

CITY OF UNION, OREGON
TECHNICAL SPECIFICATIONS
SECTION 8
STORM DRAINAGE SYSTEM

A. GENERAL

1. Scope. These specifications cover the furnishing and installation of culverts, storm drain lines, curb inlets, manholes, dry wells, channel improvements, and miscellaneous drainage appurtenances. The work includes, unless otherwise specified, furnishing all labor, materials, tools, equipment and incidentals required to construct a complete storm drainage system ready for service as outlined in the Drawings and Specifications.

2. Specifications, References. Specification references made herein for manufactured materials such as pipe, fittings, and manhole rings and covers refer to designations for the American Water Works Association (AWWA), or the American Society for Testing and Materials (ASTM).

3. Catalog Information. Catalog information on all equipment to be installed shall be submitted to the City Engineer for approval prior to purchase and installation.

4. Care and Handling of Materials. Adequate precautions shall be taken to prevent damage to pipes, fittings, manhole components, and all other materials used in construction of the storm drainage system. Pipe and other materials during transport shall be secured individually by use of wood spacer blocks or wood crates, or otherwise protected to prevent collision of individual pieces and the possible subsequent damage.

All pipe, fittings and manhole components shall be loaded and unloaded in a manner to prevent shock or damage. Under no circumstances shall such material be dropped. All materials on the ground shall be protected from damage. All pipes, fittings, manhole components, and all other materials used in the construction of the drainage system shall be carefully inspected by the Contractor prior to installation. All defective materials shall be rejected. All materials which are delivered considerably in advance of their installation shall be stored in a satisfactory manner. The Contractor will receive no payment for materials on hand that are not so protected.

Proper materials, tools and equipment shall be used by the Contractor for safe and convenient prosecution of the work. All pipes, fittings, etc. shall be carefully lowered into the trench piece by piece in such a manner to prevent any damage to the materials. Under no circumstances shall materials be dropped or dumped into the trenches.

5. Certification by Manufacturer. At the request of the City Engineer, the Contractor shall furnish a sworn statement from the manufacturer, stating that inspection and all

CITY OF UNION, OREGON
TECHNICAL SPECIFICATIONS
SECTION 8
STORM DRAINAGE SYSTEM

specified tests have been made on the supplied material and that the results thereof comply with appropriate specifications. The statement shall also state that all materials furnished are in accordance with these Contract Documents and that all materials are new.

6. Alternate Materials. Alternate materials will be considered in accordance with the Special Conditions.

B. GRAVITY STORM DRAINS

1. Materials.

a. Solid Wall PVC Pipe. Solid wall PVC pipe shall be solid wall construction and shall conform to the requirements of ASTM D-3034, SDR 35 for pipe up to 15-inch diameter and ASTM F-679, Type 1 only, for pipe sizes 18- to 27-inch diameter. Joints for solid wall PVC pipe shall conform to ASTM D-3212 using elastomeric gaskets conforming to ASTM F-477.

b. Ductile Iron Pipe. Ductile iron pipe and fittings shall conform to AWWA C150, AWWA C115, AWWA C151, and AWWA C110 and shall be minimum pressure Class 150 unless specified otherwise. All ductile iron pipe shall have a bituminous sealed cement mortar lining conforming to AWWA C104. All joints, unless otherwise specified, shall be push-on rubber gasket joints conforming to AWWA C111.

c. HDPE Pipe. Corrugated high density polyethylene pipe and fittings 48 inches and smaller shall conform to AASHTO M-252 and AASHTO M-294 accordingly. Corrugated high density polyethylene pipe and fittings shall have watertight joints and shall be either Hancor "Blue-Seal," Advance Drainage System "N-12," or equal. All joints for corrugated polyethylene pipe shall be made with a bell/bell or bell and spigot coupling and shall conform to ASTM D-3212 using elastomeric gaskets conforming to ASTM F-477. All gaskets shall be factory installed on the pipe in accordance with the manufacturer's recommendations.

2. Construction.

a. Trench Excavation and Backfill. Trench excavation and backfill shall be performed as specified in the Technical Specifications - "Excavation and Backfill of Trenches."

CITY OF UNION, OREGON
TECHNICAL SPECIFICATIONS
SECTION 8
STORM DRAINAGE SYSTEM

b. Installation of Pipe. Gravity storm drain pipe shall be installed in accordance with the best current practices and as required by the manufacturer. Gravity storm drain pipe shall be laid by progressing upgrade from the existing or newly constructed storm drain; the pipe shall be installed with bell ends laid upgrade unless otherwise approved. Each pipe shall be properly bedded so as to be supported along the full length of the pipe. A suitable foundation shall be achieved by a slight excavation for the bell at each joint.

All joints shall be properly lubricated, where required, and installed in accordance with the installation instructions of the pipe manufacturer, taking particular care to avoid pinching or otherwise causing damage to pipe gaskets. All joints shall be free of dirt and other foreign matter prior to the joining of the next pipe. All joints shall be restrained to prevent creep and misalignment of joints. All pipe shall have a ring painted around the spigot ends in such a manner as to allow field checking of setting depth of pipe in socket.

Gravity storm drain main lines shall be installed with the use of a laser beam and target. The City Engineer will provide slopes for each line and "cuts" from a hub set at each manhole. A check hub will also be set by the City Engineer 100 feet upstream from each manhole for laser checking by the Contractor. The hub will be for grade checking only. Unless the work involves deep excavations, traffic problems, water problems, or other conditions approved by the City Engineer, the trench for the first 100 feet shall not be backfilled until the pipe grade has been checked. The Contractor shall set and aim the laser as controlled by the "cuts" and "slopes." Careful attention shall be given to the setting up of the laser and the periodic checking of its aim, etc. All grade checking of the laser shall be the responsibility of the Contractor.

All pipe shall be installed true to line except when approved otherwise by the City Engineer or shown on the Drawings. A tolerance of $\pm 1/4$ -inch deviation from true grade at each joint will be allowed. Extra care shall be given to the installation of storm drain lines at minimum slopes to avoid flat slopes in the line.

All foreign matter and gravel shall be removed from the inside of the pipe and fittings before being installed, and the pipe and fittings shall be kept clean during placement. No pipe shall be laid when conditions exist that, in the opinion of the City Engineer, are unsuitable for the placing of pipe. All pipe and manholes shall be covered or plugged at night.

The Contractor may elect, at his own option, to drain or pump groundwater from the trenches into previously placed new storm drain lines as long as adequate

CITY OF UNION, OREGON
TECHNICAL SPECIFICATIONS
SECTION 8
STORM DRAINAGE SYSTEM

disposal is provided. Adequate provisions shall be made by the Contractor for final disposal of the groundwater from trenches as approved by the City Engineer. Discharge water into new storm drain lines shall be properly screened to prevent siltation, debris, and/or gravel from entering the receiving waterway. At the termination of dewatering operations, the Contractor shall thoroughly clean the storm drain lines that were used. No storm drain lines will be accepted as completed until being cleaned and until approved by the City Engineer.

3. Testing.

a. Deflection Test for PVC and HDPE Pipe. All storm drains constructed of PVC and HDPE pipe shall be deflection tested not less than 30 days after the trench backfill and compaction has been completed. The test shall be conducted by pulling a go/no-go solid pointed mandrel or sewer ball through the completed pipeline. The diameter of the mandrel or ball shall be 95 percent of the inside pipe diameter. Testing shall be conducted on a catch basin-to-manhole and manhole-to-manhole basis and shall be done after the line has been completely cleaned and flushed with water. The Contractor shall, at his own expense, locate and repair any sections failing to pass the deflection test and retest the section.

b. Equipment. The Contractor shall perform all work and furnish all materials and equipment as required to perform all required tests.

C. MANHOLES

1. Material.

a. Precast Base Sections. Precast base sections shall be approved by the City Engineer and shall conform to ASTM C-479. Concrete shall be consolidated by mechanical vibration. Reinforcing shall be provided in the base and walls. Minimum concrete thickness shall be 5 inches. All shelf area shall be uniformly shaped, have a rough float finish, and slightly slope towards the channel. The shelf shall be above the top of the storm drain pipe. The Contractor shall be responsible for the determination of pipe hole orientation and grade. Precast base sections shall be used unless otherwise specifically called for on the Drawings or by the City Engineer.

b. Precast Manhole Sections. Precast manhole sections shall conform to ASTM C-478 and consist of circular sections in the standard 48-inch diameter. No more than two lift holes shall be cast into each section. Holes shall be located as

CITY OF UNION, OREGON
TECHNICAL SPECIFICATIONS
SECTION 8
STORM DRAINAGE SYSTEM

to not damage reinforcing or expose it to corrosion. At the manufacturer's option, steel loops may be provided for handling in lieu of lift holes. All lift holes shall be patched after installation. Precast manhole cones shall be eccentric unless otherwise specified and shall meet ASTM C-478. Flat slab covers for Type "B" manholes shall conform to ASTM C-478. Slabs, cones, and ring sections shall be free from fractures, cracks, rock pockets, or exposed reinforcement.

c. Pipe Connections to Manholes. All pipe connections to manholes shall be constructed as shown on the Drawings. All pipe-to-manhole connections shall be watertight. For solid wall PVC and ductile iron pipe, a 1/2-inch pipe gasket stretched over the pipe shall be used in combination with a non-shrink grout to provide a watertight seal. Profile wall PVC and HDPE pipe to manhole connections shall utilize gaskets or fittings in combination with a non-shrink grout to provide a watertight seal and shall be approved by the City Engineer. The Contractor shall submit shop drawings for proposed profile wall PVC and HDPE pipe connections to manholes. All connections shall match the grade and alignment of the pipe entering and exiting each manhole. Manhole pipe connections shall be constructed so flow through the manhole is not restricted in any way.

d. Manhole Rings and Covers. Manhole rings and covers shall be Inland Foundry Co., Inc., No. 802 Suburban, 16 hole cover, Style 2 Pickhole, Style B raised surface skid, or approved equal. Castings shall be tough, close-grained, gray iron free from blow holes, shrinkage, and cold sheets. They shall conform to ASTM A-48 and shall be smooth, sound, clean, and free from blisters and defects. Castings and covers shall be planed and ground when necessary to ensure flat and true surfaces. Covers shall be true and shall seat within the ring at all points.

2. Construction. Manholes shall be constructed to the line, grade, and detail as shown on the Drawings and as approved by the City Engineer. Excavation and backfill of the manhole shall be performed in the same manner as specified in Technical Specifications - "Excavation and Backfill of Trenches," where applicable. The "U" shaped channels in the manhole bases shall be constructed by the use of properly shaped forms. Intersecting flow channels shall have uniform transitions. All channels inside the manhole shall have smooth troweled finishes. Backfill shall be brought up evenly on all sides of the manhole.

3. Connection to Existing Manhole. Connections to existing manholes, when required, shall be made by the Contractor. All flow lines shall be properly shaped, and all new concrete shall be placed against a clean and sound surface. An approved epoxy bonding agent shall be used on all existing surfaces to be bonded to new

CITY OF UNION, OREGON
TECHNICAL SPECIFICATIONS
SECTION 8
STORM DRAINAGE SYSTEM

concrete or mortar. All applicable conditions for new manholes described previously shall apply.

D. CATCH BASINS, AREA DRAINS, AND FIELD INLETS

1. Materials.

a. Catch Basins, Area Drains, and Field Inlets. Catch basins, area drains, and field inlets shall be precast units manufactured in accordance with the Oregon Standard Specifications for Construction, Section 00470, as approved by the City. Concrete shall have a compressive strength of 3,000 psi. Reinforcement in precast structures shall be rebar meeting ASTM A-615 Grade 60 or welded wire meeting ASTM A-497. Reinforcement shall not be required for cast-in-place structures. Precast bases shall be furnished with cutouts or knockouts. Knockouts for pipes shall have a wall thickness of 2 inches minimum and may be located on all four sides.

b. Frames and Grates. Catch basin and area drain grates shall be metal castings conforming to the requirements of the Oregon Standard Specifications for Construction, Section 00470, as approved by the City

c. Oil-Water Separators. Oil-water separators shall be constructed of a corrosion resistant material and be equipped with a watertight access port, a mounting flange, and a means to prevent siphons. The size and position of the oil-water separator shall accommodate the outlet pipe size and allow the bottom of the device to be located 6 inches below the pipe invert elevation. The oil-water separator shall be securely attached to the structure wall with an oil-resistant gasket, corrosion resistant hardware, couplings, etc., for a complete installation.

d. Pipe Connection to Catch Basins, Area Drains, and Field Inlets. All pipe connections to precast units shall be watertight. For solid wall PVC and ductile iron pipe, a 1/2-inch pipe gasket stretched over the pipe shall be used in combination with a non-shrink grout to provide a watertight seal. The profile wall PVC and HDPE pipe connection shall utilize gaskets or fittings in combination with a non-shrink grout to provide a watertight seal and shall be approved by the City Engineer. The Contractor shall submit shop drawings for proposed pipe connections to catch basins, area drains, and field inlets. All connections shall match the grade and alignment of the pipe entering and exiting each unit. Pipe connections shall be constructed so flow is not restricted in any way.

CITY OF UNION, OREGON
TECHNICAL SPECIFICATIONS
SECTION 8
STORM DRAINAGE SYSTEM

All holes shall be located to provide the design flow line and direction of any pipe entering the catch basin, area drain, or field inlet. After the pipe connection is made and set to grade, the annular space between the pre-cast unit and the pipe shall be cement grouted to permanently set the flow line of the pipe. Non-shrink cement grout shall be used.

2. Construction. Catch basins, area drains, and field units shall be constructed to the line, grade, and detail as shown on the Drawings and as approved by the City Engineer. Excavation and backfill shall be performed in the same manner as specified in Technical Specifications - "Excavation and Backfill of Trenches," where applicable. All catch basins, area drains, and field inlets are to be watertight, including all connections and joints, and any leakage shall be corrected in an approved manner. Backfill shall be brought up evenly on all sides of the catch basin.

3. Connection to Existing Catch Basins. Connections to existing catch basins, when required on the Drawings, shall be made by the Contractor. All connections shall be made in such a manner as to leave the existing catch basin watertight. All new concrete shall be placed against a clean and sound surface. An approved epoxy bonding agent shall be used on all existing surfaces to be bonded to new concrete or mortar. All applicable conditions for new catch basins described previously shall apply.

E. CULVERTS

1. General. Culverts of the size indicated on the Drawings shall be installed in the location as shown on the Drawings and as specified herein.

Culverts shall be galvanized Type 2 corrugated steel pipe and shall be minimum 14-gauge with 2 2/3"x1/2" corrugations. Fabrication of pipe shall conform to AASHTO M-274 and AASHTO M-36 Specifications. Coating shall be minimum 2-ounce zinc per square foot. Joints shall be made with corrugated steel culvert bands over 3/8-inch neoprene gaskets. Culvert bands shall be 12 inches wide.

2. Installation. Culverts shall be bedded and backfilled uniformly on both sides of the pipe at the same time to prevent displacement or buckling of the pipe. Bedding material shall be worked carefully under the pipe haunches and then compacted.

Bedding and backfill material shall consist of select native material free of particle sizes greater than 1-1/2-inch in diameter.

CITY OF UNION, OREGON
TECHNICAL SPECIFICATIONS
SECTION 8
STORM DRAINAGE SYSTEM

F. HEADWALLS AND CONTROL STRUCTURES

1. General. Headwalls and other drainage structures shall be constructed in accordance with the Drawings and Specifications. Construction shall be to the lines, grades, and dimensions called for.

2. Materials.

a. Portland Cement Concrete. The Portland Cement concrete used for this work shall be an approved commercial transit mix. The exact proportions of all the materials entering into the concrete shall be as established by an approved laboratory mix design and shall be changed only as approved by the City Engineer or laboratory when necessary to obtain the specified strength, desired density, uniformity, or workability. Previously prepared mix designs will be allowed provided adequate test data is available to document the suitability of the mix and the Contractor can document that the same materials are being used.

The mix shall have a maximum water-cement ratio of 0.59, a minimum 28-day compressive strength of 3,000 psi, a minimum of 470 pounds of cement per cubic yard of mix, and an air content of 4.0 to 7.0 percent. The maximum allowable slump shall be 4 inches for all structures covered under this section of the specifications.

b. Reinforcing. Mild steel reinforcing bars shall be furnished, cut, bent, and placed as indicated on the Drawings and to the latest methods of practice approved by the Concrete Reinforcing Steel Institute. At the time of placing concrete, all reinforcement shall be free from loose mill scale, rust, grease, or other coating which might destroy or reduce its bond with concrete. Steel reinforcement not placed in the work shall be stored under cover to prevent rusting, and shall be placed on blocking such that no steel touches any ground surfaces.

Reinforcing steel shall be in position before concrete placement is begun. All reinforcing steel shall be tied together and supported in such a manner that displacement during placing of concrete will not occur.

G. DRAINAGE CHANNEL AND DITCHES

Drainage channels and ditches shall be constructed to the lines, grades, and locations shown on the Drawings. Where storm drain pipes and culverts discharge into open ditches, a riprap layer shall be required to prevent erosion as approved by the City

CITY OF UNION, OREGON
TECHNICAL SPECIFICATIONS
SECTION 8
STORM DRAINAGE SYSTEM

Engineer. Restoration shall be as called for in the Drawings and Specifications and as approved by the City Engineer.

H. EROSION AND STORMWATER POLLUTION CONTROL

The Contractor shall install such devices as may be required to prevent erosion from the site during the construction operations and to prevent and mitigate stormwater pollution in accordance with the requirements of the State, Federal and local agencies, the Drawings and Specifications, and environmental permits. Where necessary, the Contractor shall install silt fences, sand bags, straw/hay bales, matting, biofilter bags, etc., to prevent soil erosion and stormwater pollution. The Contractor shall protect and maintain all new dry well manholes and retention basins from construction surface water and silt which would damage these facilities until the project is completed.

I. CLEANING AND FLUSHING OF COMPLETED STORM DRAINS

Prior to final inspection of the drainage system by the City Engineer, the Contractor shall flush and clean all parts of the system. All accumulated construction debris, rocks, gravel, sand, silt, and other foreign material shall be removed from the system at or near the downstream manhole or outlet. If necessary, mechanical rodding or bucketing equipment shall be used.

All drain pipes shall be flushed, as thoroughly as possible, with the water pressure and outlets available. It must be understood that flushing removes only the lighter solids and cannot be relied upon to remove heavy material allowed to get into the drainage system during construction. Where practical, the Contractor shall provide sufficient water at the upper end of the line to develop a velocity in the storm drain line during flushing of at least 2.5 fps.