

SECTION 20

WATER PROJECT INSTALLATION AND CONSTRUCTION

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20.1 General

This section shall provide general, minimum requirements for the installation and construction for City of Monticello. These standards shall apply to all areas of the construction. Where the construction passes through previously developed areas, special attention shall be given to the applicable portions of this section.

20.2 General Construction

A. Clearing

Preparatory to excavation, the site of all open cut excavations, embankments, and fills shall be first cleared of obstructions and existing facilities (except those which must remain temporarily or permanently in service). On all public or private property where grants or easements have been obtained, and on the property of the City, the Developer/Contractor shall remove and keep separate the topsoil and shall carefully replace it after the backfilling is completed.

B. Pavement Cutting

Prior to excavating paved areas all excavation edges falling within the pavement shall be saw cut in a neat, straight manner. Cutting shall be performed with a saw designed specifically for this purpose. The cut shall penetrate the entire pavement thickness where possible. If the existing pavement is more than six (6) inches thick, then a cut of not less than six (6) inch depth shall be made. If pavement cuts are made in streets which are opened to traffic prior to excavation, then the cuts shall be thoroughly filled with sand and maintained full until the excavation is performed.

C. Protection of Existing Improvements

Before any excavation is started, adequate protection shall be provided for all existing utilities and Town structures.

D. Protection of Trees and Shrubs

No existing trees or shrubs in street right-of-way and easements shall be damaged or destroyed. Where branches of trees or shrubs interfere with the Contractor's operations, they shall be protected by tying back wherever possible. No limbs or branches shall be cut. If his operations will not permit saving certain trees, the Contractor shall be wholly responsible for satisfying all claims for restoration or restitution resulting from their damage or removal.

If small trees and shrubs are moved or pruned to permit more working space, pruning shall be done in accordance with Home and Garden Bulletin No. 83, U.S. Department of Agriculture, "Pruning Shade Trees and Repairing Their Injuries". However, the Contractor shall obtain, in writing, the City's permission to move or prune trees or shrubs.

E. Maintenance of Public Travel

Works shall be carried out in a manner which will cause a minimum of interruption to traffic and may close to through travel not more than two (2) consecutive blocks, including the cross street intersected. Where traffic must cross open trenches, the Contractor shall provide suitable bridges to street intersections and driveways. The Contractor shall post suitable signs indicating that a street is closed and necessary detour signs for the proper maintenance of traffic. Prior to closing of any streets, the Contractor shall notify responsible municipal authorities.

All traffic control shall be in accordance with the latest edition of the Indiana Manual on Uniform Traffic Control Devices and Sections 104.04, 107 and 801 of the Indiana Department of Highways Standard Specifications.

F. Utility Interruption

The Contractor shall proceed with caution in the excavation and preparation of the trench or pit so that the exact location of underground structures may be determined. Prior to proceeding with trench excavation, the Contractor shall contact all utility companies in the area to aid in locating their underground services.

The Contractor shall take all reasonable precautions against damage to existing utilities. However, in the event of a break in an existing water main, gas main, sewer or underground cable, he shall immediately notify the responsible official of the organization operating the utility interrupted. The Contractor shall lend all possible assistance in restoring services and shall assume all costs, charges, or claims connected with the interruption and repair of such services.

G. Boring and Jacking

Construction of the pipeline by boring and jacking methods under highways, railroads, and streams will be permitted unless otherwise specified on the plans. Plans and details describing the materials and methods of construction proposed for use shall be submitted to the City and the City Engineer for approval.

1. Backstop: The backstop shall be of sufficient strength and positioned to support the thrust of the boring equipment without incurring any vertical or horizontal displacement during such boring operations.

2. Guide Rails: The guide rails for the boring equipment may be of either timber or steel. They shall be laid accurately to line and grade and maintained in this position until completion of the boring operations.

3. Casing Pipe: The casing pipe and joints shall be steel construction capable of withstanding the traffic load and constructed to prevent leakage from the casing or conduit throughout its entire length excepting the open ends.

- a. The casing pipe shall be welded steel pipe, new and unused. The pipe shall have a minimum yield of thirty-five thousand (35,000) psi and meet the requirements for Class B pipe under ASTM specification A-139 "Electric Fusion (Arc) - Welded Steel Pipe".

- b. The minimum wall thickness for the casing pipe shall be as follows:

Diameter of Casing	Minimum Wall Thickness (inches)
Under 14"	0.375
14"	0.375
16"	0.375
18"	0.375
20"	0.500
22"	0.500
24"	0.500
26"	0.500
28"	0.500
30"	0.500

- c. Where lengths of casing pipe are joined during the boring operations, care shall be taken to ensure that the proper line and grade is maintained. After welding of each joint, the casing pipe exterior wall shall be coated with coal tar, or bitumastic material.

 - d. The casing ends shall be suitably protected against the entrance of foreign material which would interfere with the conduit removal. Brick and mortar bulkhead walls shall be used to seal the casing ends.

 - e. Stream crossings shall be a minimum of three (3) feet from the stream bottom (as defined by the regulating agency) and the top of the casing pipe.
4. Casing Spacers: The carrier pipe shall be centered within the casing by use of stainless-steel casing spacers as manufactured by Cascade Waterworks Manufacturing Company, Yorkville, IL; or approved equal.

Casing spacers shall be bolt on style with a two (2) piece shell made from T-304 stainless steel of a minimum fourteen (14) gauge thickness. Each shell section shall have bolt flanges formed with ribs for added strength. Each connecting flange shall have a minimum of three 5/16" T-304 bolts. The shell shall be lined with a ribbed PVC extrusion with a retaining section that overlaps the edge of the shell and prevents slippage. Bearing surfaces (runners) made from UHMW polymer with a static coefficient of friction of .11-.13 shall be attached to support risers at appropriate positions to properly support the carrier within the casing and to ease installation. All metal surfaces shall be fully passivated.

Casing spacers shall be installed per the recommendations of the manufacturer, and at intervals of not more than five (5) inches.

5. Seal Ends: After the water main is fully installed within the entire length of the casing, the Contractor shall, to the satisfaction of the Engineer, seal both ends of the casing pipe with brick and mortar bulkhead walls.

20.3 Bedding and Backfill

A. General

All trenches or excavations shall be backfilled to the original surface of the ground or such other grades as required or directed. In general, the backfilling shall be carried along as speedily as possible in order to avoid open excavations.

B. Backfill Materials

The following materials shall be used for Backfill in accordance with and in the manner indicated by the requirements specified herein.

Class I - Angular, six (6) to forty (40) millimeters (1/4 to 1½ inch), graded stone such as crushed stone.

Class II - Coarse sands and gravel with maximum particle size of forty (40) millimeters (1½ inch), including various grades of sands and gravel containing small percentages of fines, generally granular and non-cohesive, either wet or dry. Soil types GW, GP, SW and SP are included in this class.

Class III - Fine sand and clayey gravel including fine sands, sand-clay mixtures and gravel-clay mixtures. Soil types GM, GC, SM and SC are included in this class.

Class IV - Silt, silty clays and clays, including inorganic clays and silts of medium to high plasticity and liquid limits. Soil types MH, ML, CH and CL are included in this class. These materials are not recommended for bedding. This class shall also include any excavated material free from rock (3 inches and larger), concrete, roots, stumps, rubbish, frozen material and other similar articles

whose presence in the backfill would cause excessive settlement.

C. Backfill of Trench Excavations for Pipes and Structures

Bedding and Backfill materials samples shall be submitted to the City or City Engineer prior to start of construction.

D. Rigid Pipe Bedding

For purposes of this specification, rigid pipe shall include those made of ductile iron and other materials as determined by the City and City Engineer.

All rigid pipe shall be laid to the lines and grades unless otherwise directed by the City. All rigid conduit and pipe shall be bedded in compacted Class I, II, or III material, placed on a flat trench bottom. The bedding shall have a minimum thickness of four inches (4") or one-fourth (1/4) the outside pipe diameter below the pipe and shall extend halfway up the pipe barrel at the sides. All material shall be placed in the trench in approximately six (6) inch layers. Each layer, shall be leveled and evenly distributed on both sides of the pipe so as not to disturb, displace or damage the pipe and shall be thoroughly compacted. When Class I or II materials are used compaction may be accomplished by hand or mechanical tamping or by "walking" the material in. Bedding from the halfway point on the pipe to a point twelve (12) inches above the top of the pipe shall be a Class I, II, III, or IV material placed in six (6) inch layers and thoroughly compacted to prevent settlement. Class III and IV material shall not be used when the trench is located in an area subject to vehicular traffic.

E. Backfill Above Pipe

For purposes of this specification, trenches shall be considered subject to vehicular traffic if all or any portion of the excavation is located within five (5) feet of a roadway or alley which is routinely traveled by powered vehicles. In the event of any question regarding the susceptibility of an area to traffic, the City and the City Engineer's decision shall govern.

1. Method A - Backfill in Areas Not Subject to Vehicular Traffic

The trench between a level twelve (12) inches above the top of the pipe and the ground surface shall be backfilled with Class I, II, III or IV materials, as described above, deposited with mechanical equipment in such a manner that it will "flow" onto the bedding and not free fall. The Contractor shall consolidate the backfill by the back and forth travel of a suitable roller, wheeled device or other similar heavy equipment until no further settlement is obtained. Heavy equipment shall not be used until there is a cover of not less than three (3) feet over the pipes. To assist in promoting maximum settlement, the surface of the trench shall be left in a slightly rounded condition. Periodical dressing of the backfill in the trench to promote the drainage and safety conditions shall be made during the course of the work.

2. Method B - Backfill in Areas Subject to Vehicular Traffic (Mechanical Compaction)

The trench between a level of twelve (12) inches above the top of the pipe and the surface, which are located in areas subject to or possibly subject to vehicular traffic, shall be backfilled with Class I or II materials, deposited in uniform horizontal layers of two (2) feet +/- six (6) inches. Each layer shall be thoroughly compacted by mechanical tamping utilizing a crane mounted hydraulic vibratory compactors. Each layer shall be thoroughly compacted before the next succeeding layer is placed. This procedure shall be followed where trench walls remain stable during compaction. If in the opinion of the City Engineer and City, and/or their representative (inspector), the trench walls become unstable during compaction, then the City Engineer, City, and/or their representative (inspector) may authorize the Contractor to push from the back of the trench the Class I or II material into the trench the full depth, not to exceed twenty (20) lineal feet horizontally along the trench bottom and compact using the vibratory compactor in two (2) foot diagonal lifts.

The crane mounted vibratory compactors shall be capable of producing 1900 cycles per minute and have a compaction plate with the minimum dimensions of twenty-three by thirty-one (23 x 31) inches. The compactor shall be similar to those as manufactured by Allied, Ho-Pac, or equal.

When Class I or II materials do not contain sufficient moisture to obtain proper compaction, in the opinion of the City Engineer, City and/or their representative, it shall be moistened or wetted as directed by the City Engineer, City and/or their representative.

F. Temporary Surfaces Subject to Traffic

All streets shall be open to traffic immediately after completing the backfill operation. This shall be accomplished by installing the compacted aggregate base immediately after granular backfill. The use of class II backfill as a temporary surface is specifically prohibited.

G. Maintaining Trench Surfaces

All surface settlement of the backfill along trenches located beneath streets, roads, alleys, driveways and parking lots which are subject to traffic shall be kept filled level with or slightly above the original paved surface at all times with compacted aggregate base material until the permanent pavement is satisfactorily restored. When temporary asphalt pavement is used, depressions and "potholes" shall be promptly filled with the temporary asphalt material. Special attention shall be given to the timely and proper maintenance, leveling and grading of the surface of all backfilled trenches, especially those subject to traffic and especially following rains. The surface of streets, roads and alleys shall be maintained smooth and free of ruts and water trapping depressions by periodic power blading, scarifying; and/or filling settled areas, ruts, pockets, or holes with compacted aggregate base material or temporary asphalt where used.

As a dust preventive, calcium chloride shall be applied over the surface of the compacted aggregate base in such amounts and at such times as are necessary to avoid or eliminate dust complaints from nearby residents. In event of any question regarding the existence or nonexistence of a dust nuisance, the City Engineer's and City's decision on the matter will govern. The material used shall be Regular Flake Calcium Chloride having a minimum chemical content of Calcium Chloride of seventy-seven percent (77%). Unless otherwise specified or ordered by the City Engineer and City, the rate of application shall be one and one half (1½) pounds per square yard of surface covered.

Wherever surface settlement is not important, unless otherwise specified or directed, the backfill shall be neatly rounded over the trench to a sufficient height to allow for settlement to grade after consolidation. Just prior to the completion of all work under the contract, any surface settlement below original ground surface shall be refilled in a satisfactory manner and reseeded as specified if required.

20.4 Water Main Installation

A. General

In general, installation of buried water mains shall conform to the requirements of the manufacturer, the AWWA Standard for the type of pipe being installed, or as specifically indicated on the plans or specified herein.

Extreme care shall be taken in handling pipe to prevent damage. Pipe, fittings and valves shall not be dropped to ground or into trench; they shall be carefully lowered, piece by piece, using crane, backhoe, or other approved lifting device. During cold weather, valves and hydrants shall not be stored where trapped moisture can freeze and damage fittings.

Where water is encountered in trench, Contractor shall furnish and operate suitable pumping equipment of capacity adequate to dewater trench, dispose of such water, and maintain drainage conditions, as approved by the City and City Engineer. It is essential that discharge of trench dewatering pumps be conducted to natural drainage channels, drains or storm sewers. No pipe shall be laid in any water without the City's and City Engineer's approval.

Mains shall be laid and maintained to the indicated lines with fittings, valves and hydrants at required locations. All valve and hydrant stems shall be set plumb.

Wherever obstructions not shown on the plans are encountered during the progress of the work and interfere to such an extent that an alteration in the plan is required, the City or the City Engineer shall have the authority to change the location from the shown line and grade.

The excavations for construction of pipelines shall be of sufficient width, and only of sufficient width to permit the work to be constructed in a workmanlike manner. Working space shall be provided in all pipe trenches to allow room all around for the proper making of joints and the drainage of water, if necessary. Sheeting

shall be used where necessary to protect curb, walk, trees, and other utility lines. Except as otherwise specified, the excavation work for the pipes, valves and hydrants shall be performed in accordance with these Standards.

Bell holes shall be provided at each joint to permit the jointing to be made properly. The trench shall be excavated to the depth required so as to provide a uniform and continuous bearing and support for the pipe on solid and undisturbed ground at every point between bell holes, except that it will be permissible to disturb and otherwise damage the finished surface over a maximum length of eighteen (18) inches near the middle of each length of pipe by the withdrawal of pipe slings or other lifting tackle. Any part of the bottom of the trench excavated below the specified grade shall be corrected by filling with approved material, thoroughly compacted in three (3) inch layers. The finished subgrade shall be prepared accurately by means of hand tools. No blocking under pipes will be permitted except as approved by the City Engineer under special conditions.

Where the bottom of the trench at subgrade is found to be unstable or to include ashes, cinders, all types of refuse, vegetable or other organic material, or large pieces or fragments of inorganic material which in the judgment of the City Engineer should be removed, the Contractor shall excavate, remove and satisfactorily dispose of such unsuitable material to the width and depth ordered by the Engineer. Before the pipe is laid, the subgrade shall then be made by backfilling with approved Class I or Class II material as defined in these Standards. The fill material shall then be thoroughly compacted by means of hand or mechanical tamping to a minimum 85% Standard Proctor Density.

In event of rock excavation or where ledge rock, boulders and large stones, or hard pan, shale or cemented gravel, are encountered in the bottom of the trench, then said materials shall be removed to provide a clearance of at least six (6) inches below and on each side of all pipe, valves and fittings. The space between the rock or other hard trench bottom and the pipe shall be filled with Class I or II material and hand or mechanically tamped as explained above.

Proper implements, tools and facilities shall be provided and used by the Contractor for the safe and convenient protection of the work. All pipe, fittings, valves and hydrants shall be carefully lowered into the trench piece by piece by derrick, ropes or other suitable tools or equipment, in such a manner as to prevent damage to pipe or pipe coating. Under no circumstances shall pipe or accessories be dropped or dumped into the trench. Before lowering and while suspended, the pipe shall be inspected for defects and rung with a light hammer to detect cracks. Any defective, damaged or unsound pipe shall be rejected. All foreign matter or dirt shall be removed from the inside of the pipe before it is lowered into its position in the trench and shall be kept clean by approved means during and after laying.

The spigot shall be centered in the bell, and the pipe brought into the true alignment and secured there with earth carefully tamped on each side, excepting at the bell holes. Care should be taken to prevent dirt from entering the joint space. At times when pipe laying is not in progress, the open ends of pipe shall

be closed by approved means, and no trench water shall be permitted to enter the pipe.

Cutting of pipe for inserting valves, fittings, or closure pieces shall be done in a neat and workmanlike manner without damage to the pipe. Unless otherwise directed, pipe shall be laid with bell ends facing in the direction of laying and for lines on an appreciable slope, bells shall face upgrade. Wherever necessary to deflect pipe from a straight line, either in the vertical or horizontal plane to avoid obstructions, to plumb stems, or for other reasons, the degree of deflection shall be within permissible limitations as defined by the manufacturer.

All plugs, caps, tees and bends shall be provided with restrained joints and grip rings. The restrained joints shall be of adequate strength to prevent movement, as approved by the City of the City Engineer.

All bedding and backfill material shall be placed and compacted in accordance with the applicable portions of these Standards.

B. Depth of Cover for Water Mains

All water mains shall be constructed with a nominal earth cover of sixty (60) inches over the top of the pipe except as follows:

1. For purpose of avoiding direct interference with existing structures or utilities, the City or City Engineer may authorize decreased depth of cover.
2. For the purpose of making grade changes within tolerable limits, the depth may be increased.
3. Unless otherwise shown on the plans or permitted by the City or City Engineer, the new mains shall cross beneath the existing mains, except in cases where the specified cover can be maintained by crossing above the existing mains.
4. Where connections to existing mains dictates changes in the required depth of cover.

20.5 Gate Valve and Valve Box Installation

A. Installation

Gate valves and valve boxes shall be installed per the manufacturer's recommendations.

The stem extension shall sit solidly on the valve operating nut and shall turn freely. The extension shall be bolted to the valve operating nut in a manner such that the bolt prohibits the extension from being pulled off of the operating nut but does not transmit any force from the extension to the operating nut during operation of the valve, thus prohibiting the bolt from shearing.

The extension must of such a length that the nut on the extension shall be

between thirty (30) inches and thirty-six (36) inches below the finished grade.

B. Testing

Each valve stem extension shall be tested by closing the valve, reducing the pressure on one (1) side of the valve to zero (0), then opening the valve with the use of the extension. Any permanent distortion or damage to the valve stem extension is unacceptable.

20.6 Hydrant Installation

Hydrant barrels shall be constructed in such a manner that it is not necessary to cut off the water or to excavate to make repairs. The barrel of the hydrants shall be constructed in sections which are to be jointed in such a manner that the upper section of the barrel extending above the ground may be separated from the lower section by impact without injury to the stem or the barrel.

Hydrants shall be located in such a manner as to provide complete accessibility, and in such a manner that the possibility of damage from vehicles or injury to pedestrians will be minimized. When set in the space between the curb or sidewalk or between the sidewalk and property line, no portion of the hydrant or nozzle cap shall be within six (6) inches of the sidewalk. All hydrants shall stand plumb and shall have their nozzles parallel or at right angles to the curb. They shall conform to the established grade, with nozzles at least twelve (12) inches above the ground.

Hydrants shall be thoroughly cleaned of dirt and other foreign matter before setting, and the hydrant shall be suitably anchored with a hydrant adapter. Said adapter shall be at least twenty-four (24) inches in length. All hydrants are to be properly supported and braced and surrounded with approximately five (5) cubic feet of washed gravel.

20.7 Service Meter Enclosure Installation

Enclosure shall be set vertically on a base of clean, washed gravel a minimum of one (1) foot deep and twelve (12) inches beyond outside of enclosure. Backfill shall be tamped in six (6) inch layers all around enclosures in excavated area to maintain stability and prevent settlement. Meter enclosure locations shall be as determined by the Developer/Contractor and approved by the City or City Engineer. Generally, meters shall be placed in lawns as near as possible to dedicated right-of-way lines.