

SECTION - 400

STORM WATER

SEWER SYSTEM

400 – STORM WATER SEWER SYSTEM

400.00.00 – Scope

This section shall include but not be limited to all items of work necessary and incidental to the planning, survey, design and construction of the City of Cave Junction storm water sewage system or systems as may be administered by the City within dedicated City rights-of-ways or easements, or as may be dedicated to the City. This section shall also apply to private storm water sewage systems insofar as they may affect the city storm water system through connection.

This work shall also include any appurtenances and other work, such as pavement removal and replacement, trench excavation and backfill, providing and installing storm water pipe and fittings, connection to existing storm sewers; providing and installing manholes and catch basins, providing and installing catch inlets and grates, providing and installing field drains and culvert inlet assemblies, providing and installing detention basins including orifice boxes, installing stormwater management facilities as part of a low impact development strategy for onsite stormwater management; installing necessary incidental curbs and gutter; and testing, flushing of the new storm water sewage system.

It shall be the responsibility of Applicants, Engineers or Contractors to visit the site of the proposed work and become fully acquainted with the conditions relating to the construction, so that they fully understand the facilities, restrictions, and difficulties involved in the construction work proposed under the Contract or development. They shall satisfy themselves as to the quantities involved, including materials, equipment, and labor.

It shall be the responsibility of the Applicant(s) or Engineer(s) to obtain the necessary permits from City, State and Federal agencies prior to performing any construction activities within City limits.

410.00.00 – General

410.10.01 – References

Oregon Administrative Rules (OAR) and Oregon Revised Statutes (ORS) current standards and revisions as may apply to Public Storm Water Sewer Systems.

Oregon Department of Environmental Quality (DEQ) current standards and revisions as may apply to Public Storm Water Sewer Systems.

Oregon Department of Transportation (ODOT) requirements and Oregon Standard Specifications for Construction, latest edition and Standard Drawings as they may apply to Public Storm Water Sewer Systems.

American Society for Testing and Materials (ASTM)

American Association of State Highway Transportation Officials, AASHTO, "Standard Methods of Test"

American Concrete Institute (ACI)

City of Cave Junction Municipal Code (CJMC) as may apply to Public Storm Water Systems.

City of Cave Junction Public Works Standards and Specifications as they apply to Storm Water systems.

State of Oregon, Manual of Uniform Traffic Control Devices (OMUTCD) current requirements, including, "Oregon Temporary Traffic Control Handbook for Operations of 3 Days or Less", latest edition.

410.10.02 – Tables

None

420.00.00 – Design Standards

420.01.00 – General

It shall be the responsibility of the Engineer to investigate the drainage area of the project, including the drainage areas of the channels or storm sewers entering and leaving the project. If a contiguous annexed drainage area of given size exists, the Engineer may use information that has formerly been established if it includes criteria for the drainage area at complete development under current zoning and Comprehensive Plan Designations. If the City does not have such information, the Engineer shall present satisfactory information to support his Storm Sewerage Design.

The Engineer shall also be required to provide all hydrology and hydraulic computations to the Public Works Department (PWD) that are necessary to substantiate the storm sewer design. The design shall be sufficient to prevent conditions of flooding, including standing water, inside and outside of the proposed project area. The storm water sewer system design shall be in conformance with applicable provisions of Oregon DEQ, DSL

and ODFW and, United States COE and consistent with the US EPA's National Pollution Discharge Elimination Phase II stormwater requirements.

420.10.00 – Minimum Design Requirements

420.10.01 – Hydrology

Basic Criteria for Storm Sewerage Design shall be as follows:

1. Local Drainage Areas located in a high risk (1% annual chance) Flood Zone as a result of a Federal Emergency Management Agency (FEMA) Study, shall have storm drains of sufficient capacity to carry runoff for a typical 10-year storm, unless the main discharge pipe or stream will have greater than 100 cubic foot per second discharge "Q" during a 10-year storm. When the discharge "Q" of storm drains exceeds 100 CFS, but is less than 200 CFS, that storm drain shall be designed to carry the runoff expected for a 50-year storm. When the main storm drain will have a discharge "Q" in excess of 200 CFS during a 50-year storm, that storm drain shall be designed to carry the runoff expected for a 100- year storm.
2. Local Drainage Areas not located in a high risk Flood Zone shall be designed to 24 hour rainfall requirements.
3. Unless the Engineer can otherwise demonstrate through hydraulic design that the existing facilities such as culverts, bridges or pipe, including any planned future development, will carry the computed discharge, the Engineer will be required to design and dedicate detention basins or other facilities for the purpose of reducing the discharge until the downstream facilities have been improved or enlarged, or until other solutions have been found.
4. The Public Works Department will require both, a pre-condition analysis and, a post condition analysis of the project area that considers all planned or estimated build-out of future facilities in order to substantiate the project design.

420.10.02 – Ground Water Control Plan

Many areas in the City of Cave Junction have a high water table that fluctuates greatly with rainfall amounts as well as surrounding use.

1. In all instances the Applicant (or Engineer) shall retain the services of a registered Hydro-Geologist to determine if ground water is present in the areas affected by construction of storm sewer systems.
2. If it is determined that ground water is present, the Hydro-Geologist in consultation with the Engineer shall develop and submit a Ground Water Control Plan.

The plan shall include as a minimum maps and tables showing the, locations, depths, quantities, flow rates, seasonal variations and any other information necessary to fully appraise the City of the conditions. The plan shall also include the Engineer's and Hydro-Geologist's recommended solution to accommodate, and if necessary maintain the ground water flows and quantities through the area under consideration.

420.10.03 – Hydraulic Design

The Public Works Department requires that storm sewer systems to be dedicated to the City shall be designed as a "closed system" in order to minimize the effect of ground water infiltration, silt and other undesirable substances with the exception of LIDA stormwater management facilities. Weep holes and grade rings above the street sub-grade level or hydraulic grade line in non-street installations, are exempted from the watertight requirement. The system shall also be designed to be "self cleaning" to the extent possible. However, 6" sumps will be required in all new catch basins and curb inlets. The minimum requirements are as follows:

1. Cleaning Velocity and Minimum Grade – A minimum cleaning velocity of 2-fps will be maintained throughout all segments of pipe between catch basins or manholes regardless of the type of pipe used. In no case shall the pipe gradient be less than 0.005-ft per foot (0.5%).
2. Cleaning velocity shall also be maintained through manholes except at specially designed sediment cleaning structures as discussed below in Section 420.10.04, Facility Design. Street curb gutters shall be designed to maintain cleaning velocities between curb inlets including the corner radii.

420.10.04 – Facility Design

1. Storm Sewer Pipes - Storm sewer mains shall normally be located 2' south or 2' west of the centerlines of streets. Eccentric manhole cones shall be positioned so as to preserve the true intersection of streets for the location of monuments.
2. Minimum Pipe Diameter – The minimum pipe diameter for any City storm drain shall be 12" I.D., with the exception of stormwater management facilities. Stormwater management facilities shall have a 6-inch minimum pipe diameter for perforated pipe within the facility and a 10-inch minimum pipe size for facility outlet piping.

Storm sewer feeders and laterals shall be normally located behind the curb section to accommodate curb inlets and catch basins. Where the storm sewer main is located near the street center- line, lateral leader pipes shall be constructed from the catch basins to a corresponding storm sewer manhole. Blind connections will not be allowed. Minimum cover of 24" over pipes within the traveled way shall be required unless Class V, Reinforced Concrete Pipe is used.

A concrete cap as shown in Standard Detail T-4, Shallow Trench Section Under Traveled Way, shall be required for all other pipe with less than 24" of cover. In no case shall the depth of cover over reinforced concrete pipe, as measured at the bell or concrete cap, be less than 12" within the paved section.

3. Curb and Gutter - Curbs, and curb and gutter sections shall not exceed 350' in length between catch basins or curb inlets. Leader pipe from catch basins or curb inlets to manholes shall not be less than 12" I.D. pipe.
4. Catch Basins – Catch basins shall be designed as shown on Standard Detail SD-3 or SD-4 as applicable. Standard 2-1/2A catch basins shall have a maximum of 3, 12" pipe entrances or exits in the basin. Standard 4A catch basins shall be used for all pipes greater than 15" I.D. diameter. Screened weep holes shall be installed at a level slightly above the sub-grade in the sub-base layer as shown on Standard Details.

The catch basin depth shall not exceed 4' as measured from the catch basin lip to the invert of the entrance of the lowest pipe. Catch basins shall be constructed with a 6" sump in the bottom to collect debris.

5. Manholes – Manholes shall be spaced at no more than 400' apart and shall be designed as shown on Standard Detail(s) SD-1 through SD-2A and shall be self-cleaning and free flowing. All pipe inverts shall be located in the base of the manhole unless otherwise approved.

The PWD may require that screened weep holes be installed in the circumference of the manhole rings above the sub-grade level if high ground water concentrations are present during construction.

Manhole lids shall be stamped with a "D" to differentiate storm drain manholes from sanitary manholes, which will be stamped with an "S".

6. Special Sediment Cleanout Structures – The Engineer shall include in the storm system design, a minimum of 1 manhole or other approved structure with a sump below the invert(s) of the entrance and exit pipes capable of collecting sediments from the upstream storm piping system. The facility shall be designed to accommodate the quantity of sediment flowing into system over a 1 year period and afford access to crew and equipment for periodic cleaning. See Standard Detail SD-2B, Storm sewer Manhole with sediment basin.

For storm systems entering a creek, open ditch or other natural waterway, the structure shall be located above the high water mark in a City Storm Sewer Easement.

The invert elevation of out flowing pipes shall be angled downstream and installed at sufficient elevation above the predicted stream level for high stream

flow events to prevent backflow into the cleanout structure or the upstream storm sewer system.

Where the outfall of the pipe entering the stream is expected to be below the stream level during high water, a swing-gate (flap-gate) or other approved device shall be installed to prevent backflow into the upstream storm sewer system. The device shall be installed such that it is oriented at a 45 degree angle downstream. All other cleanout structures shall normally be located within the street right-of-way.

7. Headwalls and Debris Racks - Where natural drainages or streams are introduced into piped storm sewers in developed areas, properly designed, grated head walls will be required. Headwalls shall be designed to pass all debris normally encountered in major stream channels. Debris racks or grates may be designed for ditches and other minor channels. Applicable standard details are shown in Oregon Standard Drawings, latest edition.
8. Other Miscellaneous Structures – Other storm sewer system structures shall be designed in accordance with standard engineering practice as necessary to accomplish a completed storm water sewer system design. Design details shall be consistent with applicable Oregon Standard Drawings, 2008.
9. Storm Sewer Outfalls - Where storm sewer piping discharges into natural drainages or creeks, satisfactory streambed and bank protection will be required. Flap gates, duckbills or other devices shall be designed to prevent stream flow from backing up the storm drain system flow during flood events, and shall be oriented at a 45 degree angle downstream.
10. Stream Bed and Stream Banks - In areas of fragile soils, such as decomposed granite, silts or sand, where streams or natural drainages pass through a development within an easement or right-of-way, stream bed and stream bank protection will be required. In other areas, evidence of stable streambed and stream bank conditions shall be required.
11. Alignment and Grade - All storm sewer piping shall be laid on straight line and grade between manholes and catch basins unless otherwise approved by the PWD. The finished pipe alignment and grade shall not exceed 0.04' for deviation from line or 0.02' for grade and any such variation shall not result in a level or reverse sloping pipe invert at any point in the line.

In some instances, if necessary, and if conditions permit, curves in the lines, either vertical or horizontal, may be allowed and must be approved in writing by the PWD during preliminary design phases. In such cases, curves shall be properly anchored, and pipe or joint deflections shall not exceed manufacturer's recommendations.

In all cases, minimum cleaning velocities and pipe grades shall be as required in Section 420.10.03, Hydraulic Design.

12. Stormwater Overflow Structures – Construct per drawings SD-13 or approved equal. Overflow structures must drain to an approved structure.

13. Low Impact Development Facilities – See Rogue Valley Stormwater Quality Design Manual. Chapter 4 applies to development and/or redevelopment that creates 2,500 square feet or more of impervious surface.

420.10.05 – Private Storm Drain Systems

All private storm drain system main lines which shall connect to the City storm drain system shall meet the same standards and criteria for design and construction as herein contained in this section. All laterals less than 10" in diameter and within the private development shall meet the requirements of the Uniform Plumbing Code as administered by the State of Oregon.

All storm drain mainlines shall connect to a properly sized catch basin or manhole within the City system. The private storm main shall be designed to be easily cleaned and maintained.

420.20.00 – Quality Assurance

420.20.01 – Construction Staking

Construction staking for the storm sewer system shall normally be accomplished after clearing and grubbing has been completed and the street section has been excavated (cored out). Staking and hubs will be required that define the location, offset distances, pipe diameter, depth of cut and invert elevations of the storm sewer pipe and structures. The Contractor is required to maintain construction staking at his own expense until project completion.

Properly calibrated "pipe lasers", where used, shall be set to the required grades as shown on the approved plans and used in conjunction with other surveying equipment to lay the pipe to the proper grade and alignment. Alternatively, batter boards and string line, or other approved methods may be set to control pipe invert grades and alignments.

420.20.02 – Inspection

In addition to periodic informal inspections the Public Works Department requires a minimum number of formally requested inspections at the following phases in order to assure that the approved plan requirements and specifications are met:

1. Alignment, grade, bedding, and pipe jointing.

2. Installation of pipe zone material.
3. Backfill operations, including density testing of layers in the variable and upper zones.
4. TV storm drain line prior to paving to ensure proper installation of pipe.

Inspections should be coordinated with the inspector and must be requested by the Contractor at least 24 hours in advance of the required inspection. Arrangements for inspections during weekends and holidays or after 5:00 PM must be made at least 48 hours in advance.

Requests for Public Works inspection may also be made through the PWD secretary at (541) 664-7602 ext.241.

Also see Section(s) 440.60.00, Cleaning and Flushing and 450.00.00, Testing.

430.00.00 – Storm System Materials

This section describes the materials specific only to the construction of the storm water sewage system. Section 900, Construction Materials describes and specifies the materials commonly used in most phases of City of Cave Junction, Department of Public Works projects.

430.10.00 – Pipe Materials

430.10.01 – Polyvinyl Chloride (PVC)

Polyvinyl Chloride (PVC) Pipe and Couplings: When specified, or allowed as an alternate for storm drain pipe construction, (PVC) pipe shall conform to the requirements of ASTM D3034 or ASTM F-789-82. Normally only 12" and 15" diameters will be allowed. Pipe diameters exceeding 15" are not allowed except as approved by the PWD.

Fittings shall conform to the applicable requirements of ASTM D1785, ASTM D 2729, ASTM D2466, ASTM D3034, or ASTM F-789. The minimum SDR shall be 35 and the minimum stiffness shall be 46 psi. Pipe shall have an integral bell and spigot conforming to ASTM – 477 or may be laid with twin gasket couplings. All fittings shall have rubber gasketed joints. Wall thickness for 12" pipe shall not be less than 0.360" and the wall thickness for 15" pipe shall not be less than 0.437".

When perforated (PVC) pipe is specified in the approved plans or is authorized by the PWD, it shall conform to the requirements of ASTM D1785, Schedule 40. Unless otherwise specified, the perforations shall consist of two rows of 2" by ¼" slots transverse to the axis of the pipe.

430.10.02 – High Density Polyethylene (HDPE)

The product supplied under this specification shall be double wall, high density corrugated polyethylene, smooth interior pipe and fittings meeting ASTM D3350 Cell Classification 325420 C and shall meet the following requirements. All (HDPE) pipe and fitting materials shall be able to withstand highway traffic loading with only 1' of cover and offer strength to withstand embankment heights up to 20' or more. Manning's "n" value for use in design shall not be less than 0.010

Pipe 12" to 48" in diameter shall conform to AASHTO M294-97 Type S.
Pipe 54" and 60" shall meet AASHTO MP7-97.

Watertight joints for closed storm systems. Joints shall be Hancor Sure-Lok WT, ADS Pro-Link WT, or approved equal and shall have joints meeting ASTM 3212 requirements. Rubber gaskets shall be supplied and installed that meet ASTM F477.

430.10.03 – Concrete Pipe

Plain Concrete Pipe: Storm sewer pipe 12" I.D. may be Class III un-reinforced concrete pipe with bell and spigot joints and rubber gaskets, conforming to ASTM C-14. For closed, watertight systems the joint and gasket requirements shall be as described below.

Reinforced Concrete Pipe: Storm sewer pipe 15" I.D. and larger shall be Class III reinforced concrete pipe with bell and spigot joints and rubber gaskets, conforming to the requirements of ASTM C-76. For closed, watertight systems the bell and spigot shall be modified to accept the rubber gaskets and withstand a field test in accordance with ASTM C 969 (leakage allowance of 200 gal./ inch of diameter/mile/day).

Cement Mortar, as required for jointing concrete pipe and for connections to small pipe manholes or catch basins shall conform to the requirements of ASTM C 387, or be proportioned 1 part Portland cement to 2 parts clean plaster sand (100% passing #8 sieve). Admixtures may be used not exceeding the following percentages by weight of cement – hydrated lime 10%, diatomaceous earth or other inert materials – 5%. The mortar shall be of such consistency that it will readily adhere to the pipe. Mortar that has been mixed for more than 30 minutes shall not be used.

Large storm drain manholes where the pipe opening has been formed or cutout to receive pipes larger than 24" shall be sealed with a non-shrink waterproof grout. An 8"X8" collar shall be formed and poured around the connection.

430.20.00 – Trench Bedding, Pipe Zone and Backfill

430.20.01 – Excess Excavated Trench Materials

Unless otherwise established by test borings or test excavation that “rock” as described in Section 330.10.01 exists at the locations of storm sewer mains, laterals or related appurtenances, it shall be assumed that all excavation will be unclassified excavation, and the Contractor shall remove all materials encountered. Excess excavated materials shall be disposed of as set forth in Section 330, of these Standard Specifications.

430.20.02 – Bedding and Pipe Zone Materials

Storm Sewer Pipe – All material used in the bedding and pipe zone areas shall be ¾”-0 crushed rock as described in Section 910.11.00, Trench Backfill and Bedding Aggregate, of these Standard Specifications.

Where incompetent or unstable trench bottoms are encountered, the PWD may authorize over excavation and stabilization of the trench bottom with 4” crushed rock or ballast material as described in section 910.10.03, Sub-base Aggregate or Section 915.00.00, Sub-grade and Trench Reinforcement Rock (ballast) prior to the placement of bedding material.

430.20.03 – Trench Backfill Materials

(a). New Street construction – All storm sewer mains and lateral lines installed within the Rights of Way for newly constructed streets shall be back filled above the pipe zone to the top of sub-grade with ¾”-0 crushed base rock as described in Section 910.11.00, Trench Backfill and Bedding Aggregate, of these Standard Specifications.

(b). Existing Paved Streets and Shoulders – All storm sewer mains and lateral lines installed, repaired or modified within the street section including sidewalks or adjacent shoulders shall be back filled according to Standard Detail T-1. Extending 3’ down from finished grade (upper zone), uncompressible 1 sack sand / cement slurry mixture as described in Section 945.00.00, Cement-Sand Slurry, shall be used. Variable zone may be ¾”-0 crushed rock or Cement-Sand Slurry as above. Paving materials shall meet the requirements of Section 925.00.00, Hot Mix Asphaltic Concrete Paving (HMAC). Also refer to Section 350.20.00, Street Cutting including Curbs, Gutters and Sidewalks.

Trenches within the shoulder but not under any portion of the paved street section, Standard Detail T-2, shall be back filled with ¾”-0 crushed rock meeting the requirements of Section 910.11.00, Trench Backfill and Bedding Aggregate.

(c). Natural Ground – Storm sewer mains and lateral lines outside the street Rights of Way may be back filled above the pipe zone with materials described in Section 910.11.01 (g), Trench Backfill Outside of Street R/W.

430.30.00 – Structures

430.31.01 – Manholes

Manholes shall be constructed in accordance Standard Detail(s) SD-1, Manholes for Small Pipe SD-2A, Manholes for Large Pipe. Concrete materials for bases, barrel sections and adjustment rings shall conform to the requirements of Section 930.00.00, Portland Cement Concrete. Pre-cast sections, bases and rings shall meet the permeability requirements set forth in ASTM C 14 and ASTM C 497. Manhole bases shall be a minimum of 6" thick. If high ground water conditions exist, 2" weep holes may be required above sub-grade, at the discretion of the PWD.

430.32.01 – Catch Basins

Catch basins shall be constructed in accordance with Standard Detail(s) SD-3, Concrete Curb Inlet and SD-4, Type B Inlet. Concrete materials shall conform to the requirements of Section 930.00.00, Portland Cement Concrete. All catch basins shall be constructed with two, 3" dia. PVC pipe weep holes with wire ¼" galvanized wire mesh, located on each side of the box at sub-grade.

430.33.01 – Curb and Gutter Inlets

Curb and Gutter inlets shall normally be pre-cast or constructed in accordance with Standard Detail(s) SD-3, Concrete Curb Inlet. Where applicable, SD-4, Type B Inlets are typically constructed with rolled curbs and gutters. The PWD may require a modified SD-4, Type B inlet without grating. Stormwater management facility curb inlets shall be constructed in accordance with SD-8, SD-9, SD-10, SD-11, SD-12, or approved equal. Concrete materials shall conform to the requirements of Section 930.00.00, Portland Cement Concrete.

430.34.01 – Grating

Where required on the plans, grates for curb inlets shall be of bicycle safe, welded frames fabricated as shown Standard Detail SD-5, Curb Inlet B Frame and Grate. Steel materials shall conform to ASTM A 36. Cast iron grates may be substituted pending PWD approval. Grates and frames for other structures shall be designed in accordance with applicable sections of Oregon Standard Specifications for Construction, latest edition and Standard Drawings.

430.35.01 – Low Impact Development Facilities

See chapter 4 in the Rogue Valley Stormwater Quality Design Manual, latest edition.

430.40.00 – Miscellaneous Structures

Special Sediment Cleanout Structures – Sediment Cleanout Structures shall be designed in accordance with Standard Detail SD-2B, Storm Sewer Manhole with Sediment Basin using materials described above in Section 430.31.01, Manholes. All manhole cleanout structures shall be constructed with four, 2" dia. PVC pipe weep holes with zinc galvanized wire mesh, located equally around the circumference at street sub- grade.

440.00.00 – Construction and Workmanship

440.10.00 – Trench Excavation, General

It is the intent of these Standard Specifications that the progress of the work shall move forward in a systematic and efficient manner so that as little inconvenience as possible to the public will result during the course of construction.

No work within a City right of way or easement shall commence until the Applicant has applied for and received a Public Works Department "Construction Permit" or unless during emergencies has been authorized by the PWD to conduct such work. Oregon DEQ, DSL, DFW or U.S. COE may also require permits or special conditions when working in or adjacent to stream channels.

Prior to beginning work the Applicant or Contractor shall submit a Traffic Control Plan to the PWD for approval. Prior to beginning work the Contractor shall notify the PWD and the Emergency Dispatch Center of the address, periods of work, road closures and detours and other operations critical to public safety. Applicant shall obtain all utility locates in accordance with OAR 952-001-0010 through 952-001-0100. Call **1-800-332-2344, or dial 811**.

Except by permission of the Public Works Department, at no time shall the trenching equipment be farther than 200' ahead of each pipe laying crew.

Backfill of the trench shall be accomplished so that no section of approved pipe shall be left open longer than 48 – hours unless otherwise authorized by the Public Works Department. Backfill and cleanup in traffic ways including sidewalks shall be completed as each section of pipe has been inspected, tested, and approved. The work site, including "track out" on existing streets shall be cleaned up at the end of each workday.

All construction and trenching operations shall be conducted in a safe manner and in accordance with OR-OSHA requirements.

The Contractor shall promptly repair and re-grade all existing drainage ditches, natural drainage courses and all other drainage facilities, including culverts, damaged or removed during the construction.

The Contractor shall give prompt consideration for reopening street, roads and driveways to the public after the pipe has been installed. No traffic-way shall be closed while work is suspended over weekends or holidays and closures during workdays shall be as brief as practicable.

Provide and maintain any temporary measures needed to promote safe traffic movement over the trench with steel jump plates, warning signs or lights, etc. All jump plates shall be secured in place with plate locks on edges.

No trench, on site or off-site, shall be left at any time in an unsafe condition. The permit holder is responsible for and is liable for hazards or damage resulting from the prosecution of the work.

The Contractor shall be required to provide the necessary trained personnel and signing to control traffic for the duration of the project in accordance with MUTCD and ODOT "Oregon Temporary Traffic Control Handbook for Operations of 3 Days or Less", latest edition.

Where private accesses are to be closed, the property owner(s) shall be notified by the Contractor at least 24-hours in advance of the closure. Access for fire and emergency equipment shall be maintained at all times. Also see Section 350.20.00, Street Cutting including Curbs, Gutters and Sidewalks

440.20.01 – Pavement Removal and Replacement (Street Cuts)

Where new storm sewer lines cross existing pavements, the Contractor shall pre-saw the lines of the pavement or concrete to the full depth of the pavement before attempting to remove the paving or curbs and gutters.

All work shall be done in accordance with Sections 350.20.00, Street Cutting Including Curbs, Gutters and Sidewalks. Paving and concrete materials shall meet the requirements defined Section 930.00.00, Portland Cement Concrete (PCC) and 925.00.00, Hot Mix Asphaltic Concrete Paving (HMAC)

Where the contractor discovers existing water, sewer and utilities lines during his excavation he shall promptly notify the Public Works Department. In accordance with other applicable sections of these Standard Specifications the Contractor at his expense shall be required to support, repair or cause to be repaired, and protect the pipe or utility. If the pipe or utility is not damaged, a "warning mound" of sand shall be placed immediately above the facility to a depth of 12" and marked with a heavy duty, highly visible metallic/ plastic locating tape laid across the full width of the trench before backfilling with the specified materials. The requirements for the plastic locating tape are described in Section 960.00.00, Miscellaneous Materials.

After backfill has been placed and compacted as required, contractor shall utilize a "T-Cut" method on the existing asphalt, in which the asphalt is cut again a minimum of 6" wider than the existing trench wall, on both sides, including any undermined areas. Exposed road bed will then be satisfactorily compacted, as determined by the Public Works Department, or their representative, prior to paving the trench.

440.25.01 – Alignment and Grade

Trenches shall be excavated to the lines and grades shown on the approved plans and profiles, as staked and as shown on the Standard Detail Sheet(s) T-1 through T- 6, Trench Section unless otherwise specified or shown on the approved plans. The Contractor shall assure that the trench width is adequate to allow bedding material to be placed and tamped beneath the haunches of the pipe up to the spring line. The minimum trench width for pipes less than 24" in diameter is the outside pipe diameter plus 18". For pipes larger than 24" the trench width shall be the pipe diameter plus 24".

440.25.02 – Rock Excavation

Where "rock" is encountered, as described in Section 330.10.01, it shall be excavated to a depth at least 4" greater than the grade required on the plans or as shown on Sheet T-1 through T-6 of the Uniform Standards.

The trench shall then be back filled to the proper trench grade with ¾"-0 crushed base rock conforming to Section 910.11.00, Trench Backfill and Bedding Aggregate, of these Standard Specifications, and compacted to a minimum of 95% AASHTO T-99 (A). When using explosives for rock excavation the Contractor shall follow all the rules and requirements of Sections 340.11.01, Use of explosives and 340.11.02, Repair of Damage.

440.25.03 – Shoring, Sheeting and Bracing

The Contractor's "competent person" shall determine all requirements, including but not limited to, equipment, materials, shoring, sheeting, bracing, trench widths, trench slopes including any methodology or techniques thereof in order to comply with all applicable OR-OSHA provisions and requirements for trench excavation and related activities.

Trench support shall remain in place until the pipe has been placed, inspected, tested, and repaired if necessary; and until the backfill in the pipe zone has been placed and compacted as specified to a minimum of 6" above the top of the pipe.

440.25.04 – Excavated Materials

Where approved excavated materials may be used in the backfill above the pipe zone, for pipes outside the street right-of-way. The excavated materials shall be piled along the trench side by the Contractor's competent person in accordance with OR-OSHA

requirements in such a manner that will not endanger the work and or obstruct traffic ways, sidewalks, gutters, storm drains and driveways.

Fire hydrants under pressure, valve boxes, meter boxes, fire and police call boxes, and other utility controls shall not be obstructed, and shall remain accessible at all times.

Gutters shall be left clear or other satisfactory provisions shall be made for street drainage. Natural watercourses shall not be obstructed. If necessary, temporary channels or smaller pipes shall be installed at low water periods to route natural flows around the project area. When excavated materials will not be used for trench backfill, they shall promptly be removed and disposed of as set forth in Section 330.10.02, Disposal of Excess Excavated Soils, and Section 800, Erosion and Sediment Control, of these Standard Specifications. Special permits or conditions may be required by other agencies if working in or adjacent to a stream channel.

440.25.05 – De-Watering

The contractor shall provide and maintain ample means and devices with which to promptly remove and dispose of all water entering the trench excavation during the time that the trench is being prepared for the pipe laying, during pipe laying operations; for such additional time as may be required for the setting or hardening of concrete aprons or other structures; during the times that backfill is being placed, and at such other times as may be specified in Special Specifications. The Contractor shall dispose of the water in a suitable manner without damage, erosion or sedimentation to adjacent property as further described in Section 800, Erosion and Sediment Control.

440.30.00 – Trench Backfill and Bedding

440.30.01 – Trench Bedding

$\frac{3}{4}$ "-0 crushed rock bedding material as specified in Section 910.11.01(d), Pipe Zone, shall be placed the full width of the trench and manipulated so as to uniformly support the pipe on a firm unyielding minimum 4" deep cushion along the full length of the pipe including the bell.

Bell holes shall be excavated in the trench bottom as necessary to obtain the 4" cushion depth of bedding at each pipe joint. Crushed rock bedding shall extend above the bottom of the pipe to the spring-line of the pipe equally on both sides of the pipe so that the pipe is not displaced during backfilling and so that the pipe is fully supported at the specified line and invert grade.

440.30.02 – Pipe Zone Backfill

Upon approval of alignment and grade of the pipe, $\frac{3}{4}$ "-0 crushed rock as specified in Section 910.11.00, Trench Backfill and Bedding Aggregate, shall be carefully placed in

lifts not exceeding 6" in depth on both sides of the pipe from the spring line up to 6" above the pipe, and shall be thoroughly compacted, equally, on both sides of the pipe so that the pipe is not deformed or displaced either vertically or laterally from grade during tamping.

Pipe zone material installed above the pipe may be mechanically tamped provided an adequate cushion is maintained to prevent damage, deformation or contact with the pipe.

440.30.03 – Backfill above the Pipe Zone

Within the street Right of Way, above the pipe zone, backfill conforming to the requirements of Section 910.11.00, Trench Backfill and Bedding Aggregate and as illustrated by Standard Detail T-1 through T-6, Trench Section, shall be placed and compacted in lifts not exceeding 8" in depth. The PWD may authorize the installation of increased lift thickness where high frequency vibrators mounted on large excavators are used. In all cases, the backfilled trench sections shall be compacted to the following densities:

On new street sections from finish sub-grade elevation (*upper zone*) to the top of the variable zone or 6" above the top of pipe, whichever is less, the ¾"-0 crushed rock backfill above the pipe zone shall be compacted to a minimum of 95% of maximum density AASHTO T-99 (A). On existing streets the upper zone backfill section is measured as 36" from finished pavement to the top of the pipe zone since there usually is not a layer of sub-base material being placed. From the top of the pipe zone to a level 36" below the top of sub-grade (variable zone), the ¾"-0 crushed rock backfill above the pipe zone shall be compacted to a minimum of 90% of maximum density, AASHTO T-99 (A).

Under all existing paved street sections, a 1 sack cement-sand slurry mix conforming to Section 945.00.00, Cement-Sand Slurry shall be used as backfill in the upper zone as shown on Standard Detail T-1.

Outside the Street Right of Way – Unless otherwise directed backfill above the pipe zone shall be placed in lifts not exceeding 12" in depth and compacted to the following densities:

From the top of the pipe zone to finish grade, the backfill above the pipe zone shall be compacted to a minimum of 90% of maximum density. AASHTO T-99 (A) shall be used in accordance with the type of backfill material installed. The type of backfill material used may be approved select native material, ¾"-0 crushed rock or decomposed granite. Muck, vegetative material, or other incompetent materials shall not be installed.

440.30.04 – Concrete Cap and Concrete Encasement

Concrete Cap - On all pipes where the total cover is less than 24" and where otherwise required on the plans, a concrete cap, with materials conforming to Section 930.00.00, Portland Cement Concrete (PCC), shall be poured from 2" below the spring line of the pipe to a minimum of 6" above the top of the pipe, and to the full width of the pipe trench. A 6-mil plastic membrane shall be placed next to the pipe to prevent adhesion of the concrete. See Section 420.10.04, Facility Design for minimum cover requirements for Reinforced Concrete Pipe.

Concrete Encasement – Where shown on the plans or as required by the PWD, a concrete encasement, with materials conforming to Section 930.00.00, Portland Cement Concrete (PCC), shall be formed and poured with a minimum thickness of 6" around all sides of the pipe. A 6-mil plastic membrane shall be placed next to the pipe to prevent adhesion of the concrete.

440.30.05 – Backfill for Manholes, Catch Basins, Inlet and similar Structures

Back fill for these applications shall be accomplished in the same manner with materials and to the same standards as backfill for pipe trenches.

440.35.00 – Installation of Storm Sewer Pipe and Fittings

440.35.01 – Distribution of Materials

Material shall be distributed on the job no faster than it can be used to good advantage. Pipe which cannot be physically lifted by workmen from the trucks hauling the pipe shall be unloaded by a forklift or other approved means in a manner that will not damage the pipe.

No pipe of any size or type shall be dropped from the bed of the truck to the ground or otherwise mishandled. No more than one week's supply of pipe material shall be distributed to the site in advance of placement, unless approved by the Engineer. All piping materials, manholes, pre-cast curb inlets and other fittings shall be protected from breakage, contamination and weathering.

440.35.02 – Preparation

All pipe and fittings shall be inspected by the Contractor or his authorized representative before being lowered into the prepared trench to insure that no cracked, broken, or defective pipe, fittings or pre-cast units are being used in the work. The ends of the pipe shall be cleaned thoroughly with a brush, or other approved means, when necessary to remove concrete spelter, soil and other foreign material. Extreme care shall be exercised to insure that the inside surfaces of the bell or coupling are smooth and free

from any projections or deformity which would interfere with the assembly or water tightness of the joint.

Foreign matter and dirt shall be removed from the inside of pipe before it is lowered into the trench, and it shall be kept clean by approved means during and after placement.

440.35.03 – Handling

Proper implements, tools and facilities shall be provided and used by the Contractor for the safe and proper protection of the work. All pipe and pre-cast units shall be carefully lowered into the trench in such a manner as to avoid any physical damage. Under no circumstances shall concrete pipe be dropped or dumped into the trenches. All deformed or damaged pipe, pre-cast units and fittings or said items suspected of damage, will be plainly marked as “damaged” or “defective”, rejected and shall be removed from the job site.

440.35.04 – Line and Grade

It will be required that storm sewer piping be laid on straight line and grade between manholes unless otherwise approved by the PWD. The finished pipe alignment and grade shall not exceed 0.04' for deviation from line or 0.02' for grade and any such variation shall not result in a level or reverse sloping pipe invert at any point in the line. Minimum cover shall not be less than 3' unless otherwise approved by the PWD.

440.45.00 – Placement and Jointing of Pipe

Unless otherwise directed, all pipes shall be laid upgrade with the bell end facing in the direction of placement.

440.45.01 – Concrete, PVC and HDPE Pipe

Pipe and fittings conforming to the materials described in Section 430, Storm System Materials above, shall be laid and jointed in strict accordance with the manufacturer's recommendations, as approved by the Public Works Department and in accordance with the requirements of the approved plans and Detail Specifications. The Contractor shall provide all special tools and devices such as special jacks, chokers, clamps and similar items required for the installation. Lubricant for the pipe gaskets shall be furnished or recommended by the pipe manufacturer and shall be non-petroleum based.

Prior to joining of pipe the bell and spigot shall be wiped clean and no dirt shall remain in the barrel. The rubber gasket and spigot end shall be properly lubricated and installed to assure a watertight joint.

After the joint has been made, the pipe shall be aligned and checked for grade. The trench bottom shall form a continuous and uniform bearing and support for the pipe at

every point between joints. Sufficient pressure shall be applied in making the joint to assure that the joint is "home" as defined in the standard installation instructions provided by the pipe manufacturer.

To assure proper pipe alignment and joint make-up, sufficient pipe zone material shall be placed to secure the pipe from movement before the next joint is installed. The contractor shall take all precautions necessary to prevent the "uplift" or floating of the line prior to the completion of the back filling operation.

The Contractor shall take the necessary precautions required to prevent excavated or other foreign material from getting into the pipe during the laying operation. At all times when laying operations are not in progress, at the close of the day's work, or whenever the workmen are absent from the job, the open end of the last laid section of pipe shall be closed and blocked to prevent entry of foreign material or creep of the gasketed joints.

440.45.05 – Cutting Pipe

The cutting of pipe for inserting fittings, couplings or closure pieces shall be done in a neat and workmanlike manner without damage to the pipe so as to leave a smooth end at right angles to the axis of the pipe.

Acceptable methods of cutting pipe are sawing with a band or powered hacksaw or with a portable, gasoline engine driven abrasive saw.

When pipe is cut in the field, it shall be cut as recommended by the pipe manufacturer, and the cut end shall be ground back or dressed as recommended by the pipe manufacturer and approved by the Public Works Department.

440.60.00 – Cleaning and Flushing

440.60.01 – Cleaning

The Contractor shall be required to remove all forms, sand, gravel, dirt and other debris from the catch basins including the street, and, curb and gutter sections before flushing the storm water sewer system. The removed material shall be swept up, loaded and removed from the street section. In no case shall the material or debris be flushed down the system.

440.60.02 – Flushing

Upon cleaning as described above, the Contractor shall flush the street, curbs and gutter, catch basins and storm water sewer system with clean water with sufficient velocity to remove dirt and silt from the system. Flushing shall be done in the presence of the inspector.

450.00.00 –Testing

450.00.01 – Storm Water System Infiltration Testing Requirement

The contractor shall be required to perform a test to determine the water tightness of the storm system. Such test shall measure the inflow rate of ground water penetration into the pipe between catch basins. The test shall be performed in the presence of the inspector during a surface dry street condition with no water flowing in the gutter.

The performance standard is as follows:

**0.002 gal. / Inch of I. D. pipe diameter / foot of pipe length / hour
(As converted to gallons per minute)**

Formula:

$$\frac{0.002 \times D \times L \times T}{60}$$

Where:

0.002 = Flow rate in gallons per inch of pipe diameter

D = Pipe diameter in inches

L = Length of pipe run being tested

T = Time in hours

60 = Converts to minutes

Example: A 48" diameter pipe 100' in length.

$(0.002) (48) (100) = 11.904$ gal. Per hour / 60 = .1984 GPM. Flow rate is 0.2 GPM rounded up.

Field test is based on Oregon Standard Specifications for Construction, latest edition, Section 00445.70, Finishing, Clean Up and Testing.

450.00.02 – Methodology

The Contractor shall provide the methods and equipment to properly conduct the test. The upstream end of the pipe or pipe system to be tested shall be sufficiently blocked or sealed to prevent inflow of water from the preceding section. The downstream opening of the pipe section where the test is conducted shall be partially blocked with no seepage to provide a means of collecting the water. An adequate container or other means shall be provided to collect and measure the outflow of water.