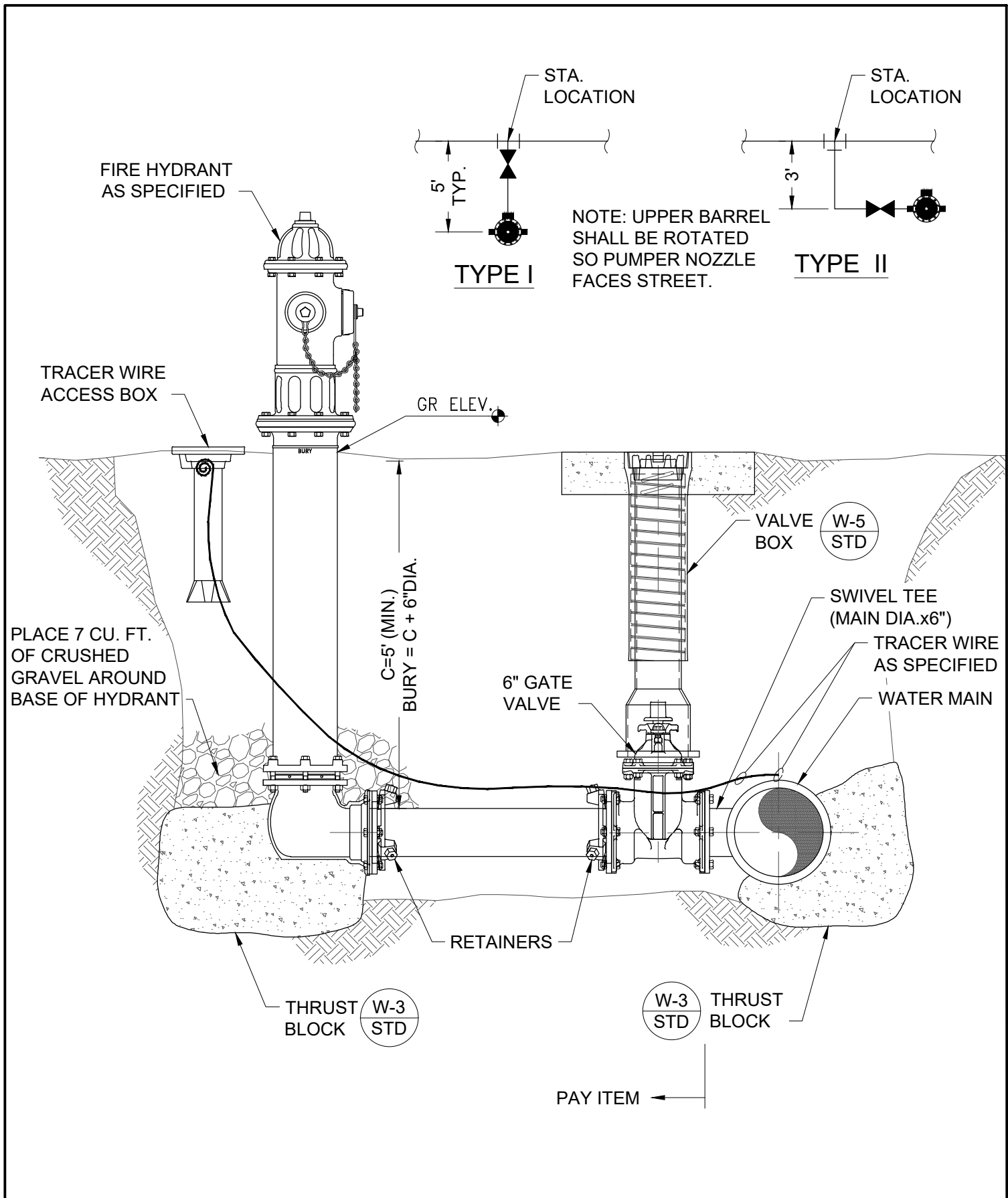
CITY OF VALLEY, NEBRASKA

GATE VALVE & VALVE BOX

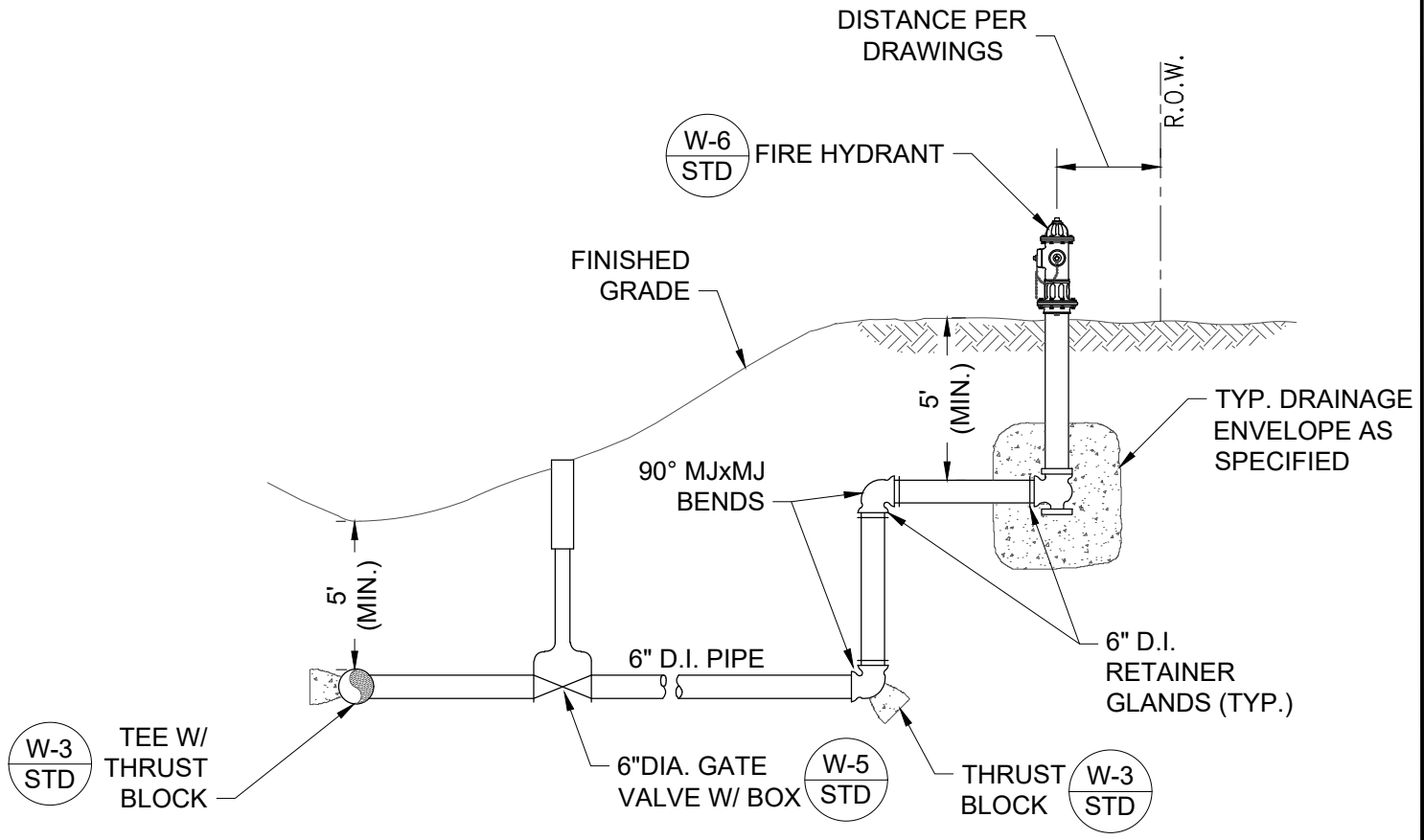
DETAIL **W-5**

OLMSTED & PERRY
CONSULTING ENGINEERS INC.

DATE
DECEMBER 2019



CITY OF VALLEY, NEBRASKA	FIRE HYDRANT ASSEMBLY	DETAIL W-6
OLMSTED & PERRY CONSULTING ENGINEERS INC.		DATE DECEMBER 2019



CITY OF VALLEY, NEBRASKA	FIRE HYDRANT ASSEMBLY (DEEP TYPE)	DETAIL W-7
OLMSTED & PERRY CONSULTING ENGINEERS INC.		DATE DECEMBER 2019

$\frac{1}{2}$ " DIA. GALV.
DISCHARGE PIPING
PAINT BLUE

AIR RELEASE VALVE
DISCHARGE PIPING W/ 24
MESH CORROSION
RESISTANT SCREEN

COORDINATE
POINT LOCATION

MANHOLE RING & GRATE
COVER EQUAL TO
DEETER FOUNDRY 1113

EXTERNAL EPDM
CHIMNEY SEAL
W/ S.S. BANDS

FINISHED
GRADE

30" CLR.

RIM

ATTACH TO MANHOLE

26" DIA. PRECAST
GRADE RING - 4" MIN.

26" DIA.

60" I.D. PRECAST FLAT
TOP MANHOLE SECTION
W/ ECCENTRIC
OPENING ASTM C478

POLY COATED
STEPS @ 16" O.C.

90° BEND

EXTERIOR JOINT
WRAP SEAL (TYP.)
AS SPECIFIED

CORE DRILL MANHOLE.
GROUT AROUND PIPE

COMBINATION AIR VALVE
(VALMATIC VM-20_C OR EQUAL)

$\frac{1}{2}$ " DIA. BRASS BALL
VALVE

$\frac{1}{2}$ " DIA. TAP & INSTALL
CORP. ON MAIN

W-1
STD D.I.P.
WATER MAIN

W-11
STD

I.E.

8"
MIN.

8"
MIN.

COMPACTED
SUBGRADE
AS SPECIFIED

12"

12"

#4 @ 12" O.C.E.W.

12"x12"x16" GRAVEL
OR CRUSHED STONE
SUMP DRAIN

NOTES:

1. PIPING INLETS AND OUTLETS DIAMETER SHALL BE EQUAL TO THE NOMINAL AIR RELEASE VALVE SIZE.
2. MINIMUM BARREL HEIGHT CLEARANCE SHALL BE 45 INCHES.

CITY OF VALLEY, NEBRASKA

**AIR RELEASE VALVE AND
MANHOLE**

DETAIL

W-8

OLMSTED & PERRY
CONSULTING ENGINEERS INC.

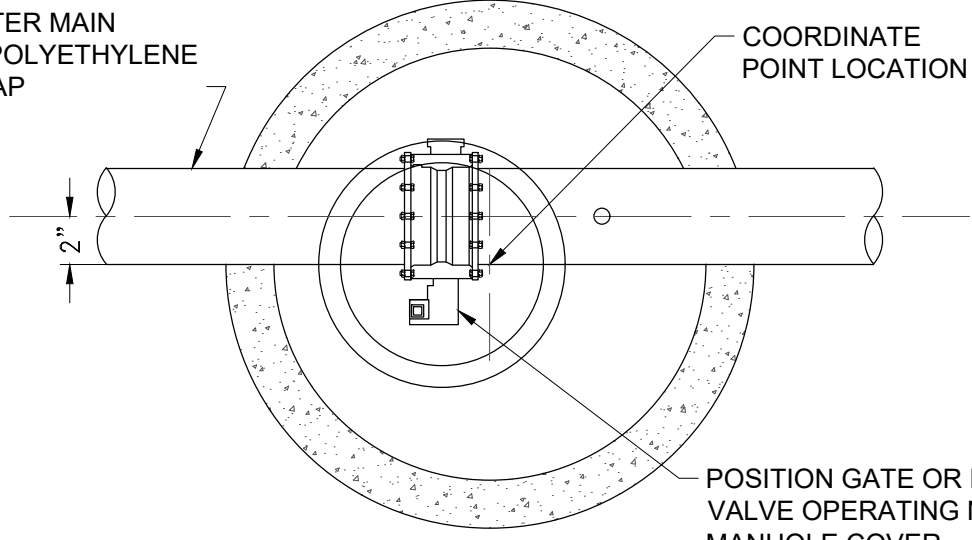
DATE

DECEMBER 2019

W-1
STD

WATER MAIN
W/ POLYETHYLENE
WRAP

COORDINATE
POINT LOCATION



POSITION GATE OR BUTTERFLY
VALVE OPERATING NUT IN
MANHOLE COVER

MANHOLE RING & GRATE
COVER EQUAL TO
DEETER FOUNDRY 1113

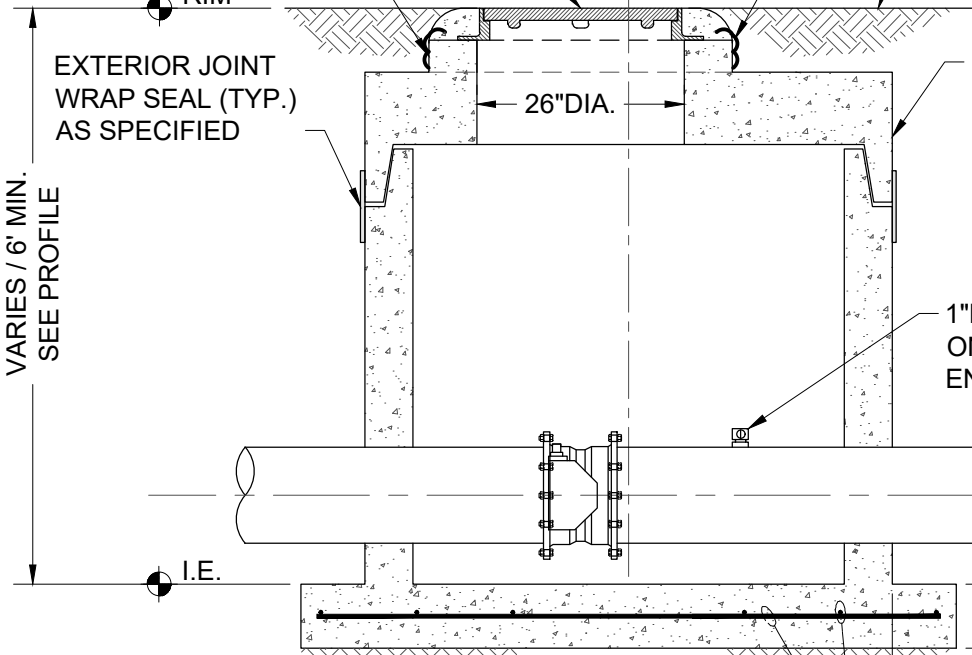
PLAN

EXTERNAL EPDM CHIMNEY
SEAL W/ S.S. BANDS

26" DIA. PRECAST
GRADE RING - 4" MIN.

FINISHED
GRADE

RIM
EXTERIOR JOINT
WRAP SEAL (TYP.)
AS SPECIFIED
VARIES / 6" MIN.
SEE PROFILE



60" I.D. PRECAST FLAT
TOP MANHOLE SECTION
W/ ECCENTRIC OPENING
ASTM C478

1" DIA. TAP & INSTALL CORP.
ON MAIN AS DIRECTED BY
ENGINEER FOR TESTING

W-11
STD

COMPACTED
SUBGRADE
AS SPECIFIED

ELEVATION

8"
MIN.

8"
MIN.

#4 @ 12" O.C.E.W.

NOTE:

1. MINIMUM BARREL HEIGHT CLEARANCE SHALL BE 45 INCHES.

CITY OF VALLEY, NEBRASKA

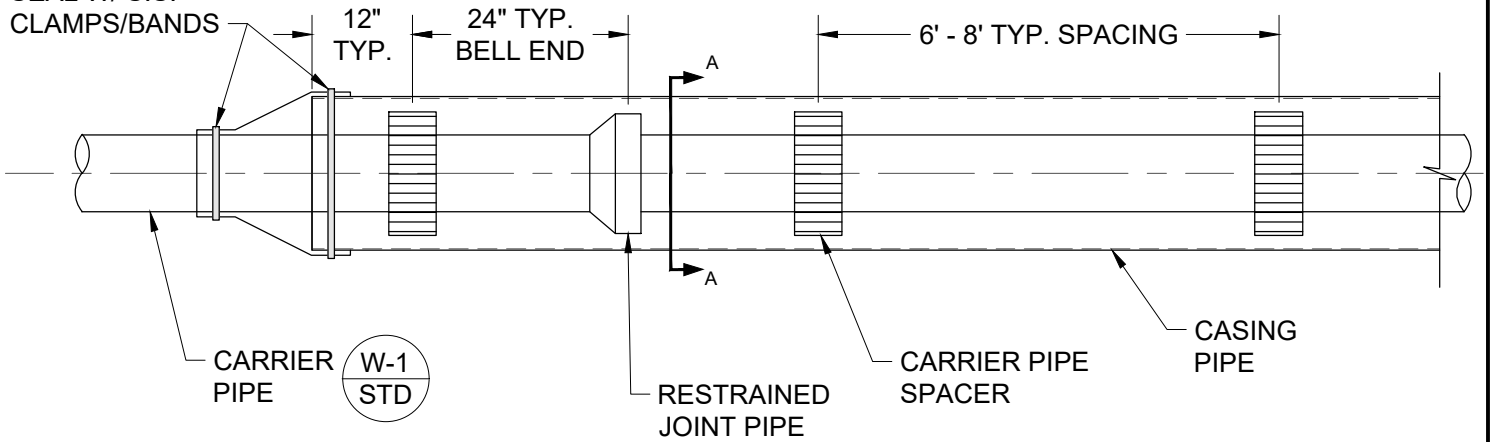
VALVE AND MANHOLE AT
UNDERWATER CROSSING

DETAIL
W-9

OLMSTED & PERRY
CONSULTING ENGINEERS INC.

DATE
DECEMBER 2019

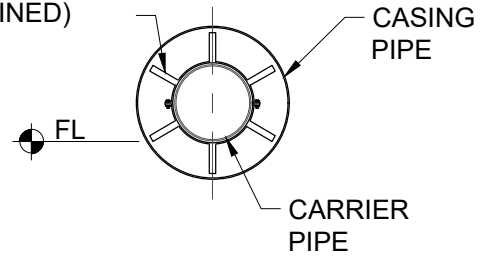
SYNTHETIC
RUBBER END
SEAL W/ S.S.
CLAMPS/BANDS



NOTES:

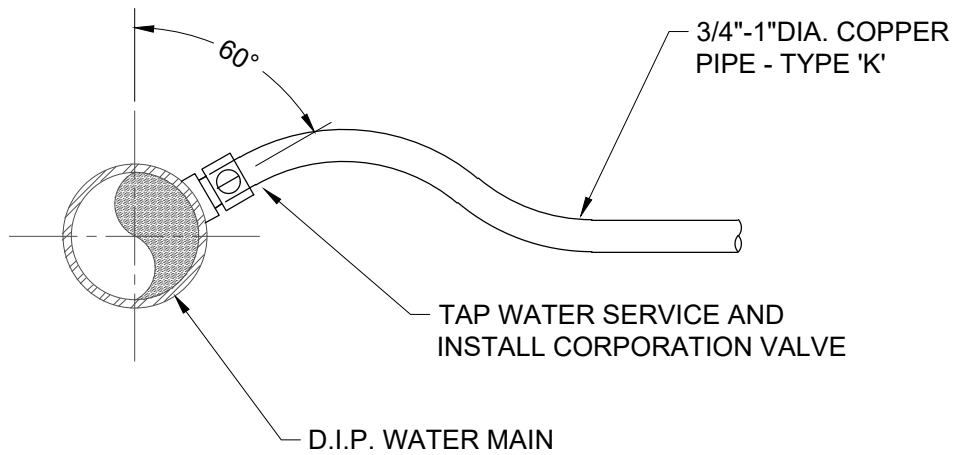
1. A MINIMUM OF TWO SPACERS PER D.I. PIPE SEGMENT (SIGOT & BELL) AND THREE SPACERS PER PVC PIPE SEGMENT (SIGOT, MIDDLE & BELL). MAXIMUM ALLOWABLE CLEARANCE BETWEEN I.D. OF CARRIER PIPE & TOP RUNNER OF SPACER IS 1".
2. ALL CASING & CARRIER PIPE SHALL BE AS SPECIFIED.

CARRIER PIPE
SPACER (CENTER
RESTRAINED)

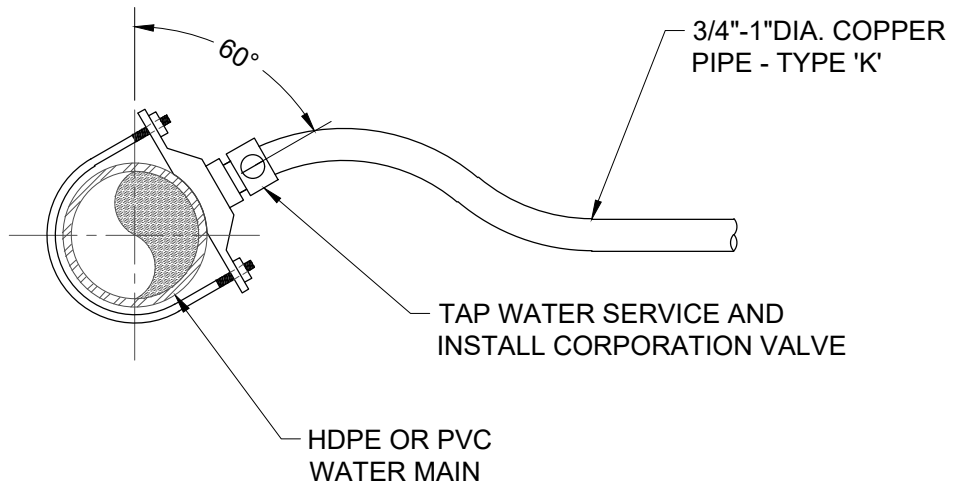


SECTION A - A

CITY OF VALLEY, NEBRASKA	BORE & JACK CASING	DETAIL W-10
OLMSTED & PERRY CONSULTING ENGINEERS INC.		DATE DECEMBER 2019

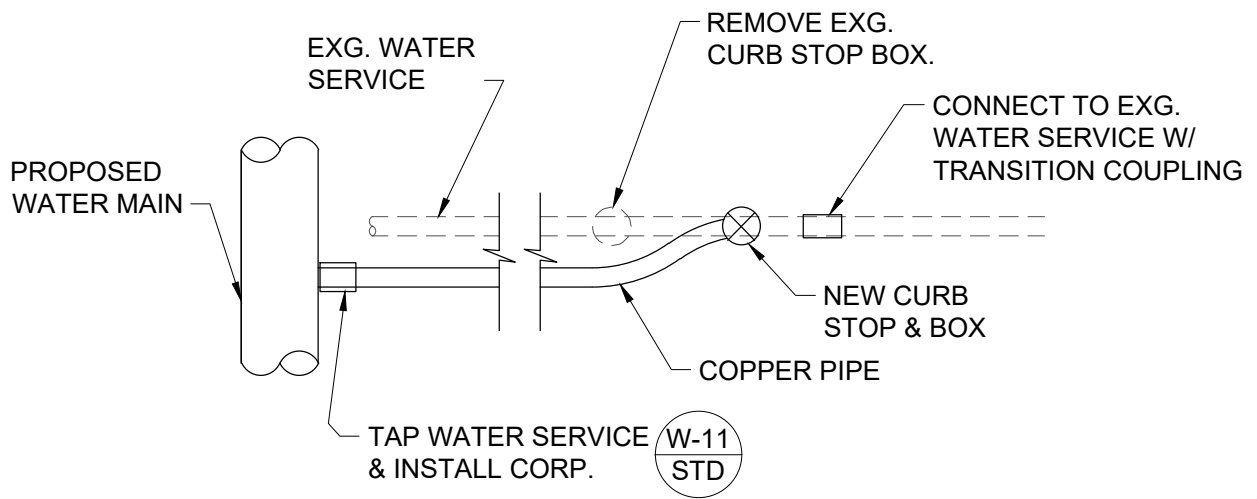


DIRECT TAP

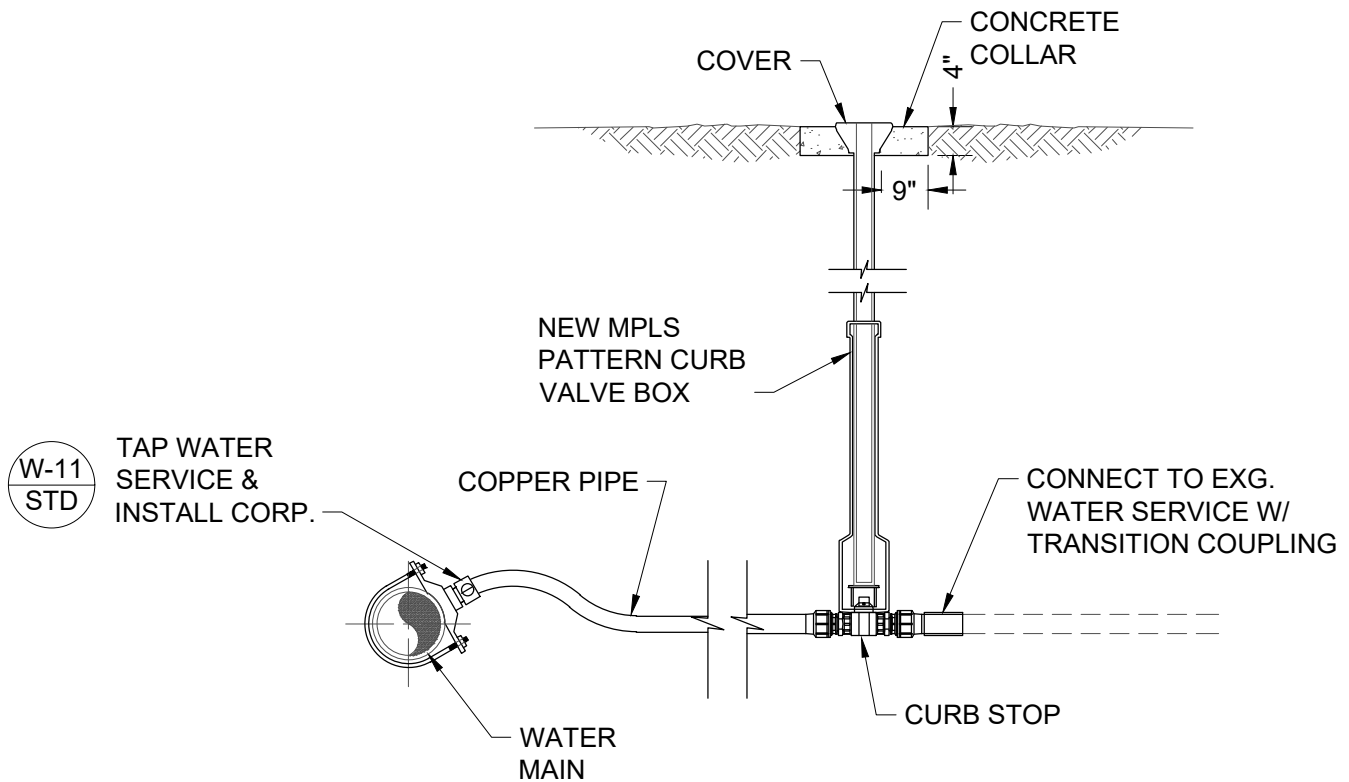


TAPPING SADDLE

CITY OF VALLEY, NEBRASKA	WATER SERVICE TAP	DETAIL W-11
OLMSTED & PERRY CONSULTING ENGINEERS INC.		DATE DECEMBER 2019



PLAN



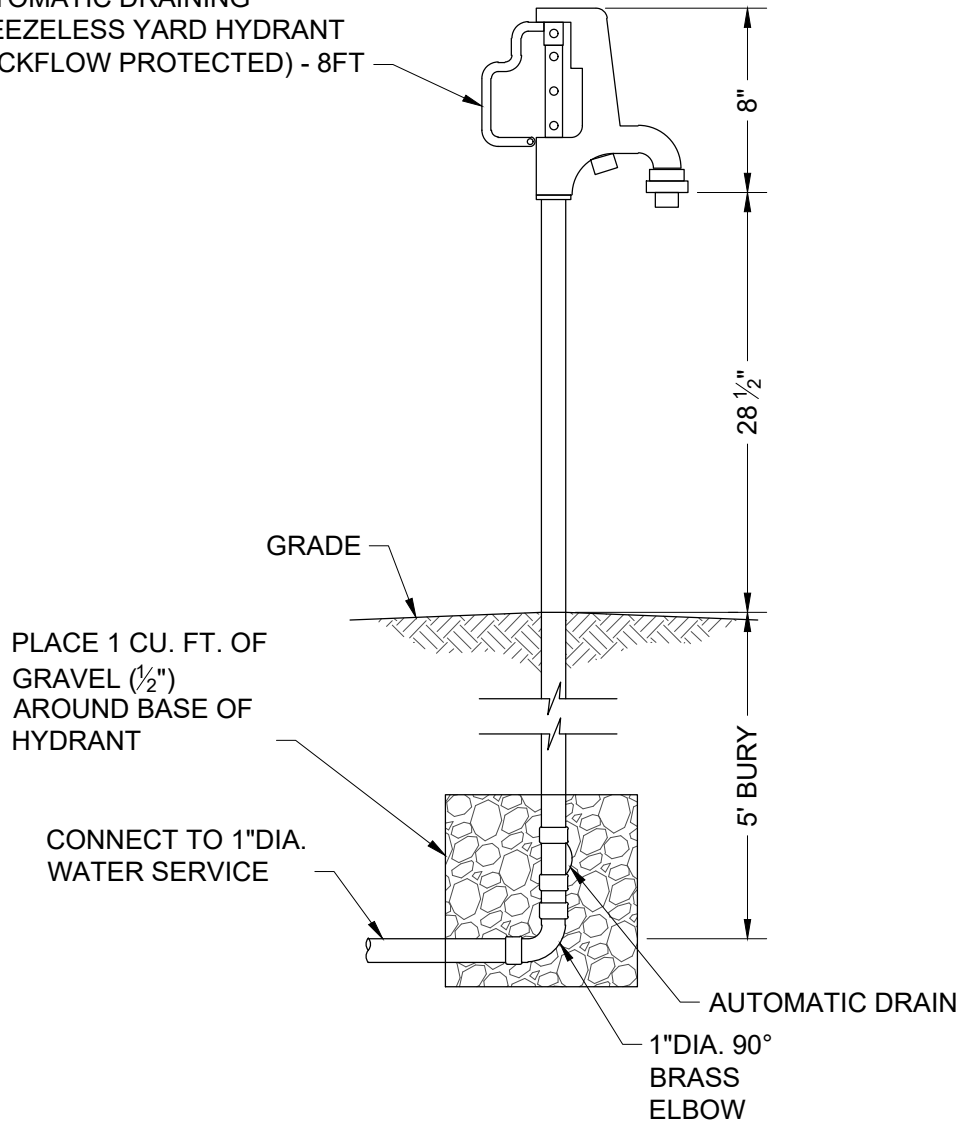
SECTION

NOTE:

BACKFILL UNDER PIPE TO LIMITS OF EXCAVATION W/ CAREFULLY COMPACTED & GRADED CRUSHED ROCK

CITY OF VALLEY, NEBRASKA	WATER SERVICE CURB STOP CONNECTION	DETAIL W-12
OLMSTED & PERRY CONSULTING ENGINEERS INC.		DATE DECEMBER 2019

AUTOMATIC DRAINING
 FREEZELESS YARD HYDRANT
 (BACKFLOW PROTECTED) - 8FT



CITY OF VALLEY, NEBRASKA

YARD HYDRANT

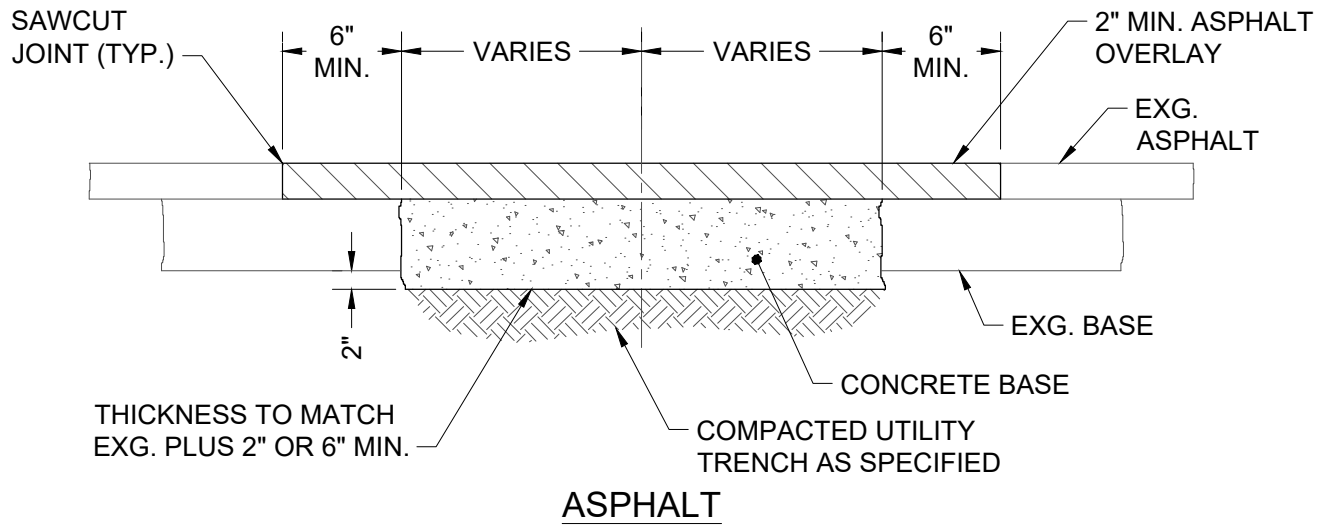
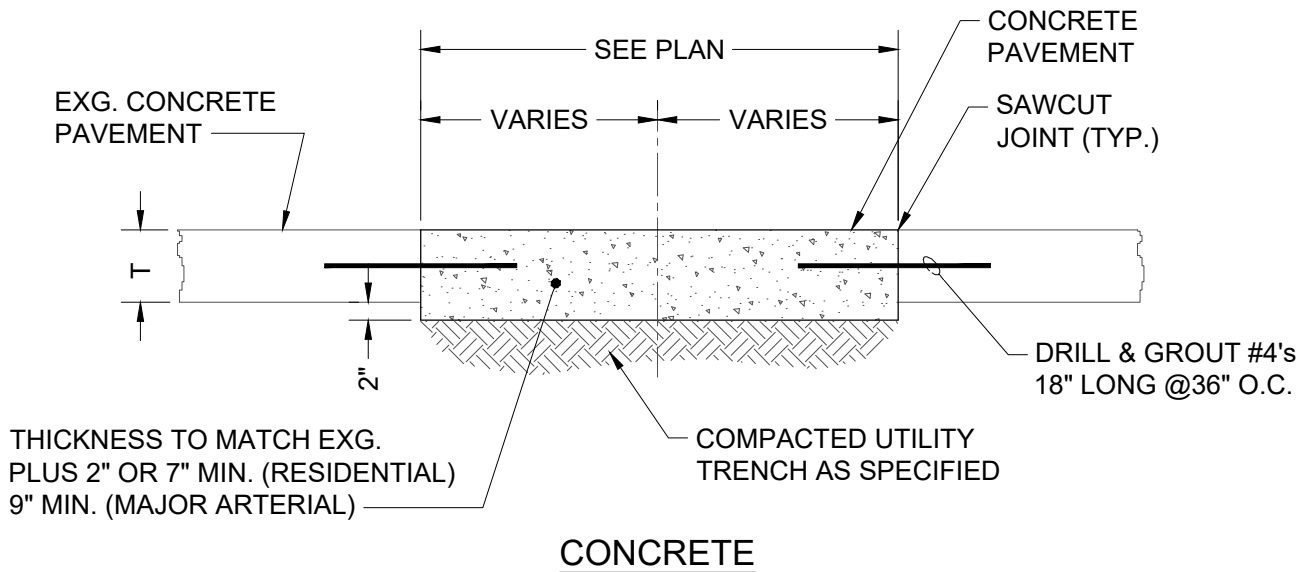
DETAIL

W-13

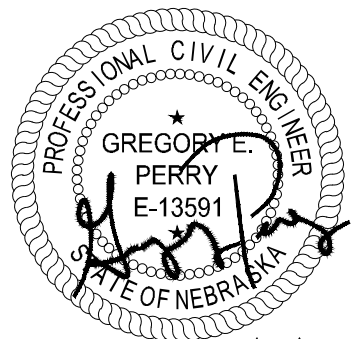
OLMSTED & PERRY
 CONSULTING ENGINEERS INC.

DATE

DECEMBER 2019



CITY OF VALLEY, NEBRASKA	PAVEMENT REPLACEMENT	DETAIL P-1
OLMSTED & PERRY CONSULTING ENGINEERS INC.		DATE DECEMBER 2019



12/04/2019

CITY OF VALLEY, NEBRASKA

DETAIL

OLMSTED & PERRY
CONSULTING ENGINEERS INC.

DATE