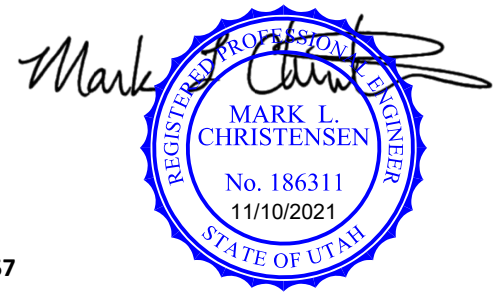
STANDARD TECHNICAL SPECIFICATIONS AND DRAWINGS

FOR

TOWN OF GENOLA

WATER DISTRIBUTION SYSTEM

November 2020
Updated November 2021



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TOWN OF GENOLA

TECHNICAL SPECIFICATIONS FOR WATER DISTRIBUTION SYSTEM

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1.2 CONTRACTOR RESPONSIBILITY

A. The Contractor shall be responsible for the protection and the restoration or replacement of any improvements existing on public or private property at the start of work or placed there during the progress of the work.

B. Existing improvements shall include but not to be limited to permanent surfacing, curbs, gutters, sidewalks, planted areas, ditches, driveways, culverts, fences, and walls. All improvements shall be reconstructed to equal or better, in all respects, than the existing improvements removed.

C. In submitting a bid, the Contractor will be deemed to have carefully examined the site of the work and to have acquainted itself with all conditions relating to the protection and restoration of existing improvements. The Public Works Director/Engineer does not guarantee that all improvements are shown on the Drawings, and it shall be the Contractor's responsibility to provide in its bid for the protection and restoration of all existing improvements whether or not each is provided for specifically on the Drawings and/or Bid Form.

PART 2 PRODUCTS

2.1 MATERIALS

A. Materials used for repair or replacement of surface improvements shall be equal to or better than the material removed.

2.2 MISCELLANEOUS IMPROVEMENTS

A. It shall be the Contractor's responsibility to restore to their original condition all irrigation canals, levees, culverts, gates, fences, drainage ditches, and all such improvements, which are cut or disturbed during construction. Topsoil in farming areas or along road edges shall be stored separate from subsoil during pipe trench excavation. Topsoil shall be replaced during backfill operations as nearly as possible to its original condition, thereby assuring suitable soil for reseeding.

2.3 RESTORATION OF SURFACES

A. Unless otherwise directed, all street surfacing (asphalt and concrete), curbs, gutters, sidewalks, driveways, or other hard surface that must be removed in the performance of the work shall be restored in kind by the Contractor in accordance with the Specifications contained herein. Deviation of more than one-fourth inch (1/4") between old and new work or within new construction shall be corrected. Such measurement shall be made from a ten-foot (10') minimum length straight edge. Adjoining surfaces between old and new must be flush.

2.4 CLEANUP

A. At the completion of each area of work all equipment, barricades, and similar items shall be removed from the area. All excess material will be removed. All rocks larger than two inches (2") shall be removed from the surface. Adjacent borrow pits and road shoulders used for storage of excavating materials will be smoothed and returned to its original contour.

2.5 PAVEMENT MARKINGS

A. The Contractor shall be responsible for restoration of pavement markings on all City and/or County roadways. Restoration of pavement markings shall conform to the applicable local and state specifications.

B. On roadways under UDOT jurisdiction temporary pavement markings shall be provided for any removed or obliterated markings. The temporary markings shall conform to UDOT standards and specifications. Permanent pavement markings will be replaced by UDOT.

END OF SECTION

SECTION 31 23 16
EXCAVATION AND BACKFILL FOR BURIED PIPELINES

PART 1 GENERAL

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1.2 BACKFILL ZONES

A. Trench backfill for piping consists of four zones: foundation, bedding, initial backfill, and final backfill. “Pipe embedment” is a commonly used term that refers to the region including the bedding and initial backfill zones, or any region within one foot (1’) of any pipe, pipeline structure, or accessory. The foundation is defined as the region between ten inches (10”) and six inches (6”) below the bottom of the pipe. The bedding is defined as the region between six inches (6”) below the bottom of the pipe and the bottom of the pipe. The initial backfill is defined as the region between the bottom of the pipe and twelve inches (12”) above the top of the pipe. The final backfill is defined as the region above twelve inches (12”) above the pipe.

B. The Public Works Director/Engineer shall determine the suitability of excavated materials for use as foundation, bedding, initial backfill, and final backfill. He may request that the soil be tested as described below or may choose to visually accept or reject excavated materials. Contractor shall not backfill with frozen materials.

1.3 REFERENCES

A. The latest edition of the following publications form a part of this specification to the extent referred. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO T 88- Particle Size Analysis of Soils
AASHTO T 180- Moisture-Density Relations of Soils Using a 10-lb. (4.54 kg) Rammer and an 18-in (457 mm) Drop
AASHTO T 191- Density of Soil In-Place by the Sand-Cone Method
AASHTO T 205- Density of Soil In-Place by the Rubber-Balloon Method
AASHTO T 238- Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
AASHTO T 239- Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 422- Particle-Size Analysis of Soils
ASTM D 698- Test Method of Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 5.5 lb. (2.5-kg) Rammer and 12-in. (305-mm) Drop
ASTM D 1556- Density of Soil in Place by the Sand-Cone method
ASTM D 1557- Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-lb (4.54-kg) Rammer and 18-in. (457-mm) Drop
ASTM D 2487- Classification of Soils for Engineering Purposes
ASTM D 2922- Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

ASTM D 3017- Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

B. The Utah Department of Transportation Standard Specification for Road and Bridge Construction, latest edition.

C. The 2017 Edition of the American Public Works Association (APWA) and Associated General Contractors of America Standard Plans and Standard Specifications.

1.4 SUBMITTALS

A. If requested by the ENGINEER, CONTRACTOR shall furnish a certified test result from an approved laboratory showing that the free draining gravel material and imported granular backfill borrow material conforms to the Specification requirements. This test result will be paid for by OWNER.

B. The following shall be submitted with Contractor Submittals:

1. Copies of Field Density Test reports shall be submitted to the Engineer or Owner's RPR at the beginning of each workday for the previous day's testing of subgrades, embankments and backfill materials.
2. Copies of all laboratory test reports shall be submitted to the Engineer or Owner's RPR within 24 hours of the completion of the test.

1.5 SITE CONDITIONS

A. Weather Softened Subgrade: CONTRACTOR shall remove and replace at no additional cost to OWNER, soft subgrade materials resulting from adverse weather conditions.

B. Protection of Graded Areas: CONTRACTOR shall protect all graded areas from traffic and erosion and shall keep these areas free of trash and debris. Work required to repair and reestablish grades in settled, eroded, and rutted areas shall be completed to specified tolerances at CONTRACTOR's expense.

C. Reconditioning Compacted Areas: All areas compacted to required specifications that become disturbed by subsequent construction operations or weather conditions shall be scarified, moisture conditioned and recompacted to the required density prior to further construction.

PART 2 PRODUCTS

2.1 PIPE BACKFILL

A. Pipe Zone Backfill shall be Import Select Fill consisting of sand, crushed gravel, or 3/4-inch minus material (no pea gravel) having stones no greater than 1-inch, or in accordance with manufacturer's recommendation, whichever is more stringent. All backfill material shall be free of frozen material, organic material, and debris.

B. Trench backfill above the pipe zone shall be Import Granular Backfill Borrow meeting the requirements of APWA Section 31 05 13 for Common Fill. No backfill material in the remainder of the trench shall have rocks larger than 2-inches in diameter. All backfill material shall be free of frozen material, organic material, and debris.

C. Within State Roadways, backfill placed above 12" over the top of the pipe shall be controlled low strength material (CLSM)/(flowable fill) as required by UDOT.

2.2 IMPORTED GRANULAR MATERIAL

A. Imported granular material for foundation, bedding, and backfill shall be cleaned crushed rock or gravel, free from sod, vegetation, and other organic or deleterious material. Slag will not be allowed in the pipe embedment. Imported granular material shall conform to the following gradation specifications:

1. Embedment Material

   a. Foundation Material: One hundred percent (100%) less than two-inch (2”) and maximum of five percent (5%) less than one-half-inch (1/2”).

   b. Bedding and Initial Backfill Material:

      i. Ductile-iron pipe - One hundred percent (100%) less than two-inch (2”) and maximum of five percent (5%) passing a No. 200 sieve.

      ii. PVC or polyethylene pipe - One hundred percent (100%) less than ¾” and maximum five percent (5%) passing a No. 200 sieve.

2. Final Backfill Material

   a. One hundred percent (100%) less than three-inch (3”) and maximum of fifteen percent (15%) passing a No. 200 sieve.

PART 3 EXECUTION

3.1 EXCAVATION

A. Excavation shall be performed to the lines and grades indicated. Excavated material not required or not satisfactory for backfill shall be removed from the site.

3.2 BARRICADES

A. Barriers shall be placed at each end of all excavations, and at such places as may be necessary along excavations, to warn all pedestrians and vehicular traffic of such excavations. Lights shall also be placed along excavations from one hour before sunset each day to one hour after sunrise of the next day, until such excavations are entirely refilled, compacted, and surfaced or final graded. All excavations shall be barricaded in such a manner as to prevent persons from walking into, falling into, or otherwise entering those excavations.

3.3 SHEETING, BRACING, AND SHORING OF EXCAVATIONS

A. Excavations shall be sheeted, braced, and shored as required to support the walls of the excavations. These measures shall be taken to protect the workers, the work in progress, existing utilities, structures, and improvements, from damage due to sliding and settling of trench walls. All such sheeting, bracing, and shoring shall comply with the regulations of the Utah State Industrial Commission, and accident prevention and safety provisions of the Contract.

B. The Contractor shall be fully responsible for the adequacy of methods and materials used in trench sheeting, bracing, shoring, and other systems provided to protect workers. Injury to or death of workers resulting from inadequate trench safety measures shall be the full and complete responsibility of the Contractor. All damages resulting from lack of adequate sheeting, bracing and shoring shall be the responsibility of the Contractor, and the Contractor shall affect all necessary repairs or reconstruction at its own expense resulting from such damage.

C. Sheeting or shoring that does not extend below the centerline of the pipe may be removed at the discretion and responsibility of the Contractor after the pipe embedment has been placed and compacted to a level twelve inches (12") above the top of the pipe. Following removal of the sheeting or bracing, the trench shall be immediately backfilled and compacted or consolidated. Contractor shall not backfill with frozen materials.

3.4 SAFETY

A. Excavations shall be sloped or otherwise supported in a safe manner in accordance with applicable State safety requirements and the requirements of OSHA Safety and Health Standards for Construction (29 CFR1926). The CONTRACTOR is responsible for assessing safety needs to meet such requirements, arranging for proper equipment and/or construction methods, and maintaining such equipment, methods, and construction practices so as to fully comply with all such safety requirements.

B. The CONTRACTOR is responsible for assessing safety needs related to confined space entry, as defined by OSHA. The CONTRACTOR shall meet all such requirements, arranging for proper equipment and/or construction methods, and maintaining such equipment, methods, and construction practices so as to fully comply with all confined space safety requirements.

3.5 TRENCH WIDTH

A. The bottom of the trench shall have a minimum width equal to two times the outside diameter of the pipe or as detailed on the drawings.

B. The width of the trench shall be ample to permit the pipe to be laid and jointed properly, and the backfill to be placed as specified. Trenches shall be of such extra width, when required, as will permit the convenient placing of timber supports, sheeting, and bracing, and the handling of special units as necessary.

3.6 TRENCH EXCAVATION

A. Excavation for pipelines shall be located as shown on the Drawings or as staked in the field. Trenches shall be excavated to the depths and widths required to accommodate the construction of the pipelines, as follows:

B. Normal Excavation:

1. Except in ledge-rock, cobbles, stones, or water-saturated earth, mechanical excavation of trenches shall not extend below an elevation six inches (6”) above the bottom of the pipe after placement in its final position. All additional excavation necessary for preparation of the trench bottom shall be made manually.

C. Authorized Over-Excavation:

1. Where ledge-rock, cobble rock, stones or other material render the trench material unsuitable for pipe bedding, as determined by the Public Works Director/Engineer, bedding material shall be imported and placed. The trench shall be excavated to a minimum of six-inches (6”) below the bottom of the pipe after placement in its final position.
2. Where unstable material is encountered in the excavation, foundation material may be required, as determined by the Public Works Director/Engineer. In such cases, a minimum of eight inches (8") below the bottom of the pipe after placement in its final position shall be removed. Over-excavation not ordered, specified, or shown shall be considered to be unauthorized excavation.

D. Unauthorized Over-Excavation:

1. Any excavation carried below the elevation required to install the pipe as specified in these Specifications, or directed by the Public Works Director/Engineer, shall be considered to be unauthorized. Such excavation shall be backfilled in accordance with these Specifications for "Imported Granular Material" and "Gravel Foundation for Pipelines and Pipeline Structures," all at the Contractor's expense.

E. Trench Width:

1. The trench shall be excavated such that the pipe is always centered in the trench. The minimum clear trench width at the horizontal diameter of the pipe must not be less than two times the outside diameter of the pipe. If a trench is excavated to a greater width, the Contractor will be required to restore the trench to an acceptable condition by following the steps outlined in these Specifications for "Trenches in Embankments."
2. Trench width for pipeline structures, valves, or other accessories shall be sufficient to leave at least twelve inches (12") clear between their outer surfaces and the trench. Backfill with earth under structures or valves will not be permitted. Any unauthorized excess excavation below the elevation indicated for foundation of any structures shall be backfilled in accordance with these specifications for "Imported Granular Materials," and "Gravel Foundation for Pipe & Pipeline Structures," at the Contractor's expense.

F. Trenches in Embankments:

1. Before laying pipes that are to be in fill or embankment areas, the embankment shall first be placed and compacted to the specified density to a depth of not less than two feet (2') above the top of the proposed pipe. After placing and compacting the embankment, the trench for the pipe or conduit shall be excavated through the fill and fine graded and the pipe installed as specified.

G. Placement of Excavated Material:

1. All excess material shall be hauled away from the construction site and disposed of in an area obtained by the Contractor and approved by the Public Works Director/Engineer. The Contractor shall be responsible for all rights-of-way, easements, and access associated with the disposal of excess excavated material. It shall further be responsible to obtain permission from the property owner or person controlling the property where the Contractor plans to dispose of excavated material. No compensation will be made to the Contractor for disposal of excess excavated material.
2. Non-excess excavated material shall be piled in a manner that will not endanger the work and will avoid obstructing sidewalks and driveways. Gutters and irrigation ditches shall be kept clear or other satisfactory provisions shall be made for street drainage and continuity of irrigation.
3. Grading of the area surrounding the trenches, including excavated materials, shall be performed as necessary to prevent surface water from flowing into trenches, or other excavations. Control of groundwater shall be as specified in Control of Water in this Section.

H. Fine Grading the Trench Bottom:

1. The bottom of the trench shall be accurately graded and prepared to provide uniform bearing and support on undisturbed soil or compacted granular bedding at every point along the entire length of the pipe. Bell holes shall be hand excavated after the trench bottom has been fine graded. Bell holes shall be only large enough to permit making the joints and to assure that any portion of the joint or bell does not support the pipe.

3.7 TRENCH CROSSINGS AND EASEMENTS

A. At road crossings or where existing driveways occur on a road, the Contractor shall make provisions for trench crossings either by means of backfill, tunnels, or temporary bridges.

B. Any disturbance to property caused by the Contractor’s activity within easements shall be restored to the satisfaction of the owner of the property. If necessary, shrubs, fences, or other objects shall be removed carefully. If work must occur on a lawn, the lawn shall be cut to a width of two feet (2’) wider than the intended work area (one foot (1’) on each side). The lawn sod shall be stacked separately from and shall not be mixed with other excavated material.

C. After the sod is removed, if excavation is necessary, the topsoil shall be removed to a depth of twelve inches (12”), or the actual depth of the topsoil, whichever is less. The

topsoil shall be stored separately from and shall not be mixed with other excavated material.

D. Following completion of the backfilling and the compaction of the trench, the Contractor shall replace topsoil, lawn sod, shrubs, fences, and other items that may have been removed from within the easement area and shall clean up and remove any rocks, dirt or any other debris that remain from the construction work. The Contractor shall obtain a release from the property owner stating that the repairs have been made to the satisfaction of the Owner. A copy of said release shall be delivered to the Public Works Director/Engineer.

3.8 OPEN TRENCH IN PUBLIC THOROUGHFARES

A. Trenches in public thoroughfares, regardless of trench depth, the Contractor shall safely barricade and limit open trenches to a maximum of 200 lineal feet in the daytime. In traveled roadways a maximum of 80 lineal feet of open trench will be allowed. All pipeline excavations need to be backfilled and compacted within 24 hours. Trenches shall be closed during nighttime conditions by but not limited to backfill and place metal plates over the trench or backfill and place a fence along the trench.

3.9 NATIVE SOIL CLASSIFICATION TEST

A. The soil shall be classified according to the Unified Soil Classification System and/or AASHTO soil classifications.

B. The AASHTO soil classification test shall conform to AASHTO M-145 of latest revision.

C. Soil classification tests at several depths may be required in each test area if so indicated by the geotechnical engineer or required by the Public Works Director/Engineer.

D. The results of all determinations, including an assessment of the appropriate engineering characteristics of the soil, shall be reported to the City in writing prepared by the geotechnical engineer.

E. The City may reject proposed use of tested native soil. The City's allowing the use of native soil does not relieve the Owner/Contractor of any responsibility associated with use of the soil.

F. All fill materials shall be compacted as specified in this section.

G. When the excavated materials are not satisfactory for foundation, bedding, or backfill, the Contractor shall provide imported granular material.

3.10 TRENCH PREPARATION

A. Each trench shall be excavated so that the pipe can be laid to the alignment and grade as required. The trench wall shall be so braced that the workmen may work safely and efficiently. All trenches shall be drained so the pipe laying may take place in dewatered conditions.

B. The trench bottom shall be given a final trim using a string line, laser, or another method approved by the ENGINEER for establishing grade, such that each pipe section when first laid will be continually in contact with the ground along the extreme bottom of the pipe. Bell holes shall be provided at each joint to permit the jointing to be made properly. The trench grade shall permit the pipe spigot to be accurately centered in the preceding-laid pipe joint, without lifting the pipe above the grade, and without exceeding the permissible joint deflection.

C. Pipe shall be bedded a minimum of 6-inches with sand or gravel meeting the bedding requirements. In unstable ground areas, where the native soils are unsuitable for the type of pipe being installed or as directed by the ENGINEER, an additional eight inches (8") of free draining gravel shall be required beneath the 6-inches of bedding material.

3.11 CONTROL OF WATER

A. CONTRACTOR shall keep all trenches free from water during excavation, fine grading, pipe laying and jointing, and pipe embedment operations. Where the trench bottom is mucky or otherwise unstable because of the presence of groundwater, and in all cases where the static groundwater is above the bottom of any trench or bell hole excavation, such groundwater shall be lowered to the extent necessary to keep the trench free from water and the trench bottom stable when the work within the trench is in progress.

B. CONTRACTOR shall provide and maintain at all times ample means and devices with which to remove promptly and to properly dispose of all water entering the trench excavation.

C. CONTRACTOR shall obtain and comply with all necessary permits required for discharge of water.

D. Water shall be disposed of in a suitable manner without damage to adjacent property or without being a menace to public health and convenience. No water shall be drained into work built or under construction without prior consent of the ENGINEER.

E. Dewatering shall be accomplished by well points, sumping, or any other acceptable method which will ensure a dewatered trench. Any dewatering method shall be subject to the approval of the ENGINEER.

3.12 FOUNDATION PLACEMENT

A. When over-excavation and placement of foundation material is authorized by the Public Works Director/Engineer, foundation material shall be placed in the foundation zone and below. The foundation material shall be placed so that the pipe bedding can be installed overtop and allow for the proper installation of the pipe. The foundation material shall be deposited over the entire trench width and compacted in layers. The layers shall have a maximum uncompacted thickness of six-inches (6").

B. The material shall then be fine graded in accordance with the specification for fine grading herein.

3.13 PIPE EMBEDMENT

A. Embedment material for other than PVC pipe may be excavated materials consisting of loose earth, sand, or gravel having no material larger than two-inches (2") in any dimension. For PVC pipe, the material must be no greater than 3/4" in any dimension. If the excavated materials are not satisfactory, the specified imported granular material shall be used for pipe embedment.

1. **Bedding**: The bedding material shall be deposited over the entire trench width to a compacted thickness of no more than six inches (6"). The material shall have a maximum uncompacted thickness of six inches (6").
2. **Initial Backfill**: After the pipe is in place, initial backfill material shall be placed at any point below the mid-point of the pipe simultaneously and uniformly on both sides of the pipe in un-compacted layers not to exceed six-inches (6") or one-half the diameter of the pipe, whichever is less. Initial backfill material shall be placed with care to prevent displacement of or damage to the pipe during the embedment process. Initial backfill material shall be scattered alongside the pipe and not dropped into the trench in compact masses.
3. That section of the pipe zone from the mid-point of the pipe to twelve inches (12") above the top of the pipe shall then be filled with initial backfill materials and compacted.

3.14 PIPELINE TRENCH BACKFILL

A. Pipeline trenches shall be backfilled to a level 12-inches above the top of the pipe with Import Select Fill material as specified in paragraph 2.01. Such material shall be compacted to 90% minimum Modified Proctor density (ASTM D-1557) in six-inch maximum lifts.

B. After the pipe has been installed and approved and the initial portion of backfill has been placed as specified above, backfilling of the remainder of the trench may proceed. All backfill above the protected pipe shall be carefully placed and compacted. Compaction shall be by mechanical tamping in 12-inch maximum lifts. All backfill material shall be free of frozen material, organic material, and debris. Backfill placed above 12-inches over the pipe in improved areas, and additional areas as designated on the drawings, shall be compacted to 90% minimum Modified Proctor density (ASTM D-1557).

3.15 MAINTENANCE OF BACKFILL

A. All backfill shall be maintained in satisfactory condition, and all places showing signs of settlement shall be filled and maintained during the life of the contract and for a period of one year following the day of final acceptance of all work performed under the contract. When CONTRACTOR is notified by the ENGINEER or OWNER that any backfill is hazardous, CONTRACTOR shall correct such hazardous condition at once. Any utility, road and/or parking surfacing damage by such settlement shall be repair by CONTRACTOR to the satisfaction of OWNER and ENGINEER. In addition, CONTRACTOR shall be responsible for the cost to OWNER of all claims for damage filed with the Court, actions brought against the said OWNER for, and on account of, such damage.

3.16 FINAL BACKFILL

A. Final backfill shall be from twelve inches (12") above the top of the pipe to the level shown on the Drawings. Excavated materials consisting of fines, sand, and gravel shall be used for final backfill. No oil cake, bituminous pavement, concrete, rock, or other lumpy material shall be used in the final backfill unless these materials are scattered and do not exceed six inches (6") in any dimension. Perishable or spongy material shall not be used in final backfilling.

3.17 FINISH GRADING, CLEANUP

A. CONTRACTOR shall grade the trench line to a smooth grade to affect a neat and workmanlike appearance of the trench line.

B. All tools, equipment and temporary structures shall be removed. All excess dirt and rubbish shall be removed from the site by CONTRACTOR.

C. CONTRACTOR shall restore the site to at least as good as original condition, including but not limited to final trench grade, native vegetation, and restoration of affected public and private facilities whether in the public right of way or on private property. Any exception to this requirement must be in writing from the ENGINEER for the job specific conditions.

3.18 COMPACTION TESTS

A. Compaction Quality Control Testing shall be the provided and paid for by the OWNER in accordance with APWA Section 31 23 26. A minimum 24 hours (or as otherwise specified) notice must be given to schedule all tests.

B. It shall be the responsibility of the CONTRACTOR to accomplish the specified compaction for backfill, fill, and other earthwork. It shall be the responsibility of the CONTRACTOR to control his operations by performing any additional tests necessary to verify and confirm that CONTRACTOR has complied, and is complying at all times, with the requirements of these Specifications concerning compaction, control, and testing.

1. Testing of Backfill Materials

a. Characteristics of backfill materials shall be determined in accordance with the requirements of APWA Section 31 23 26.

b. The CONTRACTOR shall demonstrate the adequacy of compaction equipment and procedures before exceeding 200 linear feet of trench backfill.

c. Until the specified degree of compaction on the previously specified amounts of earthwork is achieved, no additional earthwork of the same kind shall be performed.

d. After satisfactory conclusion of the initial compaction demonstration and at any time during construction, earthwork which does not comply with the specified degree of compaction shall not exceed the previously specified quantities.

e. Periodic compliance tests may be made by the ENGINEER to verify that compaction is meeting the requirements previously specified at no cost to the CONTRACTOR. The ENGINEER may require retesting of backfill that has settled from water penetration in the trench. CONTRACTOR shall remove the overburden above the level at which the ENGINEER wishes to test and shall backfill and recompact the excavation after the test is complete at no additional cost.

f. If compaction fails to meet the specified requirements, the CONTRACTOR shall remove and replace the backfill at proper density or shall bring the density up to specified level by other means acceptable to the ENGINEER. Subsequent tests required to confirm and verify that the reconstructed backfill has been brought up to specified density shall be paid by the CONTRACTOR. The CONTRACTOR's confirmation tests shall be performed in a manner acceptable to the ENGINEER. Frequency of confirmation tests for remedial work shall be double that amount specified for initial confirmation tests.

2. Field Density Tests

a. Tests shall be performed in sufficient numbers to meet the requirements of APWA Section 31 23 26 and to ensure that the specified density is being obtained.

b. Quality Assurance Confirmation tests shall be paid by the CONTRACTOR.

C. Field density tests shall be made in accordance with ASTM D-1557.

D. The cost of field density tests will be borne by CONTRACTOR.

3.19 RESTORATION OF CONSTRUCTION SITE

A. During the progress of the Work, the Contractor shall clean up all construction debris, excess excavation, and excess materials, and shall restore all fences, irrigation structures, ditches, culverts, and similar items. The Contractor shall stockpile the excavated trench material so as to do the least damage to adjacent grassed areas, or fences, regardless of whether these are on private property or public rights-of-way. All excavated materials shall be removed from grassed and planted areas and these surfaces shall be left in a condition equivalent to their original surface and free from all rocks, gravel, boulders, or other foreign materials.

END OF SECTION

SECTION 33 05 05
PIPE AND INSTALLATION

PART 1 GENERAL

1.1 SECTION INCLUDES

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B. Joints

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F. Pipe Installation

G. Damage and Repair of Water Mains and Appurtenances

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1.2 REFERENCES

A. Work covered by this Specification shall meet or exceed the provisions of the latest editions of the following Codes and Standards in effect at the time of award of the Contract:

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C 651	Standard for Disinfecting Water Mains
AWWA C 900	Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In.
AWWA M 23	Manual of Water Supply Practices - PVC Pipe - Design and Installation

INTERNATIONAL PLUMBING CODE (IPC)

IPC	International Plumbing Code (IPC)

PART 2 PRODUCTS

2.1 ALL MATERIALS

A. All materials that may come in contact with drinking water, this included pipes, gaskets, lubricant, O-rings, and appurtenances, shall be NSF certified.

B. Only materials that were used previously for conveying drinking water may be reused.

C. All pipes and pipe fitting materials shall be “lead-free.”

2.2 PIPE MATERIALS

A. Pipe for the transmission and distribution of drinking water shall be manufactured in accordance with AWWA C900, "Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4-inch through 60-inch." The PVC pipe shall have a cast-iron-pipe-equivalent outside diameter. All PVC pipe 4-inch and larger shall be DR. 18 with a working pressure of 150 PSI.

B. All plastic pipe must be approved for potable water use by the National Sanitation Foundation and must bear the logo "NSF-pw" or "NSF-61" indicating such approval.

C. Pipe Sections shall be clearly marked to:
1. Identify manufacturer's name or trademark.
2. Nominal pipe size and OD base.
3. AWWA material code designation.
4. Dimension ratio.
5. AWWA pressure class.
6. AWWA specification designation.
7. Product record code.

D. The minimum allowable pipe size shall be 8-inch. Pipe sizing is determined by city public works and/or engineer.

2.3 JOINTS

A. All joints and accessories shall be as manufactured and furnished by the pipe supplier and have bell and/or spigot configurations and have compatible pressure ratings with that of the pipe.

B. Joints shall be push on rubber gasket type. Lubrication shall be water soluble, non-toxic, non-objectionable in taste and odor imparted to the water, non-supporting of bacteria growth, and have no deteriorating effect on the PVC pipe or rubber gaskets.

2.4 FITTINGS

A. All fittings shall be Ductile Iron Pipe and shall conform to the provisions of ANSI/AWWA C110/A21.10-82 or C153/A21.53-58. FM grease shall be applied to the threads of the bolts on all fittings.

B. Fittings shall be encased in accordance with section 2.9 of Section 33 14 19 – Mechanical Appurtenances.

C. All mechanical joint fittings must be accompanied with mega-lugs or equal mechanical restraints.

D. When using tapping sleeves, the tapping sleeve must be stainless steel such as a Ford FTSS or equal.

2.5 CAUTION TAPE

A. All pipe shall include caution marker tape installed in the pipeline trench approximately twelve inches (12”) below the ground surface.

B. Tape shall be a minimum of 3" wide by 5.0 mil overall thickness, with no less than a 50-gauge solid aluminum foil core.

C. Identification tape shall be furnished with white or black printing on a colored field having the words:

CAUTION: POTABLE WATER - BELOW

2.6 TRACER WIRE

A. All pipe, including service laterals, shall include a 12-gauge solid THHN tracer wire installed according to NESC standards. The tracer wire shall be installed in the pipeline trench approximately 6-inches above the top of pipe. The tracer wire shall be brought up in the valve and meter boxes and along and fastened to each fire hydrant to permit connecting to when doing line location.

PART 3 EXECUTION

3.1 PIPE INSTALLATION

A. Installation of ductile iron pipe shall be in accordance with ANSI/AWWA C600, Installation of Ductile-Iron Water Main and Their Appurtenances. Installation of PVC pipe shall be in accordance with AWWA C900, ASTM D2774, and PVC Pipe, AWWA Manual M23 and with applicable manufacturer’s instructions.

B. Cutting

1. Cutting of pipe for closure pieces or for other reasons shall be done in a neat and workmanlike manner by a method recommended by the manufacturer. After cutting, the pipe shall be beveled and filed to prevent gasket damage in joint assembly.

C. Dewatering on Trench

1. See Section 31 23 16 – Excavation and Backfill for Buried Pipelines.

D. Laying of Pipe

1. The pipe and pipe coating (where applicable) shall be inspected for defects before installation. Any defects shall be repaired, or the pipe shall be replaced, whichever is deemed necessary by the Public Works Director/Engineer.
2. All pipe shall be laid and maintained to the required lines and grades with fittings and valves at the required locations. The pipes shall be installed with a **36-inch minimum** cover from finished road surface for culinary water. The Contractor shall be responsible to install the pipeline to the alignment set by the Public Works Director/Engineer or as shown on the Drawings.
3. Culinary water lines must be installed on the North or East side of roads.
4. Culinary lines with potential of future expansion beyond a current subdivision boundary must have a gate valve installed within 20 feet of the end of the line.
5. Potential 4-way intersections must have a cross and gate valve installed on each direction of the cross.
6. All pipes, fittings and valves shall be carefully lowered from the truck when unloading or when installing into the trench. This should be done one piece at a time to prevent damage to pipe materials and protective coatings and linings. Under no circumstances shall materials be dropped or dumped from the truck or into the trench.
7. The Contractor shall take the necessary precautions such that foreign materials do not enter the pipe. No debris, tools, or other materials shall be placed in the pipe during laying operations. When laying of pipe is not in progress, the pipe shall be closed by a watertight plug.
8. Maximum deflections at pipe joints shall not exceed the joint specifications of AWWA C605 of latest revision, or the recommendations of the pipe manufacturer.
9. Deflections in PVC pipe shall be made by longitudinal bending of the barrel of the pipe rather than deflecting the pipe joints. Longitudinal bending shall be limited to eighty percent (80%) of the manufactures recommended minimum bending radius.
10. All pipes shall be laid with a minimum of 1 foot of separation from the high-pressure gas line.
11. Caution tape shall be installed above pipe.
12. The open ends of all pipelines under construction shall be covered and effectively sealed at the end of the day's work.
13. When crossing surface waters (ditches, canals, etc.), a minimum cover of two feet shall be provided over the pipe.

E. Pipe Bedding
   1. All pipes shall be protected from lateral displacement and possible damage resulting from impact or unbalanced loading during backfilling operations by being adequately bedding.
   2. In the event trench materials are not, in the judgment of the Public Works Director/Engineer, satisfactory for pipe bedding, imported granular bedding will be required. See Imported Granular Material in Section 31 23 16 – Excavation and Backfill for Buried Pipelines.

F. Thrust Blocking
   1. Thrust blocking shall be installed at points where the pipe changes direction such as: at all tees, valves, plugs, caps, hydrants, reducers, elbows etc.
   2. Fittings shall be encased in accordance with section 2.9 of Section 33 14 19 – Mechanical Appurtenances.
   3. Thrust blocks shall be concrete having a compressive strength of not less than 3000 pounds per square inch at 28 days.
   4. Thrust blocks shall be placed between undisturbed soil and the fitting to be anchored and be so placed that the pipe and the fittings will be accessible for repair.
   5. Thrust blocks shall be constructed so that the bearing surface is in direct line with the major force created by the pipe or fitting.
   6. Thrust blocks shall be sized and constructed as indicated on the Drawings.

G. Connections to Existing Waterlines
   1. The Contractor will be responsible to verify the size, type of material and location of water lines; to determine the proper fittings and materials required; if they differ from what is shown on the plans, or if they are not shown on the plans, to obtain the Public Works Director/Engineer's approval of the planned connection; and to perform the construction in a suitable fashion.

H. Separation
   1. Maintain separation of water mains and water service laterals from sewer piping in accordance with the current Plumbing Code and Utah Division of Drinking Water Standards (R309-550-7). A minimum of eighteen-inch (18”) vertical and ten-foot (10’) horizontal separation shall be maintained unless the Division of Drinking Water grants an exception.
   2. Water mains and sewer lines shall not be installed in the same trench.

I. Cross Connections
   1. There shall be no physical cross connections between the distribution system, including but not limited to piping, pumps, hydrants, or tanks that can be contaminated from any source.

3.2 DAMAGE AND REPAIR OF WATER MAINS AND APPURTENANCES

A. The Contractor shall be responsible for any damage to water mains and water facilities caused by his operations. The Contractor may be relieved of the responsibility under the following conditions:

1. He has not excavated below or beyond the required excavation lines, and
2. He has given proper and timely notice of his work plans, and
3. He has used reasonable care, and cooperated, minimizing the damage.

B. Any damage to water gates, hydrants, valve chambers, meter boxes, and other surface appurtenances that result from the Contractor's operation shall be its sole responsibility.

3.3 FLUSHING

A. CONTRACTOR shall flush the pipeline as the work progresses by a means in accordance with good practice to ensure that sand, rocks, or other foreign material are not left in any of the pipeline. If possible, the flushing shall be made with an open pipe end.

B. All new water systems or extensions to existing systems shall be thoroughly flushed before being placed in service. Flushing shall be accomplished through hydrants, or end of line blow-off assemblies at a minimum flushing velocity of 2.5-feet per second. See chart below.

FLOW RATE AND OPENINGS TO FLUSH PIPELINES
(40- psi Residual Pressure)

Pipe Size (inches)	Flow Required to Produce 2.5 fps velocity (gpm)
2	25
4	100
6	220
8	400
10	600
12	900
14	1,200
16	1,600
18	1,980
20	2,450
24	3,525
30	5,510

3.4 DISINFECTION

A. Source of Water
1. CONTRACTOR shall assume all responsibility to obtain the necessary water supplies for disinfection of the water line system.

B. Testing Procedure
1. Leakage and pressure testing must be completed prior to disinfection procedures.

2. All water piping installed under this Contract shall be disinfected using an approved disinfection method in accordance with the "American Water Works Association Standard for Disinfecting Water Mains" (AWWA C651).
3. Heavily chlorinated water shall not be discharged onto the ground. Upon completion of disinfection, Sodium Bisulfate ($NaHSO_3$) shall be applied to the heavily chlorinated water to neutralize thoroughly the chlorine residual remaining. Water shall be neutralized to less than 1 ppm.
4. After approval of disinfection, CONTRACTOR shall flush the new system until the chlorine residual is a maximum of 0.3 ppm.
5. At the end of 24 hours, a bacteriological test will be performed by OWNER to insure adequate disinfection. If the initial disinfection fails to provide satisfactory bacteriological results, or shows the presence of coliform bacteria, then the line shall be rechlorinated, flushed, and retested until satisfactory results are obtained at the expense of CONTRACTOR.

3.5 BACTERIOLOGICAL TEST

A. The Developer/Contractor is responsible to submit and pay for the bacteriological test. Re-chlorinate the water line and retest the water, if necessary, until the results of the bacteriological test are satisfactory. Bacteriological tests shall be as follows:
   1. No samples for testing shall be taken sooner than 24 hours after system flushing.
   2. Sample water at each of the following locations, as applicable: where water enters system, ends of pipe runs, and remote outlets.
   3. Analyze water samples in accordance with State of Utah Requirements.
   4. After final flushing and before the new water line is connected to the distribution system, two (2) consecutive sets of acceptable samples, taken at least 24 hours apart, shall be collected for the new line. At least one set of samples shall be collected from every 1200 feet of new water line, plus one set from the end of the line and at least one set from each branch. All samples shall be tested for bacteriological quality in accordance with Standard Methods for the Examination of Water and Wastewater and shall show the absence of coliform organisms. Provide three (3) copies of the report to the Public Works Director.

B. The Bacteriological Report shall include the following:
   1. Date issued.
   2. Project name and location.
   3. Laboratory's name, certification number, address, and phone number.
   4. Time and date of water sample collection.
   5. Name of person collecting samples.
   6. Test location.
   7. Time and date of laboratory test start.
   8. Coliform bacteria test results for each outlet tested.
   9. Certification that water conforms or fails to conform to bacterial standards of State of Utah Public Drinking Water Regulations.
   10. Bacteriologist's signature.

3.6 PRESSURE TEST

A. Source of Water
   1. CONTRACTOR shall assume all responsibility to obtain the necessary water supplies for pressure testing of the pipeline.

B. Testing Procedure
   1. Polyvinyl Chloride pipe shall be tested at a static pressure of 200 psi for 2 hours in accordance with the "American Water Works Association Manual of Water Supply Practices - PVC Pipe -Design and Installation" (AWWA No. M23).
   2. In the case of pipelines that fail to pass the leakage test, CONTRACTOR shall determine the cause of the excessive leakage, shall take corrective measures necessary to repair the leaks, and shall again test the pipelines, all at no additional cost to OWNER.
   3. The ENGINEER shall be notified at least 48 hours before the pipeline is to be tested so that he may be present during the test.

C. **Pressurization**: 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 or section under test and corrected to the elevation of the test gage, shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Public Works Director/Engineer.

D. **Air Removal**: Before applying the specified test pressure, air shall be expelled completely from the pipe, valves, and hydrants. If permanent air vents are not located at all high points, the Contractor shall install corporation cocks at such points so that the air can be expelled as the line is filled with water. After all the air has been expelled, the corporation cocks shall be closed and the test pressure applied. At the conclusion of the pressure test, the corporation cocks shall be removed and plugged.

E. **Examination**: All exposed pipe, fittings, valves, hydrants, and joints shall be examined carefully during the test. Any damaged or defective pipe, fittings, valves, or hydrants that are discovered following the pressure test shall be repaired or replaced with sound materials and the test shall be repeated until it is satisfactory to the Owner.

END OF SECTION

SECTION 33 14 19
MECHANICAL APPURTENANCES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Water Service Connections

B. Resilient Seated Gate Valve

C. Butterfly Valve

D. Valve Box

E. Coupling

F. Fire Hydrant

G. Blow-off Valve

H. 2-Inch Air Inlet and Removal Facility

I. Water Service Connection Installation

1.2 REFERENCES

A. The latest edition of the following publications form a part of this specifications to the extent referenced. The publications are referred to in the text to by basic designation only.

B. AMERICAN WATER WORKS ASSOCIATION (AWWA)

1. C-500 Metal-Seated Gate Valves for Water Supply Services
2. C-502 Dry-Barrel Fire Hydrants
3. C-508 Swing-Check Valves for Waterworks Service, 2 In. through 24 In.
4. C-509 Resilient-Seated Gate Valves for Water Supply Service
5. C-512 Air-Release, Air/Vacuum, and Combination Air Valves for Waterworks Service
6. C-701 Turbine Meters

PART 2 PRODUCTS

2.1 WATER SERVICE CONNECTIONS

A. Water service laterals shall be constructed with materials specified and at the locations shown on the Standard Drawings or at the actual location established during construction.

B. Pipe for water service laterals shall be one inch (1") blue polyethylene pipe CTS O.D. tube or larger. Polyethylene CTS tube shall be manufactured in accordance with the standard specification for Polyethylene PEP plastic tubing as issued by the American Standard for Testing and Materials under ASTM D 2737 and AWWA C901.

1. Material designation code:

    a. Bimodal Polyethylene, PE 4710

2. Minimum cell classification as defined by ASTM D 3350:

    a. 445574E (blue color), or
    b. 445574C with blue outer layer

3. Standard pipe dimension ratio CTS (SDR) 9 – 200 or 250 psi pressure rating.

C. Service saddle must be ROMAC 202NS or equal with nylon coating and stainless steel straps.

D. Corporation Stop type Ball Valves shall be full port, bronze body, PTFE coated ball and have a double O-ring stem. Outlets shall match the connection specified. Valves shall be rated at 300 psig maximum working pressure. They shall be Ford FB100 or equal for service tap. Teflon tape is required on all taps.

E. The meter setter shall be 1” double check set meter setter (McDonald 720-421WDDD 44 or equal).

F. The meter box shall be a 21” x 36 HDPE meter box. The meter cover to be D&L Supply L-2244 or equal with recessed standard waterworks pentagon head locking device, raised cast center rim, and 2” knockout. The cover shall be marked “Water.”

G. Special joints and fittings:

1. **PE Compression Fitting Coupling Nut**: The interior surface of the coupling nut, including threads, shall have a baked on, fluorocarbon coating to reduce assembly friction and prevent the gasket from turning and twisting during tightening. The nut shall bottom on a cast or machined shoulder on the body when properly assembled. This design will provide a visual check to assure connection is properly assembled.
2. **PE Compression Fitting Sealing Gasket**: The sealing gasket shall be of molded synthetic rubber (ASTM D2000) with molded in place bronze spring (ASTM A134 Alloy #6) to eliminate the possible cold flow of the gasket between the pipe and fitting. A gripper band of hardened stainless steel (ANSI Type 401) shall be fitted into the gasket. When the gasket is compressed it will cause the gripper ring to distort the pipe giving the fitting a high resistance to pull out. The gripper band

shall overlap itself to prevent cold flow of the gasket into the cavity under the band.

3. **PE Pipe Stiffeners**: When compression fittings are used with P.E. Pipe, Stainless Steel pipe stiffeners are required to eliminate cold flow of plastic pipe.
4. **PE Fittings**: All fittings are to be for CTS Polyethylene pipe.
5. **PE Pull Out Load:** The Minimum pull out load for the fitting when used with PE plastic pipe shall be as follows for each given size:

SIZE	MINIMUM PULL OUT (FT-LBS)
¾"	400
1"	400
1 ½"	500
2"	500

6. Mueller 110 compression couplings and fittings or equivalent are to be used on all P.E. plastic pipe installations.

2.2 RESILIENT SEATED GATE VALVE

A. Valves in sizes 4" through 12" shall be of the iron body, non-rising bronze stem, resilient seated type, manufactured to equal or exceed all applicable AWWA standards of C515 latest revision and comply with the following:

1. Valves shall open left and be provided with 2" square operating wrench nuts for buried valves or handwheel for valves located in structures unless otherwise specified.
2. Buried valves shall be of flange or mechanical joint design to match pipe joint system.
3. The flanges of valves may be raised or plain faced. Flanges of valves shall be faced and drilled to 125-lb American Standard template.
4. When valves have Mechanical Joints, they shall be furnished with mechanical restraints such as mega-lugs or equal.
5. The disc shall have integrally cast ASTM B62 bronze stem nut to prevent twisting, binding, or angling of the stem. Designs with loose stem nuts are not acceptable.
6. Bronze valve stems shall be interchangeable with stems of the double disc valves of the same size, direction of opening and manufacture.
7. All internal ferrous surfaces shall be coated, holiday free, to a minimum thickness of 4 mills with a two-part thermo setting epoxy coating. Said coating shall be non-toxic, impart no taste to the water, formulated from materials deemed acceptable in the Food and Drug Administration Document Title 21 of the Federal Regulations on food additives, Section 121.2514 entitled Resins and Polymeric Coatings. It shall protect all seating and adjacent surfaces from corrosion and prevent build-up of scale or tuberculation.
8. The sealing element shall be secured to the disc with self-locking stainless steel screws, and it shall be field replaceable, and shall be such that it cannot be installed improperly.

9. Stem failure from over torque in either the open or closing position shall occur externally at such a point as to enable the stem to be safely turned by use of a readily available tool after exposure of the valve through excavation.
10. Valve design shall incorporate a positive metal-to-metal stop to prevent over-compression of the sealing element.
11. A full-faced composition gasket placed between machined body and bonnet flanges is required to eliminate cold flow or creep action present with "O" ring gasketed bodies.
12. Valves shall have a test plug in the bonnet area to vent air and allow line pressure testing.
13. The exterior of the valves shall be Asphalt Varnish, JAN-P-450. If exterior epoxy is used, all bolts and nuts shall be made of Stainless Steel to prevent galvanic corrosion of said nuts and bolts due to insulation from the ferrous valve and line.
14. Valves, valve-operating units, stem extensions and other accessories shall be installed by the CONTRACTOR where shown, or where required in the opinion of the ENGINEER, to provide for convenience in operation. Where buried valves are indicated, the CONTRACTOR shall furnish and install valve boxes to 3-inches above grade in unimproved areas, or at grade with concrete collar as shown on the Drawings in improved areas. All valves and gates shall be new and of current manufacture (except those provided by the OWNER).
15. All valves shall be furnished with pressure classes equal to or better than the pressure class of the pipe with which the valves are to be used. Unless otherwise specified, each valve body shall be tested under a test pressure equal to twice its design water-working pressure.

2.3 BUTTERFLY VALVE

A. All butterfly valves shall conform to the latest revision of AWWA Standard C504, Class 150-B, and comply with the following:
   1. Valve bodies shall be cast iron, ASTM A126 Class B. Body ends shall be flanged with facing and drilling in accordance with ANSI B16.1, Class 125; or mechanical joint in accordance with AWWA C111. All mechanical joint end valves shall be furnished complete with joint accessories (bolts, nuts, gaskets, and glands). All valves shall conform to AWWA Standard C504, Table 3, Laying Lengths for Flanged Valves and Minimum Body Shell Thickness for all Body Types.
   2. Valve disc shall be ductile iron ASTM A536, grade 65-45-12. Valve disc shall be of the offset design providing 360-degree uninterrupted seating.
   3. The resilient seat shall be natural rubber bonded to an 18-8, Type 304 stainless steel retaining ring secured to the disc by 18-8, Type 304 stainless steel screws. The seat shall be capable of mechanical adjustment in the field and field replaceable without the need for special tools. Valve body seat shall be 18-8, Type 304 Stainless Steel.
   4. Valve shafts shall be 18-8, Type 304 stainless steel. Shafts shall be of the two-piece stub design and attached to the disc by means of "O" ring sealed taper pins with lock nuts.
   5. The valve assembly shall be furnished with a non-adjustable factory set thrust bearing designed to center the valve disc at all times.

6. Shaft bearings shall be contained in the integral hubs of the valve body and shall be self-lubricated sleeve type.
7. Valve shaft seal shall consist of "O" Rings. Where the valve shaft projects through the valve body for actuator connection, the "O" Ring packing seal shall be field replaceable as a part of a removable bronze cartridge.
8. When manual actuators are required, they shall be of the traveling nut design capable of withstanding 450-foot pounds of input torque against the open and closed stops. All actuators shall have adjustable mechanical stop limits. The closed position stop shall be externally adjustable. Valves shall be installed with the shaft horizontal unless otherwise directed by the Public Works Representative/Engineer and shall be provided with a 2-inch square operating nut for manually operating the valve with a "T" handle wrench.
9. All valves shall be coated with epoxy in conformance to AWWA Standard C550, latest revision. Interior wetted ferrous surfaces shall be coating with nominal 10 mils thick for long life; and body exterior shall have a minimum of 3 to 4 mils coating thickness to provide superior base for field-applied finish coats.

2.4 VALVE BOX

A. All buried valves shall be installed complete with two-piece, cast iron, screw type, 5-1/4-inch shaft valve box with locking lid. The lid shall have the words "Water." cast in the metal depending on the application.

2.5 COUPLING

A. Couplings shall be equal to the product of Smith-Blair or Dresser with ductile iron couplings being used on all ductile iron and PVC pipe. Couplings shall be of the straight, transition, or reducing style as required by the specific installation. Where the coupling is used to join a ductile iron line to a steel line appropriate transition gasket will be used. All steel fittings and bolts shall be coated and encased in accordance with section 2.9.

2.6 FIRE HYDRANT

A. Fire hydrants shall be "traffic model" type designed to conform to AWWA Specification C502. Hydrants must be Waterous “Pacer”, no substitutions.

B. Fire hydrants and their related items such as auxiliary gate valves and valve boxes are to be furnished and installed as shown on the Drawings.

C. Fire hydrants must be no more than 500 feet apart and must be present at the end of any dead-end culinary water line unless otherwise specified.

D. Fire hydrants are to be placed on the same side of street as the water main and 3 feet from property lines.

E. One cubic yard gravel sump wrapped in geotextile fabric shall be provided at each hydrant. All hydrants shall be mechanical joint end and shall be connected to the main by means of a mechanical joint by flanged tee and flanged by mechanical joint auxiliary gate valve and box as shown on the Standard Drawings. Hydrant must be a mechanical joint inlet restrained with a mega-lug or equal mechanical restraint. Hydrant and other

fittings shall be encased in accordance with section 2.9. Set the hydrant so that the flange is 2 to 6 inches higher than the back of the sidewalk.

2.7 BLOWOFF VALVE

A. A blow-off valve is only used when specified on the culinary system in cul-de-sacs and in temporary dead-end streets. The installation in cul-de-sacs shall be permanent and shall come off near the end of the culinary water line. On temporary dead-ended streets the connection shall be made using a main line sized plug or cap with a 2-inch tap.

B. Blowoff hydrant must be a MainGuard #77 Post Hydrant.

C. Blow-offs shall not be connected directly to a sewer.

2.8 2-INCH AIR INLET AND REMOVAL FACILITY

A. The connection to the main for the air inlet and removal facility shall be by a line size by 2-inch tapped tee. Air inlet and removal facilities shall be placed at high points or uphill end points in the system.

B. Air inlet and removal facility shall not be connected directly to a sewer.

2.9 POLYETHYLENE ENCASEMENT

A. Fitting, valves, hydrants, and all other appurtenances shall be encased in 12-mil polyethylene wrap. Polyethylene encasement shall meet the requirements of ANSI A21.5 or AWWA C105. Encasement shall be done before thrust blocks are poured to prevent fittings from bonding to the thrust blocks.

B. All steel fittings and bolts shall be coated with a non-oxide coating and encased with 12-mil polyethylene wrap.

PART 3 EXECUTION

3.1 WATER SERVICE CONNECTION INSTALLATION

A. Extent:
   1. New water service laterals shall extend from the water main to five-foot (5’) past the meter box. New polyethylene pipe water services shall not have any joints between the corporation stop at the main and the meter setter.
   2. Water service laterals relocated during construction of new pipelines shall extend from the water main to the water meter if the existing service is other than copper or polyethylene or is in poor condition. Water services other than copper and polyethylene shall not have any joints between the corporation stop and the meter.

B. Connection to Main:
   1. A 24-inch gooseneck shall be formed with the tubing for all connection types. No connections shall be made to the main within 36” of the end of the pipe joint

and all connections must be at least 36” apart. On existing services, the existing connection to main will be used unless damaged or leaking. All connections shall be made using pack joints (compression) type fittings.

C. Meter Setter and Meter Box
   1. Meter setter must be a minimum of 18” below meter box lid.
   2. A curb stop ball valve must be installed on the city side of the meter setter.
   3. Meter box lid to be three-eighths inch (3/8") above top back of sidewalk. Centerline of cover shall be one-foot (1’) behind back of walk and cannot be installed under driveway approaches, sidewalks, or curb and gutter.

3.2 VALVES AND VALVE BOXES

A. Valves, valve-operating units, stem extensions and other accessories shall be installed by the Contractor where shown, or where required in the opinion of the Engineer, to provide for convenience in operation.

B. Valves and valve boxes shall be installed where shown on the drawings. Valves and valve boxes shall be set plumb. Valve boxes shall be centered directly over the valve. Valves shall be aligned with property lines where possible. Earth fill shall be carefully tamped around the valve box to a distance of four (4) feet on all sides of the box, or to the undisturbed trench face if less than four (4) feet. Valves shall have the interiors cleaned of all foreign matter before installation. All valve boxes located in streets shall be installed to grade. Valves placed in asphalt surfacing shall be constructed such that the cast iron ring is one-half inch (1/2”) lower than the finished surface. After paving the asphalt shall be jack hammered out, road base around the valve box shall be recompacted, and the concrete collar placed.

C. Valve boxes shall be 6” above grade in unimproved areas.

END OF SECTION

TOWN OF GENOLA

STANDARD DRAWINGS FOR WATER DISTRIBUTION SYSTEM

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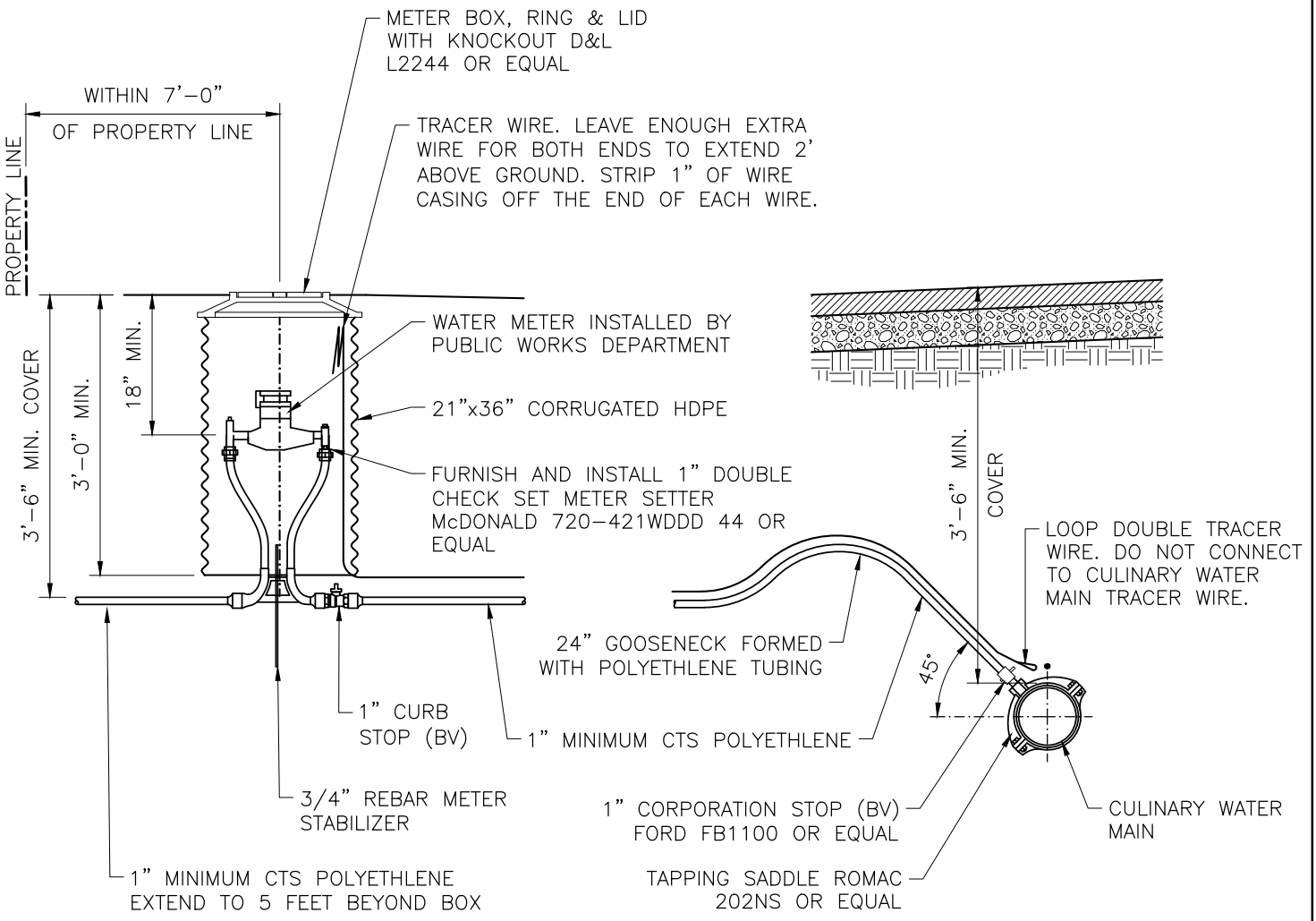


TAP ON PVC PIPE

GENERAL NOTES:

1. GENOLA PUBLIC WORKS MUST TAP ALL NEW SERVES UNLESS IN A NEW SUBDIVISION UNDER CONSTRUCTION.
2. COMPRESSION FITTINGS REQUIRED WITH STAINLESS STEEL STIFFENERS ON ALL POLYETHLENE CONNECTIONS
3. MUST BE INSPECTED BY CITY BEFORE BACKFILLING METER BOX.

REGISTERED PROFESSIONAL ENGINEER
MARK L. CHRISTENSEN
No. 186311
11/10/2021
STATE OF UTAH

JUB

STATEMENT OF USE

THIS DOCUMENT AND ANY ILLUSTRATIONS HEREON ARE PROVIDED AS STANDARD CONSTRUCTION DETAILS WITHIN THE TOWN OF GENOLA. DEVEATION FROM THIS DOCUMENT REQUIRES APPROVAL FROM THE TOWN OF GENOLA. THE TOWN OF GENOLA CORPORATION CAN NOT BE HELD LIABLE FOR MISUSE OR CHANGES REGARDING THIS DOCUMENT.

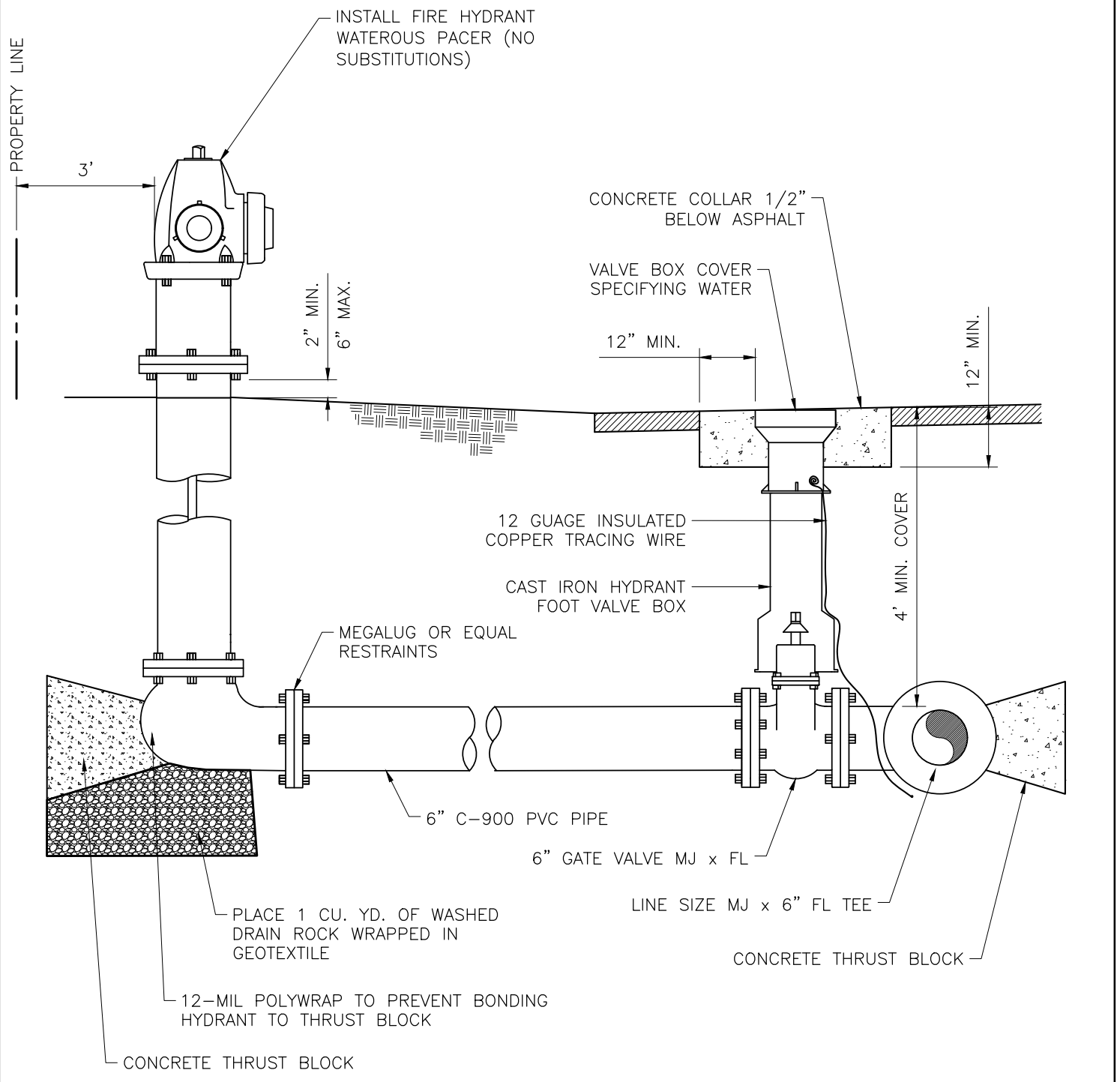
REVISION

NO.	DESCRIPTION	BY	APR.	DATE
1	CHANGE 1" DOUBLE CHECK SET METER SETTER MANUFACTURER	JMM	MLC	11/10/21
2				
3				
4				

1" CULINARY WATER SERVICE CONNECTION DETAIL

TOWN OF GENOLA
74 WEST 800 SOUTH

STANDARD DRAWING NUMBER:	1
CAD DWG:	GENOLA_STD_DWGS
PLOT SCALE:	1.000
DRAWN BY:	JMM
DESIGN BY:	EDC
CHECKED BY:	DWJ
ADOPTED DATE:	



GENERAL NOTES:

1. FIRE HYDRANTS SHALL BE PAINTED RED.
2. ALL BOLTS SHALL BE FREE FROM CONCRETE AND FULLY ACCESSIBLE.
3. FM GRADE GREASE SHALL BE USED FOR ASSEMBLY BOLT FITTINGS.
4. WATER MAIN LINE TO BE INSTALLED 3 FEET FROM PROPERTY LINE.

LICENSED PROFESSIONAL ENGINEER
260247
Delmas W. Johnson
10/30/20
STATE OF UTAH

JUB

STATEMENT OF USE

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1	DWJ			
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THE TOWN OF GENOLA UTAH

FIRE HYDRANT TYPICAL

TOWN OF GENOLA
74 WEST 800 SOUTH

STANDARD DRAWING NUMBER:	2
CAD DWG:	GENOLA_STD_DWGS
PLOT SCALE:	1.000
DRAWN BY:	JMM
DESIGN BY:	EDC
CHECKED BY:	DWJ
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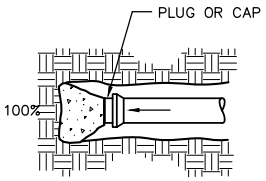
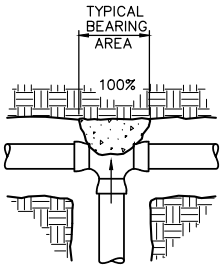
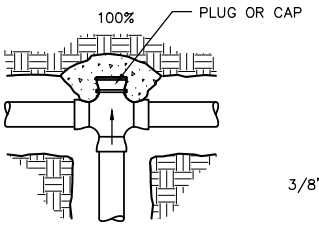


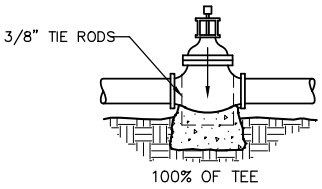
DEAD END PLAN VIEW



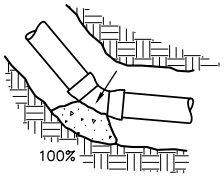
TEE PLAN VIEW



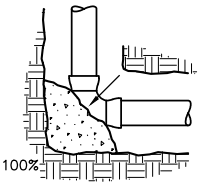
CROSS W/PLUG PLAN VIEW



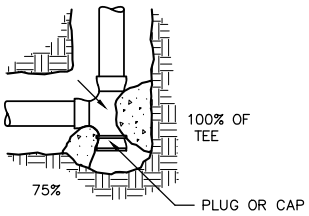
VALVE ELEVATION VIEW



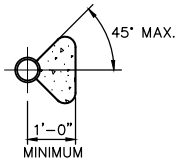
ELBOW PLAN VIEW



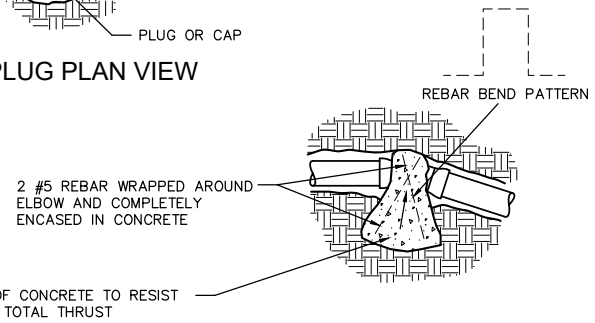
ELBOW PLAN VIEW



TEE W/PLUG PLAN VIEW



TYPICAL SECTION
THRU THRUST BLOCK



GRAVITY THRUST BLOCK
ELEVATION VIEW

NOTES:
1. THE FIGURE (100%) AT THE THRUST BLOCK INDICATES PER CENT OF TOTAL THRUST TO BE APPLIED FOR BEARING AREA.
2. THE ARROW (⟶) INDICATES THRUST DIRECTION.
3. CONCRETE FOR THRUST BLOCKS TO BE 3000 P.S.I. .
4. ALL MJ AND FLANGED FITTINGS TO BE WRAPPED WITH 12 MIL POLYETHYLENE PRIOR TO PLACING CONCRETE THRUST BLOCK
5. WHERE SUFFICIENT BEARING SURFACE IS NOT AVAILABLE FOR THRUST BLOCK, MEGALUG THRUST RESTRAINING GLANDS MAY BE USED. MEGALUG THRUST RESTRAINING GLANDS SHALL BE INSTALLED PER MANUFACTURER'S RECOMENDATION INCLUDING ANY JOINT RESTRAINT. ANY USE OF MEGALUG OR CHANGE TO THE THRUST BEARING CHART MUST BE REVIEWED BY THE ENGINEER.
6. MEGALUGS OR EQUAL REQ'D AT ALL FITTING TO PIPE JOINTS.

TABLE 1

USE WHEN LINE PRESSURE AND SOIL BEARING STRENGTH ARE KNOWN.						
LINE PRESSURE: psi TEST PRESSURE (sf = 1.5): psi SOIL BEARING STRENGTH: psf (SOIL BEARING STRENGTH DETERMINED FROM A GEOTECHNICAL INVESTIGATION.)						
SIDE THRUST (lbs.) PER 1 PSI LINE PRESSURE						
PIPE SIZE (")	PIPE AREA (sq. in.)	DEAD END OR TEE (lbs.)	90° BEND (lbs.)	45° BEND (lbs.)	22.5° BEND (lbs.)	11.25° BEND (lbs.)
4	14.39	22	31	17	9	5
6	31.17	49	69	37	19	10
8	56.88	86	121	66	34	17
10	86.92	131	185	100	51	26
12	124.29	187	264	143	73	37
14	168.33	253	358	194	99	50
16	219.56	330	466	253	129	65
18	277.59	417	589	319	163	82
20	342.41	514	727	394	201	101
24	490.09	736	1040	563	287	145
30	757.69	1137	1608	870	444	223

TABLE 2

USE WHEN LINE PRESSURE AND SOIL BEARING STRENGTH ARE NOT KNOWN.						
LINE PRESSURE: 120 psi TEST PRESSURE (sf = 1.5): 180 psi SOIL BEARING STRENGTH: 1,500 psi						
AREA OF BEARING REQUIRED (sq. ft.)						
PIPE SIZE (")	PIPE AREA (sq. in.)	DEAD END OR TEE (lbs.)	90° BEND (lbs.)	45° BEND (lbs.)	22.5° BEND (lbs.)	11.25° BEND (lbs.)
4	14.39	1.7	2.4	1.3	0.7	0.3
6	31.17	3.9	5.5	3.0	1.5	0.8
8	56.88	6.8	9.7	5.2	2.7	1.3
10	86.92	10.4	14.8	8.0	4.1	2.0
12	124.29	14.9	21.1	11.4	5.8	2.9
14	168.33	20.2	28.6	15.5	7.9	4.0
16	219.56	26.3	37.3	20.2	10.3	5.2
18	277.59	33.3	47.1	25.5	13.0	6.5
20	342.41	41.1	58.1	31.4	16.0	8.1
24	490.09	58.8	83.2	45.0	22.0	11.5
30	757.69	90.9	128.6	69.6	35.5	17.8

EXAMPLE FOR TABLE 1:
8-INCH 90° BEND
LINE PRESSURE = 100 psi
FROM TABLE: THRUST PER 1 psi =121 lbs.
CALCULATE TOTAL THRUST: 100 psi x 121 lbs/psi = 12,100 lbs
SOIL BEARING STRENGTH = 2,000 psf
AREA OF BEARING REQUIRED FOR THRUST BLOCK IS 6.1 sq. ft. (12,100 lbs / 2,000 psf = 6.1 sf. ft.)

* PIPE AREA IS BASED ON LARGEST ACTUAL INSIDE DIAMETER OF DUCTILE IRON PIPE.

LICENSED PROFESSIONAL ENGINEER
260247
Delmas W.
Johnson
10/30/20
STATE OF UTAH

JUB

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THE TOWN OF GENOLA UTAH

THRUST BLOCK DETAILS

TOWN OF GENOLA
74 WEST 800 SOUTH

STANDARD DRAWING NUMBER: 3

CAD DWG:	GENOLA_STD_DWGS
PLOT SCALE:	1.000
DRAWN BY:	JMM
DESIGN BY:	EDC
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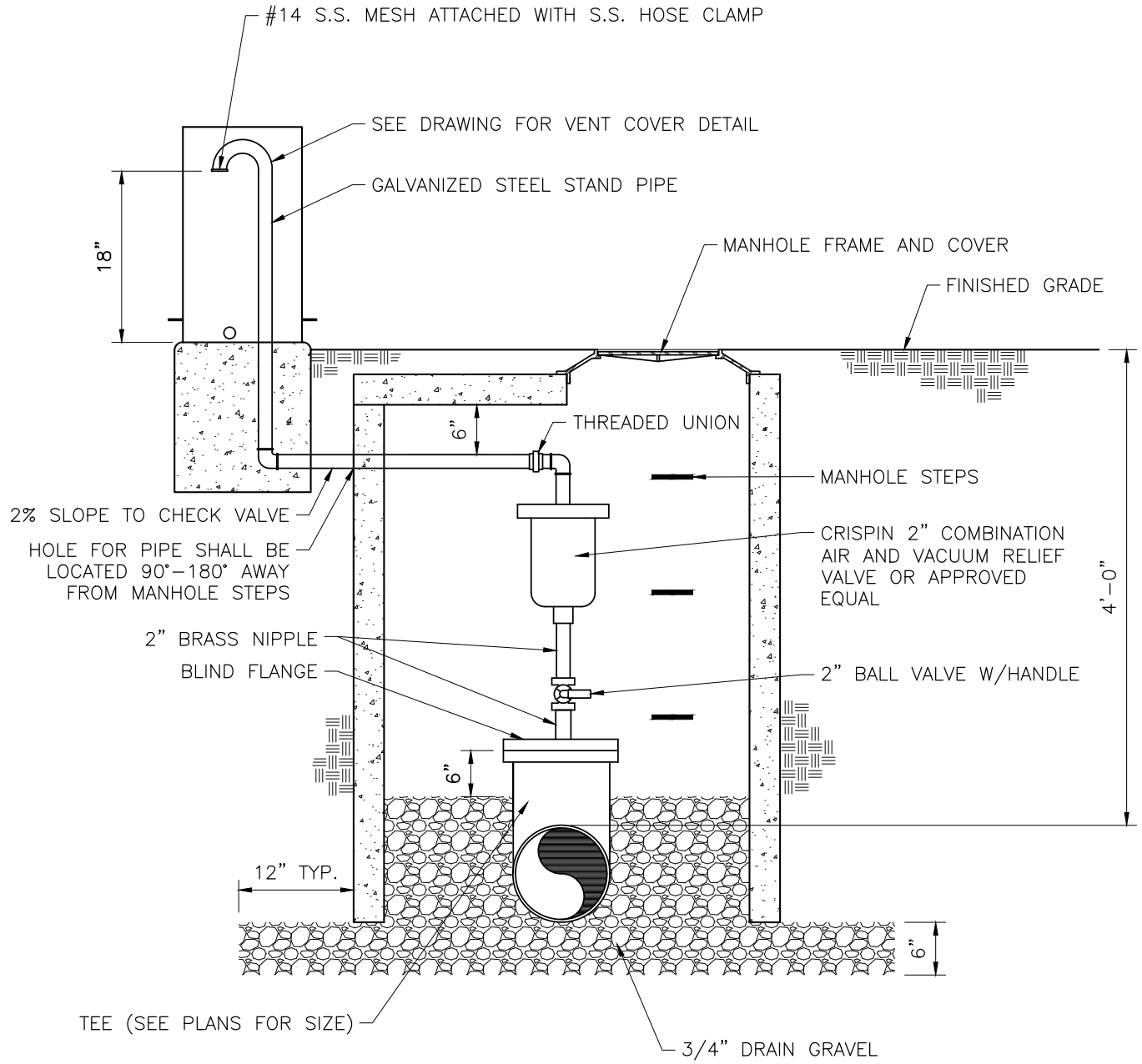

NOTES:

1. GALVANIZED STEEL MUST BE USED BETWEEN AIR/VACUUM VALVE AND THE STAND PIPE.

LICENSED PROFESSIONAL ENGINEER
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Delmas W. Johnson
10/30/20
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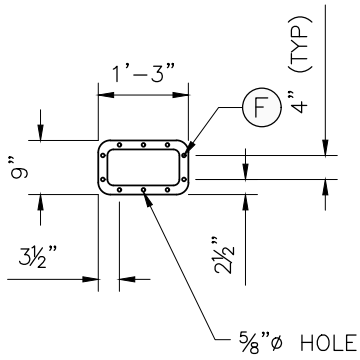
2" AIR/VACUUM COMBINATION DETAIL

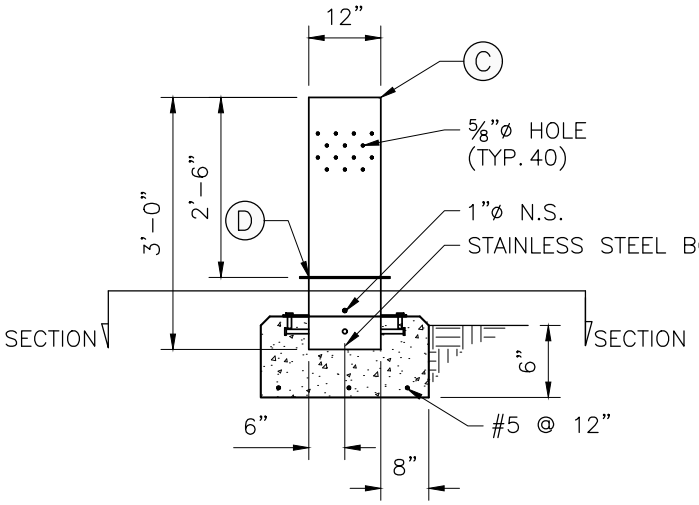
TOWN OF GENOLA
74 WEST 800 SOUTH

STANDARD DRAWING NUMBER:	4
CAD DWG:	GENOLA_STD_DWGS
PLOT SCALE:	1.000
DRAWN BY:	DETAIL
DESIGN BY:	EDC
CHECKED BY:	DWJ
ADOPTED DATE:	

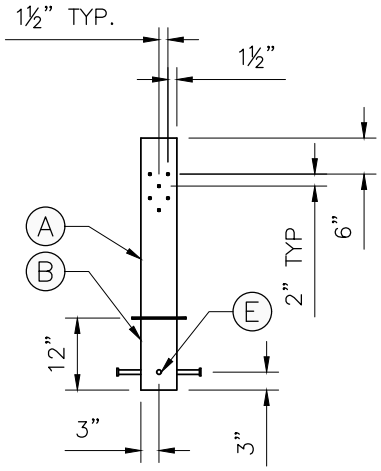


SECTION-VENT COVER

PARTS LIST		
ITEM	QTY	DESCRIPTION
A	1	TS 12"x6"x¼"x2'-6"
B	1	TS 12"x6"x¼"x12"
C	1	¼" PL – 6"x12"
D	2	¼" PL – 9"x1'-3"
E	4	¾"øx4" H.S.A.
F	10	½"øx3" BREAKAWAY BOLTS

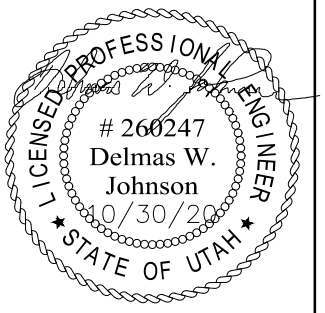


VENT COVER



SIDE VIEW
(ITEMS REMOVED FOR CLARITY

NOTES:
1. SIZE OF VENT COVER CAN VARY DEPENDING ON SIZE OF VENT.
2. OPEN TO AIR–PLACE A NO. 14 MESH NON–CORRODIBLE SCREEN OVER THE OPEN ENDS OF GALVANIZED PIPE. ATTACH W/S.S. HOSE CLAMP.
3. HOT DIPPED GALVANIZED STEEL STAND PIPE FOR AIR VENT.
4. 1½" MIN. CHAMFER ALL AROUND CONCRETE BASE.
5. 24" CONCRETE BASE FRONT OF WALK TO TOP BACK OF CURB.



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VENT COVER DETAIL

TOWN OF GENOLA
74 WEST 800 SOUTH

STANDARD DRAWING NUMBER:	5
CAD DWG:	GENOLA_STD_DWGS
PLOT SCALE:	1.000
DRAWN BY:	JMM
DESIGN BY:	EDC
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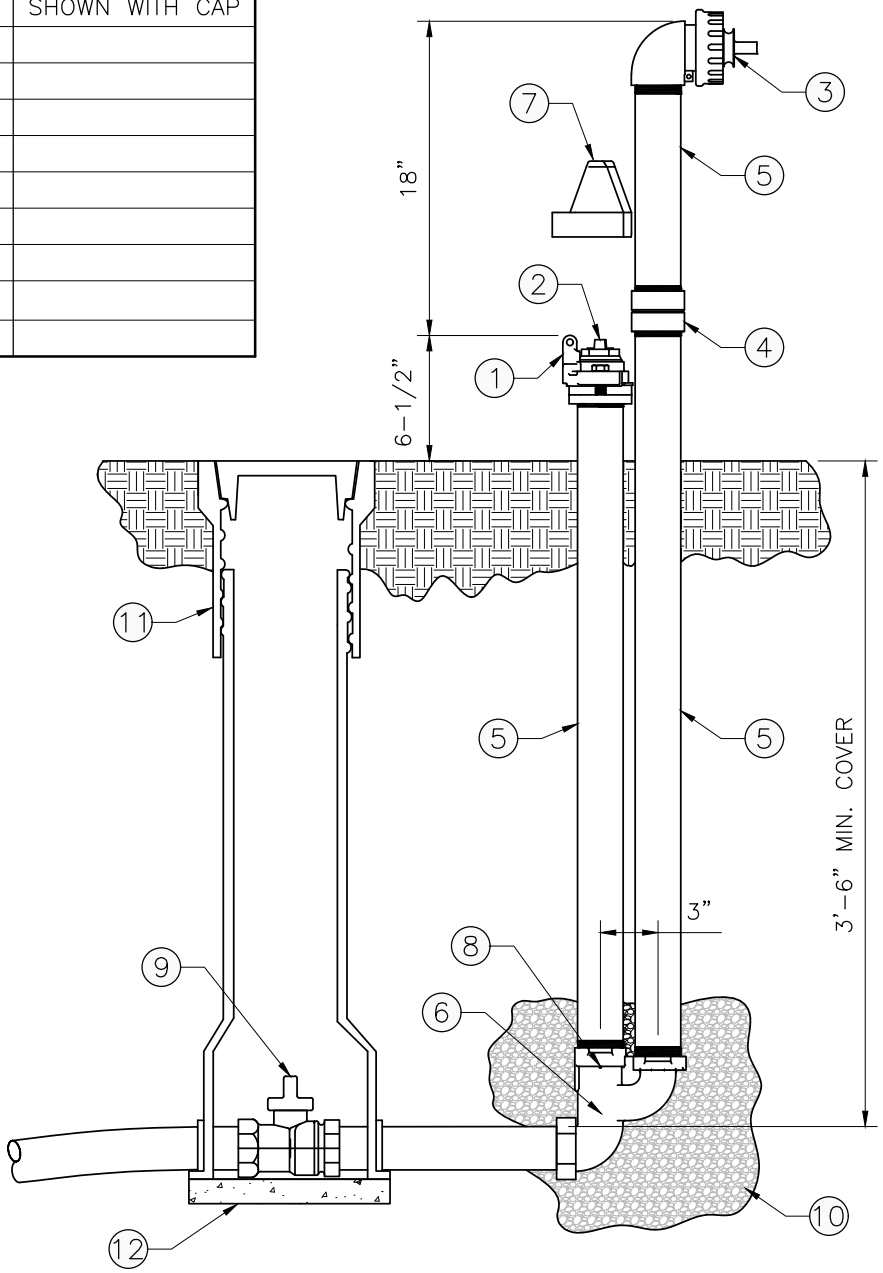
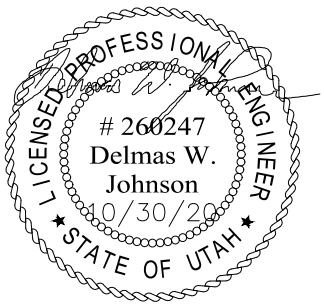
ITEM	ITEM / DESCRIPTION	NOTES
1	TOP CAP	
2	SLOTTED OPERATING NUT	
3	2–1/2" NST OUTLET	SHOWN WITH CAP
4	2" COUPLING	
5	2" STEEL PIPE	
6	INLET VALVE BODY	
7	LOCKING COVER	
8	DRAIN HOLE	
9	HYDRANT SHUT–OFF VALVE	
10	CRUSHED ROCK	
11	VALVE BOX W/LID	
12	SOUND CONCRETE BLOCK	





NOTES:

1. MAINGUARD #77 BLOW–OFF HYDRANT SHALL BE SELF–DRAINING, NON–FREEZING TYPE WITH A 3'–6" MIN. COVER. HYDRANT SHALL BE FURNISHED WITH A 2" FIP HORIZONTAL SIDE INLET CONNECTION, A NON–TURNING OPERATING ROD AND SHALL OPEN TO THE LEFT. OUTLET SHALL BE 2–1/2" NST OR SMALLER WITH CAP AND EXTEND A MINIMUM OF 12" ABOVE THE GROUND.
2. ALL WATER FLOW SHALL PASS THRU A 2" STEEL PIPE AND WATERWAY. THE OPERATING DRIVE MECHANISM SHALL RAISE AND LOWER A PLUNGER TO CONTROL THE FLOW OF WATER AND SHALL BE SERVICEABLE FROM ABOVE GROUND WITH NO DIGGING, WITH ALL WORKING PARTS BEING BRASS, GALVANIZED STEEL, OR PVC. SAID OPERATING DRIVE SHALL OPERATE WITH A STANDARD UNIVERSAL SLOTTED VALVE WRENCH. WHEN OPEN THE FLOW OF WATER SHALL BE UNOBSTRUCTED AND THE DRAIN HOLE SHALL BE COVERED.
3. HYDRANT SHALL BE SET IN 4 CUBIC FEET OF CRUSHED STONE TO ALLOW FOR PROPER DRAINAGE OF HYDRANT. RECOMMENDATION OF THE AWWA SHOULD BE FOLLOWED WHEN INSTALLING THE HYDRANT.
4. WASHOUT ONLY USED WHEN SPECIFIED BY PUBLIC WORKS. WHEN NOT SPECIFIED, A FIRE HYDRANT MUST BE USED ON DEAD LINES.

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2" WASHOUT DETAIL

TOWN OF GENOLA
74 WEST 800 SOUTH

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CAD DWG:	GENOLA_STD_DWGS
PLOT SCALE:	1.000
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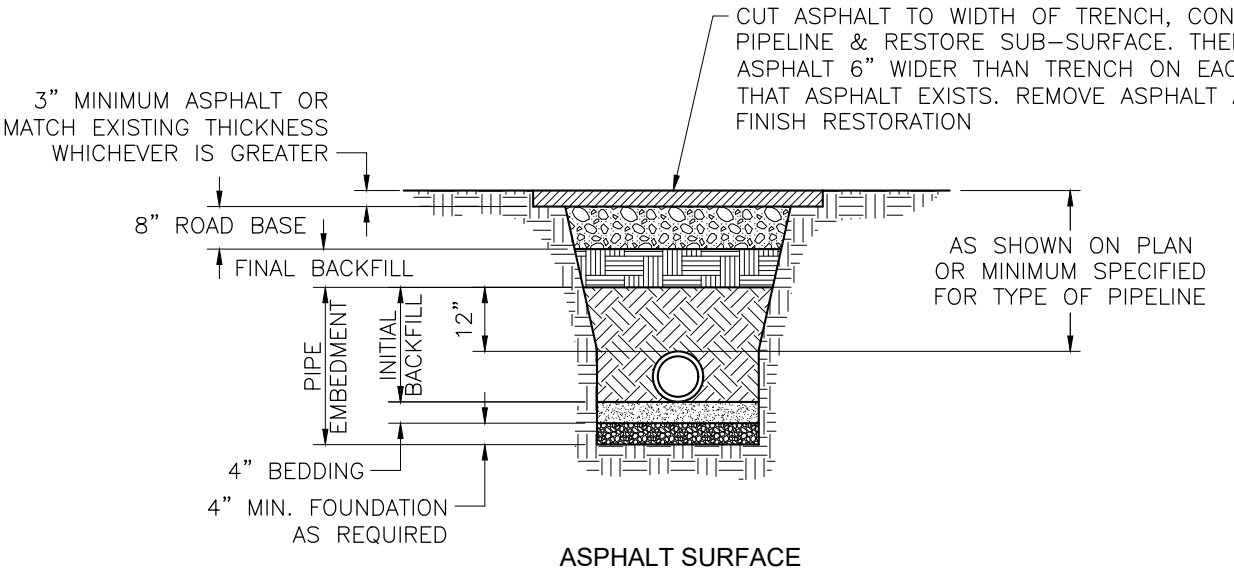
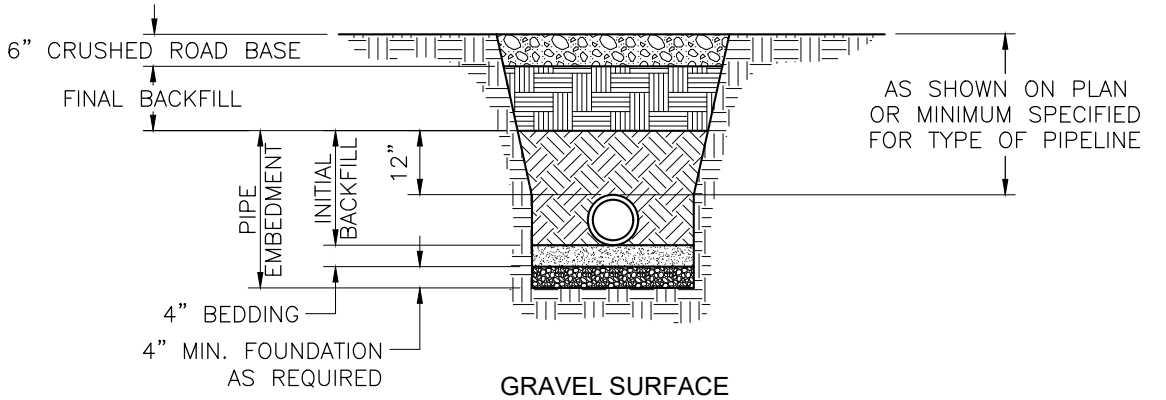
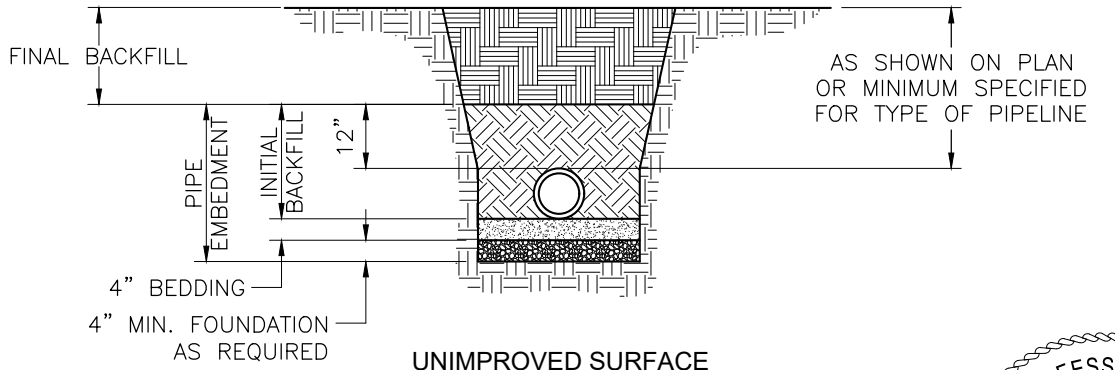


ASPHALT SURFACE



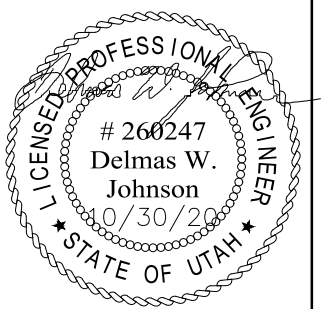
GRAVEL SURFACE



UNIMPROVED SURFACE

GENERAL NOTES:

1. SLOPE TRENCH TO MEET OSHA REQUIREMENTS (LATEST EDITION) OR USE TRENCH BOX.
2. FOUNDATION AND BEDDING MATERIAL AS REQUIRED.
3. INSTALL PIPELINE ON STABLE FOUNDATION WITH UNIFORM BEARING FOR FULL LENGTH OF BARREL. EXCAVATE IN BEDDING FOR ALL PIPE JOINTS.
4. MINIMUM TRENCH WIDTH TO BE 2 TIMES THE PIPE DIAMETER.



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THE TOWN OF GENOLA UTAH

TYPICAL TRENCH SECTION DETAIL

TOWN OF GENOLA
74 WEST 800 SOUTH

STANDARD DRAWING NUMBER:	7
CAD DWG:	GENOLA_STD_DWGS
PLOT SCALE:	1.000
DRAWN BY:	JMM
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