



17. PUMPING STATIONS, STORAGE TANKS, WELLS, ETC.

Any of the items named above or otherwise required in any project shall be designed, with plans and specifications, signed and sealed by a Registered Professional Engineer in the State of Missouri and approved by the District and MDNR on a case by case basis.

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STAKING (Cont.)

The Contractor shall have the responsibility to avoid conflicts with existing facilities, such as storm sewers and others, and proposed facilities to the extent that they are known to him by the plans and staking in the field.

In the event future fill is required that will result in the water mains having less than 3'-6" of cover, the contractor shall place compacted fill over such water mains to provide at least 3'-6" of cover for the initial installation.

For valves, fire hydrants and temporary blowoff assemblies, the stakes shall have the "cut" required noted on them along with the final "height" from the bottom of the water main to the proposed finished grade such that all valves, fire hydrants and temporary blowoff assemblies can be set to the proper height to accommodate the final grading.

5. SEPARATION OF WATER MAINS, SANITARY SEWERS AND STORM SEWERS

Water mains shall be laid at least 10 feet horizontally from any existing or proposed sanitary or storm sewer. The distance shall be measured edge to edge. In cases where it is not practical to maintain a ten foot separation, deviations may be made on a case-by-case basis, if supported by data from the design engineer. Such deviation may allow installation of the water main closer to a sewer, provided that the water main is laid on a separate trench or on an undisturbed earth shell located on one side of the sewer and in other cases, at such elevation that the bottom of the water main is at least 18 inches above the top of the sewer.

Water mains crossing sewers shall be laid to provide a minimum vertical clear distance of 18 inches between the outside of the water main and the outside of the sewer. This shall be the case where the water main is either above or below the sewer. At crossings, the full length of water pipe shall be located so both joints will be as far from the sewer as possible.

There shall be at least 10 foot horizontal separation between water mains and sanitary sewer force mains. There shall be an 18 inch vertical separation at crossings as required above for gravity sewers. No water line shall be located closer than 10 feet to any part of a sewer manhole.

Specifically, separation of water mains, sanitary sewers and combined sewers shall be in accordance with Missouri Department of Natural Resources requirements as given in Appendix A of these Specifications.

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TRENCH EXCAVATION AND BACKFILLING (Cont.)

For ductile iron pipe, if the trench bottom is stable and suitable earth, the pipe may be placed on the earth trench bottom. If the trench bottom contains large stones or solid rock, the trench shall be excavated deeper than the proposed pipe bottom and 6" of compacted bedding material shall be placed before the pipe is laid. The ductile iron pipe shall then have compacted backfill of clean earth or granular bedding material placed to a level 6" above the top of the pipe.

For PVC or ductile iron pipe, if the trench bottom contains frozen material, excessive moisture, debris or other deleterious material, the trench shall be excavated 6" or more deeper than the proposed pipe bottom and backfill to the desired grade with compacted 3/4" minus bedding material. For all pipe, bell holes in the trench bottom shall be provided to allow full contact of the pipe with the trench bottom.

Backfill for all pipes under roadways or parking lots shall consist of 1" clean crushed limestone carefully placed to avoid future settlement from 6" above the top of the pipe to the finished grade. In other areas, the backfill may be excavated earth, free of large stones, frozen material, vegetation or debris. Backfilling of all pipe shall be well compacted by means of jetting or other approved methods to eliminate settling. Any completed areas that show settlement shall be promptly re-backfilled with compacted clean earth or compacted 1" clean rock as required for the initial backfill. Refer to Detail A of these specifications.

8. PIPE INSTALLATION

Laying of the pipe shall commence immediately after the excavation is started, and the Contractor shall use every possible means to keep the completed pipe installation closely behind the trenching. The Water District may stop the trenching if it appears that the trench is open too far in advance of the pipe laying operation. The Contractor may lay pipe in the best manner adapted to securing speed and good results. The Contractor shall have the necessary equipment and tools available for making the joints for the specific materials being used.

All pipe spigot ends shall be visibly marked to fully "make-up" the joint. With exception of field cut pipe, all "make-up" marks shall be placed on the pipe at the factory. Field cut pipe shall be marked for full joint depth prior to insertion.

Cutting of pipe for closure pieces with installation of valves or fittings, or for any other reason, shall be done in a neat and workman-like manner without damage to the pipe or linings. The cutting operation shall leave a smooth cut end at right angles to the longitudinal axis of the pipe. The exterior surface of the cut end shall be beveled, and the interior surface shall be reamed or filed free of all rough edges and protrusions. All pipe cutting shall be done by saw or mechanical pipe cutters of an approved type.

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SECTION II - WATER DISTRIBUTION SYSTEM INSTALLATION

1. GENERAL

The work covered by this section of the specifications, shall consist of furnishing all previously specified materials, with all necessary equipment, machinery, tools, and labor, and performing all work required to install and/or construct the water system extensions or changes with all accessories or modifications and these specifications, all to be complete, in place, accepted and ready for use. Failure to comply with these specifications will result in the rejection of the work by the District.

2. SITE AND WORK PREPARATION

Prior to starting any water main route installations, connections, and/or changes as required, the Contractor shall notify the Water District a minimum of twenty-four (24) hours prior to the start of construction. After so doing, the Contractor shall clear the route of all trees, stumps, and other objects or materials which may directly interfere with the construction. It is assumed that all other utility companies or organizations have been notified for location of their lines and for location of their facilities prior to the start of construction. All trees, shrubs, bushes, and other plants which will not interfere with the construction shall be protected from damage. Work preparations shall include having all necessary material items, equipment, and an adequate labor force at the site in working condition, and completely instructed and prepared to perform the work to completion as required.

3. DRAINAGE

The Contractor shall control the grading in the vicinity of pipe trenches so that the surface of the ground is properly sloped to prevent surface water from running into the excavated areas. Any surface water or other liquid wastes which accumulate in the excavated areas shall be promptly removed.

4. STAKING

The staking for water mains shall be provided by the District's Engineer or Land Surveyor and the staking plans shall be signed and sealed by a Missouri Registered Land Surveyor. Stakes shall be placed along the centerline of the proposed water main or on a fixed offset as requested by the contractor. Stakes shall be set at a maximum spacing of 50 linear feet and at all valves, fittings, fire hydrants and other appurtenances. The stakes shall have noted on them the "cut" required to the outside bottom of the water main such that it will have the proper cover relative to the finished grade.

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6. HANDLING OF MATERIALS

All pipe, fittings, valves and other accessories, shall be unloaded, stored, re-handled, and installed by methods in such a manner as to insure their final location in a sound and undamaged condition, conforming in all respects to specified requirements. Under no circumstances shall pipe, fittings, valves, or other accessories, be dropped to the ground, or otherwise subjected to possible damage from impact or shock. Such materials shall be loaded by lifting with machine or hoist, or by skidding. Pipe handled on skidways shall not be skidded or rolled against other pipe.

Under all circumstances, all materials for use shall be handled in a workman-like manner, using the necessary manpower and equipment to perform the task in accordance with the manufacturer's recommendations.

All materials shall be handled in such manner that neither the coatings or the linings are damaged. Hooks for insertion into the ends of the pipes, fittings, valves, and other accessories, shall have broad, well-padded contact surfaces, and shall be of such design and size that uniform support will be provided. Under most circumstances, damage to outside coatings are repairable, and the necessary repairs shall be properly made prior to installation. Damage to interior linings are not considered repairable, and therefore, the damaged item shall be replaced at the Contractor's expense.

Proper equipment, tools, facilities, and methods satisfactory to the Water District, shall be provided and used by the Contractor for the safe handling of all materials. Fittings, valves, and other accessories shall be carefully lowered into the trench or excavation, piece by piece, by means of derrick, to protect coatings and linings. Under no circumstances shall any materials be dropped or dumped into the trench.

7. TRENCH EXCAVATION AND BACKFILLING

Trenches for water mains shall have a minimum width of the pipe O.D. plus 12 inches, and a maximum width of the pipe O.D. plus 24 inches. The finished cover over water mains shall be a minimum of 3'-6" and a maximum of 6'-0". Where additional depth is necessary to clear obstructions, the District may grant permission to allow such additional depth, but in no case shall the cover over any water main exceed 10'-0".

For PVC pipe, the trench depth shall be excavated 6" deeper than the proposed bottom of the pipe to allow for a 6" granular bedding of compacted 3/4" minus rock (See detail A of these specifications). The PVC pipe shall also have the compacted granular material placed to a level 6" above the top of the pipe with care taken to fill all void spaces beneath the pipe.

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PIPE INSTALLATION (Cont.)

Upon completion of the cutting and trimming operation, the pipe end or ends shall be marked for "make-up" depth. Prior to insertion, the pipe shall be thoroughly cleaned of all foreign materials, including filing and cutting debris.

Pipe lines are intended to be laid straight. Deflections at fittings and at ductile iron joints will be allowed when necessary but shall not exceed 2-1/2 degrees per 10' per 20' pipe length at any one joint. Bending of PVC will not be allowed only when absolutely necessary and shall be done by hand tools to avoid damage to the pipe. Bending of PVC pipe shall not exceed the following limitations:

Pipe Size	Degree of Bending	Deflection Per 20' Length
4"	3.5 degrees	15"
6"	2.5 degrees	11"
8"	2.0 degrees	8.5"
12"	1.0 degrees	5"

9. THRUST BLOCKING AND FITTING SUPPORTS

All horizontal mechanical joint fittings such as tees, bends and plugs (except for fire hydrants) shall be thrust blocked with poured concrete as shown in Detail C of these specifications. Concrete shall be as specified in Section 1 of these specifications and forms shall be provided to avoid concrete encasement of any part of mechanical joints. All form material shall be removed from the trench prior to backfilling. The pre-cast concrete block supports for fittings shall be required for all fittings installed. Thrust blocking for pipes larger than 12" shall be as called for on the plans for the project.

In general the grade or slopes where new water mains are to be installed shall not exceed 10%. Where grades are in excess of 10% but not greater than 25%, each joint of pipe shall be restrained by means of restrainers installed at the pipe joints. Where lengths of pipe to be restrained exceed 100' in length, the restrainer shall be omitted at each 100' interval. The restrainers shall be as specified below or approved equal.

For Class 200 Pressure Rated (SDR21) PVC	Uniflange 1350-S Or Ebbra Iron 6500
Ductile Iron Pipe	Uniflange 1350-C Or Ebbra Iron 1500

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10. QUALITY OF MATERIALS

All materials used for each water main project shall be new. Damaged or unsound pipe, fittings and accessories of whatever nature shall be rejected and removed from the work. All joints shall be made as previously specified. Each piece of pipe and all fittings, valves, etc., shall be checked and cleared of debris prior to being put in place. All gaskets shall be checked and cleaned of oil, grease, dirt, etc., before being inserted. All bolted joints shall be rechecked for operation and bolt tightness prior to installation. All open ends of pipe, fittings, etc., shall be carefully plugged or sealed at the end of each days work to prevent entrance of animals, water, and other foreign matter. All excavation shall be made to neat line and grade.

All personnel involved in any way with the work must be made aware of the fact that the work shall result in a first-class, professional job.

11. POLYETHYLENE ENCASEMENT INSTALLATION

The Contractor shall furnish all materials and install the polyethylene encasement as specified in the previous Section of these specifications and in accordance with AWWA C-600. The polyethylene encasement shall prevent contact between the pipe and the surrounding backfill and bedding material but is not intended to be a completely airtight and watertight enclosure. Overlaps shall be secured by the use of adhesive tape, plastic string, or any other material capable of holding the polyethylene encasement in place until backfilling operations are completed.

This Article included three different methods of installation of polyethylene encasement on pipe. Methods A and B are for use with polyethylene tubes and Method C is for use with polyethylene sheets.

Method A - One length of polyethylene tube for each length of pipe.

The Contractor shall cut the polyethylene tube to a length of approximately two (2) feet longer than that of the pipe section. The tube shall then be placed around the pipe, centered to provide one (1) foot of overlap on each adjacent pipe section, and bunched accordion-fashion lengthwise until it clears the pipe ends.

The pipe shall be lowered into the trench and the joint made up with the preceding section of pipe. A shallow bell hole shall be made at joints to facilitate installation of the polyethylene tube. After assembling the pipe joint, the bunched polyethylene shall be pulled from the preceding length of pipe, slipped over the end of the new length of pipe, and secured in place. The end of the polyethylene from the new pipe section shall be placed over the end of the first wrap until it overlaps the joint at the preceding length of pipe. The overlap shall next be secured in place by taking up slack width to make a snug, but not tight, fit along the barrel of the pipe and securing the fold at quarter points.

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POLYETHYLENE ENCASEMENT INSTALLATION (Cont.)

All rips, punctures, or other damage to the polyethylene shall be repaired with adhesive tape or with a short length of polyethylene tube cut open, wrapped around the pipe, and secured in place. Proceed with installation of the next section of pipe in the same manner.

Method B - Separate pieces of polyethylene tube for barrel of pipe and for joints.

The Contractor shall cut the polyethylene tube to a length of approximately one (1) foot longer than that of the pipe, centered to provide six (6) inches of bare pipe at each end. Make polyethylene snug, but not tight; secure ends as described for Method A.

Prior to making up a joint, a three (3) foot length of polyethylene tube shall be placed over the end of the preceding pipe section, bunched accordion-fashion lengthwise. After completion of the joint, the three (3) foot length of polyethylene shall be pulled over the joint, overlapping the polyethylene previously installed on each adjacent section of pipe by at least one (1) foot; made snug and secure at each end as described for Method A.

All rips, punctures, or other damage to the polyethylene shall be repaired as described in Method A. Proceed with installation of the next section of pipe in the same manner.

Method C - Flat polyethylene sheet encasement.

Contractor shall cut polyethylene sheet to a length of approximately two (2) foot longer than that of the pipe section. The cut length shall be centered to provide a one (1) foot overlap on each adjacent pipe section, bunching it until it clears the pipe ends.

The polyethylene shall be wrapped around the pipe so that it circumferentially overlaps the top quadrant of the pipe. The cut edge of the polyethylene shall be secured at intervals of approximately three (3) foot.

The wrapped pipe shall be placed into the trench and the pipe joint made up with the preceding section of pipe. A shallow bell hole shall be made at the joints to facilitate installation of the polyethylene. After completion of the joint, the overlap shall be as described for Method A.

All rips, punctures, or other damage to the polyethylene shall be repaired as described for Method A. Proceed with installation of the next section of pipe in the same manner.

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