CITY OF BOARDMAN, OREGON

PUBLIC WORKS STANDARDS UPDATE
TECHNICAL SPECIFICATIONS
AND DRAWINGS

JULY 2025

ANDERSON PERRY & ASSOCIATES, INC.

La Grande, Redmond, Hermiston, and Enterprise, Oregon
Walla Walla, Washington

 Job No. 439-101

TABLE OF CONTENTS

CITY OF BOARDMAN, OREGON
PUBLIC WORKS STANDARDS
2025

RESPONSIBILITY STATEMENT FOR USE OF STANDARDS

These City of Boardman Public Works Standards, Technical Specifications, and Standard Drawings have been prepared by Anderson Perry & Associates, Inc., for exclusive use by the City of Boardman on public works projects within the City of Boardman. The standards are intended to be general in nature and set minimum guidance for projects within the City. Use of these Technical Specifications and Standard Drawings or any portion thereof on projects outside of the City of Boardman is strictly prohibited without written approval of the City of Boardman and Anderson Perry & Associates, Inc.

Electronic copies of these Standard Drawings will be provided to third party licensed Civil Engineers only upon receipt of a certification from the third party that these materials will be utilized only on projects within the City of Boardman's jurisdiction.

All users of these documents on projects within the City shall modify these documents as needed to adapt their use for the specific project for which they will be used. The use of the City of Boardman's Public Works Standards, Technical Specifications, and Drawings, or modifications thereto, shall be stamped and signed by the responsible Engineer and shall be submitted to the City of Boardman for review prior to their use on a project within the City.

All third party users agree to indemnify, defend, and hold the City of Boardman, Oregon, and Anderson Perry & Associates, Inc., its partners, agents, and employees harmless from and against any and all claims, suits, demands, losses, and expenses including attorneys' fees accruing or resulting to any and all persons, firms, or any other legal entity on account of any damage or loss to property or persons, including death, arising out of the result of utilizing these standard Technical Specifications and Standard Drawings.

These 2025 City of Boardman Public Works Standards, Technical Specifications, and Standard Drawings expire December 31, 2030.

CITY OF BOARDMAN, OREGON
PUBLIC WORKS STANDARDS
2025

USE AGREEMENT

I hereby acknowledge and assume complete responsibility related to the use of the City of Boardman Public Works Standard - Technical Specifications and Drawings, in regard to the _____ _____ project. The undersigned third party user hereby certifies and agrees to use these Public Works Standards on projects only within the jurisdiction of the City of Boardman, Oregon. It is agreed that these standards will not be used in any form on projects outside the jurisdiction of the City of Boardman and will not make these standards available to any other outside party or user.

Supplemental conditions will be provided to identify modifications and edits to these Technical Specifications needed to meet the specific requirements of said project. If supplemental conditions are not prepared, I hereby take full responsibility for the applicability of these Technical Specifications for the project.

The undersigned hereby agrees to use these Standard Drawings on their project. If required, the undersigned hereby further agrees to modify and edit these Standard Drawings as needed to adapt their use for the specific project for which they will be used, as approved by the City and/or Engineer. All use of these standards shall be under the direction of a licensed Civil Engineer in the State of Oregon, and all Drawings used shall be stamped by the Engineer.

The undersigned agrees to indemnify, defend, and hold the City of Boardman, Oregon, and Anderson Perry & Associates, Inc., its partners, agents, and employees harmless from and against any and all claims, suits, demands, losses, and expenses including attorneys' fees accruing or resulting to any and all persons, firms, or any other legal entity on account of any damage or loss to property or persons, including death, arising out of the result of utilizing these standard Technical Specifications.

CONTRACTOR:

By: _____

Print Name: _____

Representing: _____

Responsible Engineer: _____

License Number: _____

License Expiration Date: _____

CITY OF BOARDMAN, OREGON
PUBLIC WORKS STANDARDS
GENERAL REQUIREMENTS
TABLE OF CONTENTS

Page GR-

CITY OF BOARDMAN, OREGON
PUBLIC WORKS STANDARDS
GENERAL REQUIREMENTS

A. GENERAL STANDARDS

1. Authority and Purpose

The City of Boardman Development Code regulates construction and development. These Public Work Standards, Technical Specifications, and Standard Drawings implement the rules and policies contained in the Code.

The purpose of these Public Works Standards, Technical Specifications, and Standard Drawings is to provide a consistent policy under which certain physical aspects of public facility design and construction shall be implemented. Most of the elements contained in the Public Works Standards, Technical Specifications, and Standard Drawings are Public Works oriented and intended to be applied to both public improvements under City contract and public improvements under private contract designated herein.

These Public Works Standards, Technical Specifications, and Standard Drawings cannot provide for all situations. They are intended to assist, but not to substitute for, competent work by design professionals and experienced Contractors. It is expected that engineers and contractors will bring to each project the best of skills from their respective disciplines.

These Public Works Standards, Technical Specifications, and Standard Drawings are not intended to limit innovative or creative efforts that could improve quality, provide cost savings, or both. However, any variance from the Public Works Standards, Technical Specifications, and Standard Drawings will be considered on the likelihood that such variances will produce an equal or better result, for the user and City residents.

Alternate materials and methods will be considered for approval by the City on a case-by-case basis and will require sufficient justification prior to approval (see “Approval of Alternate Materials or Methods” subsection below).

2. Engineering Policy

It shall be the City’s policy to require compliance with Oregon Revised Statutes, Chapter 672 for professional engineers.

All engineering plans, reports, or documents shall be prepared by a registered professional engineer (Design Engineer), or by a subordinate employee under the Design Engineer’s direction, and shall be signed by the Design Engineer and stamped with the Design Engineer’s seal to indicate the Design Engineer’s responsibility for them. It shall be the Design Engineer’s responsibility to review any proposed public facility extension, modification or other change with the City, prior to engineering or proposed design work, to determine any special requirements or whether the proposal is

permissible. A "Preliminary Review" and/or a "Plans Approved for Construction" stamp of the City, on the Plans, etc., for any job, does not in any way relieve the Design Engineer of responsibility to meet all requirements of the City or obligation to protect life, health, and property of the public. The Plans for any project shall be revised or supplemented at any time it is determined that the City's full requirements have not been met.

3. Applicability

The Public Works Standards, Technical Specifications, and Standard Drawings contained herein shall govern all construction and upgrading of all public and privately financed public facilities in the City and applicable work within its service areas.

4. Standard Specifications

Except as otherwise provided by these Public Works Standards, Technical Specifications, and Standard Drawings, all construction, design, craftsmanship, materials, equipment, and details shall be in accordance with the Oregon Department of Environmental Quality, Oregon Health Authority - Drinking Water Services (DWS), and current Oregon Standard Specifications for Construction and Standard Drawings as published by the Oregon Department of Transportation (ODOT), and American Public Works Association, Oregon Chapter.

5. Approval of Alternate Materials or Methods

Any alternate method or material not explicitly approved herein will be considered for approval as set forth in "Authority and Purpose" of this section. Such approvals shall be made by application in writing. Approval of any deviation from these Public Works Standards, Technical Specifications, and Standard Drawings shall be in written form. Approval of alternate methods and/or materials shall be made in writing.

Alternates must meet or exceed the minimum requirements as set forth in these Public Works Standards, Technical Specifications, and Standard Drawings.

The written application is to include, but is not limited to, the manufacturer's specifications and testing results, design drawings, calculations, reason, justification, and other pertinent information.

Any deviations or special issues shall be reviewed on a case-by-case basis and approved by the City. When requested by the City, full design calculations shall be submitted for review with the request for approval.

6. Special Design Applications

Special applications not covered in these Public Works Standards, Technical Specifications, and Standard Drawings require review and approval by the City. Submittal of full design calculations, supplemental drawings, and information will be required prior to any approval.

Applications requiring special review and approval may include, but are not limited to, the following:

- Sewer Forcemains
- Relining of Existing Sewers
- Internal Sealing of Existing Sewers
- Sewer Lift Stations
- Sewer Siphons
- Wastewater Treatment Plants
- Sewer Flow Measurement/Monitoring Devices
- Water Distribution Pump Stations
- Relining of Existing Water Mains
- Water Pressure Regulating Devices
- Energy Dissipaters
- Water Reservoirs
- Water Treatment Plants
- Water Flow Measurement/Monitoring
- Bridges
- Stormwater Pump Stations

7. Revisions to Public Works Standards, Technical Specifications, and Standard Drawings

Revisions to these Public Works Standards, Technical Specifications, and Standard Drawings are anticipated to be made from time to time. The date appearing on the bottom of each page is the date of the latest revision. Users should apply the latest published version to the work contemplated.

Some sections may be changed more than once, and it shall be the user's responsibility to maintain his/her copy of these Public Works Standards, Technical Specifications, and Standard Drawings with the latest changes.

8. Definitions

Alley - A public access easement or right-of-way (ROW) that intersects with a public street.

Approval - The proposed work or completed work conforms to these Public Works Standards, Technical Specifications, and Standard Drawings in the opinion of the City. Approvals shall not be considered valid unless given in writing by the appropriate City Representative.

Approved Backflow Prevention Device - A device that has been investigated and approved by the DWS.

As-graded - The extent of the surface conditions on completion of grading.

Backflow - The flow of water or other liquids, mixtures, or substances into the distributing pipes of a potable supply of water from any sources other than its intended source.

Backflow Preventer - A device or means to prevent backflow into the potable water system.

Back Siphonage - The flowing back of used, contaminated, or polluted water from a plumbing fixture or vessel into a water supply pipe due to a negative pressure in such pipes.

Bedrock - In-place solid rock typically underlying soil layers.

Bike Lanes - A designated travel-way for bicyclists that is located within the roadway directly adjacent to the outside vehicular lane or on the shoulder.

Bike Path - A designated travel-way for bicycling that is completely separated from the vehicular travel lanes and is within independent ROWs.

Bike Route - A designated travel-way for bicyclists that is shared with vehicular traffic. The roadway is designated with signs for bicycling (no pavement markings for the bike route or delineation of parking spaces are used).

Borrow - Earth material acquired from an off-site location for use in grading on a site.

City - City of Boardman, Oregon, a municipal corporation and/or City Representatives from the City of Boardman.

City Engineer - The Engineer, and his/her representative, authorized by the City of Boardman to act as the City's representative in engineering matters as they relate to improvements to the City's infrastructure or construction of new infrastructure to be built by developers and then dedicated to the City.

City Representative - The City Manager or individuals delegated by the City Manager.

Collection System - Facilities maintained by the City and connected thereto for collecting, pumping, conveying, and controlling the sewer.

Collector Street - Street that forms the boundary of major blocks of land and is intended primarily for inter-neighborhood traffic; can function as a road to service areas from the arterial system.

Compaction - The densification of earth material by mechanical means.

Contractor - The person, firm, or corporation that has been contracted to construct City infrastructure improvements for which the City will ultimately have ownership; or a developer, including the developer's Project Engineer, construction inspector, etc.

Cross Connection - Any connection or arrangement, physical or otherwise, between a potable water supply system and any plumbing fixture or any tank, receptacle, equipment or device, through which it may be possible for non-potable, used, unclean, polluted and contaminated water, or other substances, to enter into any part of such potable water system under any condition.

Cul-de-sac - A dead-end street having a turnaround area at the end.

Curb - The line indicating the edge of the vehicular roadway within the overall ROW.

Datum - The City's vertical elevation control is the North American Vertical Datum of 1988. The horizontal datum is State Plane Oregon North American Datum of 1983 expressed in international feet.

Dead-end Street - Street or series of streets that can be accessed from only one point. Dead-end streets can be either temporary (intended for future extension as part of a future street plan) or permanent.

Design Engineer - The engineer, licensed by the State of Oregon as a professional engineer, under whose direction the Plans for the work are prepared and submitted to the City for review and approval.

Detention - The holding of runoff for a short period of time and then releasing it to the natural water course where it returns to the hydrologic cycle.

Domestic Sewage - The liquid and waterborne waste derived from ordinary living processes, free from industrial wastes, and of such character to permit satisfactory disposal, without special treatment into the public sewer or by means of private sewage disposal system.

Double Check Valve Assembly - An assembly composed of two single, independently acting, approved check valves, including tightly closing shut-off valves located at each end of the assembly and fitted with properly located test cocks.

Drainage Facilities - Pipes, ditches, detention basins, creeks, culvert bridges, etc., used singularly or in combination with each other for the purpose of conveying or storing stormwater runoff.

Drawings - The Project Plans prepared by a professional engineer licensed in the State of Oregon that depict the detailed characteristics and scope of work for a particular infrastructure improvement project; and the City Standard Details.

Earth Material - Any rock, natural soil, fill, or any combination thereof.

Easement - Areas located outside dedicated ROWs that are granted to the City for special uses.

Engineering Geologist - A geologist experienced and knowledgeable in engineering geology.

Engineering Geology - The application of geologic knowledge and principles in the investigation and evaluation of naturally occurring rock and soil for use in the design of civil works.

Erosion - The wearing away of the ground surface as a result of the movement of wind, water, or ice.

Excavation - The mechanical removal of earth material.

Existing Grade - The grade prior to grading.

Expansion Joint - A joint to control cracking in the concrete surface structure and filled with preformed expansion joint filler.

Fill - The deposit of earth material placed by artificial means.

Finish Grade -The final grade of the site, which conforms to the approved plans.

Fire Hydrant Assembly - The fire hydrant, attached auxiliary valve, and associated piping and fittings.

Fire Protection System - Water line(s) with attached fire suppression infrastructure connected to a water fire service line and intended only for the extinguishing of fires and the necessary flushing for its proper maintenance.

Geotechnical Engineer - An engineer experienced and knowledgeable in the practice of geotechnical engineering.

Geotechnical Engineering - The application of the principles of soil mechanics in the investigation, evaluation, and design of civil works involving the use of earth materials and the inspection or testing of the construction thereof.

Grade - The degree of inclination of a road or slope, or the vertical location of the ground surface.

Grading - Any excavating or filling or combination thereof.

Groundwater - Water that exists underground in the cracks and voids of subsurface soil and rock.

Hydrant Lead - The water line connecting the fire hydrant to the auxiliary valve on the City distribution main.

Impervious Areas - Those hard surface areas located on real property that either prevent or retard saturation of water into the land surface and cause water to run off the land surface in greater quantities or at an increased rate of flow from that present under natural conditions preexisting to development.

Industrial Waste - Solid, liquid, or gaseous waste resulting from any industrial, manufacturing, trade, or business process or from development, recovery, or processing of a natural resource.

Irrigation Service - A metered connection intended for seasonal use and delivering water not discharged to the sanitary sewer.

Local or Residential Street - A street designated to provide vehicular access to abutting properties and discourage through traffic.

Longitudinal Joint - A joint that follows a course approximately parallel to the centerline of the roadway.

Major Partition - A partition that includes the creation of a road or street.

Major Trees - Trees within the ROW that have a caliper of 4 inches or larger measured 18 inches above the existing ground. Street improvement plans will identify major trees by location, caliper, and species.

Major tree species are those that contribute to the landscape character of the area to include: Douglas fir, cedar, redwood, sequoia, oak, ash, birch, walnut, and maple. The

identification of major trees should distinguish species generally suitably for retention adjacent to streets and those species with growth habits that create nuisances, unusual maintenance problems, or hazards to the public.

Manufacturer's Name - Any manufacturer's name, specification, catalog, number, or type used herein is specified by make and order to establish the standard requirements of the City. Other equivalent makes will be considered for approval, providing they are comparable with this established standard.

Minor Partition - A partition that does not include the creation of a road or a street.

Natural Grade - The grade of the land in an undisturbed state.

On-site Detention - The storage of excess runoff on the development site prior to its entry into a public storm drain system and gradual release of the stored runoff after the peak of the runoff has passed.

Oregon Plumbing Specialty Code - The Uniform Plumbing Code adopted by the current edition of the International Association of Plumbing and Mechanical Officials, as revised by the State of Oregon.

Owner - The owner of record of real property as shown on the latest tax rolls or deed records of the County, and includes a person who furnishes evidence that he/she is purchasing a parcel of property under a written recorded land sale contract.

Partition - To divide an area or tract of land into two or three parcels within a calendar year when such area or tract of land exists as a unit or contiguous units of land under single ownership at the beginning of such year.

Peak Runoff - The maximum water runoff rate in cubic feet per second determined for the design storm.

Person - Individual, firm, corporation, association, agency, or other entity.

Plans - Construction plans, including system plans, sewer plans and profiles, cross sections, detailed Drawings, Specifications, etc., or reproductions thereof, approved or to be approved by the City, which show the location, character, dimensions, and details for the work to be performed, in which constitute a supplement to these Public Works Standards, Technical Specifications, and Standard Drawings.

Potable Water - Water that is satisfactory for drinking, culinary, and domestic purposes and meets the requirement of the health authority having jurisdiction.

Private Collection System - A privately owned and maintained sewer system installed to serve multi-unit structures on single ownership properties, which cannot legally be further divided.

Private Storm Drain - A storm drain located on private property serving more than one structure on the same premises or parking lot catch basins.

Professional Inspection - The inspection required to be performed by the Design Engineer, geotechnical engineer, or engineering geologist. Such inspections include that performed by persons supervised by such engineers or geologists and shall be sufficient to form an opinion relating to the conduct of the work.

Project Engineer - The Engineer engaged by or representing the Contractor or developer in engineering matters as they relate to improvements to the City's infrastructure or construction of new infrastructure to be built by developers and then dedicated to the City.

Public Sanitary Sewer - Any sewer located in a public ROW or easement and operated and maintained by the City for carrying sewage and industrial waste.

Public Storm Drain - Any storm sewer located in a public ROW or easement and operated and maintained by the City.

Record Drawings - Plans signed and dated by the Design Engineer indicating that the Plans have been reviewed and revised, if necessary, to accurately show all as-built construction details and changes.

Release Rate - The controlled rate of release of drainage, storm, and runoff water from property, storage pond, runoff detention pond, or other facility during and following a storm event.

Right-of-Way - All land or interest therein which by deed, conveyance, agreement, easement, dedication, usage, or process of law is reserved for or dedicated to the use of the public for sidewalk, utility, and/or roadway/transportation purposes.

Roadway - All of that portion of the ROW used or to be used for vehicle movement, which exists between the curbs or proposed curb lines.

Rough Grade - The stage at which the grade approximately conforms to the approved Plans.

Sedimentation - Disposition of erosional debris, soil sediment transported by water from a higher elevation to an area of lower gradient where sediments are deposited as a result of slack water.

Sewage - A combination of the water-carried wastes from residences, business buildings, institutions, and industrial establishments, except industrial wastes.

Sewer Lateral - A sewer service lateral.

Sewer Line, Building - A private sanitary sewer line beginning 5 feet outside the building and extending to the property line or public easement line, connecting to the sewer service lateral.

Sewer Main - Any public pipe that conveys sewage and/or industrial waste toward the treatment plant.

Sewer Service Lateral - A private sanitary sewer line beginning at the property line or public easement line and extending to the sanitary sewer main.

Sewer Service Line - See Sewer Service Lateral.

Sidewalk - A walk or path along the side of a road for pedestrians. A ROW deeded, dedicated, and designated for the use of non-motorized vehicles and pedestrians.

Silt - Fine textured soil particles including clay and sand as differentiated from coarse particles of sand and gravel.

Siltation - Deposition of (silt) waterborne sediments.

Slope - An inclined ground surface the inclination of which is expressed as a ratio of horizontal distance to vertical distance.

Soil - Naturally occurring superficial deposits overlying bedrock.

Specifications - The detailed project specifications prepared by a registered professional engineer that consist of written descriptions of a technical nature of materials, equipment, construction systems, standards, and workmanship for a particular infrastructure improvement project; and the City Standard Technical Specifications.

Standard Drawings - The drawings of structures or devices commonly used on public improvements and referred to on construction Plans.

Stormwater - Any water generated from a precipitation/storm event that has not yet infiltrated into the subsurface or run off into a body of surface water.

Streets or Roads - Any public highway, road, street, avenue, alleyway, easement, or ROW used or to be used for vehicle movement.

Structures - Those structures designated on the Plans such as catch basins, manholes, etc.

Subdivide - To divide an area or tract of land into four or more lots when such area or tract of land previously existed as a unit or contiguous units of land under a single ownership.

Subdivision - An area or tract of land that has been subdivided.

Super Elevation - The vertical distance between the heights of the inner and outer edges of highway pavement with the cross slope of the highway being continuous across the entire width of the paved roadway.

Surface Water - Any permanent, semipermanent, or seasonal body of water found on the Earth's surface including rivers, streams, and lakes.

Terrace - A relatively level step constructed in the face of a graded slope surface for drainage and maintenance purposes.

Transverse Joint - A joint that follows a course approximately perpendicular to the centerline of the roadway.

Traveled Way - That portion of the roadway for the movement of vehicles, exclusive of shoulder and auxiliary lanes.

Trunk Sewer - The primary public sanitary sewer that conveys wastewater to the wastewater treatment plant and is primarily intended to receive wastewater from a collector sewer, another trunk sewer, an existing major discharger of raw or inadequately treated wastewater, or water pollution control facility.

Turnaround Area - An area of sufficient size and configuration that a motor vehicle may maneuver so as to travel in the opposite direction.

Underground Injection Control System - A system that places fluids (mainly stormwater) below the ground and meets all requirements of the U.S. Environmental Protection Agency and the Oregon Department of Environmental Quality.

Wastewater - The total fluid flow in the sanitary sewerage system, which includes industrial waste-sewage or any other waste including that which may be combined with any groundwater, surface water, or stormwater that may be discharged into the sanitary sewerage system.

Water Distribution System - Water distribution pipelines, pumping stations, valves, and ancillary equipment used to transmit water from the supply source to the service line.

Water Fire Service Line - A water line connecting the public water main to a fire protection system. The line generally terminates or connects to a fire protection system at or near the property line or easement boundary.

Water Main - The water supply pipes for public or community use.

Water Main, Transmission - A water main whose primary purpose is to convey water from one location to another. Transmission water mains generally do not have water service lines connected to them.

Water Service Line - The pipe connection from the City water main to the user's water meter.

Water Supply Line - The pipe carrying potable water from the water meter or other source of water supply to a building or other point of use or distribution on the lot.

Wetlands - Those lands adjacent to watercourses or isolated therefrom that may be normally or periodically inundated by the waters from the watercourse or the drainage waters from the drainage basin in which it is located. These include swamps, bogs, sinks, marshes, and lakes, all of which are considered to be part of the watercourse and drainage system of the City and shall include the headwater areas where the watercourse first surfaces. They may be, but are not necessarily, characterized by special vegetation or soils such as peat, muck, and mud. Wetlands shall include all areas identified by the National Wetlands Inventory. Any areas not included in the National Wetlands Inventory and that, in the City's opinion, could be considered a wetland shall be identified and delineated by the developer.

9. Construction Plans

a. Plan Preparation

Construction Plans and Specifications shall be prepared as specified in Sections b through i below by a professional engineer licensed in the State of Oregon.

b. General Information

Prior to any construction work and plan approval, complete construction Plans, Specifications, stormwater calculations, and all other necessary submittals shall be submitted to the City for review.

c. Sheet Size

All construction Plans shall be clearly and legibly drawn in ink on Mylar sheets measuring 22 by 34 inches or other permanent paper stock that is approved by

the City. Sheets shall have 1-1/2 inches of clear margin on the left edge and a 1/2-inch margin on all other edges.

d. Sets of Plans

When Plans are prepared for developer financed projects, the following scale of Drawings is suggested.

Plan/Scale	Horizontal*	Vertical
Street	1 inch = 20 feet	1 inch = 5 feet
Sewer	1 inch = 20 feet	1 inch = 5 feet
Storm	1 inch = 20 feet	1 inch = 5 feet
Water	1 inch = 20 feet	1 inch = 5 feet

**When a scale is used that is smaller than 1 inch = 20 feet (i.e., 1 inch = 40 feet) intersection details showing fittings and valving shall be provided at a larger scale.*

Architectural scales (i.e., 1/4 inch = 1 foot, 0 inches) are not permitted unless otherwise approved.

e. Required Sheets

Construction Plan submittals shall contain the following minimum sheets: title sheet, plan and profile sheets, and detail sheets.

f. Title Sheet

All subdivision projects and multiple street improvements projects shall have a title sheet as the first page of the construction Plans. This sheet shall contain the following minimum information.

1) Site Plans of the entire project with street ROW and/or subdivision layout at a 1 inch = 100 feet scale. A 1 inch = 200 feet scale may be used if project size is too large. The site plan shall also be a composite utility plan showing all properties served by proposed sewer, water, and storm facilities, in addition to the proposed facility and all easements. The site plan shall also include all adjacent public facilities within 100 feet of the proposed project.

2) Vicinity map at a 1 inch = 1,000 feet scale, or greater.

3) Index of sheets.

4) Complete legend of symbols, line types, and hatches used. Legend items shall clearly differentiate between existing and proposed improvements

with proposed improvements being more prominent than existing improvements. All legend items shall be unique.

5) General and construction notes pertinent to the project.

6) Temporary and/or permanent benchmarks used along with their descriptions, elevations of benchmark, and datum.

7) Horizontal and Vertical Coordinate Systems

The City requires the use of the Oregon State Plan North and the National American Vertical Datum of 1988.

8) Design Engineer's name, address, phone number, and seal.

9) Developer's/owner's name, address, and phone number for public improvements with private financing.

10) Statement referencing City of Boardman Public Works Standards, Technical Specifications, and Standard Drawings and the current Oregon Standard Specifications for Construction and Standard Drawings.

11) Provide contact phone numbers for all affected utility companies.

12) Show tax lot numbers or lot and block designations.

13) A City Standard Drawing index for all referenced Standard Drawings.

g. Plan Sheet

The plan view of each sheet shall be drawn at the appropriate scale showing the following minimum information:

1) Adjacent street curbs, property lines, ROW lines, utility easements referenced to property lines, street centerlines, and intersections. Show property corner and curb elevations to determine water service level, serviceability of lot/property and sanitary sewer, points of disposal for building storm drains, and how new curbs will join to existing curbs.

2) Location of all underground utilities within 100 feet of the project (if they are affected by the project), existing power/telephone poles and guy anchors, valves, manholes, catch basins, fire hydrants, meter boxes, vaults, signs, etc.

3) Location of all watercourses, railroad crossings, culverts, bridges, major trees, water lines, sewer lines, and/or storm drain lines within 200 feet of proposed sewer and storm drain extensions if they affect the design of the project. All watercourses shall show the 100-year floodplain as indicated on the U.S. Army Corps of Engineers and Federal Emergency Management Agency maps.

4) On sewer and storm drain Plans, each manhole, catch basin, and cleanout shall be numbered and stationed. Stationing shall tie to existing street monuments, unless the City approves the use of property corners or manholes. Each line shall be stationed continuously upgrade from left to right on the plan sheet. Each separate line shall be individually designated (e.g., sewer line 'A', storm line 'A', etc.)

5) On street Plans, horizontal stationing shall show points of tangent and curvature for centerline curve data and shall show tangent length, radius distance, centerline curve length, and delta angle. Centerline intersection stationing, in both directions, shall be shown.

6) Where streets are being widened, edge of pavement elevations shall be shown to determine pavement cross-slope to new curb or pavement edge.

7) On water Plans, all fittings shall be shown and identified by type (i.e., MJ x MJ, FLG X MJ, etc.). Fire hydrants and intersection details for valves and fittings are required when scale of Plans is smaller than 1 inch = 20 feet (i.e., 1 inch = 40 feet). All valves, fittings, and pipe conditions shall be indicated.

8) On erosion control Plans, the location of silt fences, inlet barriers, gravel entryways, temporary ditches and detention ponds, and surface preparation shall be shown. The Plan shall show the entire development. Details of erosion control devices can be shown on this sheet.

9) All notes and keynotes shall reference appropriate City Standards and/or Drawings when applicable.

h. Profile Sheet

Profiles for construction Plans shall be the same horizontal scale as the plan sheet. Where profiles are drawn on the same sheet as the plan view, the profile shall be immediately below the plan view. Stationing shall be continuously upgrade from left to right with lower stations to the left. The following minimum information shall be shown:

1) For sewers and storm drains, show locations of manholes, catch basins, and cleanouts with each numbered and stationed as indicated in General Requirements, A. General Public Works Standards, Technical Specifications, and Standard Drawings, 1.9 Construction Plans, g. Plan Sheet, (4) above.

2) Existing profile at centerline of proposed utility or street.

3) Proposed profile grade, as appropriate, for all sewers, storm drains and water lines giving pipe size, length between structures, slope, surface restoration type, pipe materials, sewer inverts, rim elevations, etc.

4) Existing underground utilities that cross the alignment of the proposed facility.

5) Beginning of all vertical curves, points of vertical intersection, end of vertical curve, low point of sag curve and length of vertical curve. Profiles of existing centerline grade shall extend a minimum of 250 feet beyond the end of the improvement.

6) Clearly show all potential utility conflicts with appropriate pipes, conduits, vaults, etc., that affect the proposed design.

7) All notes and keynotes shall reference appropriate City Standards and/or Drawings when applicable.

Note: City Record Drawings are only to be used as an aid to the Design Engineer. When a potential conflict may occur, the Design Engineer shall field locate, or cause to be located, and verify the alignment, depth, and inverts of all existing facilities shown on the Plans that will be crossed by the proposed facility.

i. Detail Sheets

Detailed drawings shall be included with all construction Plans where Oregon or City Standard Drawings do not exist or apply. If a Standard Drawing must be modified to fit existing or unique conditions, the modified Drawing shall be shown on the Plans. When appropriate, due to required detail complexity, a separate detail sheet shall be drawn. When Oregon or City Standard Drawings are used, they must be included with the Plan Set. In lieu of including the actual Standard Drawings with the design documents, an index referencing all pertinent Standard Drawings with their specific drawing number(s) may be included on the title sheet.

10. Supporting Information

The Design Engineer shall submit sufficient supporting information to justify the proposed design. Such information shall include, but not be limited to, the following:

a. Design calculations.

b. Hydrology and hydraulic calculations with basin maps. This includes storm drainage calculations.

c. Alternate materials specifications including manufacturers' design application recommendations.

d. Plan support information to include as required:

1) Geotechnical Report

2) Hydrology, Hydraulic, and Stormwater Calculations

3) Engineering Geology Report

4) Traffic Impact Analysis

11. Utility Plan

When designing sanitary or storm sewer facilities, a utility plan shall be submitted with the construction Plans when required by the City. The utility plan shall be used to identify and analyze the extension of the proposed facilities and shall include a topographic plan. The topographic plan shall show all upstream and tributary areas within no less than 200 feet of the proposed development.

The utility plan shall include existing contours at 1-foot intervals, or as approved by the City. Include locations of existing structures and public and private utilities.

12. Plan Submittal

Plans for all privately financed Public Works facility improvements shall be submitted to the City. The City shall coordinate the plan review and approval of all construction Plans, which shall include reviews for compliance with all City Codes, ordinances, Public Works Standards, Technical Specifications, Standard Drawings, Oregon Standard Drawings, and utility master plans.

All Plan submittals shall include information required in General Requirements, A. General Standards, 9. Construction Plans, along with all other information requested by the City. This information shall include, but is not limited to, construction cost estimates,

easement documents, ROW dedications, and executed agreements. All submittals shall be reviewed by the Design Engineer for completeness and the City notified if required information is missing. Submittals should be made in a timely manner as lack of information to the City may impede the review process.

13. Public Improvement Procedure

The developers/Contractors of all major developments and subdivisions within the City are responsible for installation of public improvements within all newly proposed streets, all existing adjacent unimproved streets and off-site improvements determined by the City to be necessary for the functionality of the development and/or to mitigate development impacts. Public improvements shall include, but are not limited to:

- Street paving
- Storm drainage
- Curbs
- Sidewalks
- Gutters
- Americans with Disabilities Act (ADA) ramps
- Bike paths
- Public water lines
- Public sewer lines
- Street lights
- Fire hydrants

In addition to the above-listed improvements, it may be necessary to construct or contribute to the future construction of traffic signals, water or sewer pump stations, or future infrastructure upgrades such as pipe oversizing.

All applicants for development shall attend a pre-application meeting with City development staff. This meeting is intended to familiarize applicants with the development process and the City's Standard Drawings and Technical Specifications. All applications for development shall be accompanied by preliminary drawings for installation of public improvements. Drawings shall be prepared by a professional engineer licensed in the State of Oregon and shall be in compliance with the current Public Works Standards, Technical Specifications, and Standard Drawings. Following approval of the proposed development by planning staff and/or the planning commission, public improvement plans shall be revised and receive final approval from development staff.

In most cases, the applicant shall be required to enter into an improvement agreement with the City of Boardman, agreeing to install all required improvements, specifying

time frames for installation, and agreeing to future maintenance of said improvements. The improvement agreement must be completed prior to initiating construction within the development.

In lieu of installation of improvements in new subdivisions, an applicant may provide a letter of credit for 110 percent of the total cost of all improvements. After receipt of a letter of credit, the City shall release the subdivision plat and construction of homes may begin and lots may be sold. However, the applicant must still work toward completion of all improvements and no Certificates of Occupancy shall be released until all improvements are completed. Commercial and multifamily developments may construct buildings and public improvements concurrently but also may not receive any Certificates of Occupancy until all public improvements are completed and accepted by the City.

All drainage improvements must be completed at the time any street is constructed, and sidewalks must be completed prior to any occupancy for which a sidewalk is required.

Following completion of improvement installation, City Public Works staff shall inspect all improvements. The City shall generate a punch list of corrections needed and submit said list to the applicant. Following completion of all punch list items, the applicant may request re-inspection. Once the improvements are accepted by the City, the applicant must provide Record Drawings of all public improvements, prepared by the Design Engineer. The applicant must also provide a one-year maintenance bond for 25 percent of the cost of the installed improvements.

CHECKLIST FOR PLAN REVIEW AND SUBMISSION

Action	Date
Attend Pre-Application Meeting	
Obtain Standard Drawings and Technical Specifications	
Submit Proposed Design Drawings with Erosion Control Plan	
Revised Design Drawings per City Comments*	
Resubmit Design Drawings as Required	
City Approves Design Drawings	
Sign Improvement Agreement	
Developer Schedules and Attends Pre-Construction Meeting with Selected Contractor	
Begin Construction of Improvements	
Submit Letter of Credit (if desired)	
Complete Testing of Improvements as Required	

Action	Date
Complete Construction of Improvements	
Call for Final Inspection of Improvements	
City Issues Punch List of Corrections	
Call for Reinspection	
City Approves Improvements	
Submit Record Drawings (see subsection 14 below)	
Submit Maintenance Bond	
City Releases Certificate of Occupancy	

**All revised design drawings shall include revision numbers and dates, and all revisions shall be clouded. A document shall be provided with a specific written response to each review comment.*

14. Record Drawings

For all Public Works facility improvements, the Design Engineer shall submit certified Record Drawings for all Plans approved for construction. Record Drawings shall meet the requirements of sections a through e of this section and shall be of archival quality. The Record Drawings shall be 4 mil Mylar with silver halide emulsion. Original inked Mylars may also be submitted in lieu of photographic Mylars on Mylar sheets. The Design Engineer may submit Record Drawings on another permanent paper as approved by the City.

The Design Engineer shall submit a signed statement certifying that all work for which Plans were approved has been completed in accordance with the Public Works Standards, Technical Specifications, Standard Drawings, and design documents. This statement shall be included directly on the Record Drawings. An example of an acceptable statement is shown below.

ENGINEER'S RECORD DRAWING CERTIFICATE
Affidavit certifying Engineer's inspection of project to certify compliance with approved project Plans and Specifications. Engineering Firm: I, _____, an Oregon licensed Engineer, P.E. No. _____, do hereby certify that I possess the engineering qualification required by Oregon law and that all work performed relating to the provided professional services were performed by me or under my direct supervision. That to the best of my knowledge the project complies with the approved project Plans and Specifications.

Dated _____ _____ Licensed Engineer
ENGINEER'S NOTE
The use of the word "certify" or "certification" within this certification only constitutes an expression of professional opinion regarding those facts and findings shown on this Drawing and does not constitute a warranty or guarantee, either implied or expressed.

The words "Record Drawing" shall appear as the last entry in the revision block along with the month, day, and year the Record Drawing was prepared.

Note: Actual location and depth from finish grade of any other utilities encountered during construction shall be noted on the Record Drawings.

a. Sheets

The following minimum information shall be noted on the street Record Drawings:

1) Change in horizontal alignment, curve data, and stationing of primary control points (e.g., PC, PI, PT, PRC).

2) Vertical curve or grade changes; change in location of low point in sag vertical curve.

3) Change to approved thickness for street pavement section components. Show station limits where changes in structural section have occurred.

4) Change to driveway locations or widths.

5) Other change(s) altering the approved Plans including, but not limited to, curbs, sidewalks, street monuments, ADA ramps, and lighting.

b. Storm Drains

The following minimum information shall be noted on storm drain Record Drawings:

1) Station of drainage structures such as manholes and catch basins. Tie each drainage structure to nearest property corner ROW line, and distance back from the top back of curb.

2) Show alignment changes, grade changes, and changes in construction materials. If alignment changes result in station changes, a station equation shall be shown as appropriate at a manhole.

3) Other change(s) altering the approved Plans including, but not limited to, catch basin location, manhole location, pipe size, drywell location, etc.

c. Sanitary Sewers

The following minimum information shall be noted on sanitary sewer Record Drawings:

1) Station of manhole, wye, or tee into main line. Tie each to nearest property corner at ROW line, and distance back from the top back of curb.

2) Depth at the end of service lateral measured from existing ground to invert of pipe. When required by the City, invert elevations shall be noted.

3) Length of service lateral measured from centerline of sewer main to end of pipe.

4) Changes in alignment, grade, pipe size, and construction materials. If such changes in alignment and/or grade result in station changes, the stationing and offsets shall be changed for the manholes and other structures affected by the changes.

5) Other changes altering the approved Plans.

6) Type of pipe, backfill material, and location.

d. Water Mains

The following minimum information shall be noted on water main Record Drawings:

1) Station and/or property line/corner to valves (not at standard location), all fittings, blowoffs, and dead-end lines.

2) All changes from standard 36-inch depth cover. Limits shall be shown on all Plans with annotated reason for change. Actual pipe elevation (top of pipe) will be taken at each fitting.

3) Changes in alignment, grade, pipe size, and construction materials. If such changes in alignment and/or grade result in station changes, the stationing and offsets shall be changed for the valves and other fittings affected by the changes.

4) Provide manufacturer of all valves and identify types of fittings (i.e., MJ X MJ, FLG x MJ, etc.) if there are deviations from the Plans. Provide information in the form of an inventory list on construction drawings.

5) Other changes altering the approved Plans.

6) Provide photographs of all installed valves and fittings in place before backfilling if required by the City.

e. Inspection and Testing Results

The Contractor/developer shall submit all inspection and testing results to the City as part of the Record Drawings submittal. This shall include all compaction density testing for aggregate base and asphalt concrete pavement, concrete cylinder test results (i.e., slump, air, break result, etc.), bacteria testing, air test documentation, hydrostatic test results, etc. The Record Drawings shall not be deemed complete until this information is provided.

B. CITY ENGINEER'S AUTHORITY

1. The City Engineer shall act as the City's representative on the project, and shall answer questions that may arise as to quality and acceptability of materials furnished and work performed. The City Engineer may make visits to the site and determine if the work is proceeding in accordance with the Standard Drawings and Technical Specifications. The City Engineer, however, does not guarantee the performance of the Contractor by the City Engineer's providing of such review. The City Engineer's undertaking hereunder shall not relieve the Contractor of his/her obligation to perform the work in conformity with the Standard Drawings and Technical Specifications and in a workmanlike manner; shall not make the City Engineer an insurer of the Contractor's performance; shall not impose upon the City Engineer any obligations to see that the work is performed in a safe manner; and shall not relieve the Contractor from his/her responsibility to adequately supervise the work.

2. The City Engineer will not be responsible for the construction means, controls, techniques, sequences, procedures, or construction safety.

C. PROJECT WORK MEETINGS

1. A preconstruction conference shall be held prior to Work commencing on the project. The Contractor, City, City Engineer, and other appropriate agencies, utilities, etc., shall attend. The meeting shall be held to discuss general contracting procedures, communications, roles and responsibilities, quality control, project work schedule, agency requirements, and other topics that relate to the Work as appropriate.

2. The Contractor and/or their superintendent shall meet with the City and/or City Engineer on a regular basis to review the progress of the Work, Work schedule, project concerns, etc., as may be appropriate. The intent of this meeting will be to keep communication channels open and to keep all parties informed as to the status of the Work. Generally, the meeting shall be held bi-weekly; however, it may be scheduled at other times if needed. This meeting will be used to review Record Drawings being kept on the project by the Design Engineer and/or Contractor.

D. ENVIRONMENTAL REQUIREMENTS

The Contractor shall be responsible for obtaining an NPDES Permit 1200-C for erosion and sedimentation control during construction if this permit is required. A copy of the permit shall be provided to the City and City Engineer prior to the start of construction.

If a cultural resource study, wetland delineation, Conditional Letter of Map Revision, Letter of Map Revision, or other items are required, they shall be the responsibility of the developer.

E. PROJECT SAFETY

1. The Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work, including excavation safety. The Contractor shall comply with all applicable Laws and Regulations, ordinances, rules, and orders of any public body having jurisdiction as it relates to project and Work safety. See applicable provisions of the General Conditions, as well as all other provisions of the Contract relative to project and Work safety.

2. The Contractor shall maintain local access to area residents and emergency traffic throughout the life of the project and coordinate construction activities closely with area residents to keep them informed of operations that may impact their use of any streets or roadways.

3. All signs, barricades, barriers, lights, cones, trench boxes, shoring/bracing, and other such “devices” required to warn, protect, or direct the public and workmen during the

life of the Contract shall be furnished, installed, moved, and removed by the Contractor. When conditions warrant their use, flagpersons shall also be provided by the Contractor. The determination of what measures are required, in addition to those specifically called for by the Drawings and Specifications, shall be solely the responsibility of the Contractor.

4. The City and City Engineer are not responsible for determining whether proper safety precautions, etc., are being utilized. Should the Contractor fail to furnish the necessary protective measures, the City or City Engineer may, but shall not be required to, bring to the Contractor's attention by written notice of such failure and the Contractor shall undertake such corrective measures as is proper.

5. All construction Work shall be performed in accordance with the provisions of the Occupational Safety and Health Regulations of the Oregon Occupational Safety and Health Division, and other applicable regulations. It shall be the Contractor's responsibility to meet all requirements of Chapter 437 of the State of Oregon Administrative Rules. In addition, Oregon Revised Statutes (ORS) 757.542 through 757.562 and Oregon Administrative Rules (OAR) 860-024-0007 administered by the Oregon Public Utilities Commission shall apply.

6. The materials used for and the installation of all warning and traffic control devices shall conform to the applicable provisions of the Oregon Standard Specifications for Construction - current edition, Sections 00220 and 00225, and the Manual on Uniform Traffic Control Devices, U.S. Department of Transportation, Federal Highway Administration, current edition.

7. It shall be the Contractor's sole responsibility to provide a "competent person" as defined in the regulations to be on the project site during all trenching operations. The "competent person" appointed by the Contractor shall fulfill all requirements of the regulations.

8. Prior to opening an excavation, the Contractor shall arrange for field location of utility installations such as sewer, telephone, fuel, electric, gas, water lines, or any other underground installations that reasonably may be expected to be encountered during the excavation work. When excavation operations approach the estimated location of underground installations, the Contractor shall determine the exact location of the installations by safe and acceptable means. While the excavation is open, underground installations shall be protected, supported, or removed as necessary to safeguard workers.

F. QUALITY CONTROL

1. The Contractor shall be responsible for providing its own construction monitoring and quality control program to ensure the materials used on the project and in the Contractor's operations are in compliance with the Public Works Standards, Technical Specifications, and Standard Drawings. A written quality control program shall be provided to the City for their review prior to any Work being performed. The program shall describe how the Contractor shall monitor and ensure quality control throughout the Work. Materials, equipment, or Work that fails to meet the Contract requirements shall not be used in the Work.

2. Special inspections and testing shall be performed in accordance with the latest edition of the Oregon Structural Specialty Code (OSSC). As required by the OSSC, any special inspections or tests performed on a project shall be completed by a qualified firm normally engaged in the business of providing said special inspections and tests. The special inspection and testing services shall be performed and paid for by the Contractor. All other testing and inspections required that are not deemed special inspections and testing as defined in the OSSC shall also be performed and paid for by the Contractor, unless at the City's discretion they elect to contract the testing and/or inspection services. The Contractor or developer shall be responsible for reimbursement to the City for all special inspection and testing costs.

3. The City and its representatives shall at all times have access to the Work. In addition, authorized representatives and agents of any participating federal or state agency shall be permitted to review all Work, materials, invoices of materials, and other relevant data and records. The Contractor shall provide proper facilities for such access and observation of the Work and also for any review or testing thereof. The Contractor shall notify testing personnel, including testing personnel provided by the City, at least three business days in advance of operations to allow for personnel assignments and test scheduling. All materials to be tested shall be provided by the Contractor at their expense. After tests are completed, the Contractor shall be responsible for repairing test areas to match original conditions. The Contractor shall pay for all additional reviews and retesting required because of defective Work or ill-timed notices.

4. Tests or reviews by the City or others shall not relieve the Contractor from their obligations to perform the Work in accordance with the requirements of the Standard Drawings and Technical Specifications and does not make the City, or others, an insurer of the Contractor's Work.

5. When tests are required, the technician or technicians performing any testing shall possess valid Western Alliance for Quality Transportation Construction (WAQTC) recognized certifications, Oregon Department of Transportation (ODOT) recognized

certifications, or American Concrete Institute (ACI) recognized certifications in the following disciplines:

- Aggregate Testing Technician (AgTT)
- Asphalt Testing Technician (AsTT)
- Concrete Testing Technician (CTT)
- Embankment and Base Testing Technician (EBTT)
- Density Testing Technician (DTT)
- ACI Concrete Strength Testing Technician (CSTT)
- ACI Concrete Field Testing Technician (CTT)
- Certified Aggregate Technician (CAgT) (WAQTC = AgTT)
- Certified Embankment and Base Technician (CEBT) (WAQTC = EBTT)
- Certified Density Technician (CDT) (WAQTC = DTT)
- Certified Asphalt Technician I (CAT-I) (WAQTC = AsTT)
- Certified Asphalt Technician II (CAT-II)
- Certified Mix Design Technician (CMDT)
- Quality Control Technician (QCT)
- Concrete Control Technician (CCT)
- Concrete Strength Technician (CST)
- Concrete Laboratory Testing Technician (CLTT)

6. Following are the minimum required tests and testing frequency that shall be included in the Contractor's quality control program for the materials listed. See the Technical Specifications for other testing and quality control requirements. If the Contractor fails to provide all or any part of the required quality control testing and corresponding reports for the project after the City or City Engineer has requested the Contractor to do so in writing, the City may elect to have the quality control work performed by others and withhold the actual cost of quality work plus $100 for each test performed from payments owed the Contractor on the project.

   a. Trench Backfill Materials

      A minimum of one ASTM D1557 laboratory density test will be performed for each testable material used as trench backfill, providing the maximum theoretical density and optimum moisture content of the material can be determined. Nuclear gauge density tests (ASTM D6938) shall be performed in accordance with the Standard Drawings.

   b. Earthwork

      A minimum of one AASHTO T 180 laboratory density test will be performed for each testable material used as embankment material, providing the maximum

theoretical density and optimum moisture content of the material can be determined. A minimum of one nuclear gauge density test (ASTM D6938) will be performed every 800 square yards on each lift of material to show required density is being achieved. Once an acceptable compaction method is established and verified with field density tests, the testing interval can be reduced to one test each 1,600 square yards on each lift. If backfill material or compaction equipment changes, compaction testing shall immediately be performed to verify that density is being achieved and shall continue at 800 square yard intervals until a new compaction method is verified.

c. Aggregate Base

1) Testing required to qualify material source prior to production as outlined in Technical Specifications - "Road Work" (current ODOT certification of the material source can be substituted for this testing).

2) Quality control testing required during production consists of the following:

Gradation	AASHTO T 27	Start of production and one test every 1,000 tons (three tests minimum)
Fracture Face	AASHTO T 335	Start of production and one test every 3,000 tons (three tests minimum)
Sand Equivalent	AASHTO T 176	Start of production and one test every 3,000 tons (three tests minimum)

3) Compliance of base rock produced and stockpiled before beginning the project will be determined by the following:

a) Provide all production records for testing that was performed during production.

b) If production records are not available, provide post testing of the stockpile per AASHTO T 2 as follows:

Gradation	AASHTO T 27	One test every 1,000 tons in stockpile (three tests minimum)
Fracture Face	AASHTO T 335	One test every 3,000 tons in stockpile (three tests minimum)

Sand Equivalent	AASHTO T 176	One test every 3,000 tons in stockpile (three tests minimum)

4) Compliance of base rock delivered to the project site will be determined by the following:

Gradation	AASHTO T 27	One test every 1,000 tons (three tests minimum)
Fracture Face	AASHTO T 335	One test every 3,000 tons (three tests minimum)
Sand Equivalent	AASHTO T 176	One test every 3,000 tons (three tests minimum)

5) A minimum of one AASHTO T 180 laboratory density test will be performed on base rock material, providing the maximum theoretical density and optimum moisture content of the material can be determined. A minimum of one nuclear gauge density test (ASTM D6938 or AASHTO T 310) will be performed every 800 square yards on each lift of base rock to show required density is being achieved. Once an acceptable compaction method is established and verified with field density tests, the testing interval can be reduced to one test each 1,600 square yards on each lift. If base rock material or compaction equipment changes, compaction testing shall immediately be performed to verify that density is being achieved and shall continue at 800 square yard intervals until a new compaction method is verified.

d. Asphalt Concrete Pavement (ACP)

1) Testing required to qualify ACP aggregate material source prior to production consists of the following (current ODOT certification of the material source can be substituted for this testing):

Soundness	AASHTO T 104
Abrasion	AASHTO T 96
Degradation	ODOT TM T-208
Lightweight Pieces	AASHTO T 113
Plastic Index	AASHTO T 103
Friable Particles	AASHTO T 112

2) Quality control testing required on ACP aggregate during production consists of the following:

Gradation	AASHTO T 27	Start of production and one test every 1,000 tons (three tests minimum)
Sand Equivalent	AASHTO T 176	Start of production and one test every 3,000 tons (three tests minimum)
Fracture Face	AASHTO T 335	Start of production and one test every 3,000 tons (three tests minimum)
Wood Particles	ODOT TM T-225	Start of production and one test every 3,000 tons (three tests minimum)
Elongated Pieces	ODOT TM T-229	Start of production and one test every 3,000 tons (three tests minimum)
Dust or Clay Coating	ODOT TM T-226	Start of production and one test every 3,000 tons (three tests minimum)

3) Compliance of ACP aggregates produced and stockpiled before beginning the project will be determined by the following:

a) Provide all production records for testing that was performed during production.

b) If production records are not available, provide post testing of the stockpile per AASHTO T 2 as follows:

Gradation	AASHTO T 27	One test every 1,000 tons in stockpile (three tests minimum)
Sand Equivalent	AASHTO T 176	One test every 3,000 tons in stockpile (three tests minimum)
Fracture Face	AASHTO T 335	One test every 3,000 tons in stockpile (three tests minimum)
Wood Particles	ODOT TM T-225	One test every 3,000 tons in stockpile (three tests minimum)
Elongated Pieces	ODOT TM T-229	One test every 3,000 tons in stockpile (three tests minimum)

Dust or Clay Coating	ODOT TM T-226	One test every 3,000 tons in stockpile (three tests minimum)

4) Quality control testing of the ACP mixture required during placement is as follows:

Asphalt Content	AASHTO T 308	One test every 1,000 tons, one test per day minimum
Gradation	AASHTO T 30	One test every 1,000 tons, one test per day minimum
Maximum Specific Gravity	AASHTO T 209	One test every 1,000 tons, one test per day minimum
Compaction	WAQTC TM 8	Five tests every 1,000 tons
Percent Hydrated Lime	ODOT TM T-321	One test every 1,000 tons

Asphalt content, gradation, and maximum specific gravity testing will be performed at the start of production to verify the ACP mix design.

e. Portland Cement Concrete (PCC)

Aggregate testing is required to be completed with the mix design. Should additional testing of aggregate for PCC be deemed necessary by the City or City Engineer, testing shall be performed by the Contractor as specified by ASTM C33. Samples shall be selected at random from the stockpile and tested for conformance with the Specifications. The decision to perform aggregate testing and testing frequencies shall be left to the City or City Engineer.

Quality control testing of PCC during and following placement is as follows:

Air Content	AASHTO T 152	One test per each set of cylinders
Slump	AASHTO T 119	One test per each set of cylinders
Concrete Temperature	AASHTO T 309 ASTM C1064	One test per each set of cylinders
Strength	AASHTO T 22, AASHTO T 23,	One set of three cylinders per 50 cubic yards (minimum one set per day)

G. REVIEW OF WORK

It is not the intent of the City or City Engineer to provide continuous or full-time observation of all Work. When required by the City or City Engineer, the Contractor shall provide the City or

City Engineer a weekly report of their Work progress and proposed Work schedule for the next week. This weekly communication shall be a requirement.

H. COOPERATION WITH OTHERS

The Contractor shall cooperate with the residents and business owners in the area to provide good access to private property whenever possible. Sidewalks shall be kept clear at all times of any construction materials. Barricades, traffic cones, blinkers, and signing shall be used to direct the public through the Work area safely.

I. EXISTING SURVEY MONUMENTATION

1. The Contractor shall be responsible for the protection and perpetuation of existing land survey, property, or construction monuments shown on the Drawings, which are marked or are clearly visible on the ground.

2. The Contractor shall give the City or City Engineer a minimum of 72 hours' notice prior to working in the vicinity of any such monument that the Contractor may disturb. The Contractor shall arrange for such monuments to be referenced and have any disturbed monuments restored following construction by a Professional Land Surveyor registered in the State of Oregon.

J. EXISTING UTILITIES

1. At least three business days in advance, the Contractor shall utilize the "Call Before You Dig" or One Call Center number 1-800-332-2344 to notify all utility offices affected by the construction operations. The Contractor shall not expose any marked out underground utility without first notifying the affected agency and being granted permission to do so. The Contractor is responsible for locating and exposing, if necessary, all existing underground utilities in advance of the trenching operation.

   The Contractor is responsible for protecting all power and telephone poles and overhead cables from damage. If interfering power poles, telephone poles, guy wires, or anchors are encountered, the Contractor shall notify the utility owner at least three business days in advance of construction operations to permit the necessary arrangements with the affected utility company for protection or relocation of the interfering structure. The Contractor shall be solely and directly responsible to the owner and operators of such utilities/properties for any damage, injury, expense, loss or inconvenience, delay, suits, actions, or claims of any kind brought because of injuries or damage that result from performing the contract work.

   The Contractor shall immediately notify the proper authority in the event of interruption to domestic water, sanitary sewer, storm sewer, or other utility service

resulting from accidental breakage, or as a result of being exposed or unsupported. All repair or replacement of existing water or sewer pipe must conform to the City's Public Works Standards. If an existing water or sewer pipe is damaged to any extent, the City's Water and/or Recycled Water departments must be notified immediately. The damaged pipe must remain exposed until inspected by a City Representative. Repairs shall be made upon approval by the City. All repairs or replacements shall be inspected by the City prior to backfill. Repaired or replaced sewer lines will be inspected by closed circuit television (CCTV) video by the City or independent third party at the Contractor's expense after the trench is backfilled and prior to City acceptance. The Contractor shall cooperate with the affected agency to restore services as promptly as possible and shall bear all costs of repair for the utility. In no case shall interruption of any water, sanitary sewer, or utility service be allowed outside normal working hours unless prior approval is granted by the City.

Neither the City, the utility owner, nor its officers or agents shall be responsible to the Contractor for damages resulting from the location of any underground utilities being other than that shown on the Plans, or for the existence of underground utilities not shown on the Plans or properly marked out on the site.

Should the Contractor encounter any utility service lines that interfere with trenching or conflict with the proposed work, the Contractor may obtain prior approval of the utility owner and governing authority to cut the service, dig through, and cause the service to be restored or relocated with similar and equal materials at the Contractor's expense.

The Contractor shall make any advance exploration necessary to protect all existing utilities and to properly plan the installation of pipelines or other work to the design line and grade. The Work shall include all labor, equipment, etc., necessary to perform the location work.

ATTENTION: Oregon law requires you to follow rules adopted by the Oregon Utility Notification Center. Those rules are set forth in OAR 952-001-0001 through 952-001-0100. You may obtain copies of the rules by calling the center.

NOTE: The telephone number for the Oregon Utility Notification Center is 503-232-1987.

2. The Contractor shall receive prior approval from the appropriate authority or utility owner before any public or private utility service is interrupted.

   The Contractor shall give a minimum of three business days' notice to all utility customers who will be affected by the Contractor's operations. No utility service shall be disconnected or interrupted for more than nine hours or as required by the utility owner, whichever is less, in any 24-hour period. When disruption of service will be

longer than nine hours in any one day, the Contractor shall provide safe and appropriate temporary service. All temporary service shall be coordinated with the utility owner.

When regular utility service interruption is required during the course of the Work, the Contractor shall submit a written plan to the City and utility owner that details proposed Work plan notification procedures, and estimated extent of service interruption. The Contractor must obtain written approval of their plan from the utility owner prior to interrupting the utility service. As a minimum, notification shall include door hangers and public notification in the newspaper and radio, as appropriate. Personal contact shall be made where practical.

The Contractor shall make every effort possible to provide continuous utility service to all utility customers. When special conditions exist where an interruption of utility service would create an extra hardship on the utility customer or create a hazardous condition, the Contractor shall provide continuous service. Particular care and planning must be arranged to provide continuous service of existing services or temporary services as approved by the utility owner and the City.

If the Contractor inadvertently damages or interrupts an existing utility, the Contractor shall immediately notify the affected utility company, City, and utility users and make arrangements to provide temporary service to the parties affected.

3. The Contractor shall support and otherwise protect all pipes, conduits, cables, poles, and other existing services where they cross the trench or are otherwise undermined or affected by their Work. The Contractor shall restore the support of an undermined existing utility using select backfill compacted to 95 percent maximum density as determined by ASTM D698.

K. PROGRESS OF THE WORK - CLEANUP

1. The Contractor shall arrange their work schedule such that all phases of Work, once started, shall be diligently pursued until completed. The intent is that the work area shall not be disturbed for undue periods of time. Work shall not be left uncompleted. If the City determines that Work is not being diligently completed, the City shall request the Contractor to complete said Work.

2. Cleaning up shall be a continuing process from the start of the Work to final acceptance of the project. The Contractor shall, at all times, at their own expense and without further order, keep property on which Work is in progress free from accumulations of waste material or rubbish caused by employees or by the Work, and at all times during the construction period shall maintain structure sites, rights-of-way, easements, adjacent property, and the surfaces of streets and roads on which Work is being done in a safe condition for the Contractor's workers and the public.

a. Accumulations of waste materials that might constitute a fire hazard will not be permitted.

b. Spillage from the Contractor's hauling vehicles on traveled public or private roads shall be promptly cleaned up. The Contractor shall take appropriate action to control dust caused by their operations. This shall include, but not be limited to, watering of exposed areas, cleaning of roadways, etc. This is considered a normal part of the construction project.

c. Upon completion of the Work, the Contractor shall, at their own expense, remove all temporary structures, rubbish, waste material, equipment, and supplies resulting from their operations. They shall leave such lands in a neat and orderly condition that is at least as good as the condition in which they found them prior to their operations.

d. Should the Contractor fail to provide said cleanup upon 24-hour written notice, the City shall have the right to perform or contract such Work at the expense of the Contractor.

3. The Contractor shall replace or restore, equivalent to their original condition, all surfaces or existing facilities disturbed by their Work, whether within or outside of the Work areas. Restoration work will include, but is not limited to, roadways, utilities, structures, landscaping, etc.

L. PERMITS

All permits shall be obtained before beginning construction, alteration or repairs, other than ordinary repairs, using application forms furnished by the City.

1. Application

To obtain a permit, the applicant shall first file an application in writing on a form furnished by the City for that purpose. Every such applicant shall:

a. Identify and describe the work to be covered by the permit for which application is made.

b. Describe the land on which the proposed work is to be performed by legal description, street address, or similar description that will readily identify and definitely locate the proposed building.

c. Indicate the use or occupancy for which the proposed work is intended.

d. Be accompanied by Plans, diagrams, computations, specifications, and other data as required.

e. State the valuation of any new building or structure or any addition, remodeling or alteration to an existing building.

f. Be signed by the applicant, or his/her authorized agent.

g. Give such other data and information as may be required by the building official.

2. Permit Fees

Permit fees are established by the State of Oregon and/or the City.

3. Expiration

Every permit issued by the City under the provisions of the Codes and/or Ordinances of the City shall expire by limitation and become null and void if the building or work authorized by such permit is not commenced within six months from the issue date of the permit, or if the building or work authorized by such permit is suspended or abandoned at any time after work is commenced for a period of six months. Before work can be resumed, a new permit shall be obtained to do so, and the fee shall be one-half the amount required for a new permit for such work, provided no changes have been made in the original Plans and specifications for such work; and provided further that such suspensions or abandonment has not exceeded six months.

A permittee holding an unexpired permit may apply for a one-time extension, provided he/she can show good and satisfactory reasons, and beyond his/her control the work cannot be commenced within the six-month period from the issue date. To renew work on a permit after it has expired, the permittee shall pay a new full permit fee.

4. Penalty

Any person, firm, or corporation violating any of the provisions of the Codes and/or Ordinances of the City, shall be guilty of a misdemeanor and each such person shall be deemed guilty of a separate offense for each and every day or portion thereof during which any violation of any of the provisions of the Codes and/or Ordinances is committed, continued or permitted, and upon conviction of any such violation such person shall be punishable by a fine, or by imprisonment, or by both with such fine and imprisonment as established by local applicable laws.

5. Right of Appeal

All persons shall have the right to appeal the City official's decision through a body appointed by the City and qualified by the experience and training to pass upon matters pertaining to building construction.

6. Plans

When required by the City, Plans shall be drawn to scale and shall be of sufficient clarity to indicate the nature and extent of the work proposed and shall show in detail that the project will conform to the provisions of City Standard Drawings and all relevant laws, ordinances, rules and regulations. Plans shall include a plot plan drawn to scale showing the locations of all easements, drainage facilities, adjacent grades, property lines, the proposed building, and of every existing building on the property. Two sets of Plans are required. One additional complete set of Plans shall be kept on the job site at all times and made readily accessible to the inspector.

7. Inspections

a. General

All construction of public improvements and work for which a permit is required shall be subject to inspection by the City and all such construction or work shall remain accessible and exposed for inspection purposes until approved by the City. In addition, certain types of construction shall have continuous inspection.

Approval as a result of an inspection shall not be construed to be an approval of a violation of the provisions of the Codes and/or Ordinances of the City. Inspections presuming to give authority to violate or cancel the provisions of the Codes and/or Ordinances of the City are not valid.

It shall be the duty of the permit applicant to cause the work to remain accessible and exposed for inspection purposes. Neither the City Representative nor the City shall be liable for expense incurred during the removal or replacement of any material required to allow inspection.

A survey of the lot may be required by the City to verify that the structure is located in accordance with the approved Plans.

b. Inspections for Right-of-Way Improvements

If the construction of sidewalk, curb and gutter, or asphalt concrete pavement improvements, is not included in a performance bond of an approved subdivision or the performance bond has lapsed, then every person, firm, or corporation desiring to construct sidewalks as provided by these Public Works Standards, before commencing the work or improvement, shall comply with the following:

1) An occupancy permit shall not be issued for a development until all provisions of these Public Works Standards are satisfied.

2) The City may allow temporary noncompliance with the provisions of these Public Works Standards to the landowner, builder, or Contractor when, in the City's opinion, the construction of the ROW improvements is impractical for one or more of the following reasons:

   a) Sidewalk grades have not and cannot be established for the property in question within a reasonable length of time;

   b) Forthcoming installation of public utilities or street paving is be likely to cause severe damage to the new sidewalk;

   c) Street ROW is insufficient to accommodate a sidewalk on one or both sides of the street; or

   d) Topography or elevation of the sidewalk base area makes construction of a sidewalk impractical or economically infeasible.

c. Inspection Record Card

Work requiring a permit shall not commence until the permit holder or his/her agent have posted or otherwise made available an inspection record card such as to allow the City to conveniently make the required entries thereon regarding inspection of the work. This card shall be maintained available by the permit holder until final approval has been granted by the City.

d. Inspection Requests

It shall be the duty of the person doing the work authorized by a permit to notify the City that such work is ready for inspection. Requests for inspection shall be made at least three business days before such inspection is desired. Such request shall be in writing or by telephone at the option of the City.

It shall be the duty of the person requesting any inspections required to provide access to and means for inspection of such work.

e. Required Inspections

Reinforcing steel or structural framework of any part of any building or structure shall not be covered or concealed without first obtaining the approval of the City.

The City, upon notification, shall make the following inspections and shall either approve that portion of the construction as completed or shall notify the permit holder or his/her agent wherein the same fails to comply with Public Works Standards.

f. Inspections by City Representatives

A City Representative shall be notified and/or present for the following work items.

1) Grading - Streets

a) Erosion control measures in place before construction begins

b) Geotechnical Report and special details review, if any

c) Swale and soil replacement

d) Fill material (compaction and in lifts)

e) Proof roll and deflection test of subgrade

f) Aggregate base material (compaction method [test strip if needed], depth, and cross grade and street grade)

g) Curb and gutter installation

h) Aggregate base (subbase and finish grade)

i) ACP (material, cross grade, street grade, density test)

j) ADA ramps

k) Sidewalk forms, subbase, finish grade

2) Sanitary Sewer

a) Pipe material

b) Manhole material and type

c) First manhole: aggregate base rock, mastic, boots, channel, backfill, compaction, etc.

d) Initial pipe install: bedding, haunches, setting pipe, pipe zone, backfill, and laser for grade

e) First service lateral: wye, grade, pipe, bed and backfill

f) Testing: manholes, pipe pressure, mandrel, and TV

3) Water

   a) Pipe material

   b) Check valve, fittings, and other materials

   c) Initial pipe install: same as above

   d) First valve/fitting install

   e) First service line install

   f) Pressure test

   g) Disinfection and bacteria testing

4) Storm Drain

   a) Pipe material

   b) Manhole material

   c) First manhole: aggregate base, mastic, boots, channel, backfill, and compaction.

   d) Initial pipe install: bedding, haunches, setting pipe, pipe zone, locating wire, backfill, and laser for grade

   e) First catch basin/inlet install

   f) Testing: manholes, pipe pressure, mandrel, and TV

   g) Test swale infiltration by flooding the swale

5) Final

   a) After improvements are complete, a City Representative from each relevant department shall perform a walkthrough and create a punch list of outstanding items or items in need of correction. Approved Plans are required to be on site for use by City Representative(s) performing the walkthrough.

   b) Punch list should include unfinished items (such as grading of the lots), damage done by construction (chipped curbs, etc.), items

that do not meet plans or City Standards, restoration, cleanup, maintenance bond, and/or Record Drawings.

c) Record Drawings with Design Engineer certification shall be provided to the City along with all required test results.

d) Final acceptance of construction improvements shall only be after all punch list items are completed.

END OF SECTION

CONTRACTOR'S NOTICE OF SUBSTANTIAL COMPLETION

(Contractor)_____ hereby notifies the City of Boardman, Oregon, that construction Work on the Project (Name of Project)_____ has been substantially completed in accordance with all requirements of the Drawings and Specifications. The Contractor also verifies that all system components have been properly installed, serviced, and lubricated where appropriate, and checked and tested for proper operation, all as recommended by the product manufacturer and as required by the Specifications. The Contractor further states that proper training has been given to the City's designated representative as to proper operation and service of the Project system and components.

The Contractor requests the City issue a Certificate of Substantial Completion. The attached draft punch list prepared by the Contractor lists items that need to be completed or corrected.

By: _____
(Authorized Signature)

_____
(Name)

_____
(Title)

_____
(Date)

(All items below the dotted line shall be completed by the City.)

Review by City:

☐ An inspection is scheduled for _____ to determine the status of completion.
(Date and Time)

☐ Construction Work was found not to be substantially complete. The Contractor shall complete the necessary Work and resubmit a new "Contractor's Notice of Substantial Completion."

By: _____
(Authorized Signature)

_____
(Name)

_____
(Title)

_____
(Date)

CONTRACTOR'S COMPLETION CERTIFICATE

(Contractor) _____ hereby certifies that the Project known as (Name of Project) _____ has been completed in accordance with all requirements of the Project Drawings and Specifications and City Standards. The Contractor further states that information contained in the Record Drawings and Operation and Maintenance Manual is complete, accurate, and properly describes equipment, materials, and system installed as a part of the Work. The Contractor further states that all information required by the Drawings and Specifications and City Standards has been submitted to the City. The Contractor also certifies that all title and lien issues have been resolved and that full title to all Work, materials, and equipment has passed to the Owner free and clear of any liens or other title defects, or will so pass upon final payment, including materialmen and mechanics liens.

_____
Contractor (Authorized Signature)

_____
(Name)

_____
(Title)

_____
(Date)

(All items below the dotted line shall be completed by the City.)

Review by City:

☐ The Work appears to be complete and a final inspection is scheduled for _____.
(Date and Time)

☐ The Work was found not to be complete. The Contractor shall complete the necessary Work and resubmit a new "Contractor's Completion Certificate."

By: _____
(Authorized Signature)

_____
(Name)

_____
(Title)

_____
(Date)

Instructions: This form shall be completed by the Contractor when all Work is complete and prior to receiving final payment on the Project.

NOTICE OF ACCEPTABILITY OF WORK

City: **City of Boardman, Oregon**
Contractor:
Project Engineer (if applicable):
Project:

Date Project is Ready for Acceptance

The City hereby gives notice to the above Contractor that the Work furnished and performed by Contractor for the above referenced Project is acceptable, and subject to the following terms and conditions of this Notice:

CONDITIONS OF NOTICE OF ACCEPTABILITY OF WORK

The Notice of Acceptability of Work ("Notice") is expressly made subject to the following terms and conditions to which all those who receive said Notice and rely thereon agree:

1. This Notice is given with the skill and care ordinarily used by members of the engineering profession practicing under similar conditions at the same time and in the same locality.

2. This Notice is not a guarantee or warranty of Contractor's performance, an acceptance of Work that is not in accordance with the related Specifications and City Standard Drawings including, but not limited to, defective Work discovered after final inspection, nor an assumption of responsibility for any failure of Contractor to furnish and perform the Work thereunder in accordance with the Specifications and City Standard Drawings, or to otherwise comply with the Specifications and City Standard Drawings or the terms of any special guarantees specified therein.

3. This Notice does not relieve Contractor of any surviving obligations and is subject to City's reservations of rights with respect to completion.

City of Boardman, Oregon

_____
(Authorized Signature)

By:_____
(Name)

Title:_____

Date:_____

The Contractor, _____, agrees that the date of final completion is also the date of commencement of project warranties.

_____
(Contractor)

_____
(Authorized Signature)

By:_____
(Name)

Title:_____

Date:_____

TRANSMITTAL OF SHOP DRAWINGS, EQUIPMENT DATA, MATERIAL SAMPLES, OR MANUFACTURER'S CERTIFICATES OF COMPLIANCE				DATE	NO.
SECTION 1 – REQUEST REVIEW OF THE FOLLOWING ITEMS *(This section will be initiated by the Contractor)*					
TO ENGINEER:		FROM CONTRACTOR:		PROJECT	CHECK ONE: ☐ THIS IS A NEW TRANSMITTAL ☐ THIS IS A RESUBMITTAL OF TRANSMITTAL
ITEM No.	DESCRIPTION OF ITEM SUBMITTED *(Type, size, model number, etc.)*	MFR. OR CONTR. CAT. CURVE DRAWING OR BROCHURE NO.	No. OF COPIES	CONTRACT REFERENCE DOCUMENT SPEC. SECTION NO.	CONTRACT REFERENCE DOCUMENT DRAWING SHEET NO.	COMMENTS
REMARKS NOTE: Contractor shall note any variations from requirements of the Contract Documents.				I certify that the above-submitted items have been reviewed in detail and are in accordance with the Technical Specifications and Drawings for the City of Boardman and have been approved by the Contractor. _____ NAME AND SIGNATURE OF CONTRACTOR	

WATER LINES

CITY OF BOARDMAN, OREGON

TABLE OF CONTENTS

SECTION 1

WATER LINES

CITY OF BOARDMAN, OREGON

TABLE OF CONTENTS

SECTION 1

WATER LINES

Attachments:

Test Worksheet for the Water Lines - Leakage Test

CITY OF BOARDMAN, OREGON

TECHNICAL SPECIFICATIONS

SECTION 1

WATER LINES

PART 1 - GENERAL

1.1 Scope

A. These Specifications cover the furnishing and installation of potable water lines, valves, fittings, and related appurtenances. This work includes, unless otherwise specified, furnishing all labor, materials, tools, equipment, and incidentals required to construct a complete water line ready for service as outlined in the Specifications.

B. Requirements for excavation and backfill of trenches, surface restoration, traffic control, and special appurtenance, etc., are specified under other Technical Specifications, when applicable.

C. Items specified in this Technical Specification are intended to be broad in scope and may not always apply to all items of Work to be constructed.

1.2 Specifications References

Specification references made herein for manufactured materials such as pipe, valves, and fittings refer to designations for the American Water Works Association (AWWA), American National Standards Institute, Inc. (ANSI) or to the American Society for Testing and Materials (ASTM) as they are effective on the date of call for Bids.

1.3 Interruption of Utility Service

See the "Existing Utilities" section of the General Requirements.

1.4 Delivery, Storage, and Handling

A. Adequate precautions shall be taken to prevent damage to piping and protective coatings. During transporting, pipe and other materials shall be secured individually by use of wood spacer blocks, wood crates, or otherwise protected to prevent collision of individual pieces and accompanying damage.

B. Where possible, all materials furnished by the Contractor shall be delivered and distributed at the Site by the Contractor so that each piece is unloaded opposite or near the place where it is to be placed in the trench.

C. All pipe, fittings, valves, hydrants, and accessories shall be loaded and unloaded by lifting with hoists or skidding so as to avoid shock or damage. During freezing weather,

valves shall be stored to prevent accumulation of water in housing which could freeze and damage valves. Under no circumstances shall materials dropped during handling be installed or be used in the Work.

D. All pipes, valves, fittings, and all other materials used in the construction of the water lines shall be carefully inspected by the Contractor prior to installation. All defective materials shall be rejected.

E. Proper materials, tools, and equipment shall be used by the Contractor to provide safe and convenient prosecution of the Work.

1.5 Manufacturer's Certification

If requested to do so, the Contractor shall furnish to the City a sworn statement from the product manufacturer, stating that inspection and all specified tests have been made on the supplied material and that the results thereof comply with all appropriate Specifications. The statement shall also state that all materials furnished are in accordance with these Specifications and that all materials are new.

PART 2 - MATERIALS

2.1 General

A. The Contractor shall furnish and install water lines and valves of the size, type, class, and material as specified. Where no specific type of pipe is called for, the Contractor may select any type listed herein. Once a particular type and manufacturer is selected, the Contractor shall use that type for the entire Project.

B. Materials and products which come into contact with drinking water supplied by public water systems or which come into contact with drinking water treatment chemicals used by public water systems shall meet the requirements of National Sanitation Foundation Standard 61 Drinking Water System Components - Health Effects (latest version) or equivalent. These materials and products include, but are not limited to, process media, protective materials, joining and sealing materials, pipes and related products, and mechanical devices used in treatment, transmission, and distribution systems.

2.2 Pipe

A. C900 PVC Pipe

PVC pipe for water lines shall conform to AWWA C900, DR 18 (235 psi) unless higher pressure classes are warranted. The pipe shall have flexible rubber gasketed joints conforming to ASTM D3139 and ASTM F477. Pipe shall be JM Eagle, North American Pipe Corporation, or approved equal. Pipe color shall be blue.

B. Ductile Iron Pipe

1. Ductile iron pipe and fittings shall conform to AWWA C150, AWWA C115, AWWA C151, AWWA C153, and AWWA C110 and shall be minimum pressure Class 350 unless specified otherwise.

2. All ductile iron pipe shall have a bituminous sealed cement mortar lining conforming to AWWA C104 on the interior.

3. All joints unless otherwise specified shall be push-on rubber gasket joints conforming to AWWA C111 and shall be furnished complete with all necessary accessories.

    a. Flanges for couplings and fittings shall conform to ANSI B16.1, 125-pound bolt hole template.

    b. Mechanical joints shall conform to AWWA C111.

4. Where called for on the Drawings, restrained pipe joints shall be bell and spigot ductile iron with field installed gaskets, such as the FIELDLOK™ Gasket System as manufactured by United States Pipe and Foundry Company, or approved equal.

5. Restrained mechanical joints shall be equipped with a MEGALUG Series 1100 Mechanical Joint Restraint System as manufactured by EBAA Iron, Inc., or approved equal.

6. When flanged pipe is required, the Contractor shall provide the D.I. pipe class required by the flange manufacturer to ensure the pipe and flange units are compatible. These data shall be provided to the City or City Engineer for review prior to ordering these materials.

C. High Density Polyethylene Pipe (HDPE)

HDPE pipe shall conform to AWWA C906 DR-11 (PE 4710) iron pipe size (IPS) for pipe diameters 4-inch or greater, or as called for on the Drawings. All joints shall be by the heat fusion method in accordance with the manufacturer's requirements. Fusion technicians who have been trained by the pipe manufacturer or by the fusion equipment manufacturer's representatives must conduct the butt fusion joining. Butt fusion shall be performed using suitable machinery approved by the pipe manufacturer. Fittings shall be standard commercial products manufactured by injection molding or by extrusion and machining or fabricated from AWWA C906 pipe or as called for on the Drawings. All fittings shall have the same pressure rating as the pipe unless otherwise specified on the Drawings. The Contractor shall provide detailed Shop Drawings for all joints and connections, including provisions for expansion and contraction as recommended by the pipe manufacturer.

D. HDPE Tubing for Service Lines

HDPE tubing for service lines shall be IPS meeting the requirements of AWWA C901 and ASTM D2239, SIDR 7 (PE 4710), rated for 200 psi working pressure. Stainless steel inserts shall be installed at all compression fittings.

E. Galvanized Pipe for Service Lines

Galvanized wrought iron pipe, when required, shall conform to ASTM A120.

2.3 Fittings for PVC Pipe

A. General

1. Unless specified otherwise, all fittings such as elbows, tees, crosses, valves, etc., shall have mechanical joints conforming to AWWA C111 and shall be short-bodied compact ductile iron fittings conforming to AWWA C153, Class 350.

2. When called for, flanged cast iron fittings shall conform to AWWA C110 with ANSI B16.1, 125-pound bolt hole template.

3. All fittings shall be cement mortar lined in accordance with AWWA C104.

4. Gaskets shall be either ring or full faced, 1/8-inch thick conforming to AWWA C111, Appendix B.

B. Restrained Pipe Joints and Fittings

1. Restrained Push-on Joint Pipe

When restrained joint ductile iron pipe is required, the pipe shall be the same class and type as the ductile iron pipe specified herein. Joints shall be Tyton Joint with Field Lok 350 gaskets, or approved equal. The restraint shall be boltless, integral restraining system, rated for 350 psi in accordance with the performance requirements of ANSI/AWWA C111/A21.11.

2. Restrained Fittings

All mechanical joint fittings called out to be restrained shall be equipped with a MEGALUG Series 1100 mechanical joint restraint system as manufactured by EBAA Iron, Inc., or approved equal.

C. Water Main Couplings

1. Water main couplings shall be fabricated steel "Dresser" style couplings, or approved equal, conforming to AWWA C219.

2. The Contractor shall provide the appropriate coupling and gaskets as required to match the water line types and sizes being utilized.

3. Couplings shall be rated for the working pressure of the pipe main for which they will be utilized.

2.4 Valves

A. Gate Valves

1. Gate valves 2 inches and smaller shall be all bronze, non-rising stem, conforming to Manufacturers Standardization Society (MSS) SP-80, Class A rated for a minimum working pressure of 125 psi.

2. Gate valves 2-1/2-inch to 12-inch shall conform to AWWA C509 or C515. Valves shall be designed for 200 psi minimum working pressure and shall be of iron body, resilient wedge, non-rising stem construction. Valves shall be equipped with O-ring type packing. The valve shall have a 2-inch AWWA operating nut for buried service. The valve ends shall be of the type required to match the pipe to

which they will be connected. Valves shall have mechanical joint connections, unless called for otherwise. Valves shall be resilient wedge, Kennedy KSRW or KSFW, M&H Style 4067 or 7000, Clow, or equal.

3. Gate valves 14-inch and 16-inch shall meet or exceed the requirements of AWWA C509 and shall also conform to the applicable requirements of AWWA C500. Valves shall be designed for 200 psi minimum working pressure and shall be of iron body, resilient wedge, non-rising stem construction. Valves shall be equipped with O-ring stem seal. The valve shall have a 2-inch AWWA operating nut. The valve ends shall be of the type required to match the pipe to which they will be connected. Valves shall be Metroseal 250 as manufactured by U.S. Pipe or approved equal.

4. Gate valves 18 inches and larger shall conform to AWWA C500. Valves shall be designed for 150 psi minimum working pressure and shall be of iron body, double disk, parallel seat, bronze mounted, non-rising stem construction. Valves shall be equipped with O-ring type packing. The valve shall have a 2-inch AWWA operating nut. The valve ends shall be of the type required to match the pipe to which they will be connected. Valve shall be M&H NRS Style 67 or equal.

B. Ball Valves

Ball valves 2 inches and smaller shall be bronze, conforming to Federal Specifications MSS SP-72 and MSS SP-110 rated for a minimum working pressure of 125 psi.

C. Butterfly Valves

1. All butterfly valves shall be of the rubber-seated tight-closing type that shall meet or exceed the requirements of AWWA C504. All valves shall be M&H 4500, Clow 4500, or approved equal.

2. The valve shall be for buried service with a sealed gear operator having 2-inch AWWA operating nut and shall open counter-clockwise.

3. The valve ends shall be of type required to match the pipe to which they will be connected.

D. Cast Iron Valve Box

1. Each valve shall be equipped with an adjustable cast iron box of the sliding type with a base large enough to cover the top casting of the valve.

2. The diameter of the valve box shall be not less than 5 inches, and shall be of such length so as to provide the depth of cover over the pipe without full extension.

2.5 Fire Hydrants

A. Fire hydrants shall conform to AWWA C502 and shall have 5-1/4-inch main valve opening, two 2-1/2-inch NST nozzles with STORZ couplings and one 4-1/2-inch NST pumper nozzle with STORZ coupling. Operating nut shall be 1-1/2-inch pentagon. Fire hydrants shall be Kennedy K-81 Guardian, or equal.

B. All hydrants shall have a minimum depth of bury of 48 inches. Where conditions require, hydrant extensions shall be provided and installed to provide the proper placement and installation of the hydrant.

C. Hydrants shall receive factory coats of yellow enamel paint and shall also receive an additional field coat after installation.

D. All hydrants shall be of the traffic model type.

2.6 Combination Air Release Valves

Air Release Valves shall generally be a combination air and vacuum type such as APCO No. 143 C, ValMatic No. 201C, or approved equal, designed for 150 psi operating pressure. Air Release Valves shall be sized and installed per the manufacturer's recommendations.

2.7 Service Saddles

A. Service saddles shall have a ductile iron body, wide stainless steel band, and stainless steel bolts and nuts. Service saddles shall be Ford FS101 style for 3/4-inch and 1-inch taps and Ford FS202 for all taps larger than 1 inch, or approved equal.

B. Saddle sizes and threads shall be AWWA compatible with the pipe type and sizes being utilized.

C. Service saddles are not required for ductile iron pressure class pipe for taps 1-inch and less. Service saddles are required for ductile iron pressure class pipe for taps greater

than 1-inch. Service saddles used on PVC water mains shall be specifically sized at the factory for the type of PVC water main used.

2.8 Corporation Stops

A. Corporation stops shall be brass ball valve stops complying with AWWA C800. Corporation stops shall be Ford ball corp or approved equal.

B. Inlet threads and outlet connections shall be as required for type and size of water service lines and service saddles being utilized.

2.9 Curb Stops

A. Curb stops shall be Ford brass ball valves or approved equal.

B. Valve configuration, inlet, and outlet requirements shall be as required for the size and type of water service lines and setters being utilized.

2.10 Service Line Couplings

A. Service line couplings shall be Ford pack joint couplings or approved equal.

B. Provide appropriate coupling as required to match water service line types and sizes being utilized. Appropriate stainless steel insert stiffeners shall be used for all PVC pipe and polyethylene tubing.

C. Where metal pipe of dissimilar type are being connected, an insulating adaptor gasket such as Dresser Style 65, or approved equal, shall be utilized to prevent galvanic corrosion.

2.11 Curb Stop Box

A. Each curb stop shall be equipped with an adjustable cast iron box of the sliding type and shall be of such length so as to provide the depth of cover over the pipe without full extension.

B. The curb stop box shall be equal to Ford Arch Pattern Curb Boxes with 1-inch upper section and stationary rod and Type PS plug style lid with pentagon bolt, or approved equal.

C. For service curb stops larger than 1-inch, a curb box base, Ford CB-7, shall also be provided.

2.12 Meter Setters

A. Meter setters for 1-inch and smaller meters shall be Ford 70 Series Coppersetters or approved equal.

B. Meter setters for 1-1/2-inch or 2-inch water meters shall be Ford Coppersetters or approved equal.

C. A Ford angle meter ball valve shall be provided on the meter inlet and a Ford cartridge dual check valve shall be provided on the meter outlet.

D. Provide appropriate meter setter heights, sizes, and connections, etc., as required for the meter and water service lines sizes and types being utilized.

E. Schedule 40 PVC 1-inch pipe shall also be installed in the setter pipe eyelets to increase the stability of the meter setting.

2.13 Automated Metering Reading (AMR) System

A. Water Meters

1. Water meters for 5/8-inch x 3/4-inch, 3/4-, and 1-inch sizes shall be Sensus SRII TouchRead™, or approved equal.

2. Water meters for 1-1/2- and 2-inch sizes shall be Sensus OMNI TouchRead™, or approved equal.

3. For 3-inch size, the meter shall be Sensus Series "W" turbo meter with AMR.

4. Meters shall meet or exceed the requirements of AWWA C700 latest revision. All meters shall read in gallons.

5. All meters shall be 5/8-inch x 3/4-inch size unless specifically called for otherwise on the Drawings.

B. TouchRead™ AMR System. The Contractor shall furnish the water meters with AMR system registers compatible with the TouchRead™ system. The Electronic

Communication Register (ECR) shall be included with each meter and shall include the touch or inductive pad.

2.14 Water Meter Box and Cover

A. Water meter box for 3/4-inch and smaller meters shall be 12-inch x 20-inch; for non-traffic areas, it shall be rotocast polyethylene material with polymer concrete frame; for incidental traffic areas, it shall be polymer concrete "RPM" body and frame; all as manufactured by Old Castle, or equal. The box shall be equipped with mouse holes. The lid shall be 12-inch x 20-inch Carson HD cover. Provide cover for type of meter being installed, i.e., hinged meter read lid, drilled touch read pad, etc. Where required by the City, the box and lid shall be upgraded to the 20K traffic-rated box and cover.

B. For 1- and 1-1/2-inch meters, the box shall be 17-inch x 30-inch; for non-traffic areas, it shall be rotocast polyethylene material with polymer concrete frame; for incidental traffic areas, it shall be polymer concrete "RPM" body and frame; all as manufactured by Old Castle, or equal. The box shall be equipped with mouse holes. The lid shall be 17-inch x 30-inch Carson HD cover. Provide cover for type of meter being installed, i.e., hinged meter read lid, drilled touch read pad, etc. Where required by the City, the box and lid shall be upgraded to the 20K traffic-rated box and cover.

2.15 Locating Wire

A. Locating wire shall be a minimum of 12 awg UF solid copper with blue colored insulation. The use of THHN wire will not be acceptable. The silicone splice kit shall be 3M Splice Kit DBR/Y-6 or approved equal.

B. Where location wire is to be secured to the exterior of fire hydrants, valve boxes, posts, etc., stainless steel pipe straps shall be used.

2.16 Thrust and Anchor Blocks and Concrete Collars

A. Concrete used for thrust and anchor blocks, and concrete collars shall be Portland Cement concrete with a 28-day compressive strength of 2,500 psi. Concrete thrust blocks shall cure for 3 to 5 days before hydrostatic or leakage testing of pipelines.

B. Anchor rods shall be 3/4-inch diameter galvanized steel or epoxy coated reinforcement bar conforming to AASHTO M 284, embedded a minimum of 18 inches in the concrete.

2.17 Water Line Blowoff

Water line blowoff assemblies shall be Kupferle Mainguard 2-inch blowoff hydrant Model No. 77 or approved equal.

2.18 Water Line Marker

Water line markers shall be prefabricated fiberglass construction and shall include the label "Warning: Water Pipeline."

PART 3 - EXECUTION

3.1 Trench Excavation and Backfill

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

3.2 Record Drawings

The requirements for Record Drawings, etc., as required in the General Requirements shall be carefully complied with.

3.3 Installation of Pipe

A. Water pipe shall be installed in accordance with best current practices as required by the manufacturer and as specified herein. PVC pipe installation shall conform to the Uni-Bell Plastic Pipe Association, "Guide for Installation of PVC Pressure Pipe for Municipal Water Main Distribution Systems" and also AWWA M23 "PVC Pipe - Design and Installation." Ductile iron pipe installation shall conform to the requirements of AWWA C600.

B. Water pipe shall be installed with bell ends laid facing in the direction of laying unless directed otherwise by the City or City Engineer. Each pipe shall be properly bedded so as to be supported for the full length of the pipe. A suitable foundation shall be achieved by a slight excavation under the bell at each joint. All rubber ring joints shall be lubricated and installed in accordance with the installation instructions of the pipe manufacturer, taking particular care to avoid pinching or otherwise causing damage to the rubber ring. All joints shall be free of dirt and other foreign matter prior to the joining of the next pipe.

C. Water lines shall be installed to the minimum depths called for on the Drawings and to the lines and grades when shown.

1. It shall be recognized that water line depths may vary from the minimum depths shown when adjustment of grade is required to avoid conflict with existing utilities.

2. Additional fittings may also be required when a grade adjustment is required.

D. No pipe shall be installed in water or when conditions exist that, in the opinion of the City or City Engineer, are unsuitable for the laying of the pipe.

1. At times when pipe laying is not in progress, the open ends of pipe shall be closed by a watertight plug or other approved means.

2. If there is water in the trench, the seal should remain in place until the trench is dewatered sufficiently to prevent groundwater from entering the pipe. Adequate provisions shall be made by the Contractor for final disposal of the groundwater pumped from trenches.

E. All pipe shall be installed true to line. The Contractor may install a pipeline on a curve when called for on the Drawings or when approved by the City or City Engineer.

1. For rubber gasketed ductile iron pipe installed on a curve, the pipe shall be joined in a straight alignment, then deflected. The amount of deflection shall not exceed 80 percent of the recommended maximum deflection specified in AWWA C600.

2. For PVC pipe installed on a curve, deflection of the pipe shall be achieved by bending the pipe within the limitations specified by the pipe manufacturer. Joint deflection of PVC pipe is not allowed.

3.4 Thrust and Anchor Blocks

A. Thrust and anchor blocks shall be constructed as shown on the City Standard Drawings and placed at all changes in direction, all changes in the diameter of the pipe, all dead-ends as required by the City or City Engineer.

B. All thrust blocks shall be placed between the undisturbed ground and the fitting to be anchored. Plastic sheeting shall be used to provide a bonding barrier between the

fittings and the concrete. The quantity of concrete and the area of bearing on the soil shall be as approved by the City or City Engineer.

C. All thrust blocks shall be placed so that the entire pipe and fitting joints will be accessible for repairs. Bolts for mechanical and flange fittings and fire hydrant weep holes shall not be covered with concrete. All bolts shall be accessible and removable without interference from the thrust block.

D. Thrust blocks may not be required where approved restraint joint pipe and fittings are utilized.

E. Concrete thrust blocks shall cure for 3 to 5 days before hydrostatic or leakage testing of pipelines unless otherwise approved by the City or City Engineer.

F. No backfill of thrust blocks shall occur until the Work has been observed by the City or City Engineer.

3.5 Locating Wire

A. A continuous solid copper locating wire shall be placed along the top of all water pipe, including service lines. This wire shall be secured to the top of the pipe at maximum 10-foot intervals using 6-inch strips of 2-inch wide duct tape. All splices shall be electrically continuous. At all splices the connecting ends of the wires shall be overlapped and tied. The ends shall be stripped and connected with a wire nut to ensure an electrical connection and made waterproof with an approved silicone splice kit. Access to terminal ends of the locating wire shall be made at all valve boxes, meter boxes, fire hydrants, vaults, etc. The result of this installation shall be a continuous wire circuit electrically isolated from ground.

B. The Contractor shall be responsible for testing continuity and for testing isolation from ground in the wire after all Work has been completed on the test section. The Contractor is advised to do intermediate testing on their own after backfilling operations and prior to surface restoration work to be sure continuity is maintained. If there is a break or defect in the wire, it shall be the Contractor's responsibility to locate and repair the defect.

C. The continuity of the location wire shall be tested from one test load point to the next by use of a temporary wire laid between test points in-line with an ohmmeter. Resistance shall be measured with an approved ohmmeter that has been properly calibrated. The continuity of a test section will be accepted if the resistance of the test

section does not exceed 5 ohms per 500 feet of location wire being tested. Isolation from ground shall be measured with a megohmmeter and shall be a minimum of 20 megohms for any section of location wire tested. The City or City Engineer shall witness the acceptance test. The wire and installation shall be included in the water line bid item price. No separate payment shall be made.

3.6 Service Connections

The Contractor shall connect service lines to new or existing water mains as shown on the City Standard Drawings. This Work includes the installation of a saddle and corporation stop, and making the connection. The Work will include potholing to locate any existing pipeline or service lines as required so the service connection can be performed.

3.7 Service Lines

A. The installation of new service lines and the connecting of existing service lines shall be performed in accordance with the City Standard Drawings, manufacturer requirements, and as specified herein. Water service lines shall be laid by placing the pipe on the trench bottom with sufficient slack to prevent pulling apart of the joints when the backfill is placed. Splices shall be kept to an absolute minimum. If required, they shall be made using brass compression joint couplings, Ford Pack Joint or approved equal.

B. When constructing a new water line to replace an existing line, the existing water line shall remain in service until the new water line has been tested, disinfected and approved by the City or City Engineer. When possible, the existing line and new line shall both be in operation during the transfer of service lines. The transfer shall be made so that the interruption of water service to the utility customer is held to a minimum. All service lines shall be thoroughly flushed before connecting to existing lines or meters.

C. The locations of service lines are approximate and may vary from the locations provided. The City will assist the Contractor in locating service lines; however, the primary responsibility for performing excavation work to locate existing lines will be the Contractor's.

D. The Work includes potholing to locate any existing pipelines or service lines as may be required so the service lines can be installed. The Work also includes connecting to the existing service lines when required.

E. When existing service lines will be utilized, and if the Contractor encounters an existing service line which appears to be in poor or unserviceable condition, the Contractor shall

promptly contact the City. If the City determines that a portion of the existing service line needs replacement, the Contractor shall install a new service line and shall be compensated appropriately.

3.8 Service Lines by Boring and Open Trench Methods

A. It is the general intent to try and install service lines under paved streets by boring where possible. A pneumatic boring tool or other approved method will be used to install service lines under all paved streets. There may be areas where it is not possible to bore due to ground conditions which interfere in the operation.

Where requested by the City, the Contractor shall attempt to bore under paved streets. In areas where it appears that boring will be difficult as determined by the City and the Contractor, the service lines shall be installed by the open trench method. The Contractor shall make two attempts, if required, to bore under paved streets. If the second attempt fails, the Contractor shall install the service line by the open trench method.

B. The Contractor shall take care to not damage other utilities which might exist in the area. Prior to boring, the Contractor shall pothole to locate existing utilities. "Blind-boring" is not allowed. Repairs for damage to other utilities shall be the responsibility of the Contractor.

C. Service lines to be installed in areas not under asphalt streets may be installed by either open trenching or boring as the Contractor may elect. All service lines shall be thoroughly flushed before connecting to existing lines or meters.

3.9 Valves and Valve Boxes

A. Valves and valve boxes shall be installed as shown on the City Standard Drawings. All valves and valve boxes shall be set plumb. The valve box shall be centered over the valve operator and free of any obstruction which would prevent operation of the valve nut.

B. If the bury depth of the valve is greater than 4-1/2 feet, a valve operator extension shall be provided to within 1 foot of finish grade. The extension shall be permanently attached to the valve operator and a self-centering device shall be provided near the top of the valve operator extension. The box cover shall be flush with the finished grade. A concrete collar, where required, shall be installed.

3.10 Fire Hydrants

A. Hydrant installation shall conform with AWWA Manual M17 and AWWA C600, and shall be as shown on the City Standard Drawings. Extensions required for hydrant adjustment shall be installed to the manufacturer's specifications.

B. Hydrants may be installed on new water mains installed as part of the Work, or on existing mains. Special attention shall be given when installing hydrants on existing mains to ensure that adequate thrust restraint is being achieved as the hydrants can be placed in service before normal cast-in-place thrust blocks can achieve the required strength. The block and plug shall be held securely by temporary thrust block or other approved method, such as precast thrust blocks, restraining rods, etc.

C. The newly installed hydrants shall be covered in a manner acceptable to the City until they are placed into permanent service.

3.11 Removal of Existing Fire Hydrants

A. All hydrants removed shall remain the property of the City and shall be delivered and properly stacked at a site designated by the City.

B. After the old hydrant is removed, the lead line, if it is to be abandoned, shall be plugged at the main line tee with a watertight plug and thrust block. When the lead pipe is connected to a water main which is being abandoned, it will not need a thrust block.

C. The Contractor shall apply black paint the same day the existing hydrant is disconnected from service; otherwise, mark the hydrant in a manner acceptable to the City.

3.12 Connections to Existing Lines

A. The size, type, class, and location of existing lines and associated fittings, where shown, has been obtained from Record Drawings and other municipal records. It is expected that there may be some discrepancies and omissions in the information shown. Therefore, it shall be the responsibility of the Contractor to excavate and inspect existing water lines requiring a connection in order to determine the exact fittings needed.

B. In connecting to existing lines, the Contractor may select the combination of fittings they wish to use, subject to approval by the City. Approved fabricated steel couplings,

repair bands, transition couplings, or tapping sleeves are among the options available to the Contractor.

C. Proper disinfection, as described hereafter, shall always be accomplished. The Contractor shall provide watertight plugs and thrust restraints, as required, to cap old lines after they are disconnected.

D. The Contractor shall provide special attention in providing thrust restraint for fittings installed as part of a connection to an existing line, when such connection will be placed into service before normal cast-in-place thrust blocks can achieve required strength. In such cases thrust restrained joints, precast thrust blocks, etc., must be utilized to provide thrust restraint. Methods used by the Contractor shall be approved by the City.

E. The Contractor shall not interrupt service for the purpose of connecting to an existing line until they have excavated the required location, visually inspected the connection point, and verified that they have available on the Site all fittings required for completion of the connection or connections. Isolation of a section of line to be modified will be accomplished by the Contractor only after consultation with the City for the purpose of determining the proper valves to close to effect the isolation. The Contractor shall cooperate with the City in accomplishing this isolation. When Work is started on a connection, it shall proceed continuously without interruption, and as rapidly as possible until completed. If the connection involves turning off the water, the Contractor shall be responsible for notifying the residents affected by the shutoff. See the "Existing Utilities" section of the General Requirements.

3.13 Water Meter Installation

The Contractor shall furnish all materials required and shall install the water meters as shown on the City Standard Drawings and specified herein. Water meter installations shall include appropriate meter box and cover, coppersetter, yokes, and fittings, and shall include the water meter. Meter boxes shall be set plumb with cover level and with equal clearance on all sides between the box and the plumbing.

3.14 Water-Sewer Line Crossings

A. Wherever possible, the bottom of the new water line shall be 1.5 feet or more above the top of any sanitary sewer line. One full length of water line shall be centered at all sewer crossings when the vertical separation is less than 1.5 feet.

B. Where the water line crosses over an existing sanitary sewer line but with a clearance of less than 1.5 feet, the sewer line shall be exposed to the sewer line joints on both sides of the crossing to permit examination of the sewer pipe.

1. If the sewer pipe is in good condition and there is no evidence of leakage from the sewer line as observed by the City or City Engineer, the 1.5-foot separation may be reduced.

2. When the vertical separation is less than 1.5 feet, the Contractor shall center one full length of the new water pipe over the sewer line.

3. If the City or City Engineer determines that the conditions are not favorable or finds evidence of leakage from the sewer line, the sewer line shall be replaced with a full length of PVC pressure pipe (as specified herein) centered at the crossing point.

4. When new sewer pipelines are installed as a part of the Project, it will not be necessary to expose the new sewer pipe to verify the pipes condition.

C. Where the water line crosses under the sanitary sewer line, the Contractor shall expose the existing sewer line and examine it as indicated above.

1. If conditions are favorable and there is no evidence of leakage from the sewer line, the sewer line may be left in place but must be supported with a steel beam, reinforced concrete beam, or other means of preventing settlement when it spans the water line trench, and special precautions must be taken to assure that the backfill material over the water line in the vicinity of the crossing is thoroughly compacted in order to prevent settlement which could result in the leakage of sewage. In this situation, the Contractor shall center one length of the new water line at the crossing.

2. If the City or City Engineer determines that conditions are not favorable or finds evidence of leakage from the sewer line, then the sewer line at the crossing shall be replaced as indicated above.

D. When constructing water service lines, the City or City Engineer may require the depth of the service line to be revised in order to eliminate the need for a water-sewer line crossing.

3.15 Capping Existing Water Mains and Services

A. When required, the Contractor shall cap an existing water main or service tap when an existing main or service is to be taken out of service. Each location will require different types of fittings, etc., to accomplish the Work. All caps are to be permanent and watertight. When required, thrust restraints shall be provided. Corporation stops on service taps shall be in "off" position and an approved watertight cap installed.

B. Unless specified otherwise, the capping shall be performed at the connection to the water main which is to remain in service. No stubbed water mains or service lines shall be left in the ground unless approved otherwise by the City or City Engineer. The Contractor shall excavate and expose the piping to be capped, perform the Work, and backfill as required.

3.16 Abandoned Water Lines

A. The existing water lines to be taken out of service are to remain in service until the new lines are properly installed and tested, and water services have been connected. Approval from the City or City Engineer shall be obtained before any line is abandoned.

B. The existing lines shall then be abandoned and their actual location and abandoned designation recorded on all Record Drawings.

C. Unless called for otherwise, the abandoned lines will remain in the ground. The ends of all pipes which are abandoned shall be plugged with concrete or other methods approved by the City or City Engineer.

3.17 Air Release Valves

Air release valves shall be installed as required by the manufacturer and as shown on the City Standard Drawings.

3.18 Removal and Salvage of Water Main Appurtenances, Fittings, and Other Items

A. The Contractor shall remove all existing valves, hydrants, and fittings as required to properly perform the Work. All such materials shall be transported to an area designated by the City and stockpiled. Materials shall be removed and handled in such a manner which will prevent damage.

B. All other existing valves and hydrants not used in the new system or specified for removal will be removed by the City after the new system is in operation. Salvaged material shall remain the property of the City.

C. The abandoned existing pipe is to remain in the ground, unless otherwise specified.

D. The Contractor shall apply black paint the same day to all existing hydrants when permanently disconnected from service.

3.19 Work with Existing Asbestos Cement (A/C) Pipe

A. When working with A/C pipe, the Contractor shall take all precautions necessary to reduce airborne asbestos during construction. The Contractor will be required to contact the Oregon Department of Environmental Quality (DEQ), file an ASN 6 notification form, and follow Oregon Administrative Rules (OAR) 340-248, Asbestos Requirements. The Contractor may initiate consultation with the Occupational Safety and Health Administration (OSHA) prior to construction, if necessary. Any work to be performed on existing A/C pipe shall be completed in accordance with American Water Works Association Guidelines and DEQ guidance document, "How to Remove Nonfriable Asbestos Cement Pipe," and OSHA requirements.

B. The Contractor shall cut asbestos cement pipe by using snap cutters only. The use of carbide-tipped cutting blades or high speed, abrasive disks shall not be permitted as a means of cutting A/C pipe. Machining of this pipe shall be done with a manual or power-driven field lathe, or with a manual rasp.

C. Hole cutting shall be accomplished with a tapping machine. Use of shell cutters, rasps, chisels, electric drills, right angle sanders, or other high speed abrasive tools shall not be permitted. Uncoupling of asbestos cement pipe shall be accomplished with a hammer and chisel. Use of abrasive disc cutters, right angle sanders, or other high speed abrasive tools shall not be permitted.

D. Dust and cuttings from all Work shall be removed by wet mopping.

E. All waste material shall be collected in a covered container and disposed at a landfill certified by the state or EPA to accept demolition waste.

CITY OF BOARDMAN, OREGON

TECHNICAL SPECIFICATIONS

SECTION 1

WATER LINES

3.20 Repair of Unmarked Water Lines

A. The specific location, pipe size, type and bury depth of every existing water main and service may not be known. Prior to construction, the City will mark the location of known water lines with paint.

B. The Contractor shall perform appropriate exploratory work to locate utilities when they are known to exist but the specific location is unknown or not marked accurately.

C. Contractor shall repair the water main or service coupling using materials approved by the City or City Engineer.

3.21 Water Line Marker

The Contractor shall furnish and place water line markers at locations shown on the City Standard Drawings and as directed by the City to mark the locations of certain valves and other appurtenances.

3.22 Testing and Disinfection

A. General

The Contractor shall furnish all necessary equipment and other apparatus, including gauges, necessary to properly perform the testing and disinfection of water lines as specified. Lines to be tested include mains and service lines. Each section of the lines, before being tested and placed into service, shall be isolated and slowly filled with water. Air should be expelled from the line through hydrants or taps made at the high points. The City shall have the option of requiring the use of their own gauges. Water mains shall be generally tested in sections between valves and as the Work progresses. The Contractor shall be responsible for determining the length, timing, and section of lines to be tested, unless otherwise noted. When appropriate, testing intermediate sections of long lines should be considered. The Contractor shall provide any temporary test heads, fittings, blocking, etc., as may be required to properly test any given water main section. The Contractor shall be responsible for locating and repairing any defects in the water mains which fail to pass the required test.

B. Acceptance Test

The Contractor shall perform all preliminary testing required to determine that the lines to be tested are acceptable and comply with the requirements of this section of the

Specifications. After the Contractor has determined that the lines will pass the required test, the Contractor shall arrange for an acceptance test to be witnessed by the City or City Engineer. The lines will not be accepted until the acceptance test has been witnessed and documented as passing. Forms for performing the various tests are included at the end of this Technical Specification for use and reference by the Contractor.

C. Hydrostatic Testing of Pressure Lines

All lines shall be pressure tested at 150 psi gauge or 1.5 times the actual working pressure, whichever is greater, for one hour, unless otherwise indicated. Any cracked or defective pipe, joints, or fittings shall be removed and replaced.

D. Leakage Test

Each section of the line, after all backfill and compaction work has been completed and before being placed into service, shall be tested for leakage for a period of two hours at a minimum average gauge pressure of 100 psi. Leakage is defined as the quantity of water supplied into the section of line being tested, during and at the end of the test, that quantity being such that the pressure at the end of the test is equal to the pressure at the beginning of the test. Should any test disclose leakage greater than that specified, the Contractor shall locate and repair the defective joints until the leakage is within the specified allowance.

$$\text{PVC Pipe: } L = \frac{ND\sqrt{P}}{7{,}400} \qquad \text{DI Pipe: } L = \frac{SD\sqrt{P}}{133{,}200}$$

In which:

- L = Allowable Leakage Gal/Hr
- S = Length of Pipe Tested in Ft.
- N = Number of Joints or Connections
- D = Nominal Diameter in Inches
- P = Gauge Pressure in psi

E. Disinfection of Potable Water Mains

1. Each section of the line, before being placed into service, shall be thoroughly flushed and disinfected in accordance with current regulations of the Oregon Health Authority - Drinking Water Services (DWS), specifically Oregon

Administrative Rule, Section 333-061-0050(10) Construction Standards. The DWS standards at the time of publication of these City Standards read as follows:

"(10) Disinfection of facilities:

(a) Following construction or installation of new facilities and repairs to existing facilities, those portions of the facilities which will be in contact with water delivered to users must be cleaned and flushed with potable water and disinfected according to AWWA Standards C651 through C654 before they are placed into service. Disinfection must be by chlorine unless another disinfectant can be demonstrated to be equally effective.

(b) For construction of new distribution pipelines (with any associated service connections and other appurtenances installed at the time of construction), disinfection by chlorination must be conducted as specified in paragraphs (A) through (C) of this subsection unless another method from AWWA Standard C651 is used.

(A) A solution with a free chlorine residual of 25 mg/l must be introduced to the pipe such that the solution will contact all surfaces and trapped air will be eliminated. The solution must remain in place for at least 24 hours.

(B) After 24 hours, if the free chlorine residual is 10 mg/l or greater, the chlorine solution must be drained and the pipe flushed with potable water. If the free chlorine residual is less than 10 mg/l after 24-hours, the pipe must be flushed and rechlorinated until a free chlorine residual of 10 mg/l or more is present after a 24-hour period.

(C) After the pipe is disinfected, flushed and filled with potable water, bacteriological samples must be collected to determine the procedures' effectiveness. At least two samples must be collected from the new pipe at least 16 hours apart and analyzed for coliform bacteria. If the pipe has held potable water for at least 16 hours before sample collection, two samples may be collected at least 15 minutes apart while the sample tap is left running. If the results of both analyses indicate

the water is free of coliform bacteria, the pipe may be put into service. If either sample indicates the presence of coliform bacteria, the disinfection and flushing process must be repeated until samples are free of coliform.

(c) For repaired pipelines that were depressurized and wholly or partly dewatered during repair or that likely experienced contamination during repair, disinfection according to the procedure specified in paragraphs (10)(b)(A) through (C) of this rule must be followed except that bacteriological samples must be collected downstream of the repair site. If the direction of flow is unknown, samples must be collected on each side of the repair site.

(d) A water line may be returned to service, following repairs or routine maintenance, prior to receiving a report on the bacteriological analysis if the following procedures have been completed:

(A) Customer meters were shut off prior to placing the water line out of service;

(B) The area below the water line to be repaired was excavated and dewatered;

(C) The exposed pipe was treated with a hypochlorite solution;

(D) The water line was flushed thoroughly, and a concentration of residual chlorine has been re-established that is comparable to the level normally maintained by the water system, if applicable; and

(E) Bacteriological analysis has been conducted as a record of repair effectiveness."

2. When fittings, service lines, or other components of the water system (i.e., fittings used to connect to an existing main) are not disinfected in conjunction with the water mains, the Contractor shall disinfect these items using a 300 mg/L minimum chlorine solution. These items shall be flushed or otherwise coated with the chlorine solution in such a manner that will result in thorough wetting of all surfaces on the inside of these items. These items shall have at least

15 minutes of contact time with the chlorine solution prior to flushing/rinsing and being put into service.

3. After disinfection, the Contractor shall collect bacteriological samples for testing in the presence of the City or City Engineer. A minimum of two samples shall be taken every 1,000 feet of water line to be tested. The City or City Engineer may require additional samples to be taken if the section to be tested is complex and proper disinfection could be difficult. The analysis shall be performed by a laboratory certified by the DWS or the EPA. The cost of the bacteriological testing(s) is to be paid by the Contractor. If positive results are obtained, the system shall be disinfected again by the Contractor, at their own expense. Bacteriological samples will again be collected in the presence of the City or City Engineer and resubmitted for testing. This shall be repeated until negative results are obtained. The method of disinfecting and the chlorination materials used are subject to the approval of the City or City Engineer. Disinfection by introducing granular or tablet chlorine compounds in each pipe length is not an acceptable method of disinfection.

4. The results of all bacteriological tests shall be submitted to the City or City Engineer. No section of pipe shall be placed into service until acceptable bacteriological tests have been obtained.

5. Disposal of any water containing chlorine shall be performed in accordance with AWWA C651, Section 4.5.2, and any other local requirements. Disposal may be made into existing sanitary sewer systems providing approvals are obtained from the respective sewerage agency. Any chlorinated water discharged to open stream channels must be dechlorinated prior to discharge.

3.23 Restoration, Finishing, and Cleanup

A. The Contractor shall restore or replace all paved surfaces, graveled surfaces, curbing, sidewalks, trees, shrubbery, lawns, pastures, fences, and other existing facilities equal to their original condition.

B. All surplus material and temporary structures as well as excess excavation shall be removed and the entire Site of Contractor operations shall be left in a neat and clean condition.

C. Also see Technical Specifications - "Excavation and Backfill of Trenches" and Technical Specifications - "Surface Restoration" for specific requirements.

CITY OF BOARDMAN, OREGON

TECHNICAL SPECIFICATIONS

SECTION 1

WATER LINES

END OF SECTION

TEST WORKSHEET FOR THE

WATER LINES - LEAKAGE TEST

Project Name _____

Date _____ Job No. _____

Location of Test/Stationing _____

_____

Hydrostatic Test

Test Pressure _____

Time Test Started _____

Time Test Completed _____

TOTAL TIME _____ minutes

Test Passed ☐ Yes ☐ No

Leakage Test (Min. Test Pressure 100 psi)

PVC Pipe: $L = \frac{ND\sqrt{P}}{7,400}$ DI Pipe: $L = \frac{SD\sqrt{P}}{133,200}$

In which:

L = Allowable Leakage Gal/Hr
S = Length of Pipe Tested in Ft.
N = Number of Joints or Connections
D = Nominal Diameter in Inches
P = Gauge Pressure in psi

Allowable Leakage

Pipe Section	Nominal Diameter	Number of Joints or Connections	Length of Pipe	Allowable Leakage

Total Allowable Leakage _____ gal/hr

Time Test Started _____ Total Leakage Measured _____gal.

Time Test Completed _____ Total Leakage Measured/Gal=_____ gal/hr

TOTAL TIME _____mins. _____Time (hr.)

Test Passed ☐ Yes ☐ No

Contractor's Firm Name: _____

_____

Contractor's Representative Signature _____

Engineer's Representative Signature _____

Note: See Technical Specifications for directions of use.

SANITARY SEWER LINES

CITY OF BOARDMAN, OREGON

TABLE OF CONTENTS

SECTION 2

SANITARY SEWER LINES

CITY OF BOARDMAN, OREGON

TECHNICAL SPECIFICATIONS

SECTION 2

SANITARY SEWER LINES

PART 1 - GENERAL

1.1 Scope

A. These Specifications cover the furnishing and installation of gravity sewer lines, pressure sewer lines, service lines, irrigation lines, manholes, cleanouts, and miscellaneous appurtenances. The Work includes, unless otherwise specified, furnishing all labor, materials, tools, equipment, and incidentals required to construct a complete sewer system ready for service. Requirements for excavation and backfill of trenches, surface restoration, traffic control, and special appurtenances are specified under separate sections.

B. Items included in this Technical Specification are intended to be broad in scope and may not always apply to all items of Work to be constructed.

C. The Contractor shall furnish and install pressure sewer lines of the type and class indicated in the following Specifications. These Specifications cover all buried pressurized sewer lines.

1.2 Specifications References

Specification references made herein for manufactured materials such as pipe, fittings, and manhole rings and covers refer to designations for the American Public Works Association (APWA), the American Water Works Association (AWWA), or the American Society for Testing and Materials (ASTM) as they are effective on the date of call for Bids.

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 a sewerage 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.

B. All pipe, fittings, manhole components, and valves 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, valves, and all other materials used in the construction of the sewerage 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.

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 sewage system materials be dropped or dumped into the trenches.

1.4 Certification by Manufacturer

The Contractor shall furnish to the City, when required by 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.

1.5 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 - "Excavation and Backfill of Trenches" and Technical Specifications - "Surface Restoration" for specific requirements.

PART 2 - MATERIALS

2.1 Pipe

A. General

Where no specific type of pipe is called for, the Contractor may select any type listed herein. Once a particular type of pipe is selected, the Contractor shall use that type for all pipe of the same diameter. Where a specific type of pipe is specified, the Contractor shall conform to those requirements. Such pipe shall also conform to the appropriate pipe specifications.

B. PVC Gravity Pipe

PVC gravity sewer pipe and fittings 15-inch diameter and smaller shall conform to ASTM D3034, SDR 35 unless called for otherwise on the Drawings. Pipes 18-inch

diameter to 24-inch diameter shall conform to ASTM F679 unless called for otherwise on the Drawings. The joints shall be flexible joint with rubber ring gasket.

C. PVC Pressure Pipe

1. PVC pipe for pressure sewer lines shall conform to AWWA C900, DR 18 (235 psi pipe), or as otherwise specified. The pipe shall have flexible rubber gasketed joints conforming to ASTM D3139 and ASTM F477. Pipe color shall be green.

2. Class 160 PVC pipe for pressure sewer lines shall conform to ASTM D2241, SDR 26. The pipe shall have flexible rubber gasketed joints conforming to ASTM D3139 and ASTM F477 except where solvent weld joints are specifically called for on the Drawings. Pipe color shall be green.

D. Ductile Iron Pipe

1. Ductile iron pipe and fittings shall conform to AWWA C150, AWWA C115, AWWA C151, AWWA C153, and AWWA C110 and shall be minimum pressure Class 350 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.

2. When flanged pipe is required, the Contractor shall provide the D.I. pipe class required by the flange manufacturer to ensure the pipe and flange units are compatible. This data shall be provided to the City for review prior to ordering these materials. Flanges for couplings and fittings shall conform to ANSI 16.1, 125-pound bolt hole template.

E. High Density Polyethylene Pressure Pipe

1. High density polyethylene pipe shall conform to AWWA C906 and shall have the SDR requirements called for by the Project Engineer. All joints shall be by the heat fusion method in accordance with the manufacturer's requirements.

2. Fittings shall be standard commercial products manufactured by injection molding or by extrusion and machining or fabricated from AWWA C906 pipe.

3. The Contractor shall provide detailed Shop Drawings for all joints and connections, including provisions for expansion and contraction as recommended by the pipe manufacturer.

2.2 Fittings

A. Fittings for Iron and PVC Pipe

Unless specified otherwise, all fittings such as elbows, tees, crosses, etc., shall be mechanical joint short-bodied compact ductile iron fittings conforming to AWWA C153, Class 350. When called for, flanged cast iron fittings shall conform to AWWA C110 with ANSI B16.1, 125-pound bolt hole template. All fittings shall be cement mortar lined in accordance with AWWA C104. Gaskets for flanges shall be either ring or full faced, 1/8 inch thick conforming to AWWA C111, Appendix B.

B. Fittings for Sewer Service Connection

Main line fittings for sewer service connections when installing new gravity sewer pipe shall be a gasketed tee suitable for ASTM D3034 or ASTM F679 sewer pipe. When service connections are required on existing sewer lines, a sewer tapping saddle shall be used, such as "Geneco Sealtite," of the type and model required to match the sewer main line and service line pipe materials, or approved equal.

C. Gravity Sewer Couplings

Gravity sewer couplings shall have stainless steel shear rings of the size and style required to match the pipe size and type being utilized. Couplings shall be manufactured by Fernco with stainless steel shear rings or approved equal.

D. Restrained Push-on Joint Pipe

When restrained joint ductile iron pipe is required, the pipe shall be the same class and type as the ductile iron pipe specified herein. Joints shall be Tyton Joint with Field Lok 350 gaskets, or approved equal. The restraint shall be boltless, integral restraining system, rated for 350 psi in accordance with the performance requirements of ANSI/AWWA C111/A21.11.

E. Restrained Fittings

All mechanical joint fittings called out to be restrained shall be equipped with a MEGALUG Series 1100 mechanical joint restraint system as manufactured by EBAA Iron, Inc., or approved equal.

2.3 Valves and Appurtenances

A. Gate Valves

1. Gate valves 2 inches and larger shall conform to AWWA C509. Valves shall be designed for 200 psi minimum working pressure and shall be of iron body, resilient seat, non-rising stem construction. Valves shall be equipped with O-ring type packing. The valve shall have a 2-inch AWWA operating nut for buried service.

2. The valve ends shall be of the type required to match the pipe to which they will be connected.

3. Valves shall be resilient seated Kennedy KSRW or KSFW, M&H Style 4067 or 7000, Clow, or equal.

B. Plug Valves

1. All plug valves shall conform to AWWA C504. The valve body shall be constructed of cast iron (semi-steel) conforming to ASTM A126 Class B and shall be protected with a factory-applied fusion-bonded coating meeting AWWA C550. The shaft and plug shall be integrally constructed of cast iron (semi-steel) and shall be 100 percent encapsulated with Buna N rubber. The stem seals shall be Buna N multiple "V" ring stem packing seals. The valve seat surface shall be raised welded-in overlay of not less than 90 percent nickel.

2. Flange dimensions, facing, and drilling shall conform to ANSI B16.1, Class 125. Mechanical joints shall meet the requirements of AWWA C111/ANSI A21.11.

3. The valve shall have a 2-inch AWWA operator nut for buried services and hand wheel operator for non-buried services or as called for on the Drawings. Worm gear operators shall be furnished for all 4-inch or larger valves.

4. Valves shall be M&H 1820 eccentric plug valves, Pratt Ballcentric plug valves, or approved equal.

C. Valve Boxes

Each valve shall be equipped with an adjustable cast iron box of the sliding type with a base large enough to cover the top casting of the valve. The diameter of the valve box

shall be not less than five (5) inches, and shall be of such length so as to provide the depth of cover over the pipe without full extension. Materials and installation workmanship for valve boxes shall be in accordance with AWWA C600, Section 10.3.

D. Sewage Air Release Valve

1. Air release valves where called for shall generally be Valve and Primer Corporation, #400 APCO Sewage Air Release Valve and/or #401 APCO Sewage Air and Vacuum Valve with 2-inch inlet or approved equal. An auxiliary 2-inch 125 psi bronze rising stem solid disc gate valve shall be installed with all sewage air release valves.

2. Air release valves shall be sized and installed per the manufacturer's recommendations and be furnished with accessory valves and connections (for flushing purposes).

2.4 Thrust and Anchor Blocks

Thrust and anchor blocks shall be located and sized as shown on the City Standard Drawings, and at all changes in direction, or as required by the City. Concrete used for the blocks shall be Portland Cement concrete with a minimum 28-day strength of 2,500 psi. All concrete shall be placed so that pipe joints and fittings will be accessible for repair. Concrete shall be placed against undisturbed material. Anchor rods shall be 3/4-inch diameter galvanized steel, embedded a minimum of 18 inches in concrete.

2.5 Manholes

A. Cast-in-place Concrete Base Sections

1. Cast-in-place concrete base sections for manhole construction shall have a minimum 28-day strength of 3,000 psi and shall not be less than 6 inches in thickness in any section.

2. Required "U" shaped channels shall be constructed by the use of properly shaped forms. Intersecting flow channels shall have smooth uniform transitions. All channels shall have smooth troweled finishes. All shelf area shall be uniformly shaped, have a rough float finish and shall slightly slope towards the channel. The shelf shall be above the top of the sewer pipe.

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

B. Precast Concrete Base Sections

1. Precast concrete base sections shall be approved by the City or City Engineer and shall conform to ASTM C478. Concrete shall be consolidated by mechanical vibration. Reinforcing shall be provided in the base and walls. Minimum concrete thickness shall be 5 inches unless otherwise required for deep manholes.

2. Required "U" shaped channels shall be constructed by the use of properly shaped forms. Intersecting flow channels shall have smooth uniform transitions. All channels shall have smooth troweled finishes. All shelf area shall be uniformly shaped, have a rough float finish and shall slightly slope towards the channel. The shelf shall be above the top of the sewer pipe.

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

C. Precast Concrete Manhole Sections

1. Precast concrete manhole sections shall conform to ASTM C478 and consist of circular sections in the standard 48-inch diameter, unless otherwise noted. 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. All lift holes shall be patched to prevent water seepage into the manhole, utilizing an approved, non-shrink grout.

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

3. Flat slab covers for manholes shall conform to ASTM C478. Slabs, cones and ring sections shall be free from fractures, cracks, rock pockets, or exposed reinforcement. Joint seal material shall be "Kent seal" mastic acrylic polymeric sealant, O-ring rubber gasket, or approved equal.

4. Manholes which have a depth of 5-1/2 feet or less, from the top of the manhole cover to the pipe invert, shall utilize a 48-inch diameter section and flat slab cover. Cone sections shall not be used for manholes less than 5-1/2 feet in

depth, unless approved by the City or City Engineer. Manholes with a flat slab cover may be required for depths greater than 5-1/2 feet.

D. Pipe Connection to Manholes

1. All pipe connections to manholes shall be constructed as shown on the Drawings, shall be flexible, and shall allow movement of the sewer pipe in all directions. Manhole pipe couplings shall be suitable for the sewer pipe type connecting to the manhole.

2. A-Lok field sleeve, or approved equal, may be used for cast-in-place manhole bases.

3. When precast base sections are used, an A-Lok pipe connector as manufactured by A-Lok Products, Inc., PSX 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.

4. Fittings for drop manholes shall be of the same material as the attached sewer pipe.

E. Manhole Rings and Covers

1. Castings shall be tough, close-grained, gray iron free from blow holes, shrinkage and cold sheets.

2. Manhole rings and covers shall conform to ASTM A48 and shall be smooth, sound, clean and free from blisters and defects. Castings and covers shall be planed and ground when necessary to insure flat and true surfaces. Covers shall be true and shall seat within the ring at all points.

3. Manhole rings and covers shall be EJ No. 00260111 frame with 00260325 cover, 23-inch minimum opening, no hole cover, blind pickhole, or approved equal.

4. When watertight cover is called for on the Drawings, an EJ No. 00260325 bolted and gasketed assembly with watertight cover shall be provided, or equal. Provide 2 extra gaskets for each watertight cover furnished.

F. Manhole Inflow Protectors

1. The watertight manhole inflow protectors shall be manufactured of a plastic polymer that will not corrode, cannot be damaged by sewer gases or road oils, and will not become brittle in subfreezing temperatures. They shall have a spring loaded gas relief valve automatically activated at approximately 1/2 psi and a vacuum relief valve automatically activated when the differential pressure reaches approximately 2-1/4 psi.

2. The bowl shall be deep enough that the valves or the protector are not damaged during the removal of the lid. The gasket shall be a heat welded type that conforms to the irregularities in the frame.

3. The watertight manhole insert shall be Sewer Guard by Fosroc-Preco Industries, Ltd., or approved equal.

4. The Contractor shall be responsible for measurement of manhole openings, the dimension of which is required for ordering of watertight manhole inserts. New covers to have manhole inserts shall be factory machined to accept the insert.

G. Manhole Stubouts

1. Manhole stubouts shall be constructed per the City Standard Drawings or as directed by the City. The stubouts shall have the appropriate flexible connection at the manhole.

2. The outside end of the stubout shall be secured, sealed watertight with a block and plug with rubber ring seal.

3. All stubouts shall be 8-inch unless otherwise approved or shown.

H. Pressure Sewer Discharge Manholes

The Contractor shall construct the Pressure Sewer Discharge Manholes as shown on the Drawings and also in accordance with the Specifications herein for standard manholes.

2.6 Cleanouts

A. Cast Iron Rings and Covers

Main line cleanouts shall have cast iron rings and covers such as EJ No. 00367101, for 8-inch riser pipes, and EJ No. 3671 for 6-inch riser pipes, or approved equal. Service line cleanouts shall have cast iron rings and covers such as EJ No. 00367101 or approved equal.

B. Pipe

Pipe used in the construction of cleanouts shall be consistent with type of sewer pipe to which it is connected.

2.7 Locating Wire

A. Locating wire shall be a minimum of 12 awg UF solid copper with green colored insulation. The use of THHN wire will not be acceptable.

B. At all splices the connecting ends of the wires shall be overlapped and tied. The ends shall be stripped and connected with a wire nut to ensure an electrical connection and made waterproof with an approved splice kit such as 3M splice kit DBR/Y-6 or approved equal.

C. Where location wire is to be secured to exterior of manhole cleanouts, valve boxes, etc., stainless steel pipe straps shall be used.

PART 3 - EXECUTION

3.1 Gravity Sewer Construction

A. Trench Excavation and Backfill

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

B. Installation of Pipe

1. Gravity sewer pipe shall be installed in accordance with the best current practices and as required by the manufacturer. Gravity sewer pipe, unless otherwise approved by the City or City Engineer, shall be laid by progressing up

grade from the existing or newly constructed sewer; the sewer 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 rubber ring joints shall be lubricated, except when using rolling rubber gaskets with concrete pipe, and installed in accordance with the installation instructions of the pipe manufacturer, taking particular care to avoid pinching or otherwise causing damage to the rubber ring. All joints shall be free of dirt and other foreign matter prior to the joining of the next pipe. All pipe shall be installed 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 sewer pipe shall be installed with the use of a laser beam and target. Unless the Work involves deep excavations, traffic problems, water problems, or approved by the City, the trench for the first 100 feet shall not be backfilled until the sewer 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 laser shall be the responsibility of the Contractor. All pipe shall be installed true to line and grade. A tolerance of plus or minus 1/4 inch deviation from true grade at each joint will be allowed. Extra care shall be given to the installation of sewer lines at minimum slopes to avoid flat slopes in the line. All pipe shall be installed true to line. The Contractor may not install a pipeline on a curve.

4. 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 in water or 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 and whenever the Work is not supervised.

5. The Contractor may elect, at their own option, to drain or pump groundwater from the trenches into previously placed new sewer lines as long as adequate disposal is provided. The Contractor shall not discharge any groundwater into existing live sewer lines. Adequate provisions shall be made by the Contractor for final disposal of the groundwater from trenches as approved by the City. Any

water discharged into new sewer lines shall be properly screened to prevent the entrance of debris and gravel. At the termination of dewatering operations the Contractor shall thoroughly clean the sewer lines that were used. No sewer lines will be accepted as completed until being cleaned as approved by the City.

6. All pipe/manhole connections shall be watertight. The manhole pipe couplings shall be installed in accordance with all manufacturer instructions. All connections shall match the grade and alignment of the pipe entering and exiting each manhole. Manhole pipe connections shall be constructed so that the wastewater flow through the manhole is not restricted in any way.

3.2 Gravity Service Lines

A. Gravity service lines shall be constructed in accordance with the Specifications and applicable provisions of the International Plumbing Code (IPC) as amended by the State. The minimum slope of service lines shall be 1/4-inch per foot unless otherwise approved by the City. The pipe size of gravity service lines shall be a minimum 4-inch diameter unless otherwise specified. The Contractor shall end gravity service lines at the location and at the invert provided or as set by the City. Dead ends of service lines shall be marked as shown on the City Standard Drawings.

B. Connection of service lines to new or existing gravity sewer main lines shall be as per the City Standard Drawings and shall be inspected and accepted by the City prior to backfilling. All sewer service connections shall be watertight utilizing appropriate sewer service saddles or wyes. An approved tee fitting shall be used when new sewer mains are being installed. All holes and taps into an existing sewer main shall be cut using an approved tapping machine.

C. In the construction of new sewage collection systems, connection of new services allowing sewage into the system shall not be made until approval for connections has been given by the City. No existing sewer service shall be interrupted without the approval of the City. Connections of new service lines to existing service lines shall be by the proper adaptor coupling.

D. The Contractor shall obtain all necessary permits required to construct service lines on private property. The Contractor must utilize a licensed plumber for service line work on private property when required by state or local regulations.

3.3 Gravity Sewer Testing

A. General

The Contractor shall furnish all labor, necessary equipment, and other apparatus including, but not limited to, gauges, mechanical or pneumatic plugs, and air hoses, necessary to properly perform the testing of sewer lines as specified. The Contractor may low pressure test sections of sewer lines before backfilling at their own option; but the acceptance test shall be performed only after backfilling, cleaning, and flushing has been completed.

B. Acceptance Test

The Contractor shall perform all preliminary testing required to determine that the lines to be tested are acceptable and comply with the requirements of this section of the Specifications. After the Contractor has determined that the lines will pass the required test, the Contractor shall arrange for an acceptance test to be witnessed by the City. The lines will not be accepted until the acceptance test has been witnessed and documented as passing.

C. Test Procedure

The method of testing follows the procedures outlined in the Oregon Standard Specifications for Construction, Part 00400, Section 00445.72(c), current edition. All air testing shall be by the Time Pressure Drop Method. Specific questions concerning test procedures may be referred to this publication. To facilitate test verification by the City, all air used shall pass through a single, above-ground control panel. The pressure gauge used in air testing shall have minimum divisions of 0.10 psi and have an accuracy of 0.0625 psi (one ounce per square inch). The City shall have the option of requiring the use of their own gauge. Test procedures are summarized below:

1. Field Test

    a. The Contractor may wet the lines prior to testing.

    b. Determine the average height of the groundwater over the line. The test pressures required shall be increased 0.433 psi for each foot of average water depth over the exterior crown of the pipe, but no greater than 9.0 psig.

c. Add air slowly to the section of system being tested until the internal air pressure is raised to 4.0 psig greater than the average back pressure due to groundwater.

d. After the test pressure is reached, allow at least two minutes for the air temperature to stabilize adding only the amount of air required to maintain pressure.

e. After the temperature stabilization period, disconnect the air supply.

f. Record the time in seconds that is required for the internal air pressure to drop from 3.5 psig to 2.5 psig greater than the average back pressure due to groundwater.

g. Compare the time recorded in the above step with the test time determined hereafter.

2. Acceptance

a. Record the diameter in inches and the length in feet of all pipe in the section to be tested, including the service connections on the worksheet found at the end of Technical Specifications – "Sanitary Sewer Lines."

b. Using the nomograph (Figure No. 1) found at the end of Technical Specifications – "Sanitary Sewer Lines," place a straightedge from the "d" column (diameter in inches) to the "L" column (length in feet). Read the corresponding "K" and "C" values for each of the pipes listed above, and record them on the worksheet.

c. Add all values of "K" and all values of "C" for the section being tested.

d. If the total of all the "C" values is less than one, the time shall be the total of all the "K" values.

e. If the total of all the "C" values is greater than one, the time shall be found by dividing the total of all the "K" values by the total of all the "C" values. The result is the maximum test time. To make this division using the nomograph (Figure No. 1), use the total "C" and "K" values and read the time from the "tq" scale.

f. In the event that the "d" and "L" values for a particular section of the system do not fall within the limits of the nomograph, the values of "K" and "C" may be computed from the following equations: "K" = 0.011d2L; "C" = 0.0003882dL.

3. If the "actual time" (field test) is equal to or greater than the "test time" required for the pipe section being tested, the pipe section will have passed the pressure test. (See worksheet.)

D. Infiltration Allowance

Groundwater infiltration to the collection system, including manholes, shall not exceed 50 gallons/inch diameter of pipe/mile/day. Any infiltration in excess of this amount shall be corrected at the Contractor's expense.

E. Deflection Test for PVC Pipe

1. All sanitary sewers constructed of PVC pipe shall be able to pass a deflection test. The test shall be conducted by pulling a go-nogo solid pointed mandrel or sewer ball through the completed pipeline. The diameter of the mandrel or ball shall not be less than 95 percent of the base inside pipe diameter as defined by ASTM D3034, SDR 35 and ASTM F679, T-1 pipe. The base inside pipe diameter and minimum mandrel diameter are as follows:

Nominal Pipe Size, In.	Minimum Mandrel Dia., In.	Base Inside Pipe Dia., In.
6"	5.46	5.742
8"	7.28	7.665
10"	9.08	9.568
12"	10.79	11.361
15"	13.20	13.898
18"	16.13	16.970
21"	19.00	20.004
24"	21.36	22.480
27"	24.06	25.327

2. All lines shall be tested unless determined otherwise by the City based upon their observations during pipeline installation and visual inspection of the pipeline. Testing shall be conducted on a 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. All areas failing the deflection test shall be retested after corrective action has been taken.

F. Equipment

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

3.4 Pressure Sewer Construction

A. Pipeline

1. The Contractor shall construct pressure sewer lines of the size, type, and class as specified. Pipe shall meet the material specifications contained herein. All Work performed in the installation of pressure sewer lines shall be performed as per the applicable portions of subsection "Gravity Sewers-Construction" contained herein and as required by the manufacturer. When it is necessary to deflect pipe joints to conform to the profile and alignment of the sewage forcemain, the amount of deflection per joint shall not exceed 70 percent of the deflection recommended by the Manufacturer. All pressure sewer lines shall be installed to grade as provided or as approved by the City.

2. Installation of service line pipe shall be in accordance with the applicable requirements contained herein. The Contractor shall end pressure service lines at the location and at the invert elevation as provided or as approved by the City. Dead ends of service lines shall be marked as shown on the City Standard Drawings.

3. In the construction of new sewage collection systems, connection of new services allowing sewage into the system shall not be made until approval for connections has been given by the City. No existing sewer service shall be interrupted without the approval of the City.

4. The Contractor shall obtain all necessary permits required to construct service lines on private property.

B. Testing

1. General

The Contractor shall be responsible for determining the length of any given section of line to be tested. It is recommended that the length of line to be tested not be excessive so that the identification of any problem areas can be readily made. It is also recommended that testing follow closely after the pipe installation and backfill.

2. Hydrostatic Testing of Pressure Sewer Lines

a. Before being placed into service, each section of the lines shall be isolated and slowly filled with water. Air should be expelled from the lines through taps made at the high points. The Contractor shall be responsible for making any necessary taps.

b. All lines shall be pressure tested by the Contractor at 100 psi pressure, at the lowest pipe elevation, for one hour. Any cracked or defective pipe or fitting shall be removed and replaced.

3. Leakage Test

a. Each section of the line before being placed into service shall be tested by the Contractor for leakage for a period of two hours at an average gage pressure of 60 psi. The pressure during the test shall not fall below 40 psi. The allowable leakage is defined by the following equation: $L=ND(P)^{0.5}/7400$ in which L = allowable leakage (gal/hr), N = number of joints or connections, D = nominal diameter in inches, P = average gage pressure during the test in psi.

b. Leakage is defined as the quantity of water supplied into the section of line being tested, during and at the end of the test, that quantity being such that the pressure at the end of the test is equal to the pressure at the beginning of the test.

c. Should any test disclose leakage greater than that specified, the Contractor shall locate and repair the defective joints until the leakage is within the specified allowance.

4. Equipment

The Contractor shall perform and provide all equipment and materials necessary to perform the required test.

3.5 Manhole Construction

A. Installation

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

2. The manhole base section shall be carefully placed on a prepared base of 6-inch minimum deep crushed rock so as to be fully and uniformly supported in true alignment, and making sure that all entering pipes can be inserted on proper grade.

3. All connections and joints made at manholes shall be watertight. All manholes are to be watertight and any leakage shall be corrected in an approved manner.

B. Testing

1. The Contractor shall be responsible for providing all equipment, labor, and materials necessary for performing manhole testing.

2. All manholes shall be individually tested to verify their watertightness. Each manhole shall be tested for acceptance after all Work has been completed, including restoration work. Preliminary testing prior to final acceptance is advised.

3. The testing shall be by a vacuum test in conformance with ASTM C1244 "Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test." All manholes must be watertight. Any points of leakage must be repaired by the Contractor, even if the manhole passed the vacuum test.

4. The vacuum test shall generally follow the following procedures:

   a. All pipes entering the manhole shall be temporarily plugged, taking care to securely brace the pipes and plugs to prevent them from being drawn into the manhole.

   b. The test head shall be placed at the top of the manhole in accordance with the manufacturer's recommendations.

   c. A vacuum of 10 inches of mercury shall be drawn on the manhole, the valve on the vacuum line of the test head closed, and the vacuum pump shut off. The time shall be measured for the vacuum to drop to 9 inches of mercury.

   d. The manhole shall pass if the time for the vacuum reading to drop from 10 inches of mercury to 9 inches of mercury meets or exceeds the values indicated in Table 1.

   e. If the manhole fails the initial test, necessary repairs shall be made by an approved method. The manhole shall then be retested until a satisfactory test is obtained.

   f. The results of the manhole test shall be reported on the "Attachment B - Manhole Test Record" form, a copy of which is located at the end of this section. The Contractor shall complete this form and provide it to the City prior to Substantial Completion.

TABLE 1 - Minimum Test Times for Various Manhole Diameters

Depth (ft.)	Diameter, inches								
	30	33	36	42	48	54	60	66	72
	Time, seconds								
≤ 8	11	12	14	17	20	23	26	29	33
10	14	15	18	21	25	29	33	36	41
12	17	18	21	25	30	35	39	43	49
14	20	21	25	30	35	41	46	51	57
16	22	24	39	34	40	46	52	58	67
18	25	27	32	38	45	52	59	65	73

20	28	30	35	42	50	53	65	72	81
22	31	33	39	46	55	64	72	79	89
24	33	36	42	51	59	64	78	87	97
26	36	39	46	55	64	75	85	94	105
28	39	42	49	59	69	81	91	101	113
30	42	45	53	63	74	87	98	108	121

C. Connection to Existing Manhole

1. Connections to existing manholes 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 manhole watertight.

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

3. An approved bonding agent shall be used on all existing surfaces to be bonded to new concrete or mortar. All applicable conditions for new manholes described previously shall apply.

3.6 Cleanout Construction

A. Main Line Cleanouts

Main line cleanouts shall be constructed as shown on the City Standard Drawings. The select backfill shall be carefully compacted around the cleanout riser pipe to prevent damage or displacement of the pipe.

B. Service Line Cleanouts

Service line cleanouts in public rights-of-way shall be constructed as per the City Standard Drawings and approved by the City. Service line cleanouts on private property shall be constructed in accordance with the Uniform Plumbing Code.

C. Testing

Cleanouts shall be tested as a part of the lines to which they are connected.

3.7 Water-Sewer Crossing

A. Wherever possible, the bottom of new or existing water lines shall be 1.5 feet or more above the top of the sanitary sewer line. Where the water line crosses over the sanitary sewer line but with a clearance of less than 1.5 feet, the Contractor shall center one full length of the new sewer pipe at the crossing point. Use PVC pressure pipe, ASTM D2241, SDR 32.5, (125 psi) at the crossing point. Where the water line crosses under the sanitary sewer line, the Contractor shall center one full length of the new sewer pipe at the crossing point.

B. If the City determines that conditions are not favorable or finds evidence of poor water line condition, the existing water line shall be replaced with a full length of water pipe centered at the crossing point.

C. When constructing sewer service lines, the City may require the depth of the service lines to be revised in order to eliminate the need for a water-sewer line crossing.

3.8 Locating Wire

A. A continuous solid copper tracer or locating wire shall be taped along the top of all pressure sewer lines, including service lines. This wire shall be secured to the top of the pipe at maximum 10-foot intervals using 6-inch strips of 2-inch wide duct tape. All splices shall be tied, electrically continuous, and made waterproof.

B. The location wire shall be brought to the surface at all valve boxes, cleanouts, and terminal line marker fence posts. The wire shall be secured to valve boxes, cleanouts, and posts with stainless steel pipe clamps.

C. Access to terminal ends of the locating wire shall be made at all manholes, cleanouts, valve boxes, terminal line marker posts, etc. The result of this installation shall be a continuous wire circuit electrically isolated from ground.

D. The Contractor shall be responsible for testing continuity and for testing isolation from ground in the wire after all Work has been completed on the test section. The Contractor is advised to do intermediate testing on their own after backfilling operations and prior to surface restoration work to be sure continuity is maintained. If there is a break or defect in the wire, it shall be the Contractor's responsibility to locate and repair the defect.

E. The continuity of the location wire shall be tested from one test load point to the next by use of a temporary wire laid between test points in-line with an ohmmeter.

Resistance shall be measured with an approved ohmmeter that has been properly calibrated. The continuity of a test section will be accepted if the resistance of the test section does not exceed 5 ohms per 500 feet of location wire being tested. Isolation from ground shall be measured with a megohm meter and shall be a minimum of 20 megohms for any section of location wire tested.

F. The City shall witness the acceptance test.

3.9 Cleaning and Flushing of Completed and Tested Sewers

A. Prior to final inspection of the sewer 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 sewer system at or near the closest downstream manhole. If necessary, mechanical rodding or bucketing equipment shall be used.

B. All sewer pipes including gravity sewers, pressure sewer lines, service lines, etc., installed shall be flushed, as thoroughly as possible with the water pressure and outlets available. Flushing shall be done after the pressure test has been made. 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 sewers during construction. The Contractor shall provide sufficient water and appropriately sized taps at either end of the line to develop a velocity in the sewers during flushing of at least 2.5 fps.

3.10 Sewer Line Cleaning and Inspection

A. Television Inspection

1. All gravity sewer lines shall be visually inspected by means of closed circuit television. The purpose of the television inspection is to inspect the interior of select runs of gravity sewer line to determine the general quality of pipeline installation.

2. All sections designated by the City and/or City Engineer to be TV inspected shall be cleaned sufficiently to allow passage of TV equipment and so that cracked joints and breaks can best be observed. Cleaning shall be by high pressure flushing or as approved by the City. New sewer lines that are to be TV inspected shall be flushed with water two hours prior to the TV inspection work. During the TV inspection the Contractor shall maintain a small flow of water in the pipeline in order to observe high or low areas in the grade of the pipe.

3. The television camera used for the inspection shall be one specifically designed and constructed for such inspections. The camera shall be self-propelled, with a remote control rotating head type capable of "looking up" service line connections and also capable of 360° scanning of pipeline joints. It shall be operative in 100 percent humidity conditions. Lighting and camera quality shall be suitable to allow a clear, in-focus picture of a minimum of 6 lineal feet of the entire inside periphery of the sewer pipe. The camera shall be color with standard broadcast quality or better. To ensure peak picture quality throughout all conditions encountered during the inspection, a variable intensity control of the camera lights and remote control adjustments for focus shall be located at the monitoring station. Focal distance shall be adjustable through a range of 6 inches to infinity. Monitors shall have good quality resolution. Continuously displayed on the monitors as part of the video presentation shall be the date of the inspection, number designation of the manhole section being inspected, and a continuous forward and reverse readout of the camera distance in feet from the manhole of reference. The ability to change the location of this readout on the picture is a desirable feature.

4. The operating technician shall have control of the movement of the television camera at all times. This may be accomplished by means of remote control winches or by telephone or other suitable means of communications between the winches at either end of the manhole section being inspected. The travel speed of the camera shall be uniform and shall not exceed 30 feet per minute. Any means of propelling the camera through the sewer which would exceed this rate of speed or produce non-uniform or jerky movements shall not be acceptable. At the Contractor's discretion or at the direction of the City, the camera shall be stopped and backed up to view and analyze conditions that appear unusual or uncommon to a good sound sewer. The operating technician shall at all times be able to move the camera through the line in either direction without loss of quality in the video presentation on the monitor. The picture at all times shall be free of electrical interference and provide a clear, stable image of the resolutions specified.

5. Video recording of all sewer line inspections shall be provided to the City on a thumb drive. The composite video and audio recordings of the sewer line inspections shall be compatible for replay on a computer. The replay of the recorded video information, when reviewed on a monitor receiver, shall be free of electrical interference and provide a clear, stable image. The audio portion of the composite signal shall be sufficiently free from electrical interference and

background noise to provide complete intelligibility of the oral report. Audio reports shall be recorded by the operating technician on the video as they are being produced and shall include the location of the sewer, the names or numbers of the manholes involved, a manhole-to-manhole direction of travel, and a detailed description of the conditions in the sewer line as they are encountered.

6. The video recording and the monitoring equipment shall have the capability to instantly review both video and audio quality of the productions at all times during the television inspection. The television inspection thumb drive shall become the property of the City upon completion of the project.

7. Detailed printed location records shall be made by the operating technician and shall clearly show the exact location in relation to the adjacent manholes of each infiltration point, building sewer connections, all joints which are infiltrating or exhibit other unusual conditions, roots, storm sewer connections, collapsed sections of pipe, joints sealed, presence of scale or corrosion, and other discernible features. Handwritten reports shall be submitted to the City daily. Within 20 days of completion of the initial TV inspection work, the inspection report forms shall be typewritten and submitted to the City for review. The video shall be properly indexed to the written reports using real time and an index to the written reports shall be provided which indexes each sewer line section (between manholes) to the reports. The intent is to enable a user of the report to easily find any given section of the sewer system in the reports and on the video. Prior to commencing work, the Contractor shall provide the City a sample of the proposed report format to be used by the Contractor. The City and Contractor shall agree on the report format before work proceeds. All reports shall be complete and accurate.

B. Necessary Repairs

If in the opinion of the City, after TV inspection, the sewer lines in question require repair and/or replacement to meet the Specifications, the Contractor shall be required to perform all necessary repairs and replacement. It shall be understood that any necessary repairs required will have been the result of poor construction or defective materials.

C. Inspection of Lines

Supplemental to the video inspection shall be the inspection of lines by excavation at suspected joints, etc. If, in the opinion of the City, a line is suspected to have excess infiltration, the City may require the Contractor to excavate down to the joint(s) in question. The Contractor is responsible only for those lines or parts thereof they actually constructed. If any joints or pipes are found to be defective in that portion the Contractor constructed, the Contractor alone shall bear the cost of locating, excavation, and replacing or repairing the defective pipe or joints in a line. If no defects are found in a suspect line, the City shall bear the justifiable costs incurred in the search for infiltration defects.

3.11 Work with Existing Asbestos Cement (A/C) Pipe

A. When working with A/C pipe, the Contractor shall take all precautions necessary to reduce airborne asbestos during construction. The Contractor will be required to contact the Oregon Department of Environmental Quality (DEQ), file an ASN 6 notification form, and follow Oregon Administrative Rules (OAR) 340-248, Asbestos Requirements. The Contractor may initiate consultation with the Occupational Safety and Health Administration (OSHA) prior to construction, if necessary. Any work to be performed on existing A/C pipe shall be completed in accordance with American Water Works Association Guidelines and DEQ guidance document, "How to Remove Nonfriable Asbestos Cement Pipe" and OSHA requirements.

B. The Contractor shall cut asbestos cement pipe by using snap cutters only. The use of carbide-tipped cutting blades or high speed, abrasive disks shall not be permitted as a means of cutting A/C pipe snap cutters. Machining of this pipe shall be done with a manual or power-driven field lathe, or with a manual rasp.

C. Hole cutting shall be accomplished with a tapping machine. Use of shell cutters, rasps, chisels, electric drills, right angle sanders, or other high speed abrasive tools shall not be permitted. Uncoupling of asbestos cement pipe shall be accomplished with a hammer and chisel. Use of abrasive disc cutters, right angle sanders, or other high speed abrasive tools shall not be permitted.

D. Dust and cuttings from all work shall be removed by wet mopping.

E. All waste material shall be collected in a covered container and disposed at a landfill certified by the state or EPA to accept demolition waste.

CITY OF BOARDMAN, OREGON

TECHNICAL SPECIFICATIONS

SECTION 2

SANITARY SEWER LINES

END OF SECTION

WORKSHEET FOR THE
GRAVITY SEWER LINE LOW PRESSURE AIR TEST
BY THE TIME PRESSURE DROP METHOD

Project Name _____

Date _____ **Job No.** _____

Location of Test/Stationing _____

1. Wetted Line: Yes _____ No _____

2. Average height of groundwater over crown of sewer line _____ ft.

3. Internal Air Pressure (P_1):
P_1 = 4.0 psig + Groundwater Ht. x 0.433 psi = 4.0 + (____' x .433) = ____ psig

4. Initial Starting Test Air Pressure (P_2):
$P_2 = P_1$ - 0.5 psig = _____ - 0.5 = _____ psig

5. Ending Test Air Pressure (P_3)
$P_3 = P_2$ - 1.0 psig = _____ - 1.0 = _____ psig

6. Time of test from P_2 to P_3 (in seconds)
Start Time T_1 _____
End Time T_2 _____

Actual Time = $T_2 - T_1$ _____ seconds

7. Test Time

Pipe Diameter (inches)	**Length of Pipe**	**"C" Value***	**"K" Value***
TOTAL			

*See Figure No. 1 for "C" & "K" Values

If Total "C" Value is <1.0, use Total "K" Value as Test Time in seconds.

If Total "C" Value is ≥1.0, use Total "K" Value ÷ Total "C" Value as Test Time in seconds.

Results of Test

Actual time = _____ seconds

Test time = _____ seconds

If Actual Time is equal to or greater than test time required for the pipe section being tested, the pipe section will have passed the Pressure Test.

Test Passed: _____yes _____no

Corrective Measures: _____

_____

_____

_____

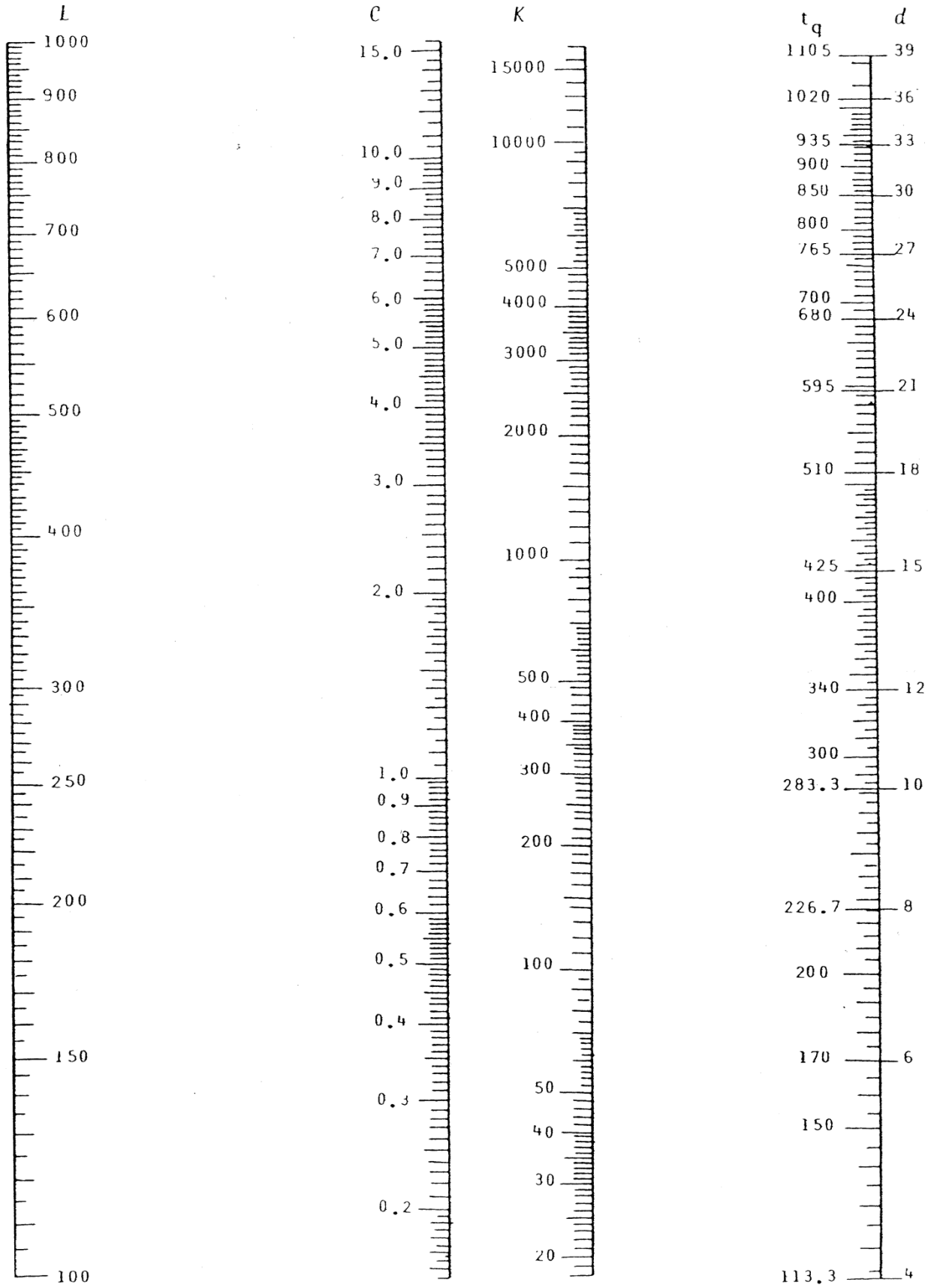
_____

Contractor's Firm Name: _____

Contractor's Representative Signature: _____ Title: _____

Owner's Signature: _____ Title: _____

FIGURE NO. 1



Nomograph for the solution of $K = .011d^2L$, $C = .0003882dL$, $t_q = K \div C$

ATTACHMENT B

MANHOLE TEST RECORD

Project: _____ Project No. _____

Contractor: _____ Testing Company: _____

Witnessed By: _____ (Inspector)

Date	MH No.	Paved? (P or U)	MH Depth	VACUUM				HYDROSTATIC						COMMENTS
				MH Diam.	Time Req.	Vac. Start	Vac. End	Time Start	Time End	Total Time	Volume Change	Loss (gph)	PASS FAIL	

NOTE:

All Adjacent surface restoration will be completed before conducting a sanitary manhole acceptance test, including finish paving and final adjustment to grade. Any test conducted beforehand shall be considered informal and will not count for acceptance.

Vacuum test will be conducted in accordance with latest applicable standards, such as established procedures based on ASTM C1244-93, starting at 10" Hg of vacuum.

Hydrostatic test will be conducted in accordance with the 1990 Oregon APWA standards Specifications for Sanitary Sewer Construction, Section 306.03. Manholes shall be filled to a mark on the iron frame at the start of the test, or to the rim of the frame.

EXCAVATION AND BACKFILL OF TRENCHES

CITY OF BOARDMAN, OREGON

TABLE OF CONTENTS

SECTION 3

EXCAVATION AND BACKFILL OF TRENCHES

CITY OF BOARDMAN, OREGON

TECHNICAL SPECIFICATIONS

SECTION 3

EXCAVATION AND BACKFILL OF TRENCHES

PART 1 - GENERAL

1.1 Summary

These Specifications cover the excavation and backfill of trenches for the installation of storm sewer, sanitary sewer, water lines, service lines, pressure sewer lines, and other underground utilities.

1.2 Definitions

A. Foundation material or stabilization fabric will only be required when standard bedding requirements will not adequately support the pipe.

B. Backfill is the filling of the trench to the existing ground level or the finish grade line.

C. General trench excavation shall include whatever materials that are encountered (except solid rock) to the depths shown or as required to properly install the pipe.

1.3 Safety

A. See requirements for Project safety in the General Requirements.

B. The determination of the safe trench width is the sole responsibility of the Contractor.

1.4 Existing Utilities

See the General Requirements for requirements for existing utilities and for preservation of survey monumentation.

1.5 Dust and Mud Control

The Contractor shall take appropriate action to control dust and mud caused by their operations. This shall include, but not be limited to, watering of exposed areas, cleaning of roadways, etc. This is considered a normal part of the construction Project.

1.6 Soil and Groundwater Conditions

The Contractor shall perform investigations of site soils and groundwater conditions as they deem necessary to acquaint themselves with actual conditions to be encountered in performing the Work. Groundwater conditions in particular should be carefully considered and are subject to change.

PART 2 - MATERIALS

2.1 Foundation Material

Foundation material shall be well-graded 2-1/2"-0 or 1-1/2"-0 crushed rock.

2.2 Bedding and Select Backfill

A. Bedding and select backfill shall be well-graded 3/4"-0 crushed rock or approved equal. All bedding and select backfill materials shall be subject to the approval of the City.

B. In general, the native soils may be used for bedding and select backfill for water pipe provided they are at or below optimum moisture at the time of placement and are free of vegetative matter, frozen material, and other unsuitable material. Where the City determines that the native soils excavated from the trench are not acceptable as bedding and select backfill, the Contractor shall import a crushed rock meeting the requirements of these Technical Specifications. Placement of bedding and select backfill, whether native soils or imported crushed rock, shall be as required by the Specifications and as shown on the City Standard Drawings.

2.3 General Backfill

A. General backfill will consist of material excavated from the trench, or material imported by the Contractor. General backfill material shall be free of vegetative matter, boulders (10-inch plus), frozen material and any other unsuitable material, and shall have a moisture content that will allow for the required compaction of the general backfill material unless approved otherwise by the City. Use of backfill material containing consolidated masses 10-inch in diameter or greater is prohibited.

B. When necessary, the Contractor shall selectively separate suitable general backfill material from unsuitable general backfill material.

C. When the City determines that the native material excavated from the trench is unsuitable or unacceptable for use as general backfill, the City may require the Contractor to remove the unsuitable material from the Project Site and import suitable general backfill material. Suitable material shall be similar in nature to native soils as approved by the City. When imported general backfill must be placed in or below the groundwater, the imported general backfill shall be free draining granular material with less than 20 percent passing a No. 4 sieve and less than 3 percent passing a No. 200 sieve.

2.4 Controlled Density Fill (CDF)

A. CDF material shall be a flowable cement, sand or pea gravel, and Fly Ash Pozzolanic, or other approved materials, mixture that contains 75 to 120 pounds of Type II cement per cubic yard.

B. The sand and other aggregates shall generally conform with the requirements of ASTM C33.

C. Air-entraining agent shall be added at the rate of 3 to 5 oz. per cubic yard.

D. The material shall have a 28-day compressive strength of 100 to 200 psi and have a slump of 7 inches plus or minus 1-1/2 inches at the time of placement. The Contractor shall provide a mix design and data on the CDF material they propose to use along with typical compression test results.

2.5 Anti-Flotation, Dewatering and Trench Stabilization Fabrics

A. Fabric for anti-flotation and dewatering shall be Mirafi 500X or approved equal.

B. Fabric for trench stabilization shall be Mirafi 140N Fabric or approved equal.

PART 3 - EXECUTION

3.1 Clearing and Grubbing

A. Contractor shall do all clearing and grubbing and removal of structures, etc. necessary to permit proper installation of the pipeline and to eliminate the possibility of stumps, logs, brush, or rubbish being mixed with the backfill material. A sufficient amount of all stumps and stump roots shall be removed so that any future removal of any remaining parts of the stumps and/or roots will not damage the pipeline. All stumps, roots, logs, brush and rubbish shall be removed and disposed of in conformance with the requirements of local authorities controlling air pollution, and solid waste disposal.

B. Should the area in which construction takes place be served by rural mail carrier service, the Contractor shall cooperate with the mail service and re-install, in a convenient location, any rural mail boxes which will have to be removed or be blocked by construction operations. As soon as the Work is completed, all mail boxes removed shall be replaced undamaged in their original location.

C. As soon as the Work is completed, all signs, guardrails, utility poles, fences, etc., that were moved for the construction operation shall be replaced undamaged in their original location. Damaged items shall be replaced by the Contractor with new items of equal quality.

3.2 Cutting of Asphalt Pavement and Concrete Sidewalks, Curbs and Driveways

A. Where the excavation is made in a paved street, the asphalt surface shall be cut on each side of the trench prior to excavation, to provide a vertical joint in the surface. Cutting of the asphalt will be made with a saw designed for the cutting of asphalt.

B. The use of a jackhammer, wheel cutter, or other similar tool may be allowed by the City only where the Contractor can demonstrate that the alternate method provides a neat straight edge.

C. Prior to excavating across a concrete structure such as a curb, sidewalk, or driveway, the Contractor shall cut and remove a section of the structure to provide for their excavation. The dimensions of the removed section shall be such that the Contractor's excavation will not result in undermining of the remaining structure.

D. The Contractor shall cut the concrete structure with a diamond saw or other equipment designed for that purpose such that a neat, straight, vertical edge is left on the remaining concrete structure. The Contractor shall similarly cut and remove any such concrete structure undermined or damaged by their construction work.

E. Following proper backfill and compaction of their excavation, as specified herein, the Contractor shall repair streets, replace the curbs, sidewalks, or driveways in conformance with the Specifications, or equal to the condition prior to removal.

3.3 Trench Excavation

A. When solid rock is encountered in trench excavation, the City Engineer shall be notified.

B. Trench Width

1. The maximum and minimum trench width shall be as shown on the Drawings. This width shall be maintained to the top of the pipe.

2. The maximum clear width above the top of the pipe will not be limited except in cases where excess width of excavation would cause damage to adjacent

structures or utilities. The determination of the safe trench width is the sole responsibility of the Contractor.

C. Unsuitable Material

When natural soil conditions exist in the bottom of the trench that are unsuitable for proper pipe installation, the Contractor shall immediately notify the City Engineer. The Contractor may then be requested to over-excavate the trench below the design grade to a depth specified by the City Engineer and place foundation material, or the Contractor may be requested to install a geotextile stabilization fabric.

D. Exploratory Work

The Contractor shall perform appropriate exploratory work to locate utilities when they are known to exist but the specific location is unknown or not marked accurately. Appropriate exploratory work shall be performed in these situations.

3.4 Shoring, Sheeting, and Bracing of Trenches

A. The Contractor shall adequately sheet and brace the trench during excavation whenever necessary to satisfy trench safety standards, prevent cave-ins, or to protect adjacent structures or property. Where sheeting and bracing are used, the Contractor shall increase trench widths for the bracing material accordingly.

B. The sheeting must be kept in place until the pipe has been placed, backfilled at the pipe zone, tested for defects, and repaired if necessary. All sheeting, shoring, and bracing of trenches shall conform to the requirements of the public agency having jurisdiction.

3.5 Dewatering Excavated Areas

A. All groundwater, seepage, or stormwater that may occur or accumulate in the excavation during the progress of the Work shall be removed. In areas where the nature of soil and hydrostatic pressures are of such a character as to develop a quick condition in the earth mass of the trench, the dewatering operation shall be conducted so that the hydrostatic pressure will be reduced to or near zero in the immediate vicinity of the trench.

B. All excavations shall be kept free of water during the construction or until otherwise requested by the City.

C. Contractor shall dispose of all waste and water removed from the trench. Disposal shall be in accordance with all state and local regulations.

3.6 Location of Excavated Materials

A. During trench excavation, the excavated material shall be located within the construction easement or right-of-way so that the excavated material will not obstruct any private or public traveled roadways or streets, or cause undue damage to the streets.

B. Contractor shall provide means of containing overly saturated soils, i.e., muck, or remove the muck from the Work area as it is excavated, if such soils are encountered in the excavation. The intent is to prevent excessive damage or disruption to street rights-of-way or easement beyond what would normally occur during such Work. Pile and maintain material from trenches so that the toe of the slope of the material excavated is at least two feet from the edge of the trench. It shall be the Contractor's responsibility, however, to determine the safe loading of all trenches.

3.7 Disposal of Excavated Materials

Contractor shall dispose of all excavated material, which is not required for, or is unsuitable for, backfill. The Contractor's method of disposal shall comply with regulations of the governing body having jurisdiction.

3.8 Trench Backfill

A. All backfill material shall be placed into the trench so that free fall of the materials into the trench is prevented until at least two feet of cover is provided over the pipe. Under no circumstances shall sharp or heavy pieces of material be allowed to drop directly onto the pipe. Methods of backfilling, other than as specified herein, shall be used only upon the approval of the City.

B. Bedding and Select Backfill

1. A minimum 4-inch depth of bedding shall be placed on the trench bottom, compacted to 85 percent of the maximum density as determined by ASTM D698, and smoothed to provide uniform bedding so the pipe is supported along its full length and not by the bells. Bell holes at each joint shall be provided to ensure support along the entire pipe length.

2. It shall be understood that the 4-inch depth is a minimum depth only, not an average depth, and does not preclude the Contractor at their option from placing additional depth of bedding to facilitate their Work. Once the pipe is properly installed, the bedding material shall be brought up to the spring line of the pipe in 4-inch lifts and compacted to 85 percent density. Care shall be used to ensure that the bedding material is properly worked under the haunch of the pipe for its full length.

3. Select backfill shall then be brought up from the spring line to the minimum distance above the top of the pipe shown on the City Standard Drawings, leveled and compacted to 85 percent of ASTM D698 density. Compaction of the bedding and select backfill by hand tamping will be allowed if the 85 percent density is achieved; otherwise, mechanical tamping will be required.

4. When an open-graded material is used for bedding or foundation material to facilitate trench dewatering, the open graded material shall be placed to the spring line of the pipe. The Contractor shall make provisions to ensure that fines from the select backfill do not migrate into the open graded bedding or foundation material. To prevent soil migration the Contractor may use any of the following:

    a. Provide a properly graded select backfill approved by the City;

    b. Provide an approved fiber/fabric between the open graded bedding material and select backfill;

    c. Hydraulically jet select backfill fines into open graded bedding material after dewatering is complete and before general backfill is placed; or

    d. Provide an alternative approved by the City.

C. All general backfill material shall be pushed first onto the slope of the backfill previously placed and allowed to roll down into the trench. The Contractor shall not push the backfill material directly into the trench until at least two feet of cover is provided over the pipe.

D. Compaction

1. In roadways, driveways, under curbs and sidewalks, or as required by the City, general backfill shall be placed in horizontal lifts not to exceed 12 inches in depth

and compacted to 90 percent of the laboratory density as determined by ASTM D1557. In state highway rights-of-way, trench backfill shall be placed and compacted as specified by the Department of Transportation. The method of compaction shall be selected by the Contractor.

2. The Contractor shall exercise extreme care to avoid damage to the pipe during compaction of the trench. Where materials consist of cobbles and coarse gravels, compaction of each lift shall be accomplished by at least five passes of an appropriate vibrating type compactor. When materials are such that meaningful in place density test cannot be run, then the Contractor and City will agree on a method of compaction which will provide adequate compaction.

3. In sections where specific compaction requirements are not specified or required by the City, general backfill shall be compacted, as a minimum, to a density equal to that of the natural ground adjacent to the trench. All trenches shall be maintained for a period of one year after final acceptance of the Project. Any settlement of the trenches during the one-year guarantee period shall be remedied promptly at the request of the City and at no additional cost.

E. CDF Placement

1. When called for, Contractor shall backfill trenches with CDF.

2. CDF shall be placed in the trench in such a manner to ensure the trench is completely filled to the lines and grades as required.

3. CDF shall be protected from traffic loads for a three-hour period, after which required surface restoration work may be performed.

F. Canal or Irrigation Ditch Crossing

1. Where the trench crosses a canal, irrigation ditch or culvert, the backfill shall be compacted the entire trench depth with mechanical tampers to 90 percent of the laboratory density as determined by ASTM D1557.

2. All backfill material in the canal or ditch liner and in the trench cut-off wall shall be imported clay or a soil/bentonite mixture as approved by the City. Unless required otherwise, the soil/bentonite mixture shall be 1 part bentonite to 10 parts soil by weight. A high grade bentonite material shall be used.

3. The ditch lining, conduit or pipe shall be restored to its original condition. The crossing shall be water tight and free of any leakage or seepage. The Contractor shall be fully responsible for repairing canal or ditch banks should leakage occur at the crossing.

G. Anti-Flotation Fabric Placement

1. When required by the Specifications or by the City, the Contractor shall place geotextile fabric over the select backfill material prior to placing general backfill. This fabric will help reduce the exposure to pipeline flotation.

2. The fabric shall be placed in accordance with the requirements of the Specifications.

3.9 Execution of Dust and Mud Control

If the Contractor fails to properly control the dust and mud, the City may request them to do so in writing. If, after 24 hours from this request, the Contractor has not corrected the dust or mud problem, the City may elect to have the corrective work performed, bill the Contractor for the work, and withhold final acceptance of the Project until the bill is paid.

3.10 Restoration, Finishing, and Cleanup

A. The Contractor shall restore or replace all paved surfaces, graveled surfaces, curbing, sidewalks, trees and shrubbery, lawns, pastures and fences, or other existing facilities disturbed by their Work unless otherwise specified. Restoration and cleanup shall be a continuing operation and shall be diligently pursued until completed.

B. All surplus material and temporary structures as well as excess excavation shall be removed by the Contractor and the entire Site of Contractor operations shall be left in a neat and clean condition.

C. Surface restoration shall be performed in accordance with Technical Specifications - "Surface Restoration." All other existing facilities shall be replaced or restored equal to their original condition.

END OF SECTION

SURFACE RESTORATION

CITY OF BOARDMAN, OREGON

TABLE OF CONTENTS

SECTION 4

SURFACE RESTORATION

CITY OF BOARDMAN, OREGON

TECHNICAL SPECIFICATIONS

SECTION 4

SURFACE RESTORATION

PART 1 - GENERAL

1.1 Scope

A. The Contractor shall perform all Work and furnish all materials to restore the work area including any gravel, asphalt, concrete, lawn, fences, or any other surfaces or items damaged or disturbed by their construction operation. Surface restoration shall follow as closely as possible the backfill and compaction of excavations.

B. Items specified in this Technical Specification are intended to be broad in scope and may not always apply to all items of Work to be constructed.

1.2 Submittals

A. Cold Mix Asphalt

The Contractor shall deliver to the Project a sample load of cold-mix asphalt concrete they propose to use on the Project. The mix shall be placed at locations which will be typical to its use on the Project. The City and Contractor shall review its performance in the field. If its performance appears satisfactory, the mix may be used on the Project. If its performance is not satisfactory, a revised mix shall be provided until a satisfactory mix is determined. Quality control of the mix will be based upon field performance. It will take some time to evaluate field performance. Therefore, the same mix shall be delivered to the Project early in the Work.

B. Hydroseed

The hydroseed mix shall be reviewed by the City prior to application.

PART 2 - MATERIALS

2.1 Base Rock

Base rock shall substantially conform to current Oregon Standard Specifications for Construction for base aggregate materials. The intent is to specify a base rock which is suitable for use in the restoration of areas disturbed by the Contractor's Work. Base rock required shall generally be 3/4"-0 unless otherwise specified or approved.

2.2 Asphalt Concrete

Asphalt concrete shall be an approved commercial mix generally conforming to the applicable provisions of the current Oregon Standard Specifications for Construction for asphalt concrete pavement. Unless approved otherwise, the gradation of the mix shall generally conform to a 1/2-inch dense mix. The Contractor shall submit for review by the City data on the asphalt concrete mix to be used. Data shall include aggregates, gradation and tolerances, aggregate suitability, asphalt concrete, mix proportions and tolerances, etc.

2.3 Surface Aggregate

A. The surface aggregate shall be crushed stone, slag, or gravel meeting the following requirements:

Liquid Limit (AASHTO T 89) 35 Maximum

Plasticity Index (AASHTO T 90) 2 to 9 Maximum

Dust Ratio $\frac{\%\text{ Passing No. 200}}{\%\text{ Passing No. 30}}$ 2/3 Maximum

Grading Requirements (AASHTO T 11 and T 27)	
Sieve	**Percent Passing**
1"	100
3/4"	70-98
#4	36-60
#8	25-47
#30	12-31
#200	8-15

B. At least 70 percent by weight of the particles retained on the #4 sieve shall have at least two fractured faces.

2.4 Cold-Mix Asphalt Concrete

Cold-mix asphalt concrete shall consist of a mixture of asphalt cement cut back with No. 2 fuel oil, and well-graded aggregate, plant mixed, and laid on a prepared foundation and compacted with a minimum 8-ton steel wheel roller. The aggregate shall meet the quality and gradation

requirements for a standard ODOT Class "C" asphalt concrete mix. The liquid fraction of the mix shall be 6-1/2 to 7 percent content by weight and shall consist of 70 percent PBA-2 or PBA-5 asphalt cement, and 30 percent No. 2 fuel oil. The cold-mix asphalt concrete shall remain alive in the stockpile until it is placed and compacted. After the No. 2 fuel oil evaporates, the remaining asphalt and aggregate mix shall remain stable and durable under traffic.

2.5 Portland Cement Concrete

A. 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 directed by the 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.

B. The mix shall have a maximum water-cement ratio of 0.45, a minimum 28-day compressive strength of 4,000 psi, a minimum of 564 pounds of cement per cubic yard of mix, and an air content of 4 to 7 percent. The maximum allowable slump shall be 4 inches for all structures covered under this section of the Specifications.

2.6 Seed

A. Lawn Seed

Lawn seed shall be a blend typically used in the area and of the type to match existing lawn areas, and must be approved by the City prior to use.

B. Pasture Seed

Pasture seed shall be a mixture of orchard grass, rye grass, and fescue, native to the area and must be approved by the City prior to use.

2.7 Fertilizer

Except for hydroseeding, inorganic fertilizer shall be commercially available 22-16-8 with 22 percent nitrogen, 16 percent available phosphoric acid, 8 percent soluble potash, and a minimum of 2 percent sulfur.

CITY OF BOARDMAN, OREGON

TECHNICAL SPECIFICATIONS

SECTION 4

SURFACE RESTORATION

2.8 Topsoil

Topsoil shall be native to the area and shall be approved by the City prior to use.

Furnish topsoil that is from the fertile part of a soil profile, commonly referred to as the "A" horizon, typically ranging in depth from 3 inches to 12 inches below original ground surface. Do not take material for topsoil from a depth greater than 12 inches below original ground surface.

2.9 Mulch

All mulch shall be straw that has been air dried and seasoned before baling or loading. It shall be free of noxious weeds and other materials detrimental to grass growth.

2.10 Sod

A. Sod shall be 100 percent Kentucky Blue Grass or other types as approved by the City.

B. The sod shall be grown on agricultural land that is cultivated specifically for turf sod. The sod shall be free of weeds, diseases, nematodes, and insects. All sod shall be mature and not less than 10 months old. All sod shall be machine cut to a uniform thickness of 5/8-inch or more, excluding top growth and thatch.

2.11 Erosion Control Matting

Erosion control matting shall be seed and curlex blanket as supplied by American Excelsior Co., of Yakima, Washington, or approved equal.

2.12 Hydroseed

A. The hydroseed shall be a specifically designed hydromulch consisting of cellulose fiber, fertilizers, seed, tackifier, etc.

B. The hydromulch shall be specifically processed cellulose fiber containing no growth or germination inhibiting factors. It shall be manufactured in such a manner that, after addition and agitation in slurry tanks with water, the fibers in the material become uniformly suspended to form a homogenous slurry. When sprayed on the ground, the material shall allow absorption and percolation of moisture. Each package of cellulose fiber shall be marked by the manufacturer to show the air dry weight and content.

C. The fertilizer shall be a complete plant food containing slow release nitrogen, phosphoric acid, and potash in the amounts of 16-16-16+1.5 FE. It shall be delivered in

uniform composition and be dry and free flowing and delivered in the original unopened containers bearing the manufacturer's guaranteed analysis.

D. The grass seed shall be certified, blue tagged, cleaned, and delivered in original unopened packages bearing an analysis of the contents. It shall be guaranteed 95 percent pure and have a minimum germination rate of 85 percent within 1 year of test. The seed shall be as agreed upon by the City. The seed shall be applied at a minimum rate of 4 pounds per 1,000 square feet.

2.13 Slope Stabilization Rock

A. Slope stabilization rock shall be pit run, a well-graded 4"-0 material with the approximate gradation:

Sieve	Percent Passing
4"	100
2"	35-50
1/2"	10-20
Less 1/4"	0-5

B. The 4"-0 slope stabilization rock shall be hard, durable, and resistant to weathering. The rock shall be angular in shape with an apparent specific gravity of 2.5 minimum. The Contractor shall develop a test pile of 4"-0 slope stabilization rock for approval by the City. Once the test pile has been approved, all other 4"-0 rock shall be visually the same as the test pile.

2.14 Hot Asphalt-Rubber Joint Sealant

Hot asphalt-rubber joint sealant shall be Roadsaver 221 as manufactured by Crafco, Inc., or equal.

PART 3 - EXECUTION

3.1 Gravel Surface Restoration

A. During trench and general excavation, the Contractor shall minimize the disturbance of adjacent gravel surfaces.

B. Backfill of trenches and other work areas shall be in accordance with Technical Specifications - "Excavation and Backfill of Trenches," or other applicable requirements.

C. In gravel streets, parking areas or driveways disturbed by the Work, the Contractor shall resurface the areas with base rock.

D. In gravel streets, shoulders, parking strips and driveways, a 4-inch minimum compacted depth shall be required or a compacted depth equal to the existing depth of gravel plus the depth of granular subbase, if any, whichever is greater, unless otherwise specified.

E. The resurfacing aggregate shall be compacted to 95 percent of laboratory density as determined by ASTM D1557.

3.2 Asphalt Street Restoration and Asphalt Parking-Driveway Restoration

A. Existing asphalt surfaces shall be cut on each side of the trench prior to excavation to provide a vertical, neat, straight-line joint in the surface. Should any asphalt surface be undermined or damaged during construction, the undermined or damaged asphalt shall be similarly cut and removed prior to backfill. This work shall be performed along neat, continuously straight lines to provide a pleasing finished appearance. Irregular lines will not be allowed.

B. Backfill shall be made in accordance with Technical Specifications - "Excavation and Backfill of Trenches."

C. The base rock under the asphalt pavement shall be replaced to a compacted depth equal to the existing base rock depth plus the depth of granular subbase, if any, or 10 inches, whichever is greater, unless specified otherwise. The base rock shall be compacted to 95 percent of the laboratory density as determined by ASTM D1557.

D. Immediately following backfill and compaction of the trench, and until the asphalt concrete is replaced, the base rock course shall be placed and compacted flush with the existing asphalt surface and maintained in a good condition.

E. In areas of heavy traffic, highway crossings, etc., a temporary cold-mix patch shall be placed and maintained until asphalt surface restoration is accomplished. The cold-mix asphalt concrete delivered to the Project shall be fresh and workable.

F. Just prior to placing the asphalt concrete, the base rock course and any temporary patch shall be excavated to the depth equal to that of the asphalt concrete to be placed.

G. Placement of Asphalt Concrete

1. Asphalt concrete for all areas, except in the State Highway, shall be 3 inches in depth after compaction or a depth equal to the existing pavement, whichever is greater, unless specified otherwise.

2. The restoration of asphalt concrete pavement in the State Highway shall be performed as described on State Highway Crossing Permits.

3. Asphalt concrete shall be compacted with an 8-ton minimum steel-wheeled roller and compacted to a minimum of 91 percent of the maximum density as determined by ASTM D2041.

4. Prior to placing the asphalt concrete, an asphalt tack coat shall be applied to the edges of the existing asphalt. An asphalt tack coat shall also be used between lifts should the Contractor elect to patch with multiple lifts. The Contractor shall utilize a paving machine, spreader box, or other approved mechanical equipment to place the asphalt concrete material. No lift of asphalt placed shall have a compacted thickness of less than 1/2 inch or greater than 3 inches. The finished asphalt surface shall be flush with the existing surface, uniform in appearance equal to or better than the existing pavement, and shall provide a smooth ride.

5. Installation shall conform to the applicable provisions of the current Oregon Standard Specifications for Construction, Sections 00495 and 00744. Asphalt Concrete for temporary patches shall conform to Section 00745.50 of the Oregon Standard Specifications for Construction.

3.3 Asphalt Concrete Joint Sealing

A. After a minimum of 30 days following completion of asphalt concrete restoration, the Contractor shall rout and clean joints between new asphalt concrete and the existing pavement.

B. Routed joints shall be 1/2-inch wide x 3/4-inch to 1-inch deep.

C. A hot asphalt-rubber joint sealant shall be placed in the joint flush with the surface to make a watertight seal.

3.4 Concrete Sidewalk and Curb Restoration

A. Existing concrete surfaces shall be saw cut on each side of the trench prior to excavation to provide a vertical, straight-line joint in the surface. Should any concrete surface be undermined or damaged during construction, the undermined or damaged concrete shall be similarly cut and removed prior to backfill. This work shall be performed along neat lines to provide a pleasing finished appearance. Irregular lines will not be allowed.

B. Backfill shall be made in accordance with Technical Specifications - "Excavation and Backfill of Trenches."

C. A 2-inch compacted depth leveling course of base rock shall be placed on the prepared subgrade. The base rock shall be compacted to 95 percent of the laboratory density as determined by ASTM D698.

D. Any forms used shall be wood or metal and shall be straight. They shall be suitably braced to prevent movement during placement. Joints shall be placed to match existing or as directed by the City. The placement and curing of the concrete shall follow good concrete placement practices. The concrete thickness, section, finish, configuration, etc., shall match the existing structure as closely as possible.

3.5 General Surface Restoration

A. General

1. The Contractor shall replace or restore, equivalent to their original condition, all surfaces, trees and shrubbery, lawns, agricultural areas, pastures and fences, or other existing facilities disturbed by their Work unless otherwise specified. Restoration and cleanup shall be a continuing operation and shall be diligently pursued until completed. Surface restoration shall be completed as soon as possible after the underground work is complete.

2. All surplus material, rock and debris, and temporary structures, as well as excess excavation, shall be removed by the Contractor and the entire Site of Contractor's operations shall be left in a neat and clean condition.

3. Lawns and pastures in private easement shall be restored to a smooth condition and reseeded with a like mixture of grass unless specified or in the easement documents. When backfilling trenches in private easements, unless otherwise specified, Contractor shall replace topsoil to minimum 1-foot depth or to a depth

equal to the original depth, whichever is less. Lawn sod shall be utilized where required by the City.

B. Agricultural Areas

1. The existing top soils in the excavation area shall be removed and stockpiled at a separate location from the general trench excavation material. This topsoil shall not be mixed or contaminated with any other materials.

2. Upon completion of the trench backfill and after all rocks and unsuitable material have been removed from the work area, the stockpiled topsoil shall be replaced and graded to match the existing ground. The depth of topsoil restoration shall be as shown on the City Standard Drawings.

C. Seeding

1. All areas to be seeded shall have a minimum of 6 inches of topsoil.

2. After the backfilling and compaction have been completed, the top 2 inches of the topsoil shall be scarified to provide a good seed bed and the area seeded, fertilized, compacted with a weighted roller, a straw mulch applied, and the initial watering completed.

3. All additional watering of the grass seed shall be the responsibility of the property owners.

4. Unless required otherwise, the seed shall be applied at a minimum rate of 4 pounds per 1,000 square feet, the fertilizer at 1 pound per 100 square feet, and the mulch at a rate needed to provide a minimum mulch thickness of 1 inch.

3.6 Lawn Sod Restoration

A. Preparation of Areas

1. Cultivate the existing ground or new topsoil so the soil is loose and friable for at least a 6 inch depth and suitable for fine grading. Remove vegetative matter, rocks, clods, roots, sticks, debris, and other matter detrimental to the germination and growth of sod from the areas to be sodded.

2. Apply herbicide to kill existing weeds and grasses.

3. Spread soil amendments and fertilizers evenly over the sod bed at the rates specified below, then thoroughly till into the upper 4 inches of the soil.

4. After tilling, fine-grade and roll the area to provide a fine-textured, smooth, firm surface, free of any undulations or irregularities.

5. The finish grade of the sod bed shall be 1 inch below the finish grade of the walks. Rates of applications shall be as follows:

Material	Rate Per 1,000 Sq. Ft.
Soil Conditioner	6 Cu. Yds. (2" Depth)
Fertilizer: 22-16-8	10 Lbs.

B. Planting Season

Perform the Work only when local weather and other conditions are favorable to bed preparation and placing of sod. Do not place sod before March 15 or after September 30 unless approved otherwise.

C. Placing Sod

1. Do not place sod until the sod bed has been approved. Immediately before placing sod, water the bed to prevent drying of grass roots.

2. Lay the first row in a straight line and place subsequent rows parallel to and tightly against each other. Stagger lateral joints. Do not stretch or overlap the sod. Tightly butt all joints. Do not use sod segments containing less than 2 square feet of surface area, broken, torn, or uneven pieces.

3. After placing sod, diagonally roll and thoroughly water. Apply a second application of fertilizer at the rate specified for preparation of areas and thoroughly water.

D. Sod Lawn Establishment

1. The establishment period for sod lawn begins after placing of sod in an area is completed. The establishment period will be at least two weeks and ends when accepted by the City. During the established period, the Contractor shall

adequately water the sod to keep the new sod green. Keep mowed to a height of 1-1/2 to 2 inches.

2. Do not attempt the first mowing until the sod is firmly rooted and secure in place. Remove no more than 1/3 of the grass leaf during initial or subsequent cuttings.

3. Control all weeds, foreign grasses, etc., that grow in or through the sod for up to 45 days after the sod is placed.

4. Acceptance of sod lawn will be contingent on the grass being uniform in color, density, and height, and being weed-free. All dead or brown sod shall be replaced at no cost to the City.

3.7 Hydroseeding

A. Application Rates

Hydroseeding shall be placed at the following application rates unless otherwise approved by the City.

Material	Application Rate
Mulch	2,000 pounds per acre
Fertilizer	Lawn 430 pounds per acre Dryland Grass 50 pounds per acre
Tackifier	20 pounds per acre
Seed	4 pounds per 1,000 square feet
Wood Cellulose Fiber Tracer	< 250 pounds per acre

B. Seeding shall not be done during windy weather or when the ground is excessively wet or otherwise un-tillable. Seed shall be placed at the rate and mix specified below. Seed will be placed with an approved hydroseeder which utilizes water as the carrying agent, and maintains continuous agitation through paddle blades.

C. Hydroseeder

1. Hydroseeder shall have an operating capacity sufficient to agitate, suspend and mix into a homogenous slurry, and the specified amount of seed and water or other material.

2. Distribution and discharge lines shall be large enough to prevent stoppage and shall be equipped with a set of hydraulic spray nozzles which will provide a uniform distribution of the slurry.

D. Seed and fertilizer may be applied in one application provided the fertilizer is placed in the hydroseeder tank no more than 30 minutes prior to application. The seed shall have a tracer added to aid uniform application. This tracer shall not be harmful to plant and animal life.

E. The Contractor shall remove mulch material which falls on plants, roadways, gravel shoulders, structures, areas where mulching is not specified, or which collects at the ends of culverts or accumulates to excessive depths, as directed.

3.8 Mulch

A. Place mulch approximately 1-1/2 inches deep in a loose condition at a rate of 2 to 2.5 tons/acre. Place grass straw mulch so that it is loose enough for sunlight to penetrate and air to circulate; but dense enough to shade the ground, reduce water evaporation, and materially reduce soil erosion.

B. Anchor using a crimping disc, an approved tackifier, or approved modified sheepsfoot roller, or another method approved by the City.

3.9 Cleanup

A. Cleaning up shall be a continuing process from the start of the work to final acceptance of the Project. The Contractor shall, at all times, keep the area on which work is in progress free from accumulations of waste material or rubbish.

B. Spillage from the Contractor's hauling vehicles on traveled public or private roads shall be promptly cleaned up. Upon completion of the work the Contractor shall remove all temporary structures, rubbish, and waste material, equipment and supplies, resulting from the Contractor's operations. The Contractor shall leave such lands in a neat and orderly condition which is at least as good as the condition in which the Contractor

found them prior to the Contractor's operations. See specific conditions in the General Requirements.

C. In roadways and traffic areas, the Contractor shall be responsible for maintaining a road surface suitable for travel by the public from the time of excavation until the road surface has been restored. Such work includes dust control, temporary patching, signing, grading, and filling of potholes on temporary street surfaces, etc. The Contractor shall be responsible for all Claims and damages resulting from their failure to maintain a suitable surface.

END OF SECTION

ROAD WORK

CITY OF BOARDMAN, OREGON

TABLE OF CONTENTS

SECTION 5

ROAD WORK

CITY OF BOARDMAN, OREGON

TECHNICAL SPECIFICATIONS

SECTION 5

ROAD WORK

PART 1 - GENERAL

1.1 Scope

These Specifications cover the construction, reconstruction and overlaying of streets and roads. Work shall include furnishing all equipment, materials, labor, etc., as required to complete the required improvements. Items specified in this Technical Specification are intended to be broad in scope and may not always apply to all items of work to be constructed. All applicable sections, as determined by the City or City Engineer, shall control the work.

PART 2 - MATERIALS

2.1 Water for Compaction

The Contractor shall be responsible for obtaining, transporting, and the application of the water. The City will allow the Contractor to use water from the existing municipal water system for a fee set by the City, provided the Contractor follows the requirements set forth by the City.

2.2 Geotextile Fabric

Geotextile fabric shall be Mirafi 500X, or approved equal.

2.3 Aggregate Base and Base Rock

A. Aggregate Base

The aggregate base shall be a well-graded 4"-0 angular basalt material with the fraction passing the No. 200 sieve not greater than 8 percent of the total aggregate weight. Aggregate base shall meet the durability requirements for base rock. Other materials may be considered by the City; however, samples must be submitted for review.

B. Base Rock

Base rock shall conform to the requirements of Section 02630 - Base Aggregate, "Oregon Standard Specifications for Construction," current edition, for dense graded aggregate as modified hereafter. Acceptable gradation includes 1"-0 or 3/4"-0 as selected by the Contractor.

C. Surface Rock

1. The surface rock shall be crushed stone, slag, or gravel meeting the following requirements:

a. Liquid Limit (AASHTO T 89) 35 Maximum
b. Plastic Index (AASHTO T 90) 2-9 Maximum
c. Dust Ratio: % Passing No. 200 / % Passing No. 30 2/3 Maximum

Grading Requirements (AASHTO T 11 and T 27):

Sieve	Percent Passing
1"	100
3/4"	70-98
No. 4	36-60
No. 8	25-47
No. 30	12-31
No. 200	8-15

2. Surface rock shall have at least 70 percent by weight of the particles retained on the No. 4 sieve and shall have at least two fractured faces.

2.4 Soil Sterilant

The sterilant shall be Pramitol 5SP as manufactured by Makhteshim Agan of North America, Inc., Monobor-chlorate, or approved equal and shall be applied in accordance with the manufacturer's or supplier's recommendations to adequately sterilize the base.

2.5 Asphalt Tack Coat

A. The material is to be CRS-1 or CSS-1 emulsified asphalt unless otherwise approved.

B. Furnish emulsified asphalt meeting the requirements of ODOT's publication "Standard Specifications for Asphalt Materials." Copies of the publication are available from the ODOT Pavement Services Engineer. The applicable specifications are those contained in the current publication on the date the project is advertised. The materials may be conditionally accepted at the source or point of loading for transport to the project.

C. Excessive delay in the use of the emulsified asphalt or excessive pumping of the emulsified asphalt may significantly reduce the viscosity and may make the material unsuitable for tack coat use. For this reason, limit pumping between the bulk storage tank, hauling transportation, field storage tanks, and distributors to an absolute

minimum to maintain proper viscosity. Final acceptance of emulsified asphalt will be at the point of application.

D. Dilution of the tack coat material may be allowed to a maximum 1:1 ratio. Determine the proportion of water to be added to the emulsified asphalt. Do not dilute the emulsified asphalt until the City or City Engineer approves the dilution ratio. Add the water to the emulsified asphalt and mix according to the asphalt supplier.

E. Obtain samples according to AASHTO T 40 prior to dilution with water, if allowed. Samples will be tested at the ODOT Materials Laboratory or other laboratory as designated by the Engineer. Emulsified asphalt will be tested within 30 calendar days from the date it is sampled.

2.6 Asphalt Concrete Pavement

A. General

1. This section is intended for local streets, parking lots, etc. The Project Engineer shall revise these Specifications as required for improvements to collector and arterial roads as required by the City and/or other governing Agency.

2. Asphalt concrete pavement (ACP) shall consist of a mixture of asphalt cement, graded aggregate, and additives as required. The use of ACP in this section refers to either hot mix or warm mix asphalt concrete. ACP shall be plant mixed into a uniformly coated mass, hot laid on a prepared foundation, and compacted to the specified density.

B. Asphalt Concrete Pavement

Materials shall be in accordance with "Section 00744 - Asphalt Concrete Pavement" and related sections of the current Oregon Standard Specifications for Construction, supplemented and modified as follows:

1. Add the following to subsection **00744.02 Definitions**:

The terms "Agency," "Owner," and "City" may be used interchangeably in this Technical Specification.

2. Project Mix Requirements

   a. Level 3 ACP
   b. 1/2- or 3/4-inch Dense Graded
   c. Asphalt Cement PG 64-28
   d. Lime Treated Aggregate Required

3. Delete subsection 00744.10 (c) and replace with the following:

   00744.10 Reclaimed Asphalt Shingles - No RAS materials shall be used on the project unless otherwise approved by the City Engineer.

4. Modify subsection **00744.13 Job Mix Formula Requirements -** as follows:

   a. Add the following paragraphs at the end of the section:

      A previously prepared JMF will be allowed, provided adequate test data are available to document the suitability of the mix, the Contractor can document that the same materials are being used, the JMF was prepared within the last 12 months, and the JMF meets the requirements of these Specifications. Copies of the results of tests made on the mix during production on previous projects shall also be submitted if any are available.

      Do not begin production on the project until the JMF is reviewed by the City or City Engineer and written consent is provided to proceed. A new JMF is required if the asphalt cement grade, any additives, or the source of the aggregate change during production. Provide a JMF for the project meeting the following criteria:

2.7 Asphalt Fog seal

Asphalt for the asphalt fog seal shall consist of CSS-1, CSS-1h, or HFRS-P1 emulsified asphalt mixed with water at a rate of 1:1.

2.8 Street Monument

The monument boxes shall be equal to Model Number 3680 as cast by EJ, or approved equal, and shall have the letters MON cast in the cover. Precast concrete monuments shall be supplied by Reese Concrete or approved equal.

2.9 Culverts

A. Culverts shall be galvanized corrugated steel pipe and shall be 14-gauge with 2-2/3" x 1/2" corrugations. Fabrication of pipe shall conform to AASHTO 218 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.

B. Bedding and backfill material, unless otherwise shown on the Drawings, shall consist of select native material free of particle sizes greater than 1-1/2-inch in diameter.

2.10 Drainage Trenches

A. Geotextile fabric for drainage trenches shall be Mirafi 140N or equal approved by the Engineer.

B. Drain rock shall be clean washed round river gravel, 1/2-inch to 2-inch size.

PART 3 - EXECUTION

3.1 Earthwork

A. Clearing and Grubbing

1. Clearing and grubbing shall include the removal and disposal of any obstructions, such as existing curbs, sidewalks, pavement, culverts, fences, etc., and organic material such as trees, tree stumps, brush, hedges, vegetation, roots, rubbish, posts, fences, topsoil, and any other obstacles or materials in the construction area which would prevent completing the project, and which are unsuitable for road work construction.

2. All vegetation and rubbish shall be removed and disposed of by the Contractor in conformance with the requirements of local authorities controlling air pollution and solid waste disposal.

B. Roadway Excavation

Prior to any excavation, the area to be excavated shall be cleared and grubbed. Roadway excavation shall consist of the excavation, haul, and satisfactory disposal of all materials taken from within the right-of-way for the construction of embankments,

subgrade, shoulders, intersections, ditches, waterways, entrances, approaches (including excavation at private entrances outside the right-of-way), curbs, sidewalks, and incidental work, in accordance with the Specifications and the lines, grades, and cross sections provided, and as required by the City or City Engineer.

C. Embankments

1. Prior to construction of any embankment, the area beneath the embankment and the areas from which embankment material will be obtained shall be cleared and grubbed. The existing soil beneath the embankment shall then be compacted to 90 percent of maximum density as determined by ASTM D1557 for a minimum of 6 inches below ground surface. Any unsuitable material shall be removed prior to placement of any embankment.

2. Upon completion of the embankment foundation, embankment material shall be placed in horizontal lifts and compacted to 90 percent of ASTM D1557. Embankment lift depth shall not exceed the capability of compaction equipment being used to achieve the required compaction for the full depth of each lift. The embankment material shall be native or import free of vegetative or organic matter, boulders 6 inches or larger in diameter, or frozen material and shall be at or below optimum moisture content at the time of placement. Depending on the type of embankment material, the Contractor may have to scarify, aerate, water, or take other actions as necessary to bring soils to proper moisture to achieve the required compaction.

3. The embankment shall be brought to the lines and grade required. Any unsuitable material which may have been used in constructing the embankment shall be removed and replaced with suitable material and compacted.

D. Roadbed Cuts

1. In roadbed cuts, the subgrade material shall be compacted to 90 percent of maximum density as determined by ASTM D1557 for a minimum of 6 inches below the top of the subgrade.

2. Depending on the type of material encountered, the Contractor may have to scarify, aerate or water, over-excavate, or take other actions as necessary to achieve the required compaction.

E. Finishing of Subgrade

1. All roadbeds, ditches, and other excavations and embankments shall be trimmed accurately to the lines, grades, and cross sections, and shall be finished in a thoroughly workmanlike manner to within plus or minus 0.05 foot of the required grade. They shall be in neat and well finished condition at the time the project is completed. The entire right-of-way area shall be cleaned up and made free of debris and foreign matter of all kinds. Accumulations of dirt and/or other materials shall be disposed of in a satisfactory manner.

2. Upon completion of the subgrade and prior to placement of base rock, the Contractor shall load test the finished subgrade surface. The load test shall consist of slowly driving a loaded dump truck over the road surface. The dump truck shall have a minimum capacity of 10 cubic yards. All soft areas shall be noted. City staff and the Contractor shall note any soft areas. The Contractor shall excavate out and either replace unsuitable material or properly compact all soft areas in order to provide a firm base that conforms to the Specifications. Any soft areas that occur as part of the project because of over-watering, improper compaction, weather, etc., shall be replaced.

F. Dust and Mud Control

1. The Contractor shall be responsible for controlling dust and mud caused by his operations. This shall include, but not be limited to, street work, trench work, shoulder work, sidewalk work, driveways, connecting streets, etc. The Contractor shall be responsible for controlling dust on the roadway surface until the time asphalt pavement is placed.

2. Dust and mud control performed by the Contractor is considered a normal part of the construction project. If the Contractor fails to properly control the dust and mud, the City may request him to do so in writing. If, after 24 hours from this request, the Contractor has not corrected the dust or mud problem, the City may elect to have the corrective work performed, bill the Contractor for the work, and withhold final acceptance of the project until the bill is paid.

3.2 Geotextile Fabric

A. Scope

This work consists of furnishing and placing geotextile fabrics in underdrains, under embankments, over roadbed subgrade, and at other locations as specified or directed by the City.

B. Construction

1. Geotextile fabric shall be installed as shown on the City Standard Drawings or as directed by the City or City Engineer.

2. Fabric placed for subgrade stabilization under embankments or over roadbed subgrade shall be placed parallel to the centerline of the roadway, with placement starting at the low side of the super elevation or crown. The fabric shall either be sewn together at all longitudinal and transverse edges or overlapped a minimum of two feet at all edges. Transverse overlaps shall be made in the direction of base material placement.

3.3 Aggregate Base and Base Rock

A. Scope

Aggregate base and base rock shall be placed to the lines, depths, and grades as required. Prior to placement of the materials, each succeeding lift, i.e., subgrade, aggregate base, base, etc., shall be properly constructed and reviewed by the City or City Engineer.

B. Construction

1. The construction procedure here described shall be understood to apply to each of the courses and/or layers of which the road base is to be constructed. The construction of the road base shall not be limited to the construction of the main roadway, but shall include the construction of base on approach roads, driveways, connecting roads and connecting streets.

2. After the subgrade is brought to the proper line, cross section and compaction, the aggregate materials shall be spread and shaped as required. The spreading and shaping of the aggregate materials shall be so performed as to prevent

separation of the coarser material from the finer materials including the use of adequate water.

3. The aggregate materials shall be brought to proper moisture content as required for compaction and compacted to 90 percent of maximum density as determined by ASTM D1557, as appropriate.

4. The finished surface when tested with a 10-foot straightedge shall not vary from the testing edge by more than 0.05 foot at any point.

5. Following construction of each lift, the Contractor shall do such blading, brooming, watering, and other work as necessary to prevent raveling and rutting. These operations are to be continued as required until the lift is covered by a following lift or until all work to be done under the Contract is completed. If the required compacted depth of the base exceeds 8 inches, it shall be constructed in two or more lifts, each lift not exceeding 8 inches in depth.

6. Upon completion of the aggregate materials and prior to placement of asphalt concrete pavement, the Contractor shall load test the finished base surface. The load test shall consist of slowly driving a loaded minimum 10 yard dump truck over the road surface. All soft areas shall be noted. The Contractor shall excavate and/or compact all soft areas in order to provide a firm base that conforms to the requirements of the Technical Specifications.

7. Gravel shoulders when required shall be constructed as a part of construction of the base and are not to be added on after completion of asphalt paving. The finished gravel shoulder shall be graded, trimmed and compacted to the required lines, grades and cross sections in a neat manner leaving the gravel shoulder flush with the edge of the asphalt pavement. Coarse segregated aggregate shall not be used in the construction of gravel shoulders. All such non-specification material shall be removed and replaced with specification material.

3.4 Soil Sterilant

A. Upon completion of the base and prior to placement of asphalt concrete, the Contractor shall apply a soil sterilant to the surface of the base.

B. The Contractor shall supply the City with a description of the sterilant and the name of the supplier prior to application in order that the suitability of the proposed product may be verified. The applicator shall be licensed by the State of Oregon for the class of

herbicide utilized. Any damage to adjacent areas caused by the sterilant shall be repaired by the Contractor.

3.5 Pre-paving Conference

At least one week before paving is scheduled to begin, the Contractor will set up a pre-paving meeting between the Contractor and the City. If a paving Subcontractor is being used they shall also be present. The intent of the meeting is to allow the City and the Contractor to jointly review the proposed method of operation, equipment, personnel, mix, schedule, etc., along with the project specifications.

3.6 Asphalt Concrete Pavement

A. Scope

After satisfactory completion of the base, the Contractor shall place and compact the asphalt concrete pavement to the lines, grades, thicknesses, and cross-sections required or as established by the Project Engineer.

B. Construction

Construction shall be performed in accordance with "Section 00744 - Asphalt Concrete Pavement" and related sections of the Oregon Standard Specifications for Construction, current edition, supplemented and modified as follows:

1. Delete subsection 00744.16 and replace with the following:

00744.16 Sampling and Testing - Perform sampling and testing according to the "Quality Control" section of the General Requirements.

2. Delete subsection **00744.17 Acceptance**.

3. Replace Section 00744.30 with the following:

00744.30 Paving Crew - Only trained and experienced personnel shall be used as the paving crew performing the Work. The Contractor shall submit to the Engineer, prior to the pre-paving conference, job assignments, experience history, and training background for all members of the paving crew. Untrained and inexperienced personnel may not be used. The Engineer may request personnel be replaced if it cannot be demonstrated that they have the proper training and experience to be a part of an experienced crew. The paving

superintendent and paving machine operator shall have at least three years experience, and the roller operators shall have at least one year of experience.

4. Replace Section 00744.40 with the following:

00744.40 Season and Temperature Limitations - Place ACP when the temperature of the surface that is to be paved is not less than the temperature indicated, unless approved by the City or City Engineer:

Nominal Compacted Thickness of Individual Lifts and Courses as shown on the typical section of the plans	**All Levels**
	Surface Temperature*
Less than 2 inches	60°F
2 inches - 2 1/2 inches	50°F
Greater than 2 1/2 inches	40°F
Temporary	40°F

* Do not use field burners or other devices to heat the pavement surface to the specified minimum temperature unless approved.
** If placing ACP between March 15 and September 30, temperature requirement may be lowered 5°F.

5. Delete the following subsections:

   a. **00744.80 Measurement**
   b. **00744.90 Payment**

3.7 Asphalt Fog Seal

A. One year after the construction of the asphalt concrete, the Contractor shall fog seal the asphalt concrete. The Contractor shall apply a fog seal consisting of CSS-1 emulsified asphalt mixed with water at a rate of 1 to 1 and applied at a rate to be determined by the City Engineer. It is anticipated that this rate will be between 0.05 to 0.20 (0.03 to 0.10 residual) gallons per square yard.

B. The areas to be sealed shall be dry and free of dirt, dust, leaves, or other foreign matter at the time of placement.

C. Provide an asphalt distributor designed, equipped, maintained, and operated so the emulsified asphalt material is applied uniformly at even heat. The distributor shall be capable of applying the asphalt on variable surface widths up to 16 feet, at readily determined and controlled rates from 0.05 to 2.0 gallons per square yard, and with uniform pressure. The variation allowed from any specified rate shall not exceed 0.02 gallons per square yard. Provide distributor equipment that includes a tachometer, pressure gauges, accurate volume measuring devices and a thermometer for measuring temperature of tank contents. Provide distributors equipped with a positive power unit for the asphalt pump, and full circulation spray bars adjustable both laterally and vertically. Set the bar height for triple lap coverage.

D. After application and initial cure of the emulsified asphalt the Contractor shall apply a light coat of clean fine sand. The sand shall be applied evenly and then broomed across the pavement surface. After approximately 5 days the Contractor shall sweep the street and remove the excess loose sand.

3.8 Construction Staking

The Contractor shall provide all construction staking necessary as described in the General Requirements.

3.9 Street Monument

The Contractor shall provide and install cast iron street monument boxes at all points required by the City or County Surveyor. Monument boxes shall be installed per the City Standard Drawings. Monuments within the boxes shall be located by a Registered Professional Land Surveyor.

3.10 Adjustment of Utility Covers to Grade

The Contractor shall adjust the tops of all existing manholes, valve boxes and other utility covers as required to bring the covers or gratings of the structures to the grade required by the improvement involved. The method of adjustment shall be as approved by the City. The Contractor shall repair any of these structures which are damaged during performance of the work.

3.11 Culverts

A. General

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

B. 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.

C. All culverts to be extended shall be installed at the extended grade and slope of the existing CMP.

3.12 Pavement Striping

A. General

Materials for painted traffic markings and striping shall meet or exceed the requirements for striping paint and glass beads of "Pavement Marking Materials" and "Oregon Standard Specifications for Construction," current edition. The paint color and type of markings shall be as required by the City or City Engineer. The Contractor shall lay out all pavement markings and striping.

B. Materials

Use materials conforming to the requirements of Section 00800 of the "Oregon Standard Specifications for Construction," current edition. Materials and suppliers for traffic paint, film, and reflective beads shall be listed in the ODOT Qualified Products List as approved by the City Engineer for the intended use. Type B-HS: Preformed, Fused Thermoplastic Film High Skid shall be used for all crosswalk, bicycle lane, bicycle railroad crossing, lane reduction arrow, parking lines, and other transverse pavement markings, the use of paint is not acceptable. Paint shall be standard waterborne traffic paint. Beads shall be virgin large reflective traffic beads.

C. Pavement Marking Placement

Pavement striping and markings shall be placed as shown on the Project Drawings according to the Manual on Uniform Traffic Control Devices, and the ODOT Traffic Line

Manual. Apply the striping and markings according to the manufacturer's recommendations. Unless otherwise specified, apply pavement striping and markings before public traffic is allowed on the freshly paved surface.

Remove and replace striping and markings not conforming to these Specifications or not properly installed before continuing the operation.

D. Submittal

A detailed of the pavement striping plan, including materials to be utilized, application process, equipment to be used, application rates, placement tolerances, accommodations for public safety, disposal of waste, and repair procedures, shall be provided to the City a minimum of seven days before placing markings.

E. Warranty

The Contractor shall guarantee the paint markings and paint striping for a period of one year from the date of application against deterioration and/or delamination beyond normal wear.

3.13 Restoration, Finishing, and Cleanup

A. Prior to the final inspection of the work, the Contractor shall restore or replace all paved surfaces, graveled surfaces, curbing, sidewalks, trees and shrubbery, lawns, pastures and fences, or other existing facilities disturbed or damaged by his work.

B. The Contractor shall clean up and leave in a neat, orderly condition the right-of-way and other property occupied in connection with the work.

C. The Contractor shall reshape, clean out ditches, retrieve shoulders and slopes, and do all other work required to bring the project to the final lines, grades, and condition called for. The finished project shall be clean and neat in its final appearance.

D. See Technical Specifications - "Surface Restoration" for additional requirements.

END OF SECTION

CONCRETE CURB, GUTTER, CROSS GUTTERS, SIDEWALKS, AND DRIVEWAY TRANSITIONS

CITY OF BOARDMAN, OREGON

TABLE OF CONTENTS

SECTION 6

CONCRETE CURB AND GUTTER, CROSS GUTTERS, SIDEWALK, AND DRIVEWAY TRANSITIONS

CITY OF BOARDMAN, OREGON

TECHNICAL SPECIFICATIONS

SECTION 6

CONCRETE CURB AND GUTTER, CROSS GUTTERS, SIDEWALK, AND DRIVEWAY TRANSITIONS

PART 1 - GENERAL

1.1 Scope of Work

A. This Work shall consist of the construction of Portland Cement concrete curb, curb and gutter, sidewalk, steps, and driveway and alley approaches. They shall be constructed in accordance with these Technical Specifications and shall be in reasonably close conformity to the lines, grades, and dimensions established by the City.

B. Concrete cross gutters shall be constructed to the same requirements as concrete curb and gutter and as detailed on the City Standard Drawings.

C. Work shall conform with the general practices outlined in the American Concrete Institute publication "Slabs on Grade" and in accordance with applicable provisions of ACI Manual of Concrete Practices, Parts 1, 2, and 3 and "Standard Specifications for Ready Mixed Concrete" (ASTM C94) except as modified below.

PART 2 - MATERIALS

2.1 Concrete Characteristics

A. The Portland Cement concrete used for this Work shall be a 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 directed by the City 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 design shall be provided to the City for review.

B. The concrete shall have the following characteristics.

Parameter	Value
Min. 28-day Compressive Strength	4,000 psi
Min. Cement per Cubic Yard	564 lbs./yd.
Max. Water-Cement Ratio	0.45
Air Content (range)	5-7 percent
Max. Allowable Slump	4 inches

C. In some localities, additional cement may be required to achieve the minimum 4,000 psi 28-day compressive strength. The use of additives will be allowed when designed into the mix. Mixes used with reinforcing steel shall have a maximum water soluble chlorine ion content of 0.06 percent of mix design concrete weight.

2.2 Portland Cement

A. Portland cement shall conform to the requirements of ASTM C150, for Type I - II cement.

B. All cement shall be stored in a suitable weather-tight building in such a manner as to protect the cement from dampness and to permit easy access for proper inspection. Storage bins for bulk cement shall be weather-tight and constructed so there will be no dead storage.

2.3 Aggregates

A. General

All aggregates for concrete shall conform to the requirements of ASTM C33.

Fine and coarse aggregates shall be stored and measured separately. Aggregates shall be protected from contamination with dust, dirt, or other foreign materials.

B. Fine Aggregate

Fine aggregate shall consist of natural sand having hard, strong, and durable particles, which does not contain more than 2 percent by weight of such deleterious substances

as clay lumps, shale, schist, alkali, mica coated grains, or soft and flaky particles. The grading of fine aggregate shall range uniformly from coarse to fine within the limits indicated in ASTM C33.

C. Coarse Aggregate

1. Coarse aggregate shall consist of clean, hard, fine grained, sound crushed rock, or washed gravel that does not contain in excess of 5 percent by weight of flat, chip like, thin, elongated, friable, or laminated pieces, or more than 2 percent by weight of shale or cherty material.

2. Any piece having a major dimension in excess of 2-1/2 times the average thickness shall be considered to be flat and/or elongated.

3. The maximum size of coarse aggregate shall not exceed 1-1/2 inches or one-fifth of the narrowest dimension between the forms nor three-quarters of the clear spacing between reinforcing bars. The minimum size of coarse aggregate shall be 3/4-inch unless approved otherwise.

4. Coarse aggregate shall be uniformly graded from coarse to fine within the limits allowed in ASTM C33.

2.4 Water

Water for mixing shall be clean, fresh, and free from injurious amounts of oil, acid, chlorides, sulfates, alkali, organic matter, or other deleterious substances.

2.5 Admixtures

The use of admixtures will be allowed only when included in the mix design or as specified. Admixtures used will be considered a means of improving workability and/or placement of the concrete. Admixtures shall conform to requirements:

Parameter	Reference
Air-entraining	ASTM C260
Water Reducer	ASTM C494, Type A
Set Retarding	ASTM C494, Type B
Water Reducing/Set Retarding	ASTM C494, Type D

High Range Water Reducing (Superplasticizer)	ASTM C494, Type F and G
Pozzolanic	ASTM C618
Fly Ash	AASHTO M 295, Class C or F

2.6 Pre-molded Joint Filler

Pre-molded joint filler for use in expansion (through) joints shall be asphalt-impregnated cane fiber and shall conform to ASTM D1751. The thickness shall be 1/2-inch or match existing adjacent expansion joints.

2.7 Aggregate Base

The aggregate base used under any of the structures listed in this section of these Technical Specifications shall conform with the requirements of Section 640 of the Oregon Standard Specifications for Construction, current edition, and shall be 3/4"-0 unless otherwise approved.

2.8 Truncated Dome Detectable Warning Texture

Truncated dome detectable warning texture used on sidewalk ramps shall be a material listed on the ODOT Qualified Products List as approved by ODOT for the intended use. See Oregon Standard Drawings RD900 series.

PART 3 - EXECUTION

3.1 Earthwork

Excavation shall be made to the required depths and to a width that will permit the installation and bracing of forms. All soft and unsuitable material shall be removed and replaced with suitable material. The top 6 inches of any cut section and the full depth of any embankment shall be compacted to a minimum of 90 percent of the maximum density as determined by ASTM D1557.

3.2 Base Aggregate

The base aggregate shall be placed as shown on the Drawings and shall be compacted to 90 percent of the maximum density as determined by ASTM D698.

3.3 Forms

Forms shall be wood or metal and shall extend for the full depth of the concrete. All forms shall be straight, free from ways, and of sufficient strength to resist the pressure of the concrete without springing. Bracing and staking of forms shall be such that the forms remain in both horizontal and vertical alignment until their removal.

3.4 General Placement and Finishing

A. The foundation and forms shall be well wetted prior to placement of the concrete. Unless otherwise specified, all concrete shall be placed upon clean, damp surfaces free of running or standing water, and never upon soft mud, dry porous earth, or frozen subgrade.

B. All concrete shall be placed before the initial set has occurred. It shall be placed within 1-1/2 hours after water has been added to the mix. The temperature of the concrete at placement shall not be below 50°F or exceed 90°F unless approved otherwise by the City.

C. The concrete shall be placed on a moist base and deposited as close as possible to its final location and to its required depth. Movement of the concrete horizontally with a vibrator will not be allowed.

D. Once the concrete has been placed, it shall be struck off to the proper elevation using a straightedge and sawing motion. A smooth surface shall be provided after the concrete has been straight edged by the use of a bull float or Darbie. A wooden bull float shall be used unless the Contractor can show that a magnesium bull float does not seal in the bleed water.

E. Bull floating shall occur immediately after striking off and before bleed water accumulates on the surface. Bull floating shall be done in such a manner that the surface is not sealed, so bleed water is not trapped below the surface. Care shall be taken not to overwork the surface. The use of a jitterbug or tamper will not be allowed. Initial edging shall be performed with a wide edger, again in a manner that will avoid sealing the surface.

F. Upon completion of the above floating, the concrete shall be allowed to sit until the bleeding has stopped, the bleed water has disappeared, and the concrete is firm enough to permit a man to walk on the surface leaving footprints no more than 1/4-inch deep.

After the waiting period, the concrete may be floated and finished as required. Adding water to the surface or working bleed water to aid in finishing is not allowed.

3.5 Curing

A. As soon as the concrete has been placed and finished, as specified, it shall be cured:

1. By application of an approved Type 2, Class B white or gray pigmented or Type 1-D clear compound with fugitive dye liquid membrane-forming compound applied uniformly at a rate of at least 1 gallon per 200 square feet to the damp concrete by pressure spray methods; or

2. By keeping the concrete continually damp for at least 120 hours. The actual curing method and materials shall meet the requirements of ACI 308 and ASTM C309.

B. The Contractor shall protect the newly placed concrete from vandalism and any other damages. The exact method of protection shall be left up to the Contractor. Any damages, regardless of the cause, shall be repaired or replaced to the satisfaction of the City.

3.6 Restrictions Due to Weather

A. Cold Weather

1. Concrete placement in cold weather (50°F or less) shall conform to "Recommended Practice for Cold Weather Concreting" (ACI 306).

2. Salts, chemicals, or other foreign materials shall not be mixed with the concrete to prevent freezing.

3. All concrete shall be effectively protected from frost action for a period of five days after placement. Upon written notice from the City, all concrete that may have become damaged by frost action shall be replaced by the Contractor at their own expense.

B. Hot Weather

1. For concrete placed during extremely hot weather (air temperature exceeding 95°F), the aggregate shall be cooled by frequent spraying in such a manner as to utilize the cooling effect of evaporation.

2. During such periods, the placement schedule shall be arranged, as approved, in such a manner as to provide time for the temperature of the previously placed concrete to begin to recede.

3. The mixing water shall be the coolest available at the Site insofar as is practical.

C. Low Humidity/Wind

1. Pouring of concrete during periods of low humidity (below 50 percent) and/or windy conditions should be avoided when feasible and economically possible, particularly when large surface areas need to be finished.

2. No concrete shall be placed if the rate of evaporation approaches 0.2 pounds per square foot per hour unless precautions against plastic shrinkage cracking are taken.

3. In any event, surfaces exposed to the drying wind shall be covered up immediately after finishing with polyethylene sheets and be water cured continuously as soon as the concrete has set up. Curing compounds, in lieu of water, may not be used.

3.7 Backfill

A. After the concrete has reached sufficient strength, the space in back of structures shall be backfilled to the required elevation with the proper material as specified, which shall be compacted until firm and solid.

B. When the entire Project has been finished, any damaged structure sections shall be repaired or replaced at no additional cost to the City.

3.8 Curb and Curb and Gutter

A. General

1. Concrete curb and curb and gutter shall be constructed in accordance with these Technical Specifications to the required lines, grades, and cross sections. They can be constructed with forms or with a curbing machine meeting the requirements of these Technical Specifications.

2. Curbs located on vertical or horizontal curves shall be constructed to result in a smooth curve.

B. Curbing Machine

1. The machine for extruding Portland Cement concrete curb shall be of the self-propelled type equipped with a material hopper, distributing screw, and adjustable curb forming devices capable of placing and compacting Portland Cement concrete to the lines, grades, and cross sections as shown in an even, homogeneous manner.

2. A grade line gauge or pointer shall be attached to the machine in such a manner that a continual comparison can be made between the curb being placed and the established curb grade as indicated by the offset guideline.

C. Placement and Finishing

1. The top and face of finished curb and curb and gutter shall be true and straight, and the top surface of curb shall be of uniform width free from humps, sags, honeycombs, or other irregularities.

2. When a straightedge 6 feet long is laid on the top face of the curb or on the surface of the gutter, the surface shall not vary more than 0.02 feet from the edge of the straightedge except at grade changes or vertical curves.

3. The Contractor shall construct all curb and gutter within 0.02 feet of true line, within 0.02 feet of established surface grade, cross section, and slope, and within 0.02 feet of specified thickness.

4. When the curbing machine is used, the Contractor shall feed the concrete into the extruding machine at a uniform rate and operate the machine under

sufficient restraint in a forward motion to produce a well compacted mass of concrete.

5. All exposed surfaces of the curb or curb and gutter shall be floated, followed by a light brush finish.

6. If forms are used, they shall be removed after the concrete has taken its initial set and while the concrete is still green enough to finish.

7. Minor defects shall be repaired with mortar containing one part Portland Cement and two parts sand. Honeycombed, slumped, and other structurally defective concrete shall be removed and replaced at no expense to the City.

8. All exposed formed surfaces shall receive a rubbed finish utilizing a Carborundum brick or other abrasive until a uniform color and texture is produced.

D. Joints

1. Expansion Joints

a. Expansion joints shall be provided opposite abutting expansion joints, at the end of curved sections, at connections to existing curbs, and adjacent to any structure.

b. The width of joints and thicknesses of filler shall match those of the joints and abutting or underlying concrete; elsewhere the filler thickness shall be 1/2 inch.

c. Each expansion joint shall be at right angles to the structure alignment, vertical to the structure surface, placed full depth of the concrete section, and shall fully separate the concrete section.

2. Transverse Contraction Joints

a. Transverse contraction joints of the weakened plane or dummy type shall be formed in the exposed surfaces opposite contraction joints in abutting Portland Cement concrete and at other locations in the new curb as required to confine the contraction joint spacing to a maximum of 10 feet. The joints shall be formed by grooving, by insertion and removal

of plates or other devices, by insertion and leaving in place of preformed bituminous filler, or by sawing.

b. Contraction joints shall be 3/16-inch in width and a minimum depth of one-quarter of the thickness of the concrete. The edges of joints shall be tooled, unfilled grooves, and shall be clean and neat. Joint filler shall be even and flush with the surface of the concrete.

c. If the joints are constructed by sawing, the sawing shall be performed as soon as practical after pouring and prior to the occurrence of any shrinkage cracking.

3.9 Sidewalk and Driveway and Alley Approaches

A. General

Concrete sidewalks shall be constructed in accordance with these Technical Specifications to the required lines, grades, and cross sections.

B. Placement and Finishing

1. Before the concrete is given the final finishing, the surface of the sidewalk shall be checked with a 10-foot straightedge; any irregularities of more than 1/4-inch in 10 feet shall be eliminated.

2. Edges, including those of expansion joints, shall be rounded with an approved finishing tool.

3. The final surface of the concrete shall receive a medium to coarse cross brooming finish so as to provide a granular or matte texture that will not be slick when wet.

4. Cross brooming shall be transverse to the length of the sidewalk and approaches.

C. Joints

1. Expansion Joints

a. Expansion joints shall be provided opposite abutting expansion joints, at the end of curved sections, at all corners other than those 90 degrees, at connections to existing sidewalks, and adjacent to any structure.

b. The width of the joints and thickness of the filler shall match those of the joints and abutting or underlying concrete; elsewhere, the thickness shall be 1/2 inch.

c. Each expansion joint shall be at right angles to the structure alignment, vertical to the structure surface, placed full depth of the concrete section, and shall fully separate the concrete section.

2. Transverse Contraction Joints

a. Transverse contraction joints are required every 5 feet along the length of sidewalks.

b. The joints between sections shall be formed by steel templates 1/8-inch in thickness or sawn in with a concrete saw after initial set of the concrete to a minimum depth of 1/4 the thickness of the concrete. Joints shall be at right angles to the alignment.

3.10 Steps

A. General

Steps shall be constructed in accordance with these Technical Specifications to the required lines, grades, and cross sections.

B. Placement and Finishing

1. All edges shall be rounded with an approved finishing tool. All horizontal surface of the step shall receive burlap or cross-brooming finish to provide a granular or matte texture which will not be slick when wet.

2. After the forms are removed and while the concrete is still green, the vertical surfaces shall be finished.

3. Minor defects shall be repaired with a mortar containing one part Portland Cement and two parts sand. Honeycombed, slumped, and other structurally defective concrete shall be removed and replaced at no expense to the City.

4. All vertical surfaces shall receive a rubbed finish utilizing a Carborundum brick or other abrasive until a uniform color and texture is produced.

3.11 Reinforcing Bars

A. 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.

B. At the time of placing concrete, all reinforcement shall be free from loose mill scale, rust, grease, or other coating that 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 so no steel touches any ground surfaces.

C. 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.

3.12 Truncated Dome Detectable Warning Texture

Truncated dome detectable warning texture shall be installed in accordance with the manufacturer's requirements and in accordance with Oregon Standard Drawings RD900 series.

3.13 ADA Requirements

All sidewalks, curb ramps, etc., shall be constructed in accordance with all ADA standards and requirements. The Contractor shall immediately notify the City if non-ADA work is being required or being performed.

3.14 Testing and Inspection

The Contractor shall provide and maintain a quality control program that will ensure the quality of the Work and materials incorporated into the Project. See the Quality Control section of the General Requirements.

END OF SECTION

STORM DRAINAGE SYSTEM

CITY OF BOARDMAN, OREGON

TABLE OF CONTENTS

SECTION 7

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. 00260349, 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. 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

UNDERGROUND UTILITIES

CITY OF BOARDMAN, OREGON

TABLE OF CONTENTS

SECTION 8

UNDERGROUND UTILITIES

CITY OF BOARDMAN, OREGON

TECHNICAL SPECIFICATIONS

SECTION 8

UNDERGROUND UTILITIES

PART 1 - GENERAL

1.1 Scope

A. These Specifications cover the installation of the utility systems and appurtenances for the electrical power, telephone, cable, and gas. The Work includes, unless otherwise specified, furnishing all labor, materials, tools, equipment and incidentals, working in cooperation with the various utility companies, required to construct the various utility systems, ready for service or cable installation as outlined in the Specifications.

B. Requirements for excavation and backfill of trenches, surface restoration, etc., are specified under separate Technical Specification sections.

1.2 Utility Contacts

A. See the General Requirements for the various utility companies, with their contact person who will service this Project.

B. Items included in this Technical Specification are intended to be broad in scope and may not always apply to all items of Work to be constructed.

1.3 Specification References

Specification references made herein such as conduits, elbows, junction boxes, transformer pad vaults, etc., refers to designations for the American Society for Testing and Materials (ASTM) current edition.

1.4 Care and Handling of Materials

A. Adequate care shall be taken to prevent damage to all material used in the construction of the utility systems. Conduit and other materials shall be adequately protected and secured during transport to prevent collision of individual pieces and possible subsequent damage.

B. All materials 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 conduit, fittings, and all other materials used in the construction of the utility systems 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.

C. The proper materials, tools and equipment shall be used by the Contractor for safe and convenient prosecution of the Work. All conduits and 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 conduit system materials or appurtenances be dropped or dumped into the trenches.

1.5 Certification by Manufacturer

The Contractor shall furnish to the City, when required by 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 Electrical Power Conduit System

A. PVC Conduit

The PVC conduit used for the electric power distribution and service systems shall be gray Type II PVC Schedule 40, suitable for use with 90°C rated wire. Conduit shall conform to UL Standard 651 and carry appropriate UL listing for below ground use.

B. Horizontal Elbows and Elbows at Service Pole Connections

Elbows for the electrical power distribution and service systems at these locations shall be 36-inch radius galvanized rigid steel conduit (GRC). The GRC elbows shall be smooth surface, heavy-wall, mild steel construction of uniform thickness and temper, reamed and threaded at each end. Protection shall be provided inside and out with galvanizing, sherardizing, or equal process. GRC shall comply with NEC Article 346.

C. Elbows at Transformer Locations

Vertical elbows at transformer locations for the electrical distribution and service systems shall be GRC complying with NEC Article 346 or Type II Schedule 40 PVC with 36-inch radius sweeps and threaded ends. The type of elbows to be used shall be approved by the power company.

2.2 Telephone Conduit Systems

A. PVC Conduit

The PVC conduit for telephone conduit systems shall be Schedule 40 PVC Type DB-120 suitable for use with 90°C rated wire. The conduit shall be suitable for below ground use meeting or exceeding the requirements of ASTM F512 and NEMA TC-8.

B. Elbows

Elbows for the telephone and television conduit systems shall be Type II Schedule 40 PVC. Elbows shall have a 36-inch radius sweep. The ends may be threaded or plain.

2.3 Cable Conduit System

Conduits for cable systems will be furnished by the cable company and installed by the Contractor as required by the cable company.

2.4 Gas Lines

All gas lines will be furnished and installed by the gas company.

2.5 PVC Cement

The PVC cement used to join the conduit sections shall be an all-weather quick-set cement, approved for use by the conduit manufacturer.

2.6 Miscellaneous Fittings

PVC lock nuts, male and female adapters, and all other fittings used in the conduit systems shall be Schedule 40 PVC suitable for below ground use with UL listing.

2.7 Pull Line

The pull line to be installed in all power conduit systems shall be non-conductive nylon with a tensile strength of at least 400 pounds. The pull line installed in all phone and television conduit systems shall be non-conductive nylon with a tensile strength of at least 100 pounds. Baling twine shall not be used as a pull line.

2.8 Street Light Pole

The street light pole shall be a BH35-11S2BG32, 30-foot mounting height, direct buried, gray pole, drilled for mask arm with hand hole and conductor entrance as supplied by General Pacific, Inc., Portland, Oregon, telephone (503) 257-0327, or approved equal.

PART 3 - EXECUTION

3.1 Coordination

A. Prior to construction of underground utility conduits, etc., the Contractor shall hold a meeting with all utilities to coordinate the Work and to work out all details related to the utility services to be provided.

B. The Contractor shall plan the installation of the power and communication conduit systems in such a manner as to avoid grade conflicts with other utilities.

C. When crossing other power or communication conduits the grade of the primary conduits shall be held and the service conduits shall pass underneath. Where necessary, the grade of the utility conduits shall be adjusted up or down to accommodate the grade of other fixed underground utilities.

3.2 Trench Excavation and Backfill

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

3.3 Gas Lines

The Contractor shall coordinate with the gas company, as required, to arrange for the gas company to furnish and install all gas main lines and service lines for the Project. Gas lines are to be installed in a common trench with the water line and power and telephone conduits. The Contractor will provide all excavation and trench backfill and bedding material for gas line installations.

3.4 Cable Service

The Contractor shall coordinate with the cable company, as required, to arrange for the installation of cable line in the conduits installed by the Contractor for cable main and service

lines. The final location of all underground conduits shall be coordinated with the cable company.

3.5 Telephone Lines and Service

The Contractor shall coordinate with the telephone company, as required, to arrange for the installation of telephone line in the conduits installed by the Contractor for telephone main and service lines. The final location of all underground conduits shall be coordinated with the telephone company.

3.6 Power Service

The Contractor shall coordinate with the power company, as required, to arrange for the installation of power service for the Project. The power company shall install power lines in conduits furnished and installed by the Contractor. The developer will pay all power service fees for the Project. The final size, location, and number of underground conduits shall be coordinated with the power company.

3.7 Street Lights

The Contractor shall install street light poles as required. The Contractor shall then arrange for the power company to install power to the street lights and install street lights on poles furnished and installed by the Contractor. All fees for street lights charged by the power company will be paid for by the developer.

3.8 Record Drawings

In addition to the requirements for Record Drawings, etc., as required in the General Requirements, which shall be carefully complied with, the Contractor shall maintain a record showing the locations and depths of the various conduit systems installed.

3.9 Installation of Conduit

A. Conduit shall be installed in accordance with best current practices as required by the manufacturer and as specified herein.

B. Conduit shall be installed with bell ends laid facing in the direction of laying unless directed otherwise by the City. Each pipe shall be properly bedded so as to be supported for the full length of the pipe. All joints shall be glued with waterproof solvent cement and joined in accordance with the installation instructions of the conduit manufacturer.

All joints shall be free of dirt and other foreign matter prior to application of glue and the joining of the next conduit.

C. Conduits shall be installed to the minimum depths and to the lines and grades when shown. It shall be recognized that conduit depths may vary from the minimum depths shown when adjustment of grade is required to avoid conflict when crossing other utilities.

D. No conduit shall be installed in water or when conditions exist that, in the opinion of the City, are unsuitable for the installation. At times when conduit laying is not in progress, the open ends of the conduit shall be closed by a watertight plug or other approved means. This provision applied during the noon hour as well as overnight. If there is water in the trench, the seal should remain in place until the trench is dewatered sufficiently to prevent groundwater from entering the conduit. Conduits shall be kept clean and dry during installation. Secure ends of all open conduits after installation to prevent the introduction of debris and/or water.

3.10 Pull Line

A. Each power conduit shall be installed with a nylon pull string having a tensile strength of at least 400 pounds for the power conduit system and 100 pounds for the phone and television conduit system.

B. Each conduit shall be proved to verify that it is properly installed.

C. Where conduits are stubbed up and capped, coil a minimum of 72 inches of pull line at the termination of primary or main conduit, and 15 feet at the termination of secondary or service conduits.

D. Attach a label to each pull line as to conduit starting or termination point and the intended future use.

E. Use plastic labels with indelible markings.

3.11 Elbows

All vertical elbows shall be installed plumb and at the required locations. Adjust depth of conduit for the required stub-up height. Do not cut off elbows. Bundle stubs together and bind together with a PVC tie or stainless steel band. Place a PVC lock nut on the terminal ends of all elbows.

3.12 Acceptance

The systems will be considered accepted after the various utilities have successfully installed their conductors and communication cables. Any defects of the conduit systems discovered during the installation of the power conductors or the communication cables shall be promptly and properly repaired by the Contractor, at the Contractor's expense.

END OF SECTION