CITY OF BOARDMAN, OREGON

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STORM DRAINAGE

CITY OF BOARDMAN, OREGON

TECHNICAL SPECIFICATIONS

SECTION 7

STORM DRAINAGE

PART 1 - GENERAL

1.1 Scope

These Specifications cover the furnishing and installation of gravity storm drain lines, catch basins, manholes, and miscellaneous 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 these Specifications.

1.2 Specification 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), the American Society for Testing and Materials (ASTM), or the American Association of State Highway and Transportation Officials (AASHTO), current edition(s).

1.3 Care and Handling of Materials

A. 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 possible subsequent damage.

B. 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 that are delivered considerably in advance of their installation shall be stored in a satisfactory manner.

C. 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.

1.4 Certification by Manufacturer

The Contractor shall furnish to the City a sworn statement from the manufacturer stating that inspection and all specified tests have been made on the supplied material and that the results thereof comply with appropriate Specifications, and that all materials are new.

PART 2 - MATERIALS

2.1 Gravity Storm Drains

A. Solid Wall PVC Pipe

Solid wall PVC pipe shall be solid wall construction and shall conform to the requirements of ASTM D3034, SDR 35 for pipe up to 15-inch diameter and ASTM F679, Type 1 only, for pipe sizes 18- to 27-inch diameter. Joints for solid wall PVC pipe shall conform to ASTM D3212 using elastomeric gaskets conforming to ASTM F477.

B. Profile Wall PVC Pipe

Profile wall PVC culvert pipe and profile wall PVC storm sewer pipe shall be Johns-Manville "Perma-Loc," or equal, meeting the requirements of AASHTO M 304 or ASTM F794 Series 46. Joints for profile wall PVC pipe shall conform to ASTM D3212 using elastomeric gaskets conforming to ASTM F477.

C. 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.

D. Concrete Pipe

Non-reinforced concrete pipe and fittings shall conform to the specifications of ASTM C14. Reinforced concrete pipe and fittings shall conform to ASTM C76. The types and classes of pipe shall be as required on the Drawings or as otherwise specified. All joints shall be push-on rubber gasket joints conforming to ASTM C443.

E. 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 D3212 using elastomeric gaskets conforming to ASTM F477. All gaskets shall be factory installed on the pipe in accordance with the manufacturer's recommendations.

F. Warning Tape

All warning tape shall be green, approximately 3 inches wide, manufactured of a durable, non-degrading material, and state "Caution Buried Sewer Line Below."

2.2 Manholes

A. Precast Base Sections

1. Precast base sections shall conform to ASTM C479. Concrete shall be consolidated by mechanical vibration. Reinforcing shall be provided in the base and walls. Minimum concrete thickness shall be 5 inches.

2. 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.

3. The Contractor shall be responsible for the determination of pipe hole orientation and grade.

4. Precast base sections shall be used unless otherwise specified.

B. Precast Manhole Sections

1. Precast manhole sections shall conform to ASTM C478 and consist of circular sections in the standard 48-inch diameter.

2. No more than two lift holes shall be cast into each section. Holes shall be located as 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.

3. Precast manhole cones shall be eccentric unless otherwise specified and shall meet ASTM C478.

4. Flat slab covers for Type "B" manholes shall conform to ASTM C478.

5. Slabs, cones, and ring sections shall be free from fractures, cracks, rock pockets, or exposed reinforcement.

C. Pipe Connections to Manholes

1. All pipe connections to manholes shall be constructed as shown on the City Standard Drawings. All pipe-to-manhole connections shall be watertight.

2. For solid wall PVC and ductile iron pipe, A/C sewer couplings with an appropriate adaptor gasket by Romac Industries, or approved equal, may be used for cast-in-place manhole bases OR an A-Lok pipe connector as manufactured by A-Lok Products, Inc., PSC Flexible Connector as manufactured by Press Seal Gasket Corporation, Kor-N-Seal as manufactured by Core and Seal Company, or approved equal shall be used when precast base sections are used, OR 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.

3. 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. The Contractor shall submit Shop Drawings for proposed profile wall PVC and HDPE pipe connections to manholes.

4. 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

1. Manhole rings and covers shall be EJ No. 2603, 16 hole cover, Style 2 Pickhole, Style B raised surface skid, or approved equal.

2. Castings shall be tough, close-grained, gray iron free from blow holes, shrinkage, and cold sheets. They shall conform to ASTM A48 and shall be smooth, sound, clean, and free from blisters and defects.

3. Castings and covers shall be planed and ground when necessary to ensure flat and true surfaces.

4. Covers shall be true and shall seat within the ring at all points.

2.3 Catch Basins, Area Drains, and Field Inlets

A. Catch Basins, Area Drains, and Field Inlets

1. Catch basins, area drains, and field inlets shall be precast units manufactured in accordance with ASTM C139 and C913. Basin type shall be ODOT standard G-2 inlet base with appropriate precast concrete adapter to match frame and grade, or approved equal.

2. Concrete shall have a compressive strength of 3,000 psi.

3. Reinforcement in precast structures shall be rebar meeting ASTM A615 Grade 60 or welded wire meeting ASTM A497. Reinforcement shall not be required for cast-in-place structures.

4. 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

1. Catch basin and area drain grates shall be metal castings conforming to the requirements of ASTM A48, Class 30. Castings shall be tough, close-grained, gray iron free from blow holes, shrinkage, and cold sheets. They shall be smooth, sound, clean, and free from blisters and defects. Castings shall be planed and ground when necessary to ensure flat and true surfaces.

2. Catch basin frame and grate shall be EJ 7035 with M6 vane grate, or approved equal.

3. Field inlet frames and grates shall be hot dip galvanized flat bar A36 steel or approved equal.

C. Oil-Water Separators

1. Oil-water separators shall be The Snout by Best Management Products, Inc. (800-504-8008), or approved equal.

2. 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.

3. 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

1. All pipe connections to precast units shall be watertight.

2. 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.

3. 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.

2.4 Culverts

A. Corrugated Steel

Culverts shall be Type 2 corrugated steel pipe and shall be a minimum 14-gauge with 2-2/3-inch x 1/2-inch corrugations. Fabrication of pipe shall conform to AASHTO M 274 and AASHTO M 36 specifications. Joints shall be made with corrugated steel culvert bands over 3/8-inch neoprene gaskets. Culvert bands shall be 12 inches wide.

B. Reinforced Concrete Culvert Pipe

1. Reinforced concrete culvert pipe shall be round and conform to the requirements of AASHTO M 170 except as modified below. Pipes shall be within the maximum and minimum diameters set forth in AASHTO M 170. The wall thickness and steel area for all classes of pipe that are not described in AASHTO M 170 shall be determined by interpolation from data given in the tables for pipes of diameters next smaller and next larger, respectively.

2. For all classes of pipe, except Class I, which are smaller than the minimum size set forth in AASHTO M 170 for the particular class, the minimum wall thickness shall be 1 3/4-inch and the steel area shall not be less than 0.06 square inch per linear foot of pipe barrel length.

3. All bell and spigot concrete culvert pipe shall be joined with rubber gaskets conforming to AASHTO M 198.

PART 3 - EXECUTION

3.1 Existing Utilities

The Contractor shall be responsible for the actual locating and protecting of existing utilities. If a conflict develops between the design line and grade of a pipeline and an existing utility, the City may adjust the pipeline grade or have the existing utility relocated. See the General Requirements for further requirements.

3.2 Restoration, Finishing, and Cleanup

The Contractor shall restore or replace all paved surfaces, graveled surfaces, curbing, sidewalks, trees and shrubbery, lawns, pastures, fences, and other existing facilities to their original condition. See Technical Specifications - "Surface Restoration" for specific requirements.

3.3 Installation of Gravity Storm Drains

A. Trench Excavation and Backfill

Trench excavation and backfill shall be performed as specified in the Technical Specifications - "Excavation and Backfill of Trenches." When installation involves replacement of an existing line, trench excavation and backfill shall include the removal of existing curbs, sidewalks, paving and base rock, and also the existing line.

B. Installation of Pipe

1. 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.

2. 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.

3. Gravity storm drain main lines shall be installed with the use of a laser beam and target. 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.

4. Warning tape shall be located on top of the select backfill above all storm drain piping.

5. All pipe shall be installed true to line except when approved otherwise by the City or shown on the Drawings. A tolerance of ±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.

6. 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, are unsuitable for the placing of pipe. All pipe and manholes shall be covered or plugged at night.

7. The Contractor may elect, at their own option, to drain or pump groundwater from the trenches into previously placed new storm drain lines as long as adequate disposal is provided. Adequate provisions shall be made by the Contractor for final disposal of the groundwater from trenches as approved by the City. 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.

C. Testing

1. 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 their own expense, locate and repair any sections failing to pass the deflection test and retest the section.

2. Equipment

The Contractor shall perform all Work and furnish all materials and equipment as required to perform all required tests.

3.4 Manhole Installation and Connections

A. Construction

1. Manholes shall be constructed to the line, grade, and detail as shown on the Drawings.

2. 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. Backfill shall be brought up evenly on all sides of the manhole.

3. The "U" shaped channels in the manhole bases shall be constructed by the use of properly shaped forms.

4. Intersecting flow channels shall have uniform transitions. All channels inside the manhole shall have smooth troweled finishes.

B. Connection to Existing Manhole

1. Connections to existing manholes, when required, shall be made by the Contractor.

2. All flow lines shall be properly shaped, and all new concrete shall be placed against a clean and sound surface.

3. An approved epoxy bonding agent shall be used on all existing surfaces to be bonded to new concrete or mortar.

4. All applicable conditions for new manholes described previously shall apply.

3.5 Catch Basins, Area Drains, and Field Units

A. Catch basins, area drains, and field units shall be constructed to the line, grade, and detail as required and as approved by the City.

B. Excavation and backfill shall be performed in the same manner as specified in Technical Specifications - "Excavation and Backfill of Trenches," where applicable. Backfill shall be brought up evenly on all sides of the catch basin.

C. 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.

D. New Connections

1. 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.

2. 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.

E. Connection to Existing Catch Basins

1. Connections to existing catch basins, when required, shall be made by the Contractor.

2. 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.

3. An approved epoxy bonding agent shall be used on all existing surfaces to be bonded to new concrete or mortar.

4. All applicable conditions for new catch basins described previously shall apply.

3.6 Culverts

A. Culverts shall be installed in the location and at the grade as required and specified herein.

B. 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.

3.7 Cleaning and Flushing of Completed and Tested Storm Drains

A. Prior to final inspection of the storm drain system by the City, 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 closest downstream manhole. If necessary, mechanical rodding or bucketing equipment shall be used.

B. All storm drain pipes, manholes, and catch basins installed shall be flushed as thoroughly as possible. 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 pipes during construction. The Contractor shall provide sufficient water and appropriately

sized taps to develop a velocity in the pipes during flushing of at least 2.5 fps. Check local rules for discharges to natural waterways.

3.8 Environmental Protection of Catch Basins

The Contractor shall provide biofilter bags, or approved equal, at each catch basin, field inlet, or area drain installed by the Contractor on the Project. The biofilter bags shall be in place during the Contractor's Work to prevent sediment from entering the catch basins and shall be maintained until the risk of sediment entering the catch basin from construction activities on the Site no longer exists. When all Work is complete, the biofilter bags shall be removed by the Contractor.

END OF SECTION