

TECHNICAL SPECIFICATIONS

SECTION 01100
SPECIAL PROVISIONS

PART 1 GENERAL

These Special Provisions supplement and amplify certain sections of the General Conditions and Supplementary General Conditions. The General Conditions and Supplementary General Conditions shall apply except as modified herein. These Special Provisions and additional technical specifications may contain occasional requirements not pertinent to the project; however, these specifications shall apply in all particulars insofar as they are applicable to this project.

1.1 Applicable Standard Specifications and Plans

The requirements of the City of Roseburg Public Works Department and Building Department. In the case of discrepancy, unless noted otherwise herein, the more restrictive provisions shall apply.

1.2 Scope of Work

The work contemplated consists of construction of new potable water pipelines at the City's Main Reservoir site, including approximately 818 linear feet of 24-inch diameter ductile iron (DI) pipe, 317 lineal feet of which is installed within a sloped embankment, removal and abandonment of existing piping, asbestos abatement, connections to existing piping, isolation valves, fittings, blowoff and drain assemblies, air release assemblies, site grading, chain-link fence removal and replacement, surface restoration and related work, and the performance of any other work as called for by the project plans and specifications.

The work has been divided into two separate Bid Schedules, A and B, that are related to work associated with installation of DI water pipeline Alignments A and B, respectively. The City will determine whether both Bid Schedules or Bid Schedule A alone will be completed as part of this project.

The above general outline of principal features of the work does not in any way limit the responsibility of the CONTRACTOR(s) to perform all work and furnish all equipment, labor and materials required by the specifications and drawings. The drawings and specifications shall be considered and used together. Anything appearing as a requirement of either shall be accepted as applicable to both even though not so stated therein or shown.

No attempt has been made in these specifications or drawings to segregate work covered by any trade or subcontract under one specification. Such segregation and establishment of subcontract limits will be solely a matter of specific agreement

between the CONTRACTOR and its subcontractors and shall not be based upon any inclusion, segregation or arrangement in or of these specifications.

1.3 Coordination of Drawings and Specifications

The drawings and specifications are intended to describe and provide for a complete work. Any requirement in one is as binding as if stated in all. The CONTRACTOR shall provide any work or materials clearly implied in the Contract Documents even if the Contract Documents do not mention it specifically. If there is a conflict within the Contract Documents, it will be resolved by the following order of precedence:

- A. Permits for outside agencies required by law
- B. OWNER-CONTRACTOR Agreement
- C. Addenda to Contract Documents
- D. CONTRACTOR's Proposal
- E. Special Provisions
- F. Contract Drawings
- G. Technical Specifications
- H. Supplementary General Conditions
- I. General Conditions of the Contract
- J. Standard Specifications
- K. Standard Plans

Dimensions shown on the drawings or that can be computed shall take precedence over scaled dimensions. Notes on drawings are part of the drawings and govern in the order described above. Notes on drawings shall take precedence over drawing details.

The intent of the drawings and specifications is to prescribe the details for the construction and completion of the work which the CONTRACTOR undertakes to perform according to the terms of the Contract. Where the drawings or specifications describe portions of the work in general terms, but details are incomplete or silent, it is understood that only the best general practice is to prevail and that only materials and workmanship of the best quality are to be used. Unless otherwise specified, the CONTRACTOR shall furnish all labor, materials, tools, equipment, and incidentals, and do all the work involved in executing the Contract in a manner satisfactory to the ENGINEER.

The contract drawings are designated by general title, sheet number and sheet title. When reference is made to the drawings, the "Sheet Number" of the drawing will be used. Each drawing bears the ENGINEER's File No. 14-1551.204 and the general title:

CITY OF ROSEBURG
RESERVOIR HILL YARD PIPING
IMPROVEMENTS PROJECT – PHASE II

The specific titles of each sheet are contained on Sheet G-2.

1.4 Code Requirements

All work shall be done in strict compliance with the requirements of:

- A. International Building Code
- B. Uniform Mechanical Code
- C. Uniform Plumbing Code
- D. National Electric Code
- E. National Electric Safety Code
- F. Oregon State Department of Labor and Industries
- G. City of Roseburg Public Works Department
- H. City of Roseburg Building Department
- I. Oregon Department of Environmental Quality

In case of disagreement between codes or these specifications, the more restrictive shall prevail.

1.5 Time of Completion/Liquidated Damages

The CONTRACTOR shall complete all work shown and specified within the time limits stated in the Construction Contract. The written Notice to Proceed will be sent to the CONTRACTOR after the CONTRACTOR submits the signed Contract, Bonds and Insurance Certificates to the OWNER and those documents have been approved as to form and executed by the OWNER. The CONTRACTOR's attention is directed to the Construction Contract as respects liquidated damages.

1.6 Coordination With Other Contractors and With OWNER

Certain work within this contract may require connection to and coordination with the work of other contractors and OWNER. The CONTRACTOR under these specifications shall cooperate fully with all other contractors and OWNER and carefully fit its own work to such other work as may be directed by the ENGINEER. The CONTRACTOR shall not commit or permit any act to be committed which will interfere with the performance of work by any other contractor or the OWNER.

1.7 Access to Work

Access to the work shall be provided as may be required by the OWNER or its representatives, and all authorized representatives of the state and federal governments and any other agencies having jurisdiction over any phase of the work, for inspection of the progress of the work, the methods of construction or any other required purposes.

1.8 Permits and Licenses

Unless provided for otherwise in these contract documents, all permits, licenses and fees shall be obtained by the CONTRACTOR and all costs shall be borne by the

CONTRACTOR. CONTRACTOR shall pay all plan check fees and other fees necessary to obtain permits and shall accommodate special inspections required thereof. CONTRACTOR shall be responsible for compliance with all permit provisions and shall accommodate all special inspections required thereof, all at no additional expense to the OWNER beyond prices as bid.

1.9 Site Investigation and Physical Data

The CONTRACTOR acknowledges that it is satisfied as to the nature and location of the work and the general and local conditions, including but not limited to those bearing upon transportation, disposal, handling and storage of materials, availability of water, roads, groundwater, access to the sites, coordination with other contractors, and conflicts with pipelines, structures and other contractors. Information and data furnished or referred to herein is furnished for information only. Any failure by the CONTRACTOR to become acquainted with the available information and existing conditions will not be a basis for relief from successfully performing the work and will not constitute justification for additional compensation.

The CONTRACTOR shall verify the locations and elevations of existing pipelines, structures, grades and utilities, prior to construction. The OWNER assumes no responsibility for any conclusions or interpretations made by the CONTRACTOR on the basis of the information made available.

1.10 Temporary Utilities for Construction Purposes

The CONTRACTOR shall make all arrangements necessary to provide all temporary utilities for construction purposes and shall pay all costs associated those temporary utilities. The CONTRACTOR shall make its own arrangements for obtaining a potable water supply for flushing, testing and disinfection of the pipelines and appurtenant facilities. Water supply may be made available to the CONTRACTOR from the City of Roseburg water system depending upon the operational status of its existing reservoirs, water demands, other water needs, and other factors.

The CONTRACTOR shall furnish all valves, hoses, connections and other devices and facilities as necessary to obtain sufficient water for construction and for filling and testing of water lines as required. Fire hydrant use is allowed only by permission of the utility owner. Backflow protection is required on all connections to potable water systems.

1.11 Field Service by Manufacturer's Representative

The CONTRACTOR shall furnish the services of a manufacturer's or material supplier's representative for all major equipment and materials furnished by the CONTRACTOR or OWNER under this contract, to check, place in operation and test the installation, and train operating personnel. The manufacturer's representative shall be qualified and authorized to perform repairs and maintenance on the equipment.

The above gives a general scope of the services desired from the manufacturer's representative. It will be the responsibility of the CONTRACTOR and the equipment manufacturer to determine detailed requirements. Costs for services of the manufacturer's representative shall be included in the proposal of the CONTRACTOR. The operator training mentioned above shall include sufficient time during the CONTRACTOR's operation and testing period to fully explain to the operating personnel the features of the equipment and maintenance thereof.

1.12 Construction Within Public Rights-of-Way

When the work contemplated is wholly or partly within the right-of-way of a public agency such as a city, county or state, the OWNER will obtain from these agencies any right-of-way and street opening permits and all other necessary permit(s) required for the work. The CONTRACTOR shall abide by all regulations and conditions stipulated in the permit(s). Such conditions and requirements are hereby made a part of these specifications, as fully and completely as though the same were fully set forth herein. The CONTRACTOR shall examine the permit(s), if any, granted to the OWNER by any city, county, state and federal agencies. Failure to do so will not relieve the CONTRACTOR from compliance with the requirements stated therein.

The CONTRACTOR shall obtain all construction permits and pay all fees or charges and furnish any bonds and insurance coverages as necessary to insure that all requirements of the city, county, state or federal agencies will be observed and the roadway and ditches are restored to their original condition or one equally satisfactory. A copy of all permits shall be kept on the work site for use of the ENGINEER.

The OWNER has not obtained any permits for the project as all work is within City-owned properties.

1.13 Construction Within Private Easements

When portions of the work contemplated are within easements held by the OWNER on private property, the CONTRACTOR shall ascertain for itself to what extent the width, status and special conditions attached to easements may have on its operations and all costs resulting therefrom shall be included and absorbed in the unit prices of the CONTRACTOR's bid. CONTRACTOR shall coordinate with private property owners and businesses if required. Landscaping, surface restoration and fence restoration shall be completed within 24 hours following piping and conduit installation and other construction work. Temporary fencing shall be provided continuously until such private fencing is properly restored.

The CONTRACTOR's attention is directed to Paragraph 5.8 of the General Conditions regarding safety and the protection of property. Certain portions of this project may require working in close proximity to existing structures and property within private easements. It is the CONTRACTOR'S responsibility to conduct its

operations and limit the size of equipment used in such a manner so as to prevent damage to existing property from excessive vibration or from other direct or indirect CONTRACTOR operations. The cost associated with repairing or replacing property that is damaged by the CONTRACTOR's operations shall be the responsibility of the CONTRACTOR, in accordance with the General Conditions.

1.14 Private Roads and Driveways

Bridges at entrances to business properties where vehicular traffic is necessary shall be provided and maintained. Bridges shall be adequate in width and strength for the service required. No private road or driveway may be closed without approval of the ENGINEER unless written authority has been given by the owner whose property has been affected. Driveways shall be left open and ready for use at the end of the work shift. All expenses involved in providing for construction, maintenance, and use of private roads or driveways, shall be borne by the CONTRACTOR and the amount thereof absorbed in the unit prices of the CONTRACTOR's bid.

1.15 Traffic Control and Protection

The CONTRACTOR shall maintain traffic control and protection in all of the work areas twenty-four (24) hours per day. Traffic control shall conform to the standards set forth in the latest edition of the "Manual on Uniform Traffic Control Devices for Streets and Highways" (MUTCD) and any modifications to that manual contained herein or any other requirements as prescribed by any agency with authority over the project.

Prior to beginning construction, the CONTRACTOR shall submit a detailed street closure and traffic control plan to the ENGINEER. This plan shall address any traffic impacts to NE Bellview Court and SE Stephens Street which shall be the only allowed access for the CONTRACTOR to the project site. The closure and traffic control plan shall be prepared in accordance with the Oregon Department of Transportation Traffic Control Plans Design Manual. This plan shall be organized to address the closure and traffic control requirements of the MUTCD and the City of Roseburg. The ENGINEER will submit the plan to the City of Roseburg for their review. The CONTRACTOR shall modify or correct the plan and resubmit the plan, as required by either agency, as necessary to obtain approval. Construction may not proceed until approval has been obtained.

All work shall be carried on with due regard for safety to the public. Work zone areas shall be provided with barricades of a type that can be seen at a reasonable distance. Work zone areas shall be distinctly indicated at night by adequately placed lighting which shall consist of a minimum of two lighting plants within the work zone. The CONTRACTOR shall designate an individual on the project to be its traffic control superintendent. The CONTRACTOR shall work with the OWNER in support of its public relations program as described elsewhere in these Special Provisions to provide

notification of construction activities and road closures to the City of Roseburg and local residents, businesses, school districts, and other institutions and agencies.

The specific additional requirements of the City of Roseburg are as follows:

At least two (2) weeks before construction begins, provide and install project signage at one location, NE Bellview Court, for the purpose of notifying the public of the coming construction and including estimated construction beginning and ending dates. One lane of traffic shall remain open at all times during active construction in the vicinity of NE Bellview Court. When construction is suspended, the full width of the roadway shall be restored to normal use. The CONTRACTOR shall provide traffic control signs designating detour routes. The CONTRACTOR shall be prepared to reopen the roadway immediately and at any time if so directed by the City of Roseburg. The CONTRACTOR will need to provide a phone number for the public and others if they have any complaint about the road maintenance on the access road, NE Bellview Court.

1.16 Stockpile and Staging Plan

The CONTRACTOR shall submit a stockpile and staging plan to the ENGINEER. This plan will describe the CONTRACTOR's plan for stockpiling and staging of construction materials and equipment on the project site. This plan will include no stockpiling of materials allowed on the non-trenched lanes. Stockpiling of materials will only be allowed on areas where the pavement is being overlaid.

If the CONTRACTOR makes arrangements with private or public land owners for use of property outside of public rights-of-way for stockpiling and staging, then the CONTRACTOR shall submit documentation to the ENGINEER that the CONTRACTOR's warrants that its activities comply with all environmental, land use and any other requirements under all Federal, State and local statutes and codes. The CONTRACTOR shall also submit documentation of permission from the property owner for the proposed activity. Upon completion of construction, the CONTRACTOR shall submit to the ENGINEER a release from the property owner confirming that the property has been restored to the satisfaction of the owner and that all obligations have been satisfied.

1.17 Work Hour Limitations and Restrictions

Work hour limitations and restrictions apply to the project depending upon the governmental jurisdiction within which the work is being conducted. Work hour limitations and restrictions by agency are as follows:

City of Roseburg:

Weekdays: 7 AM to 7 PM, or darkness, if it shortens the work period
Saturdays: 8 AM to 6 PM, or darkness if it shortens the work period

Requests for variations in work hours shall be made in writing for consideration by the ENGINEER and the OWNER. No work shall be conducted outside of the above-described days and hours without prior approval of the ENGINEER and the OWNER.

1.18 Materials and Compaction Testing

The CONTRACTOR shall provide, at no cost to the OWNER, the services of a licensed, independent agency to perform materials and compaction testing for this project. The agency must be approved by the ENGINEER. The scope of these services to be performed by the agency will include the following: soil and aggregate classification and testing; soil and aggregate compaction testing; hot mixed asphalt concrete (HMAC) testing and compaction; and controlled low-strength material (CLSM) testing.

Compaction tests will be required to show that specified densities of compacted backfill and asphaltic concrete surfacing are being achieved by the CONTRACTOR's compaction methods. The CONTRACTOR shall provide the ENGINEER with copies of recent Proctor tests for the backfill and paving material in addition to copies of compaction tests performed in the field.

After the ENGINEER is satisfied that the CONTRACTOR's method of compaction consistently meets specified compaction requirements, the testing frequency may be reduced. The ENGINEER may direct testing at a higher frequency upon failure to obtain specified densities or if the CONTRACTOR changes compaction equipment or methods of compaction. All test locations shall be determined by the ENGINEER.

1.19 Dechlorination and Disposal of Chlorinated Water

Any discharge of chlorinated water shall include dechlorination to limits acceptable by the Oregon State Department of Environmental Quality (DEQ) for discharge into the existing storm drainage system or natural waterway. No chlorinated water shall be discharged into a storm drainage system or natural waterway prior to successful treatment with approved dechlorination treatment.

1.20 Limits of the Work and Storage of Spoils

The limits of the site which may be used for construction, storage, materials handling, parking of vehicles and other operations related to the project include the public rights-of-way and water line easements as shown on the drawings and adjacent public rights-of-way subject to permission of the public owner of that right-of-way. The limits of work also include rights of access that may be obtained by the CONTRACTOR, subject to all public laws and regulations and rights of access by utility companies and other holders of easement rights.

1.21 Existing Water System Shutdown

If the project involves the need to shut down an existing water system, the CONTRACTOR shall coordinate the work to insure a minimum of shutdown time. The CONTRACTOR shall submit a written shutdown schedule to the ENGINEER for approval. The CONTRACTOR shall provide 72-hour notice preceding each shutdown. See Section 01654 Work Sequences and Constraints for additional requirements.

1.22 Field Changes, Alignment and Grade

Changes of alignment and grade shall be made during the course of work in order to avoid interference with unforeseen obstructions. The CONTRACTOR shall locate existing utilities to be crossed, by potholing ahead of the pipe installation, of sufficient distance to avoid conflicts through pipe joint deflection if possible. All costs for minor field changes of alignment and grade shall be borne by the CONTRACTOR. The ENGINEER will endeavor to make prompt decisions on such matters. CONTRACTOR shall anticipate a minimum of 72 hours for any decision requiring significant piping change.

1.23 Testing and Operation of Facilities

It is the intent of the OWNER to have a complete and operable facility. All of the work under this contract will be fully tested and inspected in accordance with the specifications. Upon completion of the work, the CONTRACTOR shall operate the completed facilities as required to test the equipment under the direction of the ENGINEER. During this period of operation by the CONTRACTOR, the new facilities will be tested thoroughly to determine their acceptance.

1.24 Protection of Existing Structures and Work

The CONTRACTOR must take all precautions and measures necessary to protect all existing structures and work. Any damage to existing structures and work shall be repaired by removing the damaged structure or work, replacing the work and restoring to original condition satisfactory to the ENGINEER.

1.25 Salvage and Debris

Unless otherwise indicated on the drawings or in the specifications, all castings, pipe, equipment, demolition debris, spoil or any other discarded material or equipment shall become the property of the CONTRACTOR and shall be disposed of in a manner compliant with applicable Federal, State and local laws and regulations governing disposal of such waste products. No burning of debris or any other discarded material will be permitted.

1.26 Safety Standards and Accident Prevention

The CONTRACTOR shall be solely and completely responsible for conditions of the job site, including safety of all persons and property during performance of the work. This requirement shall apply continuously and not be limited to normal working hours. The required and/or implied duty of the ENGINEER to conduct construction review of the CONTRACTOR's performance does not, and is not intended to, include review of the adequacy of the CONTRACTOR's safety measures in, on, or near the construction site.

The CONTRACTOR shall comply with the safety standards provisions of applicable laws and building and construction codes. The CONTRACTOR shall exercise every precaution at all times for the prevention of accidents and protection of persons, including employees, and property. During the execution of the work the CONTRACTOR shall provide and maintain all guards, railing, lights, warnings, and other protective devices which are required by law or which are reasonably necessary for the protection of persons and property from injury or damage.

1.27 Warranty Period

The CONTRACTOR shall warrant all furnished materials and equipment for a period of one year from date of final acceptance of the Work by the OWNER. This warranty shall mean prompt attention to the correction and/or complete replacement of the faulty material or equipment. The expiration of the one-year warranty period shall not affect any other claims or remedy available to the OWNER. There may be other warranty provisions in these contract documents in addition to those noted above.

1.28 Utility Properties and Service

In areas where the CONTRACTOR's operations are adjacent to or near a utility and such operations may cause damage which might result in significant expense, loss and inconvenience, the operations shall be suspended until all arrangements necessary for the protection thereof have been made by the CONTRACTOR.

The CONTRACTOR shall notify all utility offices which may be affected by the construction operation at least 48 hours in advance. Before exposing any utility, the utility having jurisdiction shall grant permission and may oversee the operation. Should service of any utility be interrupted due to the CONTRACTOR's operation, the proper authority shall be notified immediately. It is of the utmost importance that the CONTRACTOR cooperates with the said authority in restoring the service as promptly as possible. Any costs shall be borne by the CONTRACTOR.

Utilities which may be impacted include the following:

City of Roseburg

Water & Instrumentation and Control Wiring

1.29 Sanitary Facilities

The CONTRACTOR shall provide and maintain sanitary facilities for its employees and its subcontractors' employees that will comply with the regulations of the local and State Departments of Health and as directed by the ENGINEER.

1.30 Street Cleanup

The CONTRACTOR shall clean daily all dirt, gravel, construction debris and other foreign material resulting from its operations from all streets and roads.

1.31 Vehicle Parking

The vehicles of the CONTRACTOR's and subcontractors' employees shall be parked in accordance with local parking ordinances.

1.32 Protection of Quality of Water

The work to be performed may involve connections to an existing potable water system. If such work is included in the project, the CONTRACTOR shall take such precautions as are necessary or as may be required to prevent the contamination of the water. Such contamination may include but shall not be limited to deleterious chemicals such as fuel, cleaning agents, paint, demolition and construction debris, sandblasting residue, etc. In the event contamination does occur, the CONTRACTOR shall, at its own expense, perform such work as may be necessary to repair any damage or to clean the affected areas of the water mains to a condition satisfactory to the ENGINEER.

1.33 Record Drawings

CONTRACTOR shall maintain at the site one set of specifications, full size drawings, shop drawings, equipment drawings and supplemental drawings which shall be corrected as the work progresses to show all changes made. Drawings shall be available for inspection by the ENGINEER. Upon completion of the contract and prior to final payment, marked up specifications and drawings shall be turned over to the ENGINEER.

1.34 "Or Equal" Clause

In order to establish a basis of quality, certain processes, types of machinery and equipment or kinds of material may be specified on the drawings or herein by designating a manufacturer's name and referring to its brand or product designation. It is not the intent of these specifications to exclude other processes, equipment or materials of a type and quality equal to those designated. When a manufacturer's name, brand or item designation is given, it shall be understood that the words "or equal" follow such name or designation, whether in fact they do so or not. If the CONTRACTOR desires to furnish items of equipment by manufacturers other than

those specified, he shall secure the approval of the ENGINEER prior to placing a purchase order.

No extras will be allowed the CONTRACTOR for any changes required to adopt the substitute equipment. Therefore, the CONTRACTOR's proposal for an alternate shall include all costs for any modifications to the drawings, such as structural and foundation changes, additional piping or changes in piping, electrical changes or any other modifications which may be necessary or required for approval and adoption of the proposed alternate equipment. Approval of alternate equipment by the ENGINEER before or after bidding does not guarantee or imply that the alternate equipment will fit the design without modifications.

1.35 Surveys

Based upon the information provided by the Contract Documents, the CONTRACTOR shall develop and make all detail surveys necessary for layout and construction, including exact component location, working points, lines and elevations. Prior to construction, the field layout shall be approved by the OWNER's representative. The CONTRACTOR shall have the responsibility to carefully preserve bench marks, reference points and stakes, and in the case of destruction thereof by the CONTRACTOR or resulting from its negligence, the CONTRACTOR shall be charged with the expense and damage resulting therefore and shall be responsible for any mistakes that may be caused by the unnecessary loss or disturbance of such bench marks, reference points and stakes. See Section 01580, Construction Survey Work, for additional requirements.

1.36 Dust Prevention

All unpaved streets, roads, detours, haul roads or other areas where dust may be generated shall receive an approved dust-preventive treatment or be routinely watered to prevent dust. Applicable environmental regulations for dust prevention shall be strictly enforced.

1.37 Erosion and Sediment Control

Temporary construction site erosion control measures shall be designed and constructed in accordance with the project plans and specifications, and the requirements of the City of Roseburg, Douglas County, and the Oregon Department of Environmental Quality.

Erosion control measures shall be maintained throughout the project site until approved permanent cover such as a healthy stand of grass, other permanent vegetation, or other ground covering is established. When approved, permanent ground cover is established, all temporary erosion control measures shall be removed from the construction site. Erosion control measures shall be installed as approved, per the erosion control drawing(s) in the above referenced document. Erosion control

measures including stabilized construction entrances and sediment barriers must be established in conjunction with site clearing and grading.

During construction, and until permanent vegetation or other ground covering is established, the erosion control facilities shall be upgraded as needed for unexpected storm events or site conditions and with the purpose of retaining sediment and sediment-laden water on the construction site.

1.38 Interferences and Obstructions

At certain places, power, light and telephone poles may interfere with excavation and the operation of the CONTRACTOR's equipment. Necessary arrangements shall be made with utility companies for moving or maintaining such poles. The utility company affected by any such interferences shall be notified thereof so that the necessary moving or proper care of poles and appurtenances may have appropriate attention.

All costs resulting from any other interferences and obstructions, or the replacement of such, whether or not herein specifically mentioned, shall be included and absorbed in the unit prices of the CONTRACTOR's bid.

1.39 Noise Limitations

All applicable City of Roseburg and Douglas County ordinances and State and Federal regulations shall be compiled with.

1.40 Storage and Protection of Equipment and Materials

A. Materials and equipment stored overnight shall be placed neatly on the job site. Unusable materials (i.e. rejected or damaged liner material, old concrete chunks, metal scraps, etc.) shall be expeditiously removed from the job site.

Provide appropriate barricades, signs, and traffic control devices in like-new condition where necessary to protect the public from any hazards associated with the storage of materials and equipment used for this project.

B. No equipment and/or materials shall be stored outside the immediate work area on public right-of-ways, in the following locations, or in the following manner:

1. In any maintained landscaped or lawn area.
2. In a manner that would totally eliminate an individual residents' street parking.
3. In front of any business.

The "immediate work area" is the area where work is taking place or will be taking place within one calendar day. The CONTRACTOR shall immediately

move stored material or equipment which causes a nuisance or creates complaints.

1.41 Competent Person Designation

CONTRACTOR shall designate a qualified and experienced “competent person” at the site whose duties and responsibilities shall include enforcement of Oregon - OSHA regulations regarding excavations, the prevention of accidents, and the maintenance and supervision of construction site safety precautions and programs.

1.42 Emergency Maintenance Supervisor

The CONTRACTOR shall submit to the ENGINEER the names, addresses and telephone numbers of at least two employees responsible for performing emergency maintenance and repairs when the CONTRACTOR is not working. These employees shall be designated, in writing by the CONTRACTOR, to act as its representatives and shall have full authority to act on its behalf. At least one of the designated employees shall be available for a telephone call any time an emergency arises.

1.43 Prevailing Wage Rates for Public Works Contracts in Oregon

The CONTRACTOR shall abide by ORS 279C.800 through 279C.870 which relate to the prevailing wage rates for the building and construction trades in the State of Oregon and, if applicable, the Federal prevailing wage rates required under the Davis-Bacon Act (40USC276a). Additional information on required prevailing wage rates is included elsewhere in these contract documents.

1.44 Oregon Products

CONTRACTOR's attention is directed to the provisions of Oregon Law, ORS 279A.120 regarding the preference for products that have been manufactured or produced in Oregon. CONTRACTOR shall use Oregon-produced or manufactured materials with respect to common building materials such as cement, sand, crushed rock, gravel, plaster, etc., and Oregon-manufactured products in all cases where price, fitness, availability and quality are otherwise equal.

1.45 Use of Explosives

The use of explosives shall not be allowed on this project. Alternative methods of excavation shall be utilized.

1.46 Contaminated Material

A. General

It is possible that the CONTRACTOR may encounter contaminated material (soil and/or water) during excavation activities. This specification identifies requirements for handling and disposing contaminated media.

B. Definitions

1. “Contaminated material” is defined as soil, water, free product, Underground Storage Tanks (UST), buried abandoned utility lines containing residual or free product, solid waste, treated wood waste, chemical containers, or other solid, liquid, or gas substances with contamination levels above background levels.
2. “Hazardous substances” shall mean those substances or materials defined in the Oregon Revised Statutes (ORS) 465.200, as amended.
3. “Release” shall have the meaning as defined in ORS 465.200, as amended.
4. “Environmental laws” shall mean any applicable statute, law, ordinance, order, consent decree, judgment, permit, license, code, covenant, deed, common law, treaty, convention or other requirement pertaining to protection of the environment, health or safety, natural resources, conservation, wildlife, waste management or disposal, hazardous substances or pollution, including but not limited to regulation of releases to air, land, water, and groundwater.

C. Execution

1. Discovery of Contaminated Material

In the event that the CONTRACTOR, during the course of construction or during any other activities authorized under this contract, should encounter suspected contaminated material or any other materials suspected of posing a threat to human health and the environment, the CONTRACTOR shall notify the ENGINEER immediately and manage according to requirements identified below.

2. Discovery of Contaminated Soil

CONTRACTOR shall note evidence of contamination (odor, visual staining of soil, free liquid product seeping from soil, sheen on groundwater etc.) and note location of evidence on a sketch of the excavation and provide to the ENGINEER.

CONTRACTOR shall report the discovery to the ENGINEER immediately. CONTRACTOR shall stop all excavation activities, and secure the site to prevent entry by the public. The excavation shall not be backfilled. Protect all open excavations with berms, plates and fencing. CONTRACTOR may continue with work in other non-contaminated areas.

CONTRACTOR shall assist ENGINEER in collecting sample(s) of suspected contaminated media for testing and characterization. CONTRACTOR shall allow 21 days, at no cost to OWNER, for testing, results and instructions as to how to proceed with contaminated materials.

The CONTRACTOR shall obtain a copy of an approved soil disposal/acceptance permit (Disposal/Treatment Facility requires transporter to have a copy of the permit.)

CONTRACTOR will transport and dispose of contaminated material at an approved disposal/treatment facility.

CONTRACTOR shall provide the ENGINEER with a copy of the contaminated soil disposal receipt.

3. Handling of Contaminated Soil

After approval from the ENGINEER, excavate the soil in a manner that prevents commingling of contaminated and non-contaminated soil. ENGINEER will make determination (based on soil saturation) if contaminated soil can be directly transported to a treatment or disposal facility, or if soil needs to be stockpiled to reduce water content. ENGINEER will determine when stockpiled soil can be transported off-site.

CONTRACTOR will be responsible for stockpiling contaminated soil in containers or on impervious surface to prevent the spread of contamination. Any water runoff from the contaminated soil stockpile area(s) must be contained by CONTRACTOR and handled as contaminated water.

Minimize movement of excavation equipment over or through contaminated soil to prevent movement of contaminated soil into areas where no contaminated soil exists.

Stockpiles will be created on an approved site and shall be surrounded by a fence to limit access. The stockpiles must be covered and bermed during periods of rainfall to prevent run-on and run-off. The stockpiles shall be covered with a minimum 10 mil high density polyethylene (HDPE) plastic during periods of strong winds, nightfall, over the weekends, or during extended work stoppages. If dust is observed coming from the stockpiles, the stockpiles shall be either covered or the dust controlled with water.

Maintain excavation equipment in good working order. Prevent spillage of oil, fuel, or hazardous substances from equipment. In particular, promptly repair oil leaks from equipment and clean up any contaminated soil.

4. Transport of Contaminated Materials

CONTRACTOR shall comply with all applicable Federal, State, or local laws, codes, and ordinances that govern or regulate contaminated substance transportation. Contaminated soils placed in stockpiles shall be loaded into trucks in a manner that prevents the spilling or tracking of contaminated soil into areas of the site with uncontaminated soil. Loose material falling onto the exterior of the truck during loading shall be removed before the truck leaves the loading area. Any material collected in the loading area shall either be placed back into the truck or back into the stockpile. If loading areas are unpaved, the surface soil shall be sampled at the conclusion of the loading activities to confirm that contaminated soil is not present. If loading areas are paved, any loose soil shall be cleaned from the pavement at the conclusion of the loading activities.

Specific truck haul routes shall be established before beginning off-site contaminated media transport. On-site truck routes shall be established to minimize or prevent movement of trucks over contaminated soils. Off-site truck routes shall be established to reduce the risk of releases of contaminated soils and impact on local traffic. The CONTRACTOR shall be responsible for ensuring that loaded truck weights are within acceptable limits. All trucks shall be covered before they leave the loading area.

The CONTRACTOR shall ensure that all drivers of vehicles transporting contaminated substances have in their possession during transport all applicable Oregon State and local vehicle insurance requirements, valid driver's license, and vehicle registration and license. The CONTRACTOR shall be responsible for informing all drivers of transport vehicle about:

- a. The nature of the material transported.
- b. Required routes to and from the off-site thermal treatment or disposal facility.
- c. Applicable County street regulations and requirements, and State of Oregon Department of Transportation codes, regulations and requirements.

- d. The County's requirement for proper handling and transportation of the substances.

The CONTRACTOR shall not allow contaminated substances to be spilled or tracked off-site at any time during the project. Trucks used for the transportation of contaminated substances off-site shall be water tight, substance compatible, licensed, insured, and permitted pursuant to federal, state, and local statutes, rules, regulations and ordinances.

If contaminated media is discarded prior to removal of contaminated material, the price per cubic yard of soil materials and price per 100 gallons of contaminated water will be negotiated with OWNER.

1.47 Work with Existing Asbestos Water Pipelines

The CONTRACTOR shall comply with all requirements of the State of Oregon, Department of Environmental Quality (DEQ) with respect to the safe handling, removal and disposal of asbestos cement pipe, including all reporting requirements. A DEQ fact sheet, DEQ guidelines, and DEQ notification and report forms are included as supplementary information in Volume 3 – Supplementary Information of these specifications.

1.48 Definitions

Whenever used in these Contract Documents, the following pairs of terms shall have the same meaning.

<u>Term Used in Technical Specifications</u>	<u>Equivalent Term in General Conditions</u>
CONTRACTOR	Contractor
ENGINEER	Engineer
OWNER	City
Drawings	Plans

1.50 Permits and Approvals

The OWNER has obtained no permits for the project. The Contractor shall be responsible for obtaining all permits required by DEQ to perform asbestos abatement work. See Specification Section 02060, Existing Pipeline Abandonment for additional information.

END OF SECTION

SECTION 01200

MEASUREMENT AND PAYMENT

PART 1 GENERAL

Measurement and payment will be on a unit price basis in accordance with the prices set forth in the proposal for individual work items. Where work is required but does not appear as a separate item in the proposal, the cost for that work shall be included and absorbed in the unit prices named in the proposal. CONTRACTOR shall make a careful assessment when preparing the bid.

Item No. Description

SCHEDULE A – 24-inch DI Pipe Alignment A and Related Work

A-1. Mobilization, demobilization, bonds and insurance (Schedule A): Payment for mobilization, demobilization, bonds and insurance will be on a lump sum basis. The amounts paid for mobilization in the contract progress payment will be based on the percent of the original contract amount that is earned from other contract items, as follows:

- A. When 5 percent is earned, either 100 percent of the amount for mobilization or 5 percent of the original contract amount, whichever is the least;
- B. When all work is completed, amount of mobilization exceeding 5 percent of the original contract amount.

This schedule of mobilization progress payments will not limit or preclude progress payments otherwise provided by the contract.

A-2. Ductile iron (DI) pipe, AWWA C151, Class 52, restrained: Payment for furnishing and installing AWWA C151, Class 52 ductile iron (DI) restrained joint pipe for nominal sizes, and pipe zone and trench backfill as listed in the bid schedule, complete, including all work and materials, testing, inspection and acceptance, marking tape, tracer wire, gaskets, field joints, polyethylene encasement, restrained joints, AWWA C115 flange by plain end spools (size as required), incidentals, appurtenances, handling, storage and transport, tree removals, excavation, dewatering, sheeting, shoring and bracing, compaction, Class D (3/4 inches maximum aggregate size) or Class B (compacted native material) bedding, Class D (3/4 inches maximum aggregate size) or Class B (compacted native material) pipe zone backfill and Class B (compacted native material) or Class D (imported granular material) trench backfill, as required, will be at the unit price per linear foot regardless of depth for each backfill material.

The unit price shall include rock excavation as incidental.

Measurement for all piping covered under this bid item will be based on the total length of piping constructed with trench backfill as required and at the specific locations as indicated on the plans and in the specifications. The pay length will be on the basis of the horizontal length of pipe laid without deductions for valves or fittings. Where pipe is laid on a continuous slope greater than 10 percent for a distance greater than 100 feet, payment will be made upon the average slope distance between 100 foot stations.

- A-3. Cast or ductile iron fittings for ductile iron pipe: Payment for furnishing and installing cast or ductile iron fittings will be made on a per pound basis. The weight of fittings used for payment will be the nominal weights listed in AWWA Standard C110 for the actual Class and type of fitting specified and shown on the plans. Fitting installation will be considered a separate pay item from work performed under other pay items. Fitting accessories including glands, bolts, gaskets, joint restraining systems and polyethylene encasement shall be considered incidental in the fitting weights for payment. AWWA C115 ductile iron flange by plain end spools will not be paid for under this bid item and will be paid for under their applicable per linear foot ductile iron piping bid item as described above. DI fittings installed on a temporary basis to facilitate testing and disinfection of new water mains to be paid for under other bid items.
- A-4. Air and vacuum valve assemblies (2-inch): Payment for furnishing and installing 2-inch air and vacuum valve assemblies for ductile iron pipe including excavation, rock excavation, Class D bedding and backfill, polyethylene encasement, and any other items as shown on the drawings and as specified will be on a per each assembly basis, complete.
- A-5. 6-inch blow-off assemblies: Payment for furnishing and installing 6-inch blowoff assemblies for ductile iron pipe including excavation, rock excavation, Class D bedding and backfill, polyethylene encasement, and any other items as shown on the drawings and as specified will be on a per each assembly basis, complete.
- A-6. 24-inch butterfly valves (BFV): Payment for furnishing and installing 24-inch buried butterfly valves for end connections as shown on bid schedule, including valve boxes, covers, risers, riser extensions if required, glands, bolts, gaskets, joint restraining systems and polyethylene encasement will be on a per each valve basis, complete.
- A-7. 8-inch diameter gate valves (GV): Payment for furnishing and installing 8-inch gate valves, including valve boxes, covers, risers and extensions if required, glands, bolts, gaskets, joint restraining systems and polyethylene encasement, will be on a per each valve basis, complete.

- A-8. 24-inch diameter insulated flexible couplings (IFC/Reducing CPLG): Payment for furnishing and installing 24-inch nominal diameter insulated flexible coupling will be made on a per each basis and shall include exploratory excavation as required to confirm existing pipe connection location, outside diameter, and out-of-roundness. Contractor to assume flexible coupling will require a reducing center ring and end rings sized to match OD's of pipes to be coupled.
- A-9. Abandonment of existing ARV vault: Payment for work required to remove and dispose of existing precast concrete ARV vault and remove and abandon existing ARV located near STA A6+24, as shown on Drawings. DI fitting required for ARV abandonment shall be paid for under a separate bid item.
- A-10. Ductile iron pipe corrosion monitoring system: Payment for furnishing and installing the ductile iron corrosion monitoring system on all of the new Alignment A ductile iron pipe including insulating joints, joint bonding of pipes, valves and fittings, test stations, system testing and all other requirements of the plans and specifications, will be made on a lump sum basis, complete.
- A-11. Site grading adjacent to Reservoir Nos. 6 and 7: Payment for site grading work shall be made on a lump sum basis for all work required including clearing and grubbing, tree removals, general excavation and off-site disposal of excavated materials for areas requiring site grading as shown on the Drawings, complete. Rock excavation during site grading will be paid for under a separate pay item.
- A-12. Perimeter fence replacement: Payment for removal and replacement of approximately 325 linear feet of existing chain link fence as shown on the Drawings shall be made on a lump sum basis. Temporary fencing to secure site while permanent fence section is removed shall be paid for under a separate bid item.
- A-13. Additional payment for foundation stabilization: Payment for over-excavation and installation of crushed rock backfill material for stabilization for unsuitable foundation conditions will only be considered as approved by the ENGINEER. When such pre-approval is obtained, payment will be made on a per cubic yard basis.
- A-14. Flushing, testing and disinfection of new ductile iron mains and appurtenances: Payment for flushing, testing and disinfection of ductile iron mains and appurtenances including air and vacuum valve assemblies and blow-off assemblies for pipeline Alignment A will be on a lump sum basis for and shall include furnishing, installing and removing temporary testing equipment, piping, dechlorination equipment, flow control equipment and miscellaneous temporary piping, valves, fittings and thrust restraint. The OWNER shall provide off-site laboratory analysis of water test samples. Payment for any re-testing shall be paid for by the CONTRACTOR.
- A-15. Connections to existing water system facilities: Payment for labor and equipment to install connections to existing water system facilities shall be on a lump sum basis for

pipeline Alignment A, complete. Bid item will also include exploratory excavation work required to determine and/or confirm existing piping connection requirements. Piping and fitting quantities to complete connections to be paid for under other bid items.

- A-16. Erosion and sediment control, complete: Measurement and payment for temporary construction site erosion and sediment control measures shall be made on a lump sum basis for all work required for Schedule A, complete. The lump sum price shall include compensation for all labor, equipment and materials for construction site erosion and sediment control measures including meeting all water quality requirements for treatment and disposal of water pumped from excavations and discharged at the project site, all in accordance with the erosion and sediment control plan (ESCP) and any other requirements of the City of Roseburg, Douglas County, the Oregon Department of Environmental Quality and any other regulatory agencies with jurisdiction over the project as well as any other requirements, or as otherwise identified in the contract documents.
- A-17. Additional payment for controlled low strength material (CLSM) backfill: Payment for furnishing and placing controlled low strength material (CLSM) trench or structure backfill will be made on a per cubic yard placed basis where approved and directed by the ENGINEER.
- A-18. General surface restoration: Payment for surface restoration of impacted surfaces on City property for Schedule A work, and on access road leading up to site, and not otherwise provided for in other bid items including repair and restoration of any damaged surfaces, removal of all temporary erosion and sediment control facilities, removal of all construction materials and debris, and final cleanup upon completion of construction, removal and reinstallation of site's chain-link fencing where required, and providing temporary fencing to secure site while permanent fence is removed, and final reseeding will be on a lump sum basis, complete.

SCHEDULE B – 24-inch DI Pipe Alignment B and Related Work

- B-1. Mobilization, demobilization, bonds and insurance (Schedule B): Payment for mobilization, demobilization, bonds and insurance will be on a lump sum basis. The amounts paid for mobilization in the contract progress payment will be based on the percent of the original contract amount that is earned from other contract items, as follows:
- A. When 5 percent is earned, either 100 percent of the amount for mobilization or 5 percent of the original contract amount, whichever is the least;
 - B. When all work is completed, amount of mobilization exceeding 5 percent of the original contract amount.

This schedule of mobilization progress payments will not limit or preclude progress payments otherwise provided by the contract.

- B-2. Ductile iron (DI) pipe, AWWA C151, Class 52, restrained: Payment for furnishing and installing AWWA C151, Class 52 ductile iron (DI) restrained joint pipe for nominal sizes, and pipe zone and trench backfill as listed in the bid schedule, complete, including all work and materials, testing, inspection and acceptance, marking tape, tracer wire, gaskets, field joints, polyethylene encasement, restrained joints, AWWA C115 flange by plain end spools (size as required), incidentals, appurtenances, handling, storage and transport, tree removals, excavation, dewatering, sheeting, shoring and bracing, compaction, Class D (3/4 inches maximum aggregate size) or Class B (compacted native material) bedding, Class D (3/4 inches maximum aggregate size) or Class B (compacted native material) pipe zone backfill and Class B (compacted native material) or Class D (imported granular material) trench backfill, as required, will be at the unit price per linear foot regardless of depth for each backfill material.

The unit price shall include rock excavation as incidental.

Measurement for all piping covered under this bid item will be based on the total length of piping constructed with trench backfill as required and at the specific locations as indicated on the plans and in the specifications. The pay length will be on the basis of the horizontal length of pipe laid without deductions for valves or fittings. Where pipe is laid on a continuous slope greater than 10 percent for a distance greater than 100 feet, payment will be made upon the average slope distance between 100 foot stations.

- B-3. Cast or ductile iron fittings for ductile iron pipe: Payment for furnishing and installing cast or ductile iron fittings will be made on a per pound basis. The weight of fittings used for payment will be the nominal weights listed in AWWA Standard C110 for the actual Class and type of fitting specified and shown on the plans. Fitting installation will be considered a separate pay item from work performed under other pay items. Fitting accessories including glands, bolts, gaskets, joint restraining systems and polyethylene encasement shall be considered incidental in the fitting weights for payment. AWWA C115 ductile iron flange by plain end spools will not be paid for under this bid item and will be paid for under their applicable per linear foot ductile iron piping bid item as described above. DI fittings installed on a temporary basis to facilitate testing and disinfection of new water mains to be paid for under other bid items.
- B-4. Air and vacuum valve assemblies (2-inch): Payment for furnishing and installing 2-inch air and vacuum valve assemblies for ductile iron pipe including excavation, rock excavation, Class D bedding and backfill, polyethylene encasement, and any other items as shown on the drawings and as specified will be on a per each assembly basis, complete.

- B-5. 6-inch blow-off assemblies: Payment for furnishing and installing 6-inch blowoff assemblies for ductile iron pipe including excavation, rock excavation, Class D bedding and backfill, polyethylene encasement, and any other items as shown on the drawings and as specified will be on a per each assembly basis, complete.
- B-6. 24-inch butterfly valves (BFV): Payment for furnishing and installing 24-inch buried butterfly valves for end connections as shown on bid schedule, including valve boxes, covers, risers, riser extensions if required, glands, bolts, gaskets, joint restraining systems and polyethylene encasement will be on a per each valve basis, complete.
- B-7. 8-inch diameter gate valves (GV): Payment for furnishing and installing 8-inch gate valves, including valve boxes, covers, risers and extensions if required, glands, bolts, gaskets, joint restraining systems and polyethylene encasement, will be on a per each valve basis, complete.
- B-8. 24-inch diameter insulated flexible couplings (IFC/Reducing CPLG): Payment for furnishing and installing 24-inch nominal diameter insulated flexible coupling will be made on a per each basis and shall include exploratory excavation as required to confirm existing pipe connection location, outside diameter, and out-of-roundness. Contractor to assume flexible coupling will require a reducing center ring and end rings sized to match OD's of pipes to be coupled.
- B-9. Abandonment of existing reservoir yard piping and asbestos abatement: Payment for abandonment of existing reservoir yard piping where shown on plans shall be on a lump sum basis. Work under this item shall include excavation for removal and proper disposal of existing pipes, cutting of existing pipes as required, capping the ends of existing abandoned piping or plugging the ends of existing abandoned piping with concrete or grout, removal and disposal of existing reservoir piping and appurtenances as required per the plans and as described in the specifications.

Work to properly remove and dispose of existing reservoir piping with coatings containing asbestos including, but not limited to, assessment of the site by an accredited asbestos surveyor, application for variances through DEQ, if required, permitting through DEQ, preparation of proper DEQ notification paperwork, removal of friable and non-friable forms of asbestos, shall be considered incidental to this pay item. All work shall be performed by a licensed asbestos abatement Contractor, and all disposal shall be performed in accordance with DEQ and OSHA guidelines and Oregon Administrative Rules. It is anticipated that the asbestos encountered will become friable during pipeline abandonment, pipeline disassembly, and removal.

- B-10. Ductile iron pipe corrosion monitoring system: Payment for furnishing and installing the ductile iron corrosion monitoring system on all of the new Alignment B ductile iron pipe including insulating joints, joint bonding of pipes, valves and fittings, test stations, system testing and all other requirements of the plans and specifications, will be made on a lump sum basis, complete.

- B-11. Site grading adjacent to Reservoir Nos. 6 and 7: Payment for site grading work shall be made on a lump sum basis for all work required including clearing and grubbing, tree removals, general excavation and off-site disposal of excavated materials for areas requiring site grading as shown on the Drawings, complete. Rock excavation during site grading will be paid for under a separate pay item.
- B-12. Perimeter fence replacement: Payment for removal and replacement of approximately 325 linear feet of existing chain link fence as shown on the Drawings shall be made on a lump sum basis. Temporary fencing to secure site while permanent fence section is removed shall be paid for under a separate bid item.
- B-13. Additional payment for foundation stabilization: Payment for over-excavation and installation of crushed rock backfill material for stabilization for unsuitable foundation conditions will only be considered as approved by the ENGINEER. When such pre-approval is obtained, payment will be made on a per cubic yard basis.
- B-14. Flushing, testing and disinfection of new ductile iron mains and appurtenances: Payment for flushing, testing and disinfection of ductile iron mains and appurtenances including air and vacuum valve assemblies and blow-off assemblies for pipeline Alignment B will be on a lump sum basis for and shall include furnishing, installing and removing temporary testing equipment, piping, dechlorination equipment, flow control equipment and miscellaneous temporary piping, valves, fittings and thrust restraint. The OWNER shall provide off-site laboratory analysis of water test samples. Payment for any re-testing shall be paid for by the CONTRACTOR.
- B-15. Connections to existing water system facilities: Payment for labor and equipment to install connections to existing water system facilities shall be on a lump sum basis for pipeline Alignment B, complete. Bid item will also include exploratory excavation work required to determine and/or confirm existing piping connection requirements. Piping and fitting quantities to complete connections to be paid for under other bid items.
- B-16. Erosion and sediment control, complete: Measurement and payment for temporary construction site erosion and sediment control measures shall be made on a lump sum basis for all work required for B, complete. The lump sum price shall include compensation for all labor, equipment and materials for construction site erosion and sediment control measures including meeting all water quality requirements for treatment and disposal of water pumped from excavations and discharged at the project site, all in accordance with the erosion and sediment control plan (ESCP) and any other requirements of the City of Roseburg, Douglas County, the Oregon Department of Environmental Quality and any other regulatory agencies with jurisdiction over the project as well as any other requirements, or as otherwise identified in the contract documents.

- B-17. Additional payment for controlled low strength material (CLSM) backfill: Payment for furnishing and placing controlled low strength material (CLSM) trench or structure backfill will be made on a per cubic yard placed basis where approved and directed by the ENGINEER.
- B-18. General surface restoration: Payment for surface restoration of impacted surfaces on City property for Schedule B work, and other surface restoration work not otherwise provided for in other bid items including repair and restoration of any damaged surfaces, removal of all temporary erosion and sediment control facilities, removal of all construction materials and debris, and final cleanup upon completion of construction, removal and reinstallation of site's chain-link fencing where required, and providing temporary fencing to secure site while permanent fence is removed, and final reseeding will be on a lump sum basis, complete.
- B-19. Rock excavation (for site grading): Payment for rock excavation for site grading work will be made at the unit price per cubic yard of rock excavated while performing grading work adjacent to Reservoir Nos. 6 and 7, as specified on the Plans. The pay limits for rock excavation will be defined by the finished grade surface contours shown on the Plans, or as directed in writing by the Engineer. No payment will be made for rock excavation beyond these limits during site grading. Rock excavated during pipeline trenching will be paid for under other pay items. Rock excavation is defined in Section 02200, Earthwork. CONTRACTOR's attention is directed to Section 01100, Special Provisions, which presents requirements related to CONTRACTOR's use of explosives.

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 GENERAL

The CONTRACTOR shall provide submittals including shop drawings, schedules, drawings, and such other information as may be necessary for the prosecution of the work in the shop and in the field as required by the contract documents or the ENGINEER's instruction. There may be other submittals required elsewhere in these Specifications that are not necessarily included or mentioned in this Section.

Within fourteen (14) days after award of the contract, the CONTRACTOR shall submit to the ENGINEER a proposed list of manufacturers, suppliers, and subcontractors and a schedule of specific target dates for the submission and return of shop drawings required by the contract documents. The list and schedule shall be updated and re-submitted when requested by the ENGINEER. All shop drawings for interrelated items shall be scheduled for submission at the same time. Not less than one (1) week shall be allocated to each submittal for processing by the ENGINEER. At least six (6) copies of all submittals shall be provided to the ENGINEER. Four (4) copies of all submittals will be kept by the ENGINEER. If the CONTRACTOR requests that more than two (2) copies be returned, then the CONTRACTOR shall submit the appropriate quantity of submittals.

The ENGINEER will review shop drawings to determine compliance with the design concept of the project and return them to the CONTRACTOR within the period established in the shop drawings schedule. The ENGINEER may hold shop drawings in cases where partial submission cannot be reviewed until the complete submission has been received or where shop drawings cannot be reviewed until correlated items affected by them have been received. When such shop drawings are held, the ENGINEER will advise the CONTRACTOR in writing that the shop drawing submitted will not be reviewed until shop drawings for all related items have been received.

The CONTRACTOR shall submit to the ENGINEER, for review, six (6) copies each of such shop drawings, electrical diagrams and catalog information for fabricated items and manufactured items required for construction. The ENGINEER will review the submitted data and shop drawings, and will make notations thereon indicating "No Exception Taken", "Make Corrections Noted", "Rejected", "Revise and Resubmit", or "Submit Specified Item". The ENGINEER will then return two copies of the submitted data and shop drawings to the CONTRACTOR. The ENGINEER's review of submittals and shop drawings is not a check of any dimension or quantity, and will

not relieve the CONTRACTOR from responsibility for errors of any sort in the submittals and shop drawings.

When shop drawings and/or submittals are required to be revised or corrected and resubmitted, the CONTRACTOR shall make such revisions and/or corrections and resubmit those items or other materials in the same manner as specified above.

Submitted data shall be sufficient in detail for determination of compliance with the Contract Documents. Color samples for all items for which colors are to be selected shall be submitted at the same time. No equipment or material for which listings, drawings, or descriptive material is required shall be installed until the CONTRACTOR has received review from the ENGINEER.

Regardless of corrections made in or review given to the drawings by the ENGINEER, the CONTRACTOR shall be responsible for the accuracy of such drawings and for their conformity to the drawings and specifications. The CONTRACTOR shall check all submittals before submitting them to the ENGINEER and shall stamp its approval on all copies of the shop drawing documents. Any submittals received by the ENGINEER which do not bear the CONTRACTOR's approval shall be returned without review. If more than two (2) submissions are required to meet the project specifications, the cost of reviewing these additional submissions may be charged directly against the CONTRACTOR and the OWNER may withhold the funds necessary to cover these costs.

Materials and equipment shall be ordered a sufficient time in advance to allow time for reviews, and shall be available on the job when needed. Last minute review will not be given for inferior substitutes for material or equipment.

Required submittals include items listed below. This list is provided for CONTRACTOR's convenience only and may not be complete in all respects. CONTRACTOR shall provide all submittals required, whether or not specifically listed herein.

A. Schedules -- The CONTRACTOR shall prepare and submit to the ENGINEER, within fifteen (15) days after notice to proceed, a practicable schedule showing the order in which the CONTRACTOR proposes to carry out the work, the dates on which the important features of the work will start, and the contemplated dates for completing same. In addition to a time-scaled bar chart schedule depicting the project critical path, the CONTRACTOR shall submit a detailed CPM logic diagram. The CPM diagram and time-scaled bar chart shall include the following:

- Construction activities
- Submittal and approval of material samples and shop drawings

- Procurement of critical materials
- Fabrication, installation, and testing of special material and equipment
- Duration of work, including completion times of all stages and their sub-phases

The activities shall be separately identifiable by coding or use of sub-networks or both. The duration of each activity shall be verifiable by manpower and equipment allocation, in common units of measure, or by delivery dates and shall be justifiable by the CONTRACTOR upon the request of the ENGINEER.

Detailed subnetworks will include all necessary activities and logic connectors to describe the work and all restrictions to it. In the restraints, include those activities from the project schedule which initiated the subnetwork as well as those restrained by it.

Include a tabulation of each activity in the computer mathematical analysis of the network diagram. Furnish the following information as a minimum for each activity:

- Event (node) number(s) for each activity
- Activity description
- Original duration of activities (in normal workdays)
- Estimated remaining duration of activities (in normal workdays)
- Earliest start date or actual start date (by calendar date)
- Earliest finish date or actual finish date (by calendar date)
- Latest start date (by calendar date)
- Latest finish date (by calendar date)
- Slack or float time (in workdays)

Computer printouts shall consist of at least a node sort and an “early start/total-float” sort.

CONTRACTOR’S attention is drawn to typical local climatic weather patterns and the CONTRACTOR shall coordinate work accordingly.

- B. Breakdown of Contract Price -- The CONTRACTOR shall, at the preconstruction meeting, submit a complete breakdown of all lump sum bid items showing the value assigned to each part of the work including an allowance for profit and overhead adding up to the total lump sum contract price. Breakdown of lump sum bids shall be coordinated with the items in the schedule. Preparatory work, bonds, and insurance required in setting up the job will be allowed as a separate entry on the cost breakdown but shall not

exceed 5 percent of the total base bid. Upon acceptance of the breakdown of the contract price by the ENGINEER, it shall be used as the basis for all requests for payment.

- C. Shop Drawings, Schedules and Drawings -- The CONTRACTOR shall provide shop drawings, schedules and such other drawings and information as may be necessary for the prosecution of the work in the shop and in the field as required by the contract documents and/or ENGINEER's instruction.
- D. Design Submittals -- Design submittals as may be required for equipment and systems elsewhere in these Specifications.
- E. Erosion and Sedimentation Control Plan
- F. Materials Lists
- G. CONTRACTOR Contact Persons
- H. Material Safety Data Sheets
- I. Traffic Control and Protection Plan
 - a. The Douglas County Right of Way Activity Plan requires that a traffic control plan be submitted to the County for approval.
- J. Miscellaneous Materials and Other Submittals As Required Elsewhere in the Specifications
- K. Operation and Maintenance Instructions

Before acceptance of the installation, the CONTRACTOR shall submit four (4) copies of complete operation and maintenance instructions for all equipment supplied. Submit items in 8-1/2 x 11-inch heavy-duty three-ring binders when appropriate, or in 8-1/2 x 11-inch file folders. All binders and folders shall have clear plastic pockets on the front of the cover and the spine to allow for insertion of identifying information. The equipment manufacturer may furnish instruction manuals prepared specifically for the equipment furnished or standard manuals may be used if statements like "if your equipment has this accessory..." or listings of equipment not furnished are eliminated. Poorly reproduced copies are not acceptable. Operation and maintenance instructions shall contain the following as a minimum:

1. Approved shop drawings and submittal data
2. Model, type, size and serial numbers of equipment furnished

3. Equipment and driver nameplate data
4. List of parts showing replacement numbers
5. Recommended list of spare parts
6. Complete operating instructions including start-up, shutdown, adjustments, cleaning, etc.
7. Maintenance and repair requirements including frequency and detailed instructions
8. Name, address and phone numbers of local representative and authorized repair service

END OF SECTION

SECTION 01580

CONSTRUCTION SURVEY WORK

PART 1 GENERAL

1.1 Description

This work consists of all surveying activities necessary to control the many phases of work required to construct the project to the lines and grades as shown, specified, established or required. The CONTRACTOR shall retain a surveyor for the project. The surveyor shall make all supporting computations and field notes required for control of the work and as necessary to establish the exact position, orientation, and elevation of the work from control stations, including furnishing and setting construction stakes and marks, reference marks, and additional control stations, if necessary to be established.

1.2 Surveyor

The individual designated by the CONTRACTOR to perform the work shall be licensed in the State as a Professional Land Surveyor and placed in “responsible charge” of the survey work.

1.3 Mandatory Pre-Survey Conference

The CONTRACTOR, relevant subcontractors, the surveyor and survey crew leader shall meet with the ENGINEER at least two weeks prior to beginning survey work. The purpose of this meeting will be to review and discuss the proposed methods and practices for accomplishing the required survey work.

1.4 Owner and Engineer Responsibilities

The OWNER and the ENGINEER will perform the following:

- A. Provide copies of plans and specifications to the CONTRACTOR.
- B. Establish initial horizontal and vertical control stations in the proximity of the work.
- C. Provide horizontal and vertical alignment data.
- D. Provide cross-section finish grade elevations.
- E. Perform measurements and calculations for pay quantities.
- F. Perform final “as constructed” measurements, if needed.

1.5 Surveyor's Responsibilities

The Surveyor will perform the following:

- A. Staking of Public Rights-of-Way and Land Parcels - The surveyor shall locate and stake one or both lines of certain public rights-of-way, easements and the specified lines of land parcels within the project limits in the vicinity where construction is being conducted. The surveyor will locate sufficient representative survey monuments along the line to be staked so as to provide for reasonable accuracy for staking of the line and for defining the boundaries within which to continue construction activity. Reasonable accuracy is defined as 1-1/2-inches on either side of the true right of way line. Stakes marking the right of way lines shall be so marked and set at the beginning and end of the construction corridor and at 100 foot stations in between. If sufficient monumentation is not found to allow for staking of the right of way lines to this level of accuracy, the ENGINEER shall be consulted for resolution. The ENGINEER may direct that property surveys be conducted in order to establish additional monumentation. Property surveys will be considered as extra work. Staking of public rights-of-way and land parcels will be required at the following locations:
 - 1. Southern Pacific Railroad Right-of-Way: Stake the northerly right-of-way line of the railroad 20 feet northwesterly and 20 feet southeasterly of the point of connection of the new 12-inch ductile iron main to the existing 12-inch ductile iron main.
- B. Staking of New Water Mains - The surveyor shall stake all new water mains. The surveyor shall set line and grade and transfer to offset stakes at 25 foot stations. The CONTRACTOR shall establish line and grade for the pipe construction using a laser or by transferring the line and grade from the offset stakes to the trench at the intervals necessary to maintain line and grade. During construction, the CONTRACTOR shall check line and grade at 25 foot intervals or less if necessary or directed by the ENGINEER. Variance from the established line and grade shall not be greater than 1/32-inch per inch of nominal pipe diameter and, regardless of pipe size, shall not exceed 1/2- inch for line and 1/4-inch for grade. Any variances from grade will not be allowed if such variances result in a level or reverse-sloping invert.
- D. Staking of Existing and Replacement Fences - The surveyor shall survey and record the location of all existing fences with respect to existing rights-of-way or easement lines or property corners or property lines. The surveyor will set offset stakes for all existing fences that will be partially or totally removed and replaced so that the fences can be reconstructed in the same location with reasonable accuracy. Reasonable accuracy is defined as 1.5-inches on either side of the existing fence centerline. The surveyor will set centerline stakes for any fence replacement. The stakes shall be set on each side lot line of each parcel and at 50 foot stations in between on each parcel.

- E. The frequency of survey staking may be reduced in certain areas where site conditions allow, if the pipeline can be constructed with the line and grade as shown on the drawings, as approved by the ENGINEER. Following contract award, electronic survey data and design drawings will be made available to the CONTRACTOR for use in construction surveys.

1.6 Protection of Survey Markers

A. Permanent Survey Markers

- 1. The CONTRACTOR shall not disturb permanent survey monuments, stakes, lot stakes, bench marks or other permanent survey monumentation. The CONTRACTOR shall restore all such disturbed monumentation and shall bear the expense of replacing any that are disturbed.

B. Construction and Survey Markers

- 1. The CONTRACTOR shall preserve construction survey stakes and markers for the duration of their usefulness during construction. If survey stakes are lost or disturbed by the CONTRACTOR's and need to be replaced, the CONTRACTOR shall restore the stakes or markers and shall bear the expense of performing that work.
- 2. At the completion of construction and upon approval of the ENGINEER, the CONTRACTOR shall remove from the construction site all temporary survey stakes and markers.

END OF SECTION

SECTION 01650

PIPELINE TESTING AND DISINFECTION

PART 1 GENERAL

1.1 Description

- A. This section covers field pressure testing, disinfection and purity testing of potable water systems piping, fittings, and valves. All piping shall be flushed and hydrostatically pressure and leak tested. Defective items revealed by the testing procedures shall be removed and replaced or otherwise corrected as directed by the ENGINEER. All costs for labor and materials necessary to conduct the flushing, testing and disinfecting procedures specified herein, and all costs of labor and materials required to remedy defective items shall be borne by the CONTRACTOR.
- B. The CONTRACTOR shall provide 72 hour notification to the ENGINEER and OWNER prior to conducting flushing, hydrostatic testing and disinfection. CONTRACTOR shall provide coordination and scheduling required for the OWNER and ENGINEER to witness and provide necessary labor for operating OWNER's existing system during hydrostatic testing and disinfecting procedures. CONTRACTOR shall not operate any part of the existing water system.
- C. The CONTRACTOR shall perform flushing and testing of all pipelines and appurtenant piping for water and disinfection of all pipelines and appurtenant piping for potable water, complete, including conveyance of test water to point of use and all disposal thereof, all in accordance with the requirements of the Contract Documents.
- D. Unless otherwise directed by the ENGINEER, new water mains and appurtenances must be completely installed, flushed, tested, disinfected, and satisfactory bacteriological sample results received prior to completing permanent connections to existing water system.

1.2 Reference Specifications, Codes, and Standards

Codes and Standards: Comply with the provisions of the latest edition of the following codes, standards and specifications, except as otherwise shown and specified:

ANSI/AWWA B300 Hypochlorites

ANSI/AWWA B301 Liquid Chlorine

ANSI/AWWA C651 Disinfecting Water Mains

ANSI/AWWA C600 Installation of Ductile-Iron Water Mains and Their Appurtenances

ANSI/AWWA C605 Underground Installation of PVC Pressure Pipe and Fittings for Water

1.3 Contractor Submittals

A pipeline testing and disinfection plan will be required to be submitted by the CONTRACTOR for review and approval by the ENGINEER a minimum of one month before testing is to start. As a minimum, the CONTRACTOR's pipeline testing and disinfection plan shall include the following:

- A. Testing schedule.
- B. Proposed equipment and chemicals.
- C. Proposed plan for water conveyance including flow rates.
- D. Proposed plan for water control.
- E. Proposed plan for water disposal including flow rates.
- F. Proposed measures to be incorporated in the project to minimize erosion while discharging water from the pipeline.
- G. Proposed plan for disinfection.
- H. Proposed plan for dechlorination of flushing water and superchlorinated disinfection water including discharge points and discharge rates.
- I. Proposed plan for testing chlorine levels throughout the length of the pipeline including test locations.

PART 2 PRODUCTS

2.1 Equipment

- A. All test equipment, chemicals for chlorination, temporary valves, bulkheads, or other water control equipment and materials shall be determined and furnished by the CONTRACTOR subject to the ENGINEER's review. No materials shall be used which would be injurious to the construction or its future functions.
- B. As a minimum, the CONTRACTOR shall furnish the following equipment and materials for the testing:

<u>Amount</u>	<u>Description</u>
2	Graduated containers approved by the ENGINEER
1	Hydraulic pump approved by the ENGINEER with hoses, valves and fittings as needed and required for the testing and disinfection of the facilities.

2	Pressure gauges with pressure range at least 120% greater than the required maximum test pressure with graduations in two (2) psi increments. Gauges shall have been calibrated within 90 days of pressure testing.
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- C. Chlorine for disinfection shall be in the form of liquid chlorine or sodium hypochlorite solution.
- D. Sodium hypochlorite shall be in accordance with the requirements of ANSI/AWWA B300. Liquid chlorine shall be in accordance with the requirements of ANSI/AWWA B301.
- E. All temporary thrust restraint and equipment and facilities required for hydrostatic testing will be considered incidental.

PART 3 EXECUTION

3.1 General

The CONTRACTOR shall make arrangements for obtaining a potable water supply or supplies for flushing, testing and disinfection of the pipelines and appurtenant facilities. See Section 01100, Special Provisions, for information regarding water supply availability from the City of Roseburg. No other water supply source will be allowed to be used for flushing, testing and disinfection of the pipelines and appurtenant facilities. Discharge to the Roseburg Urban Sanitary Authority (RUSA) sanitary sewer system of any water from the testing and disinfecting operations on the pipeline is prohibited.

The pipelines and associated appurtenances shall be tested and disinfected in segments between isolation valves and/or end caps as the construction of those segments including all appurtenances has been completed. The pipeline testing and disinfection plan shall be arranged such that at no time shall construction continue on successive pipeline segments between isolation valves until all previously constructed pipeline segments between isolation valves have successfully passed testing and disinfection procedures. All new pipelines shall remain physically isolated from and not connected to the existing potable water system until the new pipelines are flushed, pressure tested and disinfected to the satisfaction of the ENGINEER and the OWNER. Only at such time may the new pipeline be connected to the existing potable water system and put into service. Flushing water shall be arranged for by the CONTRACTOR from available hydrants or other potable water sources with the approval of the OWNER and with OWNER-approved backflow prevention equipment installed at any connection to the OWNER's water supply system.

When flushing the new water mains, discharge points for the flushing water shall be as approved by the ENGINEER and the OWNER.

The CONTRACTOR shall provide facilities that distribute discharged flow into the drainage ditches and creeks to avoid erosion of the ditch bed material. Furthermore, the CONTRACTOR shall monitor the flow levels in the ditches, creeks and associated culverts to assure that there are no adverse impacts to downstream properties resulting from the flushing water discharge.

Temporary caps are provided for in the project design at each end of new mains and at intermediate locations if shown on the plans. These caps shall be tapped with the appropriate size of tap and valve to provide for the introduction and release of testing, flushing and disinfection waters. Upon successful completion of flushing, pressure testing and disinfection, the temporary caps shall be removed and the final connections to the existing transmission main shall be made. The CONTRACTOR shall develop and submit for approval a plan for flushing of the new mains and for dechlorination and disposal of the flushing water.

Upon completion of the flushing of each pipeline segment, not less than two consecutive sets of acceptable samples, taken at least 24 hours apart, shall be collected from the new main at the planned point of connection to the existing piping system. Results of the bacteriological testing shall be satisfactory with the water system owner and the State Department of Health and/or other appropriate regulatory agencies, or disinfection shall be repeated at the expense of the CONTRACTOR. Upon successful completion of the sample testing, the flow of water in the new water piping into the City of Roseburg's water supply system can commence.

3.2 Hydrostatic Testing of Water Mains

- A. The CONTRACTOR shall make all necessary provisions for conveying water to the points of use and for the proper disposal of test water.
- B. No section of the pipeline shall be hydrostatically tested until all field-placed concrete or mortar has attained full strength. At the CONTRACTOR's option, early strength concrete may be used when the full strength requirements conflict with schedule requirements. All such early applications shall be approved by the ENGINEER prior to each installation.
- C. All piping shall be tested under a hydrostatic test pressure not less than 150 psi (+/- 5 psi) at the highest point along the test section or as shown on the plans. Testing shall be performed by filling the pipe with water, allowing for natural absorption to occur, and applying the specified test pressure by pumping. Once the test pressure has been attained, the pump shall be valved off. The test will be conducted for one two-hour period with the allowable leakage not to exceed value as per Paragraph 3.1D below.
- D. During the test, pipe, fittings and valves with welded and/or flanged joints shall be completely watertight. Pipe, fittings and valves with rubber gasketed

joints (mechanical joints or push-on joints) shall have a measured loss not to exceed the rate given in the following formula:

$$AL = \frac{LD(P)^{1/2}}{148,000}$$

In the above formula:

AL = Allowable leakage, in gallons per hour

L = Length of pipe tested in feet

D = Nominal diameter of pipe in inches

P = Average test pressure during the leakage test in pounds per square inch.

- E. During the test period, operate the pump as required to maintain pressure in the pipe within 5 psi of the specified test pressure at all times. At the end of test period, operate the pump until the specified test pressure is again obtained. The pump suction shall be in a graduated barrel or similar device or metered so that the amount of water required to restore the test pressure may be accurately measured.
- F. If the test reveals any defects, leakage in excess of the allowable, or failure, the CONTRACTOR shall furnish all labor, equipment and materials required to locate and make necessary repairs. The testing of the line (and repairing of defects, excessive leakage, and failures) shall be repeated until a test satisfactory to the ENGINEER has been achieved. All costs for locating, repairing, and retesting shall be borne by the CONTRACTOR.

3.3 Disinfection of Water Mains

- A. After testing and repairing where necessary, all potable water systems shall be thoroughly flushed, cleaned, and disinfected by the CONTRACTOR in accordance with the latest version of AWWA C651. Chlorination by means of tablets or powders (calcium hypochlorite) placed in each length of pipe during installation is specifically prohibited.
- B. Before sterilizing, flush all foreign matter from the pipeline. The CONTRACTOR is to provide at no additional cost to OWNER, hoses, temporary pipes, ditches, etc., as required to dispose of flushing water without damage to adjacent properties. Flushing water discharged to any public water in the State of Oregon shall be dechlorinated in accordance with Oregon Administrative Rule Chapter 340, Division 41 – Water Quality Standards: Beneficial Uses, Policies, and Criteria for Oregon and Oregon Department of Environmental Quality memorandum entitled “Chlorinated Water Discharges”, Water Quality Division, DEQ, May 19, 1997. Flushing velocities shall be at least 2.5 fps.

- C. Potable water piping shall be disinfected with a solution containing a minimum 25 parts per million (ppm) and a maximum 50 ppm chlorine. The chlorine solution shall remain in the piping system for a period of 24 hours at which time the sterilizing mixture shall have a strength of at least 10 ppm of chlorine. If check samples fail to produce acceptable results, the disinfection procedure shall be repeated at the expense of the CONTRACTOR until satisfactory results are obtained.
- D. Disposal of any water containing chlorine shall be performed in accordance with the latest edition of AWWA C651, Section 01100 Special Provisions of this specification, and any other state or local requirements. Disposal may not be made into existing sanitary sewer systems. Any chlorinated water discharged to open stream channels must be dechlorinated prior to discharge.
- E. The OWNER will collect samples after the pipeline is flushed in accordance with the latest edition of AWWA C651 at locations directed by ENGINEER. The chlorine residual must be below 1.5 mg/L when the sample is taken.
- F. Results of the bacteriological testing shall be satisfactory with the water system owner and the State Department of Health and/or other appropriate regulatory agencies, or disinfection shall be repeated at the expense of the CONTRACTOR.

3.4 Disinfection of Water Main End Connections and Tie-Ins

Disinfection and pressure testing of potable water piping and appurtenances at end connections which are required to remain in service due to restrictions in allowable shutdown time shall be pressure tested and disinfected as described below:

- A. Prior to connecting new potable water piping and appurtenances with existing piping and appurtenances, the interior of all new pipe, fittings, valves and appurtenances shall be swabbed or sprayed with a 1% to 5% percent calcium hypochlorite solution.
- B. Following the disinfection procedures described above, connection of the new piping and appurtenances to the existing water system shall be made. During the system startup, the ENGINEER and CONTRACTOR shall visually inspect all new fittings, piping, valves and appurtenances for evidence of leakage. Any leakage observed during this period shall be promptly repaired by the CONTRACTOR, at CONTRACTOR's expense as required by the ENGINEER.

END OF SECTION

SECTION 01654

WORK SEQUENCES AND CONSTRAINTS

PART 1 GENERAL

1.1 Scope

- A. This Section describes general constraints to the Work and identifies proposed project phasing and coordination requirements.

1.2 Related Work Specified and Performed Under Other Sections.

<u>Section/Division No.</u>	<u>Item</u>
01100	Special Provisions

1.3 General Constraints on Sequence and Scheduling of Work:

- A. Coordinate construction schedule and operation with OWNER and ENGINEER.
- B. Coordinate proposed work with OWNER and ENGINEER before implementing shutdowns of any water system facilities associated with the Project. Under no circumstances shall work cease at the end of a normal working day if such actions may inadvertently cause a cessation of any facility operating process; in which case, CONTRACTOR shall remain on site until necessary repairs are complete and full water system function is restored.
- C. Do not close lines, open valves, or take other action that would affect the operation of existing systems, except as specifically required by the Contract Documents and after approval of OWNER and ENGINEER.
- D. CONTRACTOR shall not operate any of the existing equipment or facilities without written permission from the OWNER naming the specific piece of equipment and dates the CONTRACTOR may use the equipment or facilities. The CONTRACTOR is liable for any loss or damage caused to property or equipment or facilities or any personal injury resulting from or related to this usage.

- E. CONTRACTOR shall have all equipment and parts necessary to finish the work and be prepared to reinstall temporary or existing removed piping and equipment upon short notice if for any reason service needs to be restored.
- F. The OWNER may determine the order of preference and the time and season at which any portion or portions of the work shall be commenced and carried on in order to ensure proper completion of the contract or proper operation of the facility.
- G. If applicable to the project, the CONTRACTOR shall provide temporary motor control equipment or modify existing motor control equipment such that the pumps remaining in service are operational.

1.4 Submittals

- A. Submit a Work Sequencing Plan detailing the complete sequence of construction for all activities contained herein.
- B. Identify the following in the Work Sequencing Plan:
 - 1. Major work activities to occur.
 - 2. General schedule when work will occur. Submit separately a detailed schedule as specified in Section 01300, Submittals. Incorporate materials in detailed schedule and work sequencing plan.
 - 3. Proposed modifications to normal facility operations for each major work activity.
 - 4. Number and duration of process shutdowns required, if applicable.
 - 5. Facility, equipment, or utility to be shutdown and the maximum anticipated time of the shutdown.
 - 6. What equipment will be present, including temporary equipment during shutdowns.
 - 7. What assistance will be required of OWNER's operating personnel during shutdowns.
 - 8. Contingency backup plan identifying what action will be taken if activities during a shutdown cannot be completed within the allotted

times, or if there is a failure of the CONTRACTOR's temporary equipment.

9. Name of individual in charge of CONTRACTOR's activity during shutdown.

1.5 Interruption of Utility Service.

- A. Indicate required shutdowns of existing utilities or interruptions of existing operations on Progress Schedule. Interruptions to utility service will be allowed to the extent that customer service will not be adversely compromised.
- B. Submit requests for interruptions to utility service not less than ten (10) business days in advance of the date scheduled for the interruption.
- C. Following receipt of the request, ENGINEER will notify the CONTRACTOR if the requested date will be permitted. Evaluation of the request will be based upon the availability of the utility owners personnel to assist and monitor utilities during the shutdown period and impact to customer service.
- D. Minimize the period of interruption by thorough advance planning. Procure required materials, equipment and labor and have on hand during the shutdown.
- E. Do not begin interruption until written authorization is received from ENGINEER.

1.6 Temporary Shutdowns

- A. Provide 14-day minimum advance Notice of Request for Approval of a Temporary Shutdown of a facility.
- B. Each Notice of Request for Approval of a Temporary Shutdown submitted to the OWNER shall include the following:
 1. Dates, times, and duration of proposed shutdown.
 2. Work activities to be performed during the shutdown.
 3. Assistance required of OWNER's personnel before, during, and after shutdown.
 4. CONTRACTOR's personnel to be on site during shutdown.

5. Contingency plan if work during shutdown is not completed during allotted time or critical equipment fails.
- C. Upon receipt of such request, the OWNER will decide what actions need to be taken and if the requested shutdown is acceptable considering the system operation needs at that time. The request from the CONTRACTOR will be returned with the OWNER's decision noted. If the OWNER deems that the requested shutdown is unacceptable, the OWNER will state such reasons, and the CONTRACTOR shall reschedule the shutdown as required.
 - D. Disapproval by the OWNER of the CONTRACTOR's shutdown request does not entitle the CONTRACTOR to any time extension unless the CONTRACTOR can demonstrate to the satisfaction of the OWNER, through an updated CPM schedule, that the overall project completion date will not be met as a result of this disapproval.
 - E. The OWNER may postpone a planned and approved shutdown at any time if the OWNER determines that such shutdown may jeopardize water system operations, public safety or for any other substantive reason.

PART 2 PRODUCTS – Not Used

PART 3 EXECUTION

3.1 General Requirements for Execution of Work

- A. Maintain overall coordination of execution of Work.
- B. Obtain all necessary permits for the work.
- C. Obtain schedules from subcontractors and suppliers and assume responsibility for correctness.
- D. Incorporate schedules from all parties into Progress Schedule to plan for and comply with sequencing constraints.
- E. Pre-locate by exploratory excavation existing utilities to minimize service interruption and demands on OWNER's personnel.

3.2 Sequence of Construction Requirements

The work has been divided into two separate Bid Schedules, A and B, that are related to work associated with installation of DI water pipeline Alignments A and B,

respectively. **Schedule A work shall be completed prior to Schedule B work.** In order to meet the objectives of this project, certain elements of work must be completed in the following sequence as listed below.

Schedule A Work

- A. At no time will Reservoirs No. 5, 6 or 7 require shutdown and draining.
- B. Complete construction of the new 24-inch diameter main from approximate STA A1+10 to STA A6+19. Complete flushing, testing and disinfection of new main. Test electrical continuity of new main prior to connecting to existing piping.
- C. Install cut-in tee and connect to existing Phase 1, 24-inch diameter DI main at STA A1+00. Provide jumper bonds as required to electrically connect Phase 2 DI piping to existing Phase 1 DI piping at STA A1+00. Connect to existing 24" valve at STA A6+24. Fill the new DI pipeline and provide visual inspection of DI pipe joints at connection locations.
- D. Provide erosion control for disturbed native hillside embankment areas until favorable weather conditions allow for seeding, typically beginning April 1st, and after seeding as required to stabilize slope. Contractor shall provide erosion blankets, silt fencing and other long term erosion control mitigation and maintenance for slope stabilization until grass seed germinates and grass is established on hillside embankment.

Schedule B Work

- E. Contractor to install insulated flexible coupling and 24-inch butterfly valve to connect to existing OD steel inlet tee for Reservoir No. 7, near STA B1+00. This will require temporary shutdown of 24-inch OD steel supply main to reservoir site. Contractor to coordinate the supply main shutdown and subsequent shut downs of existing 24-inch, 18-inch, and 16-inch OD steel supply mains for pipe replacement and abandonment with the City. This is to be done in advance of the remainder of Alignment 'B' pipe installation and also site grading work east of Reservoir Nos. 6 and 7.
- F. Complete construction of the new 24-inch diameter main from approximate STA B1+10 to STA B3+89. Site grading and fence removal work shown on Sheet C-2 of the Drawings may be completed prior to pipe installation work at the Contractor's option. Remove and abandon in-place existing 24-inch, 18-inch, and 16-inch OD steel supply mains as required. Complete flushing, testing and disinfection of new main. Test electrical continuity of new main prior to connecting to existing piping.

- G. Provide connections to existing adjacent pipelines to Alignment 'B' as follows: connect to new 24-inch DI near STA B1+10; complete connection to 6-inch main on eastern slope of reservoir hill property near STA B2+35; connect to existing Phase 1, 30-inch DI main near STA B2+42; connect to existing Phase 1, 24-inch DI main near STA B3+89; Provide jumper bonding as required to electrically connect Phase 2 DI piping to existing Phase 1 DI piping near STA B2+42 and STA B3+89. Fill the new DI pipeline and provide visual inspection of DI pipe joints at connection locations.
- H. Provide cathodic protection monitoring testing of combined Phase 1 and 2 DI piping (Schedule A and B work).
- I. Install new fence to replace existing removed fence and provide general surface restoration, seeding, and cleanup as required (Schedule A and B work excluding new fence install; new fence install is Schedule B work only).

3.3 Temporary Shutdowns of Existing Mains

Short-term temporary shutdowns (12 hours or less) of the existing 24-inch diameter O.D. steel supply main will be arranged for by the OWNER at any time except during very high water demand conditions which may occur from June 15 through September 15, if required.

END OF SECTION

SECTION 02060

EXISTING PIPE ABANDONMENT

PART 1 GENERAL

1.1 Description

- A. Work covered in this Section includes the removal or abandonment of existing buried piping and abandonment in place of existing buried piping.
- B. A portion of the existing reservoir piping to be removed from the reservoir site is coated with coal tar epoxy coating system which contains asbestos. This work shall include permits, mobilization of equipment, insurance coverage, bonding, preparation of job site, preparing site staging area, security measures, and clean-up necessary for satisfactory completion of work.

1.2 Submittals

- A. See Section 01300 for CONTRACTOR submittals.
- B. If there is piping on the project that will be abandoned and filled with Controlled Low Strength Material (CLSM), the CONTRACTOR shall submit a piping abandonment plan to the ENGINEER for review. The abandonment plan shall identify fill locations for pipe and a pumping plan. Upon completion of CLSM pumping, the CONTRACTOR shall submit volume quantities of CLSM used to fill abandoned pipe.
- C. Provide an asbestos management plan containing the following information, and as required in subsection 3.4.
 - 1. Submit qualifications of company(s) that demonstrate an accredited asbestos surveyor will complete an asbestos survey of the affected area of the site including a bulk sample of the waterproofing material and concrete substrate.
 - 2. Submit qualifications of company(s) that demonstrate a licensed asbestos abatement Contractor will properly handle, remove, and dispose of asbestos material to be removed as part of this project.
 - 3. Submit documentation certifying the proper handling and disposal of the asbestos material to be removed as part of this project.

1.3 Requirements of Regulatory Agencies

- A. Permits -- The CONTRACTOR is responsible for obtaining all necessary permits required for completion of the work described herein at no cost to the

OWNER. Permits may include, but are not limited to, a DEQ ASN1 notification, a DEQ ASN6 notification, and an application to DEQ for any variances, if applicable, that includes, but is not limited to, all required paperwork, work practices and proposed procedures clearly documented for approval by DEQ.

- B. Protection of Persons and Property: Meet all federal, state and local safety requirements for the protection of workmen, other persons, and property in the vicinity of the work and requirements of the General Provisions.

1.4 Repair of Damage

- A. Work procedures shall provide for safe conduct of the work, careful removal and disposition of materials and equipment, protection of facilities, utilities and property which are to remain undisturbed, coordination with existing facilities and utilities to remain in service.
- B. Any damage to existing facilities or utilities to remain as caused by the CONTRACTOR's operations shall be repaired at the CONTRACTOR's expense.
- C. Damaged items shall be repaired or replaced with new materials as required to restore damaged items or surfaces to a condition equal to and matching that existing prior to damage or start of work of this contract.

1.5 Protection of Existing Work

- A. Before beginning, the CONTRACTOR shall carefully examine the Drawings and Specifications to determine the extent of the work. The CONTRACTOR shall take all necessary precautions to prevent damage to existing facilities or utilities which are to remain in place, and be responsible for any damages to existing facilities or utilities, which are caused by the operations. The CONTRACTOR shall carefully coordinate the work of this section with all other work and construction.

1.6 Existing Conditions

- A. If the pipe material contains any hazardous materials such as asbestos, that will require special handling upon removal, it is the responsibility of the CONTRACTOR to remove and dispose of the material as required in accordance with all applicable federal, state and local regulations. See subsection 3.4 for additional information regarding asbestos abatement.

PART 2 PRODUCTS

2.1 Ownership of Existing Materials

- A. All materials, equipment, miscellaneous items and debris involved, occurring or resulting from pipe removal work shall become the property of the CONTRACTOR at the place of origin unless otherwise specified by the OWNER.

2.2 Controlled Low Strength Material

- A. Refer to Section 02200, Earthwork, for description and required submittals.

PART 3 EXECUTION

3.1 General

- A. Where shown on the Plans or otherwise required, all fire hydrants, air release valves, service lines and appurtenances being abandoned shall be removed to 36-inches below finished grade. Existing service line appurtenances, including valves and meter boxes, shall also be removed. All exposed ends of pipes and fittings to remain in service shall be capped or plugged with an appropriate ductile iron blind flange, cap or plug and restrained. A pipe shall be considered in service if it is possible to flood the pipe with water by opening valves in the water system. All excavation and backfilling for pipe abandonment or removal shall be performed in accordance with Section 02222, Excavating, Backfilling and Compacting for Utilities.

3.2 Filling Pipe With CLSM

- A. Where identified on the Plans, abandoned pipe shall be filled with CLSM. CLSM shall be placed in a manner to ensure complete filling of the pipe, leaving no cavities or voids. The CONTRACTOR shall install hot taps, saddles, fill lines and appurtenances as necessary for pumping CLSM from the surface into the pipe being filled. CLSM shall be pumped up grade from fill lines rigidly connected to pipes being filled. Fill lines shall be located at elevations lower than the pipe being filled. CLSM shall be pumped. Placement by free flowing (non-pumped) methods will not be acceptable. As the CLSM is being placed, use other fill lines as view ports to ensure complete filling of the pipes. Relocate pumping equipment as necessary to complete filling of the pipes. Excavate and cut access holes in the pipes as necessary to complete filling operations. The CONTRACTOR shall eliminate all air pockets and shall submit placed CLSM volume calculations for each filled segment to verify that pipelines have been completely filled.

3.3 Pipe Removal and In-Place Abandonment

- A. Where identified on the Plans, the CONTRACTOR shall remove and dispose all pipe material and associated appurtenances. All exposed ends of pipes being abandoned in place shall be cut and plugged with grout. When existing pipe is removed, the CONTRACTOR shall plug any remaining piping being abandoned in place with a minimum of two (2) feet in length of grout. Prior to placing grout, roughen interior pipe surface and apply epoxy bonding agent.

3.4 Removal and Disposal of Reservoir Piping with Coal Tar Coating Containing Asbestos

- A. When reservoir piping with coal tar coating containing asbestos is to be removed and disposed of the CONTRACTOR shall comply with OAR 340-248, ORS 468A.700 to 468A.760, and all Oregon DEQ rules and regulations. The pipe with coating containing asbestos material shall be disposed of together as hazardous waste if required to comply with all applicable Oregon DEQ requirements as enforced by the OAR.

All pipe coating material that contains asbestos shall be handled in such a manner to insure removal from the reservoir site without causing the release of free asbestos fibers.

Contractor shall remove and dispose of all asbestos containing materials encountered, except that may remain buried, undisturbed and abandoned in-place per the project specifications. Contractor is responsible for proper identification, handling, and disposal of asbestos materials. Contractor shall provide properly trained and certified workers and shall be prepared to deal with both friable and non-friable forms of asbestos. Permit and permit fees related to this work shall be the Contractor's responsibility. Contractor is solely responsible for pursuing work in a way that is consistent with all state, local, and federal rules, regulations and guidelines. An asbestos management plan shall be provided to engineer a minimum of four weeks prior to the work being performed and shall address the following:

- Personnel training and experience
- Subcontracted specialists including contact information
- Anticipated work scope and contingency measures
- Worker Safety and OSHA compliance
- Plan for DEQ Permitting and Compliance
- Plan for removal and disposal of friable material
- Plan for remove and disposal of non-friable material

The Contractor shall remove all asbestos contaminated material from the project site for disposal at a landfill licensed to handle asbestos waste.

3.5 Cleanup

- A. During and upon completion of work, the CONTRACTOR shall promptly remove all unused tools and equipment, surplus materials and debris. Adjacent areas shall be returned to their existing condition prior to the start of work.

END OF SECTION

SECTION 02100

SITE PREPARATION

PART 1 GENERAL

1.1 Description

Work includes all demolition, clearing and grubbing indicated on the Drawings or required for completion of work specified elsewhere.

1.2 Submittals

Submit to ENGINEER a copy of written permission of private property owners with copy of fill permit for said private property as may be required for disposal of materials.

1.3 Requirements of Regulatory Agencies

- A. Permits -- Burning on project site will not be permitted.
- B. Protection of Persons and Property -- Meet all federal, state and local safety requirements for the protection of workers, other persons, and property in the vicinity of the demolition and clearing work and requirements of General Provisions.

1.4 Site Conditions

- A. Existing Conditions -- CONTRACTOR shall determine extent of work requirements and limitations before proceeding with work.
- B. Protection -- Protect existing site improvements, trees and shrubs to remain to preclude damage during construction. Except for those marked to be removed, protect existing trees and shrubs against cutting, breaking or skinning of roots, skinning and bruising of bark, smothering of roots by stockpiling construction materials, excavated materials, excess foot or vehicular traffic and parking of vehicles within drip line. Provide temporary guards, as necessary, to protect trees and vegetation to be left standing. Repairable damage to trees designated to remain shall be made by a professional tree surgeon approved by the ENGINEER. Cost shall be borne by the CONTRACTOR.

- C. Existing Utilities -- Before starting clearing of site work, notify utility agencies; disconnect or arrange for disconnection of utilities (if any) affected by required work. Keep all active utilities intact and in continuous operation.

PART 2 PRODUCTS

2.1 Ownership of Existing Materials

All materials, equipment, items and debris involved, occurring or resulting from demolition, clearing and grubbing work shall become the property of the CONTRACTOR at the place of origin except as otherwise indicated.

2.2 Wound Paint

Emulsified asphalt formulated for use on damaged plant tissues, as approved by the ENGINEER.

PART 3 EXECUTION

3.1 Workmanship

Perform work in accordance with recognized standard and efficient methods. Operators of equipment shall be conscientious and skilled.

3.2 Clearing and Grubbing

A. Clearing -- Remove trees, saplings, snags, stumps, shrubs, brush, vines, grasses, weeds and other vegetative growth within the clearing limits except those trees and shrubs noted to remain or as directed by the ENGINEER. Clearing shall be performed in such a manner as to remove all evidence of the presence of vegetative growth from the surface of the project site and shall be inclusive of sticks and branches of thickness or diameter greater than 3/8-inch and of grasses, weeds, exceeding 12 inches in height except as otherwise indicated.

B. Grubbing -- Limits of grubbing shall coincide with the limits of clearing. Remove all stumps, roots over one inch in diameter and matted roots within the limits of grubbing work to the following depths.

1. New or existing water pipeline corridors 24 inches
2. Future structures and building areas 24 inches

- | | | |
|----|-------------------------|-----------|
| 3. | Roads and parking areas | 18 inches |
| 4. | All other areas | 12 inches |

- C. The CONTRACTOR shall confine construction activity to within the identified construction limits at all times.
- D. Except in areas to be excavated, all holes resulting from the clearing and grubbing operations shall be backfilled and compacted in accordance with the applicable sections of these Specifications.

3.3 Preservation and Trimming of Trees, Shrubs and Other Vegetation

The CONTRACTOR shall avoid injury to trees, shrubs, vines, plants, grasses and other vegetation growing outside of the areas to be cleared and grubbed and those trees and shrubs designated to be preserved. Provide protection for roots and limbs over 1-1/2-inch diameter cut during construction operations. Coat the cut faces with an emulsified asphalt. Temporarily cover exposed roots with wet burlap to prevent roots from drying out; cover with earth as soon as possible.

3.4 Landscaped Areas

When any portion of the work crosses private property or landscaped areas, the CONTRACTOR shall excavate the upper 12 inches of topsoil separately and pile it on the opposite side of the trench from the subsoil and shall conduct his work in a manner that will restore original conditions as nearly as practicable.

The CONTRACTOR shall remove and replace all trees, shrubs, plants, sod or other vegetative material. All shrubs or plants shall be balled by experienced workers, carefully handled and watered, and replaced in their original positions without damage. Sod shall be handled in a similar manner. Sod within the wetland boundaries shown on the drawings shall be stripped with sod harvesting equipment above and to one foot outside the top of trench walls, placed aside with the topsoil, and replaced to its nearly original location on top of the placed and graded topsoil. Wherever sod cannot be saved and restored, the ground must be reseeded and cared for until a stand of grass is reestablished. Plants or shrubs killed or destroyed must be paid for by the CONTRACTOR. It is the intent of this paragraph that the CONTRACTOR shall leave the surface and plantings in substantially the same conditions as before the work is undertaken. All costs incurred by the CONTRACTOR shall be absorbed in the unit prices of his bid unless otherwise specified.

3.5 Demolition and Removal

Remove from the project site all debris, materials, equipment and items found thereon and materials and debris resulting from the work of demolition except as otherwise indicated. All existing improvements designated on the Drawings or specified to be removed including but not limited to structures, pipelines, walls, footings, foundations, slabs, pavements, curbs, fencing and similar structures occurring above, at, or below existing ground surface shall be included in the demolition work. Unless otherwise specified, any resulting voids shall be thoroughly cracked out for drainage and backfilled with suitable excavated or imported material compacted to the density of the adjacent soil.

3.6 Disposal

- A. Removal -- All material resulting from demolition, clearing and grubbing, and trimming operations shall be removed from the project site and disposed of in a lawful manner. Materials placed on property of private property owners shall be by written permission only.
- B. Clean-up -- During the time that the work is in progress, the CONTRACTOR shall make every effort to maintain the site in a neat and orderly condition. All refuse, broken pipe, excess fill material, cribbing and debris shall be removed as soon as practicable. Should the work not be maintained in a satisfactory condition, the OWNER may cause the work to stop until the clean-up of the work has been done to the satisfaction of the ENGINEER. The work will not be considered complete or the final payment certificate issued until all rubbish, unused material, or equipment shall have been removed and the premises left in a condition satisfactory to the OWNER and the ENGINEER.

END OF SECTION

SECTION 02140

DEWATERING

PART 1 GENERAL

1.1 Description

- A. The CONTRACTOR shall provide all labor, materials, and equipment necessary to dewater trench and structure excavations, in accordance with the requirements of the Contract Documents. The CONTRACTOR shall secure all necessary permits to complete the requirements of this Section of the Specifications.
- B. The CONTRACTOR shall provide portable pumps and water control service for the entire project, including water control for all excavations and dewatering for all project structures and utilities until project completion.
- C. The CONTRACTOR shall implement all measures required to ensure that receiving stream water quality is not negatively impacted by discharge from dewatering systems, and that all regulatory requirements are complied with. The CONTRACTOR shall deploy and use equipment and facilities as needed to meet discharge requirements, including but not limited to settling ponds, filtration bags, special treatment systems, and settling tanks (“Baker Tanks”).
- D. All work shall comply with all Federal, State and local permits and regulations.

1.2 Submittals

The CONTRACTOR shall submit a dewatering plan to be reviewed by the ENGINEER prior to the beginning of construction activities requiring dewatering. The dewatering plan shall include a plan to treat and dispose of water to local road ditches and waterways and shall incorporate all of the requirements of this section. Review by the ENGINEER of the CONTRACTOR’s design shall not be construed as a detailed analysis of the adequacy of the dewatering system, nor shall any provisions of the above requirements be construed as relieving the CONTRACTOR of its overall responsibility and liability for the work.

1.3 Quality Control

- A. It shall be the sole responsibility of the CONTRACTOR to control the rate and effect of the dewatering in such a manner as to avoid all objectionable settlement and subsidence.
- B. All dewatering operations shall be adequate to assure the integrity of the finished project and shall be the responsibility of the CONTRACTOR.
- C. Where the critical structures or facilities exist immediately adjacent to areas of proposed dewatering, reference points shall be established and observed at frequent intervals to detect any settlement which may develop. The responsibility for conducting the dewatering operation in a manner which will protect adjacent structures and facilities rests solely with the CONTRACTOR. The cost of repairing any damage to adjacent structures and restoration of facilities shall be the responsibility of the CONTRACTOR.

PART 2 PRODUCTS

2.1 Equipment

Dewatering, where required, may include the use of well points, sump pumps, temporary pipelines for water disposal, rock or gravel placement, and other means. Standby pumping equipment shall be maintained on the jobsite.

PART 3 EXECUTION

3.1 Dewatering

- A. The CONTRACTOR shall provide all equipment necessary for dewatering and shall have on hand, at all times, sufficient pumping equipment and machinery in good working condition. The CONTRACTOR shall have available, at all times, competent workers for the operation of the pumping equipment. Adequate standby equipment shall be kept available at all times to insure efficient dewatering and maintenance of dewatering operation during power failure.
- B. Dewatering for structures and pipelines shall commence when groundwater is first encountered, and shall be continuous until such times as water can be allowed to rise in accordance with the provisions of this Section or other requirements.

- C. At all times, site grading shall promote drainage. Surface runoff shall be diverted from excavations. Water shall be prevented from entering the excavation from surface runoff by collecting it in shallow ditches around the perimeter of the excavation, drained to sumps, and pumped or drained by gravity from the excavation to maintain a bottom free from standing water.
- D. Dewatering shall at all times be conducted in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation.
- E. If foundation soils are disturbed or loosened by the upward seepage of water or an uncontrolled flow of water, the affected areas shall be excavated and replaced with drain rock at no additional cost to the OWNER.
- F. The CONTRACTOR shall maintain the water level below the bottom of excavation in all work areas where groundwater occurs during excavation construction, backfilling, and up to acceptance.
- G. Flotation shall be prevented by the CONTRACTOR by maintaining a positive and continuous removal of water. The CONTRACTOR shall be fully responsible and liable for all damages which may result from failure to adequately keep excavations dewatered.
- H. If well points or wells are used, they shall be adequately spaced to provide the necessary dewatering and shall be sandpacked and/or other means used to prevent pumping of fine sands or silts from the subsurface. The CONTRACTOR shall frequently check and maintain systems to ensure that the subsurface soil is not being removed by the dewatering operation.
- I. The release of groundwater to its static level shall be performed in such a manner as to maintain the undisturbed state of the natural foundation soils, prevent disturbance of compacted backfill and prevent flotation or movement of structures, pipelines, and sewers.
- J. Dewatering of trenches and other excavations shall be considered as incidental to the construction of the work and all costs thereof shall be included in the various contract prices in the bid forms.
- K. The CONTRACTOR shall treat and dispose of water from the work in accordance with the approved dewatering plan and shall meet all applicable environmental regulations and project permit requirements and without damage to the environment or adjacent property. Water shall be treated using an approved method to remove turbidity and any other contaminants to the required levels before disposal into any drainage system or waterway. No

water shall be drained into work built or under construction without prior consent of the ENGINEER. The CONTRACTOR shall be responsible for obtaining any additional permits not already obtained by the OWNER that may be necessary to dispose of water.

END OF SECTION

SECTION 02200
EARTHWORK

PART 1 GENERAL

1.1 Description

Work covered in this section includes general excavation, fill and backfill work. Earthwork shall meet the specifications of this Section and Oregon Department of Transportation, Standard Specifications for Highway Construction. In the case of conflict, the more stringent specification shall apply.

1.2 Submittals

- A. Submit results of aggregate sieve analysis and standard proctor tests for all granular material.
- B. Submit mix proportions for Controlled Low Strength Material (CLSM). The proposed mix design shall be strength tested in accordance with ASTM D 4832 at 7, 14 and 28 days age and results submitted to the ENGINEER. The CONTRACTOR shall submit to the ENGINEER batch weights of each batch of CLSM used during construction.
- C. See Section 01300 for CONTRACTOR submittals.

1.3 Reference Specifications, Codes and Standards

A. Commercial Standards

ASTM C 94	Specification for Ready-Mixed Concrete
ASTM C 403	Test Method for Time of Setting Concrete Mixtures by Penetration Resistance
ASTM D 422	Method for Particle-Size Analysis of Soils
ASTM D 698	Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5-lb (2.49-kg) Rammer and 12-inch (304.8-mm) Drop (AASHTO T-99)
ASTM D 2487	Classification of Soils for Engineering Purposes
ASTM D 2922	Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

ASTM D 4253	Test Methods for Maximum Index Density of Soils Using a Vibratory Table
ASTM D 4254	Test Methods for Minimum Index Density of Soils and Calculation of Relative Density
ASTM D 4832	Preparation and Testing of Controlled Low Strength Material Test Cylinders

B. Reference Standards

References herein to the “Standard Specifications for Highway Construction” shall mean the Oregon Department of Transportation, Standard Specifications for Highway Construction. References herein to “AASHTO” shall mean Association of American State Highway Transportation Officials.

1.4 Classification of Excavation

A. Unclassified Excavation

Unclassified excavation is defined as all excavation, regardless of the type, character, composition or condition of the material encountered and shall further include all debris, junk, broken concrete, and all other material. All excavation shall be unclassified unless provided for otherwise elsewhere in these specifications.

B. Classified Excavation

1. Common Excavation

Common excavation is defined, as the excavation of all material not classified as Rock Excavation.

2. Rock Excavation

Rock excavation is defined as the removal of rock by systematic and continuous drilling and blasting, if allowed, and hammering, breaking, splitting or other approved methods. Rock is defined as material including boulders, solid bedrock, or ledge rock, which, by actual demonstration, cannot be reasonably excavated with suitable power excavation equipment. Suitable machinery is defined as a track-mounted hydraulic excavator of the 52,800 to 72,500 pound class equipped with a single shank ripper. The ENGINEER may waive the demonstration if the material encountered is well-defined rock. The term "rock excavation" shall be understood to indicate a method of removal and not a geological formation.

If material which would be classified as rock by the above definition is mechanically removed with equipment of a larger size than specified, it shall be understood that any added costs for the removal of material by this method shall be included in the unit price for common excavation.

Before the removal of rock by the methods described above will be permitted, the CONTRACTOR shall expose the material by removing the common material above it and then notify the ENGINEER who, with the CONTRACTOR or his representative, will measure the amount of material to be removed.

In trench excavations, boulders or pieces of concrete below grade larger than one half (1/2) cubic yard will be classified as rock if blasting, hammering, breaking or splitting actually required and used for their removal from the trench. If material, which would be classified as rock by the definition above and elsewhere within these specifications, is mechanically removed without blasting, hammering, breaking or splitting, it will be considered common excavation. If equipment larger than the "suitable machinery" as defined above is brought on the project site for the sole purpose of rock removal without blasting, hammering, breaking or splitting, then such removal will be considered rock excavation.

The use of explosives for excavation of rock will not be allowed on this project.

1.5 Quality Assurance

- A. Soil and Aggregate Testing -- Soil and aggregate sampling and testing shall be conducted by an independent laboratory approved by the ENGINEER. The frequency of testing is to be determined by the ENGINEER. All soil and aggregate sampling and testing shall be paid for by the CONTRACTOR. All soil and aggregate sampling and testing that produces unacceptable results must be repeated and shall be paid for by the CONTRACTOR.
- B. Compaction Tests -- Maximum density of optimum moisture content by ASTM D698 (AASHTO T 99). In-place density by nuclear methods in accordance with AASHTO T 310.
- C. Soil Classification -- All imported materials, classification in accordance with ASTM D2487.
- D. Allowable Tolerances -- Final grades shall be plus or minus 0.04 foot.

- E. In Place Testing of CLSM -- CLSM shall be tested in accordance with ASTM C 403.
- F. Compressive Tests of CLSM -- CLSM shall be compressive tested in accordance with ASTM D 4832.

1.6 Site Conditions

- A. Quantity Survey -- CONTRACTOR shall be responsible for calculations of quantities of cut and fill from existing site grades to finish grades established under this contract as indicated on the plans or specified and shall include the cost for all earthwork in the total basic bid.
- B. Dust Control -- Must meet Oregon State DEQ and Local requirements. Protect persons and property from damage and discomfort caused by dust. Water as necessary and when directed by ENGINEER to quell dust.
- C. Soil Control -- Soil shall not be permitted to accumulate on surrounding streets or sidewalks nor to be washed into sewers. See provisions for erosion control.
- D. Existing Underground Utilities -- Protect active utilities encountered and notify persons or agencies owning same. Remove inactive or abandoned utilities from within the project grading limits to a depth at least twelve (12) inches below subgrade established under this contract. All abandoned piping to be plugged as approved by ENGINEER.

PART 2 PRODUCTS

2.1 Crushed Rock

Crushed rock with 3/4 inch-0, 1 inch-0, and 1 1/2 inch-0 gradation as shown on the plans shall meet the gradation and other requirements of the Standard Specifications for Highway Construction for Base Aggregates.

2.2 Granular Drain Backfill Material

Granular drain backfill material shall be crushed or uncrushed rock or gravel as shown on the plans and shall be clean and free-draining. Granular drain backfill material shall be the size as shown on the plans and shall meet the gradation and other requirements of the Standard Specifications for Highway Construction for such material.

2.3 Controlled Low Strength Material (CLSM)

CLSM shall be composed of cement, pozzolans, fine aggregate, water, and admixtures. CLSM shall have a low cement content, be non-segregating, self consolidating, free-flowing and excavatable material which will result in a hardened, dense, non-settling fill and a compressive strength at 28 days of 100 to 200 psi if not otherwise shown or specified.

2.4 Select Native Fill

Select native fill shall consist of approved earth obtained from on-site excavations, free of peat, humus, vegetative matter, organic matter, and rocks greater than 12 inches in diameter, processed as required to be placed in the thicknesses prescribed and at the optimum moisture content to obtain the level of compaction required by these specifications.

2.5 Imported Fill

Imported fill material shall consist of approved imported earth substantially free of organic material and foreign debris. Imported fill material shall meet the requirements for select native fill as defined above and shall be approved by the ENGINEER.

2.6 Topsoil

Top 6-12 inches of existing soil containing organic matter. ENGINEER's decision shall be final as to determination of what is of topsoil quality. Topsoil shall be stockpiled on site for later use in landscaping. Care shall be taken in collection of topsoil so as to preserve native seed stocks, which are valuable to restoring native species as part of finish landscaping.

2.7 Spoils

All excess material not suitable or not required for backfill and grading shall be hauled off site and disposed of at a location approved by the ENGINEER. The CONTRACTOR shall make arrangements for disposal of the material at no additional cost to the OWNER. Landfill permit to be obtained by the CONTRACTOR and provided to ENGINEER prior to commencement of disposal.

2.8 Riprap

Riprap material shall consist of angular rock with thickness of a single rock not be less than 1/3 its length and shall meet the below gradation requirements for the class specified. All riprap shall be free from overburden, spoil, shale and organic material. Non-durable rock, shale or rock with shall seams is not acceptable

Riprap Gradation Requirements
Weight of Rock (pounds)

Class 50	Class 100	Class 200	Class 700	Class 2000	Percent passing by Weight
50-30	100-60	200-140	700-500	2000-1400	20
30-15	60-25	140-80	500-200	1400-700	30
15-2	25-2	80-8	200-20	700-40	40
2-0	2-0	8-0	20-0	40-0	10-0

PART 3 EXECUTION

3.1 General

- A. Prior to work in this section, become familiar with site conditions. In the event discrepancies are found, notify the ENGINEER as to the nature and extent of the differing conditions.
- B. Do not allow or cause any work performed or installed to be covered up or enclosed prior to required tests and approvals. Should any work be enclosed or covered up, uncover at CONTRACTOR's expense.

3.2 Topsoil Stripping and Stockpiling

- A. Site within clearing limits shall be stripped of topsoil to depths approved by the ENGINEER, as required to obtain topsoil necessary to complete work indicated on plans or specified.
- B. Topsoil shall be free of sticks, large rocks, clods, and subsoils.
- C. Stockpile topsoil at locations approved by ENGINEER for redistribution as specified. Grade surface of stockpiles remaining over winter months to prevent ponding of water. Cover stockpile to minimize the infiltration of water. See other provisions for erosion control.

3.3 Excavation

- A. Excavate material of every nature and description to the lines and grades as indicated on the drawings and/or as required for construction of the facility.
- B. Provide and maintain equipment to remove and dispose of water during the course of the work of this section and keep excavations dry and free of frost or ice.

- C. Project dewatering is specified elsewhere. Coordinate drainage requirements with this work. Provide temporary drainage ditches as required and regrade as indicated at completion of project.
- D. Excavated material not approved for use in the embankments or in excess of that needed to complete the work shall be hauled off site and disposed of at no expense to the OWNER.

3.4 Rock Excavation

- A. Where the bottom of the excavation encounters ledge rock and/or boulders and large stones which meet the definition of “rock” as described herein, said rock shall be removed to provide 12 inches of clearance on each side and below all structures, pipe and appurtenances.
- B. Excavations below subgrade in rock shall be backfilled to subgrade with approved bedding material and thoroughly compacted.
- C. If explosives are allowed on this project, the CONTRACTOR shall comply with the requirements for the use and security of explosives as specified in the special provisions.
- D. The use of explosives will not be permitted on this Project.
- E. The CONTRACTOR shall provide all necessary approved types of tools and devices required for loading and using explosives, blasting caps and accessories, and conform to and obey all federal, state, and local laws that may be imposed by any public authority.
- F. When blasting rock, cover the area to be shot with blasting mats or other approved types of protective material that will prevent the scattering of rock fragments outside the excavation. The CONTRACTOR shall give ample warning to all persons within the vicinity before blasting, station people and provide signals of danger in suitable places to warn people and vehicles before firing any blasts. Fire all blasts with an electric blasting machine which shall be connected to the circuit immediately prior to the time for firing, and only then by the person who will operate the blasting machine.
- G. The CONTRACTOR shall assume all liability and responsibility connected with or accruing from blasting, or the use of explosives or dangerous material of any kind whatsoever. Such liability shall extend to include, but not be limited to, damage to work or adjacent property, injuries, lawsuits, complaints and all other adverse results, whether actual, alleged, inferred or implied.

3.5 Grading and Filling

- A. General -- Grading and filling operations shall not take place when weather conditions and moisture content of fill materials prevent the attainment of specified density. Vertical curves or roundings at abrupt changes in slope shall be established as approved by ENGINEER. Bring all graded areas to a relatively smooth, even grade and slope by blading or dragging. Remove high spots and fill depressions.
- B. For areas receiving surface structures or existing paved areas to be constructed or replaced by the CONTRACTOR or by others, such as railways, roadways, driveways, parking lots, and sidewalks, place clean well-graded gravel fill material (3/4 inch – 0 inch) in 6-inch lifts and compact with vibratory equipment to 95 percent maximum density unless otherwise specified.
- C. Embankment Construction -- Place fill material shown or specified in 8-inch loose lifts and compact with approved equipment. All fill material within 3 feet of top of fill elevations shall be compacted with vibratory equipment to 95 percent maximum density unless otherwise specified. All fill material below the 3-foot limit shall be compacted with vibratory equipment to 90 percent maximum density unless otherwise specified.

3.6 Topsoil Fill

- A. Scarify prepared subgrade to depth of four inches immediately prior to placing topsoil.
- B. Place topsoil in areas to be seeded to depths indicated to a minimum depth of six inches. Place loose; do not compact, do not place in wet or muddy conditions.

3.7 Controlled Low Strength Material (CLSM)

- A. At time of placement, the CLSM must be at least 40 degrees F and ambient air temperature must be at least 34 degrees F and rising. Subgrade on which CLSM is to be placed shall be free of disturbed or soft material, debris and water.
- B. After CLSM is placed, further construction proceeding upon it will be permitted only after initial set is attained, as measured by ASTM C 403. No traffic or construction equipment shall be allowed on CLSM for at least 24 hours after placement.

END OF SECTION

SECTION 02205

EXISTING TREE PROTECTION

PART 1 GENERAL

1.1 Instructions

- A. Provide temporary fencing, barricades, and guards as necessary or required to protect trees designated on the Drawings to remain, from damage above and below grade.
- B. Protect root systems from smothering and compaction. Do not store construction materials or permit vehicles to drive or park within the drip line area of any tree to remain.
- C. Protect all plant growth, including root systems of trees, from dumping refuse, chemically injurious material or liquids, and continual puddling or running of water.
- D. This specification shall be applied concurrently and in conjunction with other plant material protection measures herein described and specified.

PART 2 MATERIALS – Not Used

PART 3 EXECUTION

3.1 Inspection

- A. Inspect all trees specified on the Drawings for protection prior to construction. Document with written memorandum and photographs any unusual conditions. Submit copies of documentation to ENGINEER prior to beginning work. Verify all conditions regarding tree protection prior to any site disturbance.
- B. The ENGINEER must be present during demolition of existing conditions occurring within the drip line of trees designated to remain.
- C. Notify ENGINEER 24 hours prior to inspections and/or tagging of protected trees.

3.2 General

- A. Install specified barricades at drip lines of trees designated to remain prior to the commencement of construction. Clearly designate protected trees to be clear of any material storage, personnel, or vehicular movement.

- B. Protect root systems of trees to remain from damage due to noxious materials in solution caused by runoff or spillage during mixing and placement of construction materials.
- C. Protect root systems of trees to remain from flooding, erosion, or excessive wetting resulting from dewatering operations and compaction.
- D. Protect all existing trees to remain against unauthorized cutting, breaking, skinning roots and branches, or bruising bark. Refer to Site Preparation specification for damages caused by construction activity.
- E. No burning on the site will be permitted.
- F. Where cutting is necessary, review conditions with the ENGINEER before proceeding, and comply with directives of ENGINEER.

3.3 Excavation Around Trees

- A. Excavate within drip lines of trees only where indicated on plans or as directed by ENGINEER.
- B. Where trenching for utilities is required within drip lines, tunnel under or around roots by hand excavating. Do not cut main lateral roots or tap roots over one inch in diameter. Where possible trench toward trunk of tree and tunnel under central root mass to avoid severing all lateral roots on side of trench. Temporarily support and protect from damage until permanently covered with approved backfill.
- C. Do not allow exposed roots to dry out before backfill is placed. Provide temporary earth or burlap cover. Water roots daily when exposed and maintain in a moist condition.
- D. Only backfill roots upon inspection approval from the ENGINEER. Backfill around root excavations only with clean imported topsoil free from materials deleterious to root growth. Backfill to eliminate voids and compact only by means of manual tamping at root areas. Water sufficiently to settle topsoil and eliminate voids or air pockets around roots. Allow for natural settlement of soil surface, and furnish and apply topsoil sufficient to bring to original finish grade after backfill settlement.
- E. If during excavation, any condition arises that threatens the survivability of the protected tree, or an unknown condition arises that affects the stability or integrity of the root system, notify the ENGINEER immediately.

3.4 Repair and Replacement of Damaged Trees

- A. In the event of damage to existing trees, the CONTRACTOR shall immediately prune limbs smaller than 3-inch caliper, or roots smaller than 2-inch caliper to repair trees damaged by construction operations. Make repairs promptly after damage occurs to prevent progressive deterioration of damaged trees. Any such pruning and/or repairs shall be approved in advance and at completion by ENGINEER. The ENGINEER shall reserve the right, at cost to the CONTRACTOR, to obtain the services of a Certified Consulting Arborist with current membership in the American Society of Consulting Arborists to determine the severity of damage. The CONTRACTOR is responsible for the cost of repairs caused by their actions or by the actions of subcontractors engaged by the CONTRACTOR.
- B. The CONTRACTOR shall remove and replace dead or damaged trees which are determined by the ENGINEER to be incapable of restoration to normal growth patterns.
- C. The CONTRACTOR shall provide new trees of the same species as those removed or damaged, with size and/or quantity to be determined by ENGINEER. Furnish to the site and plant, maintain, and warranty as directed by the ENGINEER. If trees are not replaceable with the same species, and size, compensate the OWNER for the replacement cost of the trees based on the evaluation of a Certified Consulting Arborist. CONTRACTOR is responsible for additional costs of removing damaged trees and labor for planting new specimens.

3.5 Designated Tree Removal Procedures

- A. If designated tree removal is specified by ENGINEER, furnish labor, material, and equipment necessary for removing and/or salvaging existing trees, if necessary, as designated on the Drawings for removal. Verify location and species with ENGINEER prior to removal.
- B. Salable logs or timber may be sold to CONTRACTOR's benefit, upon notification and prior approval of OWNER. Upon approval, remove promptly from site.

3.6 Designated Tree Transplanting Procedures

- A. If designated tree transplanting is specified by ENGINEER, verify and identify existing trees to be transplanted.
- B. All work shall be in accordance with the standards and practices outlined in the following: Tree and Shrub Transplanting Manual, E.B. Himelick, 1981 Ed., International Society of Arboriculture.

- C. Prior to commencement of work, submit a coordination schedule, method of transplanting, traffic control, routing, etc., to ENGINEER, for review and approval.
- D. Warranty for transplanted trees shall be determined and directed on a case by case basis by the ENGINEER, upon contracting of specified transplanting work.
- E. Review and verify location of utilities in area of operation. Obtain location and jurisdictional approval from utilities prior to transplanting activities. Protect utilities and the public at all times.
- F. Prior to transplanting, spray trees with an anti-desiccant emulsion-type film forming agent, "Dowax" by Dow Chemical Company, "Wilt-Pruf" by Nursery Specialty Products Inc., "D-Wax", by Plant Products Inc., or approved equal, prior to digging with two separate applications allowing 48 hours apart. Use a power sprayer to provide an adequate film over trunks, branches, stems, twigs, and foliage. Anti-desiccant must be dry prior to relocation.
- G. Dig, ball and burlap, and move designated trees for relocation to the new planting location shown on the Drawings. In the event the new planting area is not prepared, place tree in a storage area approved by the ENGINEER solely designated for healing-in of plant materials until final planting may occur. Brace in a vertical position, provide shade, wind protection, and irrigation at plant storage area. Utilize all horticulturally proper methods for plant storage. Plants shall be maintained by CONTRACTOR while in storage.

3.7 Grading and Filling Around Trees

Maintain existing grade within drip line of trees unless otherwise indicated on the Drawings or directed by the ENGINEER.

3.8 Maintenance of Protective Measures

- A. Maintain protective measures throughout the construction process. Immediately repair any alteration to protection measures throughout construction process. Repair or reinstall protective measures immediately upon alteration. Monitor protective measures daily.
- B. Remove and clear area of debris and fencing, barricades, etc., upon final written approval of ENGINEER.

END OF SECTION

SECTION 02222

EXCAVATING, BACKFILLING AND COMPACTING FOR UTILITIES

PART 1 GENERAL

1.1 Description

- A. Work covered in this Section includes trench excavation for pipe, utility vaults and other utilities, pipe and utility vault bedding, and trench and utility vault backfill. All work shall conform to City of Roseburg Standards, Douglas County Standards and Oregon Department of Transportation Standard Specifications for Highway Construction except as modified herein. In the case of discrepancy, the more stringent provisions shall apply.
- B. Excavation for Utilities Includes
 1. Work of making all necessary excavations for the construction of all contract work.
 2. Furnishing, placing and use of sheeting, shoring, and sheet piling necessary in excavating for and protecting the work and workmen.
 3. Performing all pumping and work necessary to keep the trenches free from water.
 4. Providing for uninterrupted flow of existing rivers, treatment plant processes, drains, and sewers and the temporary disposal of water from other sources during the progress of the work.
 5. Damming and coffer damming where necessary.
 6. Supporting and protecting all structures, pipes, conduits, culverts, railroad tracks, posts, poles, wires, fences, buildings, and other public and private property adjacent to the work.
 7. Removing and replacing existing sewers, culverts, pipelines, and bulkheads where necessary.
 8. Removing after completion of the work all sheeting and shoring not necessary to support the sides of excavations.
 9. Removing all surplus excavated material.
 10. Performing all backfilling and rough grading of compacted backfill to limits specified or ordered by the ENGINEER.

11. Restoring all property damaged as a result of the work involved in this contract.
- C. The work includes obtaining and transporting suitable fill material from off-site when suitable on-site material is not available.
- D. The work includes transporting surplus excavated material not needed for backfill at the location where the excavation is made, to other parts of the work where filling is required, or disposal of all surplus material on other sites provided by the CONTRACTOR.
- E. Backfill and Fill Compaction: Test consolidated backfill material in trenches around pipes and structures in conformance with "Compaction Tests" specified herein. Where tests indicate insufficient values, perform additional tests as required by the ENGINEER. Testing shall continue until specified values have been attained by additional compaction effort.
- F. The work includes furnishing and installing temporary facilities to treat and dispose of any water pumped from the trench or utility vault excavations in a proper and approved manner in accordance with all laws and regulations.

1.2 Submittals

- A. Submit results of aggregate sieve analysis and standard proctor tests for all granular material.
- B. See Section 01300 for CONTRACTOR submittals.

1.3 Protection

- A. Exploratory Test Pits -- The CONTRACTOR shall dig such exploratory test pits as may be necessary in advance of excavation to determine the exact location and elevation of subsurface structures, pipelines, duct banks, conduits, and other obstructions which are likely to be encountered or need to be connected to and shall make acceptable provision for their protection, support, and maintenance of their continued operation.
- B. Sheeting, Shoring and Bracing
 1. The CONTRACTOR shall furnish and install adequate sheeting, shoring, and bracing to maintain safe working conditions, and to protect newly built work and all adjacent and neighboring structures from damage by settlement or other ground movement.
 2. Bracing shall be arranged so as not to place a strain on portions of completed work until the construction has proceeded far enough to provide ample strength. Sheeting and bracing may be withdrawn and removed at the time of backfilling, but the CONTRACTOR shall be

responsible for all damage to newly built work and adjacent and neighboring structures.

C. Construction Sheeting Left in Place

1. The CONTRACTOR shall furnish, install, and leave in place, construction sheeting and bracing when specified or when indicated or shown on the Drawings.
2. Construction sheeting and bracing, placed by the CONTRACTOR to protect adjacent and neighboring structures, may be left in place if desired by the CONTRACTOR. All such sheeting and bracing left in place shall be included in the cost for excavation.
3. Any construction sheeting and bracing which the CONTRACTOR has placed to facilitate its work may be ordered in writing by the ENGINEER to be left in place. The right of the ENGINEER to order sheeting and bracing left in place shall not be construed as creating an obligation on its part to issue such orders. Failure of the ENGINEER to order sheeting and bracing left in place shall not relieve the CONTRACTOR of its responsibility under the contract.

D. Removal of Water

1. The CONTRACTOR shall at all times during construction provide and maintain ample means and devices with which to remove promptly and dispose of properly all water entering the excavations or other parts of the work and shall keep said excavations dry until the pipelines to be placed therein are completed. In water bearing sand, well points and/or sheeting shall be supplied, together with pumps and other appurtenances of ample capacity to keep the excavation dry as specified.
2. The CONTRACTOR shall dispose of water from the work in a suitable legal manner without damage to adjacent property or structures.

1.4 Definitions

A. Bedding and Pipe Zone Backfill

Bedding and pipe zone backfill is defined as the furnishing, placing and compacting of material below, around and above the top of the pipe barrel to the dimensions shown on the trench detail on the Drawings. The minimum depth for pipe bedding shall be 4 inches. The compaction requirement for the pipe bedding and pipe zone shall not be less than that required for the trench backfill above the pipe zone.

B. Trench Backfill Zone

Trench backfill is defined as the furnishing, placing and compacting of material in the trench above the pipe zone, up to bottom of the pavement base rock, ground surface or surface material.

C. Bedding, Pipe Zone and Backfill Classification

Class A: Backfill with suitable native excavated material. Place the material in lifts with mechanical compaction sufficient to insure that no bridging occurs. Mound the excess material over the trench.

Class B: Backfill with suitable native excavated material. Place the material in lifts and mechanically compact to a relative density as shown on the Drawings or specified herein. Remove and dispose of excess material.

Class C: Backfill with suitable native excavated material. Place the material in the trench and water settle to a relative density as shown on the Drawings or specified herein. Remove and dispose of excess material.

Class D: Backfill with approved imported granular material. Place the material in lifts and mechanically compact to a relative density as shown on the Drawings or specified herein. Remove and dispose of excess material.

Class E: Backfill with controlled low strength material (CLSM). See Section 2200, Earthwork.

D. Foundation Stabilization

Foundation stabilization is defined as removing unsuitable native material below the design grade of the area being excavated and replacing and compacting with crushed rock to the dimensions shown on the trench detail, as approved by the ENGINEER, or as otherwise directed by the ENGINEER. Foundation stabilization material shall be placed in lifts not to exceed eight (8) inches and compacted to 95 percent of the maximum density at optimum moisture content.

E. Classification of Excavated Material

Excavated materials are defined within Section 02200, Earthwork.

1.5 Quality Assurance

A. Compaction Requirements

In place dry density of compacted material shall be at the percent of maximum dry density specified or shown at optimum moisture content determined on the basis of the latest edition of AASHTO T-99.

B. Testing Requirements

Soil and aggregate sampling and testing shall be conducted by an independent laboratory approved by the ENGINEER. The location and frequency of testing is to be determined by the ENGINEER. All soil and aggregate sampling and testing shall be paid for by the CONTRACTOR. All soil and aggregate sampling and testing that produces unacceptable results must be repeated and shall be paid for by the CONTRACTOR.

1.6 References

- A. Standard Specifications for Public Works, APWA, current manual, hereinafter called "APWA Standard Specifications".
- B. Oregon Department of Transportation, Standard Specifications for Highway Construction, current manual, hereinafter called "Standard Specifications for Highway Construction".
- C. Douglas County, Department of Public Works, Facility Permit Requirements and Specifications.
- D. City of Roseburg, Public Works Department Requirements.

PART 2 MATERIALS

2.1 Native Backfill Material

Native backfill material shall be select excavated native material free from roots or other organic material, trash, mud, muck, frozen material and large stones and shall comply with the select native fill specification within Section 02200, Earthwork. When native excavated material is used for backfill around the pipe, it shall be free of rocks, cobbles, stones or other debris having a dimension greater than 1-1/2 inches.

2.2 Granular Backfill Material

Unless otherwise shown on the plans or specified herein, granular backfill material shall be well graded crushed rock with a maximum aggregate size of 3/4-inch in the bedding and pipe zone, and a maximum aggregate size of 1-1/2-inch in the trench backfill zone. All gradations of crushed rock shall comply with Section 02200, Earthwork.

2.3 Foundation Stabilization Material

Foundation stabilization material shall be 6 inch - 2 inch or 4 inch - 2 inch gravel, free from clay balls and organic debris, and being well crushed gravel or crushed rock graded with less than 8 percent by weight passing the 1/4-inch sieve, as approved by the ENGINEER.

PART 3 EXECUTION

3.1 Preparation

- A. The site of an open cut excavation shall be first cleared of all obstructions preparatory to excavation. Wherever paved or surfaced streets are cut, saw wheel or approved cutting devices shall be used. Width of pavement cut shall not be less than 12 inches greater than trench width. Any cut or broken pavement shall be removed from site during excavation.
- B. The CONTRACTOR shall maintain street traffic at all times and erect and maintain barricades, warning signs, traffic cones, and other safety devices during construction in accordance with the latest edition of Manual of Uniform Traffic Control Devices (MUTCD), Part 6, to protect the traveling public in any area applicable. Provide flaggers as required during active work in roadway areas.
- C. Intent of specifications is that all streets, structure, and utilities be left in condition equal to or better than original condition. Where damage occurs and cannot be repaired or replaced, CONTRACTOR shall purchase and install new material, which is satisfactory to OWNER. Plans and/or specifications cover and govern replacement and restoration of foreseeable damage.
- D. The CONTRACTOR's operations shall be confined to rights-of-way and easements provided. Avoid encroachment on, or damage to, private property or existing utilities unless prior arrangements have been made with copy of said arrangement submitted to ENGINEER.

3.2 Obstructions

This item refers to obstructions, which may be encountered and do not require replacement. Obstructions to the construction of the trench such as tree roots, stumps, abandoned piling, abandoned buildings and concrete structures, logs, rubbish, and debris of all types shall be removed without additional compensation from the OWNER. The ENGINEER may, if requested, make changes in the trench alignment to avoid major obstructions, if such alignment changes can be made within the perpetual easement and right-of-way and without adversely affecting the intended function of the facility or increased costs to the OWNER.

3.3 Interfering Structures or Roadways

- A. The CONTRACTOR shall remove, replace and/or repair any damage done by the CONTRACTOR during construction to fences, buildings, cultivated fields, drainage crossings, and any other properties at its own expense and without additional compensation from the OWNER. The CONTRACTOR shall replace or repair these structures to a condition as good as or better than their pre-construction condition prior to commencing work in the area.

- B. Where paved roadways are cut, trench backfill will be Class D as defined herein. New pavement shall be equal to or better than the existing paved surface, and shall not deviate by more than 1/4-inch from the existing finish elevation at acceptance and at the end of the warranty period.
- C. If the CONTRACTOR encounters existing structures, which will prevent construction and are not adequately shown on the plans, the CONTRACTOR shall notify the ENGINEER before continuing with the work in order that the ENGINEER may make such field revisions as necessary to avoid conflict with the existing conditions. The cost of waiting or “down time” during such field revisions shall be borne by the CONTRACTOR without additional cost to the OWNER or liability to the ENGINEER. If the CONTRACTOR fails to so notify the ENGINEER when a conflict of this nature is encountered, but proceeds with construction despite this interference, the CONTRACTOR shall do so at the CONTRACTOR’s own risk with no additional payment.

3.4 Easements

- A. Where portions of the work are located on private property, easements and permits will be obtained by the OWNER. Easements shall provide for the use of property for construction purposes to the extent indicated on the easements. Copies of these easements and permits will be available from the OWNER for inspection by the CONTRACTOR. It shall be the CONTRACTOR’s responsibility to determine the adequacy of the easement obtained in every case. The CONTRACTOR shall confine its construction operations to within the easement limits or street right-of-way limits, or make special arrangements with the property owners for the additional area required and notify the ENGINEER of any such conditions.
- B. Any damage to private property, either inside or outside the limits of the easements provided by the OWNER, shall be the responsibility of the CONTRACTOR. Before the ENGINEER will authorize final payment, the CONTRACTOR will be required to furnish the OWNER with written releases from the property owners, where the CONTRACTOR has obtained special agreements or easements or where the CONTRACTOR’s operations, for any reason, have not been kept within the construction right-of-way obtained by the OWNER. Any such special agreements must be in written form and shall not involve the OWNER or ENGINEER as to liabilities in any way.

3.5 Trench and Utility Vault Excavation

- A. Excavation for trenches in which pipelines are to be installed shall provide adequate space for workers to place and joint the pipe properly and safely, but in every case the trench shall be kept to a minimum width. The width of trench at the top of the pipe shall not exceed the limits specified or as shown

on the Drawings. Excavation for manholes and other structures shall be wide enough to provide a minimum of 12 inches between the structure surface and the sides of the excavation.

- B. Unless otherwise permitted by the ENGINEER, trenching operations shall not be performed beyond the distance which will be backfilled and compacted the same day.
- C. In general, backfilling shall begin as soon as the pipe or conduit is in approved condition to receive it and shall be carried to completion as rapidly as possible. New trenching shall not be started when earlier trenches need backfilling or the surfaces of streets or other areas need to be restored to a safe and proper condition.
- D. Where the excavation activities require the removal of portions of an abandoned pipeline, masonry plugs shall be installed in the open ends of the pipe, unless otherwise noted on the plans or by the ENGINEER. Coordinate with ENGINEER prior to plugging. For plugs less than 36 inches in diameter, 8-inch deep masonry units shall be used. For plugs in larger pipelines, 12-inch deep masonry units shall be used.
- E. Excavated material shall be placed at locations and in such a manner that it does not create a hazard to pedestrian or vehicular traffic, or interfere with the function of existing drainage facilities or system operation. The CONTRACTOR shall make arrangements for and dispose of all excess material not required elsewhere on the project at no cost to the OWNER.
- F. The CONTRACTOR shall provide the materials, labor and equipment necessary to protect trenches at all times. The trench protection shall provide safe working conditions in the trench and protect the work, existing property, utilities, pavement, etc. The method of protection shall be according to the CONTRACTOR's design. The CONTRACTOR may elect to use a combination of shoring, overbreak, tunneling, boring, sliding trench shields, or other methods of accomplishing the work provided the method meets the approval of all applicable local, state and federal safety codes. Damages resulting from improper shoring, improper removal of shoring or from failure to shore shall be the sole responsibility of the CONTRACTOR.
- G. The CONTRACTOR shall remove and dispose of existing abandoned sewer pipe, structures, and other facilities as necessary to construct the improvements. The cost of such removal will be considered incidental to trench excavation and backfill.
- H. Trench excavation for piping, utility vaults and other utilities shall be performed to the alignment and grade as indicated on the plans or as required

by the ENGINEER. Where grades are not shown, pipe or other utilities shall be laid to grade between control elevations shown on the plans. Unless otherwise shown or specified, water mains shall be installed with a minimum cover of 36 inches.

Changes in the grade and horizontal alignment of the pipeline as shown on the plans or as provided elsewhere in the specifications may be necessary due to unanticipated interferences or other reasons. No additional compensation will be allowed the CONTRACTOR for changes in horizontal alignment unless otherwise provided for within these specifications. No additional compensation will be allowed for changes in grade, which require additional depth of trench excavation and backfill up to 2 feet from those shown on the plans unless provided for within these specifications.

- I. The trench at all times shall be kept free from water to facilitate fine grading, the proper laying and joining of pipe, and prevention of damage to completed joints. Adequate pumping equipment shall be provided to handle and dispose of the water without damage to adjacent property. Water in the trench shall not be allowed to flow through the pipe while construction work is in progress unless special permission to do so has been given by the ENGINEER. An adequate screen shall be provided to prevent the entrance of objectionable material into the pipe.
- J. For pipe or utility vaults to have bedding material, excavate to a depth of 6 inches minimum below the bottom of the pipe or utility vault. Care shall be taken not to excavate below depths required. If over digging occurs, the trench bottom shall be filled to grade with compacted bedding material. The width of the pipe trench at and below the top of the pipe shall be such that the clear space between the barrel of the pipe and the trench shall not exceed 12 inches on either side of the pipe. The width of the trench above that level may be as wide as necessary for sheeting and bracing and the proper performance of the work.

3.6 Excavation Below Grade

If the trench bottom is unsuitable below the depth required for bedding, the ENGINEER may require additional excavation. This extra excavation shall be backfilled with compacted foundation stabilization material. This backfill shall be placed in lifts not to exceed 8 inches and compacted to 95 percent of the maximum density at optimum moisture content.

3.7 Tunneling

The CONTRACTOR may utilize tunnel methods for installation of pipe where ground conditions are favorable and such methods will not disturb foundations under curbs,

sidewalks and other structures. The ENGINEER must approve tunneling methods. Where tunneling is used, payment for the pipe installation will be made for the equivalent trench excavation and backfill as if the open cut method was used. Payment will not be made for surface restoration including pavement, curbs, sidewalks and other surface improvements whose replacement is avoided by the tunneling method.

3.8 Pipe Bedding

All pipe 4-inch nominal diameter and greater, all steel pipe, all concrete sewer pipe, all plastic pipe, all pipe under existing or future structures or roadways, and all pipe at a depth greater than 6 feet shall be laid in pipe bedding material. Unless otherwise noted on the plans, pipe or conduit of less than 4-inch diameter, outside structure lines and at a depth of less than 6 feet shall be bedded in native material properly shaped as specified below, all as detailed on the drawings.

Following the excavation of the trench, compacted pipe bedding material shall be placed the full width of the excavated trench to a depth as shown on the trench detail. In lieu of a detail, the depth shall be 6 inches. The bottom of the trench shall be accurately graded and rounded to fit the bottom quadrant of the pipe to provide uniform bearing and support for each section of pipe. Depressions for jointing shall be only of such length, depth and width necessary for the proper making of the joint.

3.9 Pipe Zone and Trench Backfill

- A. All backfill except CLSM shall be placed and compacted in 6 to 8-inch lifts. Backfill shall be carefully placed around the pipe and thoroughly compacted in 6 to 8-inch lifts or in a manner satisfactory to the ENGINEER so as to achieve the specified compaction requirements. When placing pipe zone backfill, the CONTRACTOR shall prevent pipe from moving either horizontally or vertically during placement and compaction of pipe zone material.
- B. Backfill Immediately: All trenches and excavations shall be backfilled immediately after pipe is laid therein and necessary testing is complete, unless otherwise directed by the ENGINEER. Under no circumstances shall water be permitted to rise in open trenches after pipe has been placed.
- C. Where trenches are under existing or future structures, paved areas, road shoulders, driveways or sidewalks, or where designated on the plans or specified elsewhere in these specifications, the trench backfill shall be Class D or Class E and pipe zone backfill shall be Class D. Class D trench backfill shall be compacted to 95 percent of maximum density at optimum moisture content in accordance with AASHTO T 99.

- D. Where trenches are outside existing or future structures, paved areas, road shoulders, driveways or sidewalks, or where designated on the plans or specified elsewhere, the trench backfill shall be Class B or Class D and pipe zone backfill in these areas shall be Class D. For these locations, compaction of Class B trench backfill shall be to not less than 90 percent of maximum density at optimum moisture content in accordance with AASHTO T 99.

Class D trench backfill shall be compacted to not less than 95 percent of maximum density at optimum moisture content in accordance with AASHTO T 99.

3.10 Compaction Testing

- A. Compaction tests will be required to show that specified densities of compacted backfill are being achieved by the CONTRACTOR's compaction methods.
- B. Tests of pipeline backfill materials shall be made on each lift of fill for every 200 feet of pipeline trench as measured along the pipe centerline. After the ENGINEER is satisfied that the CONTRACTOR's method of compaction consistently meets specified compaction requirements, the testing frequency may be reduced to not less than one test per lift of fill for every 1,000 feet of pipeline trench if compaction method is consistently meeting the compaction specified. The ENGINEER may direct testing at a higher frequency at no additional cost to the OWNER upon failure to obtain specified densities or if the CONTRACTOR changes compaction equipment or methods of compaction. The ENGINEER shall determine all test locations.

3.11 Utility Crossings

- A. Vertical clearance between the new pipe and existing utilities shall be 12 inches minimum unless otherwise noted on the plans or specified. Where existing utility lines are damaged or broken, the utility shall be repaired or replaced, care being taken to insure a smooth flow line and absolutely no leakage at the new joints. Unless otherwise specified herein, all expenses involved in the repair or replacement of leaking or broken utility lines that have occurred due to the CONTRACTOR's operations shall be borne by the CONTRACTOR and the amount thereof shall be absorbed in the unit prices of its bid.
- B. Water Lines Crossing Sewer Lines -- Whenever water lines cross sewer lines, CONTRACTOR shall comply with Health Department requirements. Wherever possible, the bottom of the water line shall be 1.5 feet or more above the top of sewer pipe and one full length of the water line pipe shall be centered at the crossing. For clearances less than 1.5 feet, the CONTRACTOR

shall replace the existing sewer pipe with ductile iron or PVC of equal size, or shall encase existing sewer pipe with concrete for a minimum of 10 feet on both sides of crossing, as directed by the ENGINEER, at no additional cost to the OWNER.

3.12 Disposal of Unsuitable and Surplus Material

- A. All excavated materials which are unsuitable for use in backfilling trenches or around structures, and excavated materials that are in excess of that required for backfilling and for constructing fills and embankments as shown on the drawings, shall be disposed of by the CONTRACTOR at its own expense and at disposal sites provided by the CONTRACTOR as may be required; except that the OWNER reserves the right to require the CONTRACTOR to deposit such surplus at locations designated by the OWNER within a 2-mile radius.
- B. Surplus excavated material shall be disposed of by the CONTRACTOR in a legal manner, in full compliance with applicable codes and ordinances.

3.13 Surface Restoration and Clean-Up

- A. At the end of each work day, all open trenches shall be backfilled and all trenches within streets shall be temporarily paved to the satisfaction of the ENGINEER. Temporary paving shall be replaced with permanent street paving, at completion of construction within street rights-of-way or sooner if deemed necessary by the ENGINEER. No gravel-filled trenches shall be left within the street right-of-way at the end of the workday.
- B. Where trenches cross lawns, garden areas, pastures, cultivated fields, or other areas on which reasonable topsoil conditions exist, the CONTRACTOR shall remove the topsoil to the specified depth and place the material in a stockpile. The CONTRACTOR shall not mix the topsoil with other excavated material. After the trench has been backfilled, the topsoil shall be replaced.
- C. CONTRACTOR shall clean up and remove all excess materials, construction materials, debris from construction, etc. CONTRACTOR shall replace or repair any fences, mailboxes, signs, landscaping, or other facilities removed or damaged during construction. CONTRACTOR shall replace all lawns, topsoil, shrubbery, flowers, etc., damaged or removed during construction. CONTRACTOR to be responsible for seeing that lawns, shrubs, etc. remain alive and leave premises in condition equal to original condition before construction.

END OF SECTION

SECTION 02485

FINISH GRADING, EROSION CONTROL AND SEEDING

PART 1 GENERAL

1.1 Description

This section covers the work necessary for the finish grading, erosion control, establishment of seeding, complete, including furnishing and delivery of labor, materials and equipment. All areas of the project with soil disturbance resulting from the project work shall receive appropriate erosion control measures.

1.2 Submittals

The following submittals are required as part of this work:

- A. Materials including seed, mulch, and tackifier.
- B. Alternate erosion control matting materials and/or techniques other than specified herein.

1.3 Maintenance of Erosion Control and Seeding

The CONTRACTOR shall through the entire project maintain in a manner acceptable to the ENGINEER all erosion control measures and all seeding until final acceptance of the erosion control and seeding work.

1.4 Final Acceptance

Final acceptance will be acknowledged, in writing by the ENGINEER, when all erosion control and seeding work under this section is complete and acceptable. All disturbed areas shall have been seeded and an acceptable ground cover established and all deficiencies corrected.

PART 2 MATERIALS

2.1 Existing Topsoil

Existing topsoil consists of the top 6 inches of soil at locations where topsoil exists.

2.2 Imported Topsoil

Imported topsoil shall be a natural, friable soil, representative of productive soils in the vicinity. It shall be obtained from well-drained areas, free from admixture of subsoil and foreign matter and objects larger than 2-inches in diameter, toxic substances, and any other deleterious material which may be harmful to plant growth or be a hindrance to grading, planting and maintenance. Imported topsoil supply shall be approved by the ENGINEER.

2.3 “Native Grasslands” Seed Mix, as provided by Sunmark Seeds International, Inc., or approved equal.

- A. Seed shall be certified, blue tag, clean, delivered in original, unopened packages bearing an analysis of the contents, guaranteed 95% pure and to have a minimum germination rate of 95% in one year.
- B. The following seed mix shall be applied to areas disturbed by the Contractor which are located outside of the reservoir perimeter fence limits.

<u>Seed Mix</u>	<u>Minimum Application Rate,</u> <u>lbs/acre</u>
Blue wildrye (<i>Elymus glaucus</i>)	17.39
California brome (<i>Bromus carinatus</i>)	17.39
Native Red Fescue (<i>Festuca rubra rubra</i>)	6.52
Tufted Hairgrass (<i>Deschampsia cespitosa</i>)	2.17

2.4 “DOT Multipurpose” Seed Mix, as provided by Sunmark Seeds International, Inc., or approved equal.

- A. Seed shall be certified, blue tag, clean, delivered in original, unopened packages bearing an analysis of the contents, guaranteed 95% pure and to have a minimum germination rate of 95% in one year.
- B. The following seed mix shall be applied to areas disturbed by Contractor which are located within the reservoir perimeter fence limits.

<u>Seed Mix</u>	<u>Minimum Application Rate, lbs/acre</u>
Blazer 4 Perennial Ryegrass (<i>Lolium perenne</i> var <i>Blazer 4</i>)	90
Express II Perennial Ryegrass (<i>Lolium perenne</i> var <i>Express II</i>)	90
Windward Chewing Fescue (<i>Festuca rubra</i> spp <i>fallax</i> var <i>Windward</i>)	60
Garnet Creeping Red Fescue (<i>Festuca rubra</i> var <i>Garnet</i>)	60

2.5 Erosion Control Matting

- A. Jute Matting: Jute matting shall consist of a uniform, open, plain weave of single jute yarn. The yarn shall be of loosely-twisted construction and shall not vary in thickness by more than one-half of its normal diameter. The weave shall provide openings of about 1 square inch.

Furnish the matting in widths of 45 inches or more, continuous lengths of not less than 150 feet, and weigh not less than 0.9 pounds per square yard.

Use staples of 12 gauge or heavier steel wire which is bent to a U-shape 2 inches wide. Staples shall not be less than 10 inches long unless the ENGINEER allows a shorter length for hardpan soil conditions.

- B. Excelsior Matting (Erosion Blankets): Consisting of a machine produced blanket of curled wood fibers, of which 80% are 6-inches or longer. Furnish a blanket of uniform thickness, with the fiber evenly distributed over the entire area of the mat. Matting shall have a minimum dry weight of 0.8 pounds per square yard (+/- 10%). Furnish in a minimum 36-inch wide rolls.
- C. Alternate Matting Material: Submit proposed alternate erosion control matting material with specifications, costs, and manufacturer's literature to the ENGINEER for consideration and approval. Alternate materials may be used only if approved after review of submittals.

2.6 Mulch

Mulch shall be wood or straw mulch processed so that the fibers are uniformly suspended under agitation in water. Fibers shall have moisture-absorption and percolation properties to form a blotter-like cover on the ground. Ship in packages of uniform weight (+/- 5%) and labeled with manufacturer's name and air-dry weight. The mulch shall be blended with additives to form a homogeneous slurry. For use for

erosion control, the mulch shall be blended with a tackifier. For use for seeding, the mulch shall be blended with seed, fertilizer, tackifier and other additives in a hydroseeding mixture. The processed mulch shall have the ability to hold grass seed in contact with soil.

2.7 Tackifier

Emulsion designed to retain moisture and heat in the soil. Mulch shall be chemically inert, nontoxic to plants, humans, and animals. Tackifier shall be J-Tac, Sentinel, or equal.

PART 3 EXECUTION

3.1 Finish Grading Procedures

- A. Finish Grading: Spread fill/topsoil material and rake the area to a uniform grade so that all areas drain, as indicated on the Drawings and approved by the ENGINEER.
- B. Preparation of Ground Surface: Remove all trash and all stones exceeding 2-inches prior to seeding.

3.2 Time of Seeding

Conduct seeding operations under favorable weather conditions during seasons which are normal for such work which are generally from April 1 through May 31 and September 1 through October 31.

3.3 Erosion Control Matting

Erosion control matting shall be placed on all slopes with a slope ratio of 2:1 and greater, or as directed by the ENGINEER. Matting shall be laid flat in single thickness strips paralleling the direction of probable water flow. Multiple strips of matting shall overlap in shingle fashion. Adjacent strips of matting shall be overlapped a minimum of 1-foot, or as recommended by the manufacturer. The erosion matting shall be in contact with the soil at all points and shall be held in place with wire staples, or as recommended by the manufacturer. Anchor the matting in ditches at the top of the slope to ensure it will stay in place. The installation and minimum spacing of wire staples shall be as per manufacturer's specifications.

3.4 Mulching and Seeding

- A. **Mulching for Erosion Control:** Mulching of disturbed areas for erosion control shall be accomplished immediately upon completion of the final grading of the disturbed construction areas. The mulching for erosion control shall consist of mulch and tackifier. If the initial application of mulching for erosion control is not sufficient to control erosion, the CONTRACTOR shall re-apply the mulch or undertake and complete other erosion control measures as necessary to control erosion, all as approved by the ENGINEER and at no additional cost.

- B. **Seeding:** Seeding of disturbed areas shall be accomplished within the time period specified above in "Time for Seeding". Seeding shall consist of seed, mulch and tackifier. Seeding can be substituted for mulching for erosion control if seeding can be accomplished immediately upon completion of the final grading of the disturbed construction areas and within the time period for seeding. Seeding is considered acceptable if an acceptable stand of grass providing uniform coverage at 70 percent or greater density of the surrounding existing grassy areas is achieved. If early germination occurs or for any other reason an acceptable stand of grass is not achieved, the areas shall be re-seeded one or more times until an acceptable stand is achieved, all at no additional cost.

END OF SECTION

SECTION 02505

PAVEMENT AND SURFACE RESTORATION

PART 1 GENERAL

1.1 Scope

This section covers the work necessary to replace all pavements, pavement base, curbs, sidewalks and other surface features damaged directly or indirectly during construction. All work shall meet the standards and requirements of the Oregon Department of Transportation and the City of Roseburg.

1.2 Reference Standards

- A. References herein to "AASHTO" shall mean Association of American State Highway Transportation Officials.
- B. Standard Specifications: Where the term "Standard Specification" is used, such reference shall mean the current edition of the Oregon Department of Transportation Standard Specifications for Highway Construction. Where reference is made to a specific part of the Standard Specifications, such applicable part shall be considered as part of this section of the Specifications. In case of a conflict in the requirements of the Standard Specifications and the requirements stated herein, the requirements herein shall prevail.
- C. City of Roseburg Construction Standards

1.3 Quality Assurance and Acceptance

- A. All sampling and testing shall be conducted by an independent testing laboratory approved by the ENGINEER. The location and frequency of testing is to be determined by the ENGINEER. All soil and aggregate sampling and testing and asphalt concrete sampling and testing shall be paid for by the CONTRACTOR. All soil and aggregate sampling and testing and asphalt concrete sampling and testing that produces unacceptable results must be repeated and shall be paid for by the CONTRACTOR.
- B. The Hot Mix Asphalt Concrete (HMAC) will be randomly sampled, as directed by the ENGINEER, from a grade sample prior to compaction, or from a plant sample taken from the discharge of the paving plant mixture. Samples shall be taken once for every 250 tons of HMAC placed or a maximum of one sample per day. Samples shall be tested for Asphalt Cement Content

according to AASHTO T308; Aggregate Gradation according to AASHTO T27 test method; Moisture Content according to ASSHTO T255, Microwave Method. Compaction shall be tested using the Moving Average Maximum Density (MAMD) Method for compaction measurement. A minimum of one density test per 500 lineal feet of HMAC, per lift of HMAC, will be required. HMAC shall be compacted to a minimum of 91% of MAMD for the first lift placed on aggregate base and 92% of MAMD on all other lifts.

- C. The surface smoothness of the replaced pavement shall be such that when a 10-foot straightedge is laid longitudinally across the patched area between the edges of the old surfacing and surface of the new pavement, the new pavement shall not deviate from the straightedge more than 1/8 inch and surface drainage shall be maintained. Additionally, paving must conform to the grade and crown of the adjacent pavement and contain no abrupt edges, low or high areas or any other imperfections as determined by the ENGINEER. Pavement trench construction not meeting these requirements will be repaired by grinding the existing pavement to a 2 inch depth and replacing with a Level 3, 1/2-inch dense graded, PG 70-22 HMAC the full width of the travel lane at no cost to the OWNER.

PART 2 PRODUCTS

2.1 Aggregate Material

Base Course and Leveling Course: The aggregate material shall be a clean, well-graded crushed base aggregate conforming to the Standard Specifications. Base course shall be 1-1/2 inches minus aggregate and leveling course shall be 3/4-inch minus aggregate, unless shown otherwise on the drawings or specified elsewhere.

2.2 Asphalt Concrete Pavement

A. Hot Mix Asphalt Concrete

Use Level 3, 1/2-inch dense graded, PG 70-22 HMAC. Conform to the requirements as specified in Section 00745 of the Standard Specification.

B. Cold Mix Asphalt Concrete

Use cold mix asphalt concrete and 1/2-inch-0-inch gradation with either MC 250 liquid asphalt, CMS-2, CMS-2S or CSS-1.

C. Asphalt Prime Coat

Liquid asphalt for use as a prime coat under asphalt concrete shall be MC 250 liquid asphalt, CMS-2S or CSS-1.

D. Seal and Cover Coat

Asphalt material shall be CRS-2 cationic emulsified asphalt. Cover stone shall conform to size 1/4-inch - #10 aggregate in Standard Construction Specifications.

PART 3 EXECUTION

3.1 Surface Restoration, General

- A. All areas disturbed as a result of construction shall be restored to their original condition as nearly as possible, or surfaced as shown on the Plans. Restoration work for all areas disturbed as a result of construction shall conform to this section of the specifications and to the requirements of Section 02485, Finish Grading, Erosion Control and Seeding. All excess material shall be removed from the site. Any damaged concrete walks or driveways shall be restored. All dirt and debris that accumulates from the CONTRACTOR's operations shall be removed from inlets, catch basins, connecting pipelines and similar structures. Any material entering manholes or ditch culverts from street resurfacing and trenching work shall be removed. Daily clean up of all visible mud and debris is required.

3.2 Aggregate Pavement Base

- A. Place pavement base to the depth shown on the plans or as specified in all cases, pavement base shall be compacted to a minimum depth of 6 inches. Bring the top of the pavement base to a smooth, even grade at a distance below finished grade equivalent to the required pavement depth.
- B. Compact the pavement base with mechanical vibratory or impact tampers to a density of not less than 95 percent of the maximum density, as determined by AASHTO T-99.

3.3 Temporary Pavement

Prior to opening any roadway to traffic, all trenches within the roadway shall be temporarily or permanently paved. If temporarily paved, a temporary hot or cold asphalt patch at least 2-inches thick shall be installed. Until replacement of the

permanent pavement, the CONTRACTOR shall continuously maintain the trenches in a condition acceptable to the OWNER, ENGINEER and/or responsible roadway agency at no additional cost to the OWNER.

3.4 Asphalt Concrete Pavement

- A. CONTRACTOR shall conform to the requirements for prime coat and tack coat in Standard Specifications. Tack coat all edges of existing pavement, manhole and clean out frames, inlet boxes and like items. When rate is not specified, asphalt will be applied at the rate of 0.1 gallon per square yard.
- B. Asphalt Concrete Placement
 - 1. Except as specifically modified herein, conform to the requirements for construction in Standard Construction Specifications. The limits of the asphalt concrete restoration shall include all damage to or undermining of existing surfacing.
 - 2. Provide a smooth tee cut by saw cutting the existing pavement parallel to the trench and beyond the sides of the trench excavation as shown on the plans. Remove any pavement which has been damaged or which is broken and unsound outside this area by making alternating traverse and parallel saw cuts. Parallel cuts must be a minimum of 25 feet long, unless otherwise directed by ENGINEER. Keep trench cuts in a smooth condition throughout the duration of the project. Provide a smooth, sound edge for joining the new pavement.
 - 3. Place the asphalt concrete to the specified depth on the prepared subgrade over the trench. When depth is not specified, place asphalt concrete to the depth of the adjacent pavement, except that the minimum depth of new roadway pavement shall be not less than 4 inches nor more than 6 inches. Asphalt concrete depth for private driveways and roads shall be 3 inches thick. When a prime coat is specified, place asphalt concrete after the prime coat has set. Asphalt concrete shall be placed in lifts from a minimum of 2-inches up to a maximum of 4-inches in depth. Spread and level the asphalt concrete with hand tools or by use of a mechanical spreader.
 - 4. When the utility trench is placed closer than 3 feet inside the edge of existing pavement, the remaining pavement must be removed and replaced with the trench repair. When the trench is under the existing edge of pavement, additional pavement shall be removed to allow a three foot minimum width of repair and to maintain the original street width.

5. Where shown on the drawings and/or specified, for pipe trenches that run the length of the roadway, grind and remove the top 2 inches of existing asphalt concrete for the full width of the lane damaged. Place a 2-inch thick surface leveling course over the ground-down existing pavement and the new base course within the trench limits.
6. Settlement of 1/4-inch or greater for asphalt concrete patches, occurring within one year of substantial completion, shall require repair or replacement as directed by the ENGINEER at the CONTRACTOR's expense.

3.5 Concrete

- A. Replace concrete driveways, sidewalks and curbs to the same section, width, depth, line and grade as that removed or damaged. Saw broken or jagged ends of existing concrete on a straight line and to a vertical plane. Place new concrete only on approved compacted trench.
- B. Replace concrete driveways and sidewalks between scored joints and make replacement to prevent a patched appearance. Unless otherwise shown, provide a minimum 2-inch thick compacted leveling course of clean 3/4-inch minus crushed aggregate.
- C. All replaced concrete driveways, sidewalks and curbs shall be constructed in accordance with ODOT, Douglas County and City of Roseburg construction standards.

3.6 Rock Surfacing

Place rock surfacing only where shown on plans or directed on streets, driveways, parking areas, street shoulders, and other areas disturbed by the construction. Rock surfacing shall be 3/4 inch – 0 inches crushed aggregate. Spread the rock surfacing to conform to adjacent existing grades and surfaces as directed. Compact as directed with mechanical vibratory or impact tamper.

On the gravel portions of private roadways, after pipeline installation and backfill, blade and compact the full width of the existing gravel roadways to the desired contours as directed by the ENGINEER. Place a 1-1/2-inch thick overlay of 3/4 inch – 0 inches gravel the full width of the road and blade smooth and compact.

3.7 Dust Control

When the weather is dry and when, as determined by the ENGINEER, the dust becomes a nuisance, the CONTRACTOR shall sprinkle water on surfaces twice a day

in order to keep the dust down. This sprinkling shall be maintained until the project is accepted. On paved streets when the backfilling has been completed, the streets shall be washed to remove all dirt and debris. If the dust becomes a nuisance before backfilling is completed, the CONTRACTOR shall wash the streets to the satisfaction of the ENGINEER.

3.8 Restoration of Permanent Pavement Striping and Marking

The CONTRACTOR shall restore all permanent pavement striping and marking that is removed or damaged during the project construction. The work shall include the removal of existing damaged markings where required, furnishing and installing thermoplastic and/or painted markings in accordance with the roadway owners' requirements (Douglas County) and other incidental work as required to completely restore existing pavement striping and marking to the satisfaction of the roadway owners.

END OF SECTION

SECTION 02620

DUCTILE IRON PIPE, FITTINGS AND SPECIAL ITEMS

PART 1 GENERAL

1.1 Description

Work under this Section applies to the furnishing and installation of ductile iron pipe, fittings and special items for buried service. The CONTRACTOR shall furnish and install ductile iron pipe, fittings, valves, special items and all appurtenant work, complete in place, all in accordance with the requirements of the Contract Documents.

1.2 Reference Specifications, Codes, and Standards

A. Commercial Standards

ANSI B16.1	Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800
ANSI/NSF Standard 61	Drinking Water System Components
ASTM A126	Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
ANSI/AWWA C104/A21.4	Cement-Mortar Lining for Ductile-Iron Pipe and Fittings
AWWA C105	Polyethylene Encasement for Ductile- Iron Pipe Systems
ANSI/AWWA C110/21.10	Ductile-Iron and Gray-Iron Fittings
ANSI/AWWA C111/A21.11	Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
ANSI/AWWA C115/A21.15	Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
ANSI/AWWA C150/A21.50	Thickness Design of Ductile-Iron Pipe
ANSI/AWWA C151/A21.51	Ductile-Iron Pipe, Centrifugally Cast

ANSI/AWWA C153/A21.53

Ductile-Iron Compact Fittings for Water Service

AWWA C600

Installation of Ductile-Iron Water Mains and Their Appurtenances

1.3 Submittals

- A. See Section 01300, Submittals, for submittal procedures.
- B. Product technical data and material data; including all pipe, fittings, restrained joint systems, and appurtenance information.
- C. Lining and coating data.
- D. Applicable material certifications and testing certificates.
- E. Manufacturer's handling, delivery, storage and installation requirements.

1.4 Quality Assurance

- A. Unless otherwise noted, all water works materials provided for the project shall be new, of first class quality and shall be made by reputable manufacturers. All material of a like kind shall be provided from a single manufacturer unless otherwise approved by the ENGINEER. All material shall be carefully handled and installed in good working order free from defect in manufacture, storage and handling. Where an item is to be used but does not have its quality specified herein, it shall be equal to that specified in the appropriate American Water Works Association (AWWA) Standard Specification.
- B. All references to standards of AWWA or other organizations shall be the latest versions of those standards.
- C. All pipe and fittings shall be manufactured in the United States of America unless otherwise approved by the OWNER. The only exception shall be non-domestic ductile iron fittings manufactured by Tyler Union which meet the requirements listed elsewhere in Section 02620.

PART 2 PRODUCTS

2.1 General

- A. Ductile iron piping materials and specials shall meet the specifications of this Section and of the appropriate AWWA Standard Specifications. In the case of conflict, the more stringent specifications shall apply.
- B. Unless otherwise specified herein or shown on the plans, the minimum working pressure rating of all water works material specified herein shall be 1.5 times the operating pressure or 150 psi minimum.
- C. All coatings and materials specified herein that come in contact with potable water shall be National Sanitation Foundation (NSF) approved.

2.2 Ductile Iron Pipe

- A. Ductile iron pipe shall conform to AWWA Standard C151 and shall be the standard push-on joint type or restrained joint type as identified on the drawings. Push-on joints shall be "TYTON" type or "Fas-Tite" type without exception. Unless otherwise specified herein or shown on the plans, ductile iron pipe shall be thickness Class 52. Polyethylene encasement shall be installed on all ductile iron pipes and shall conform to AWWA Standard C105.
- B. Piping 24 inches in diameter or greater that is to be cut in the field shall be gauged full length, meeting the outside diameter standard dimensions and tolerances required for spigot ends along the entire length of pipe to within 2 feet of the bell. Pipe shall be externally marked, in manufacturer's color, indicating gauged pipe. In addition to pipe supplied for anticipated cutting, a minimum of 5% of each size of piping 24 inches in diameter or greater shall be provided gauged full length as described above.
- C. Ductile iron pipe shall be cement mortar lined, interior and exterior sealed in accordance with ANSI/AWWA C104.A21.4.
- D. Push-on or mechanical type pipe joints shall conform to AWWA Standard C111. Flanged ductile iron pipe shall conform to AWWA Standard C115.
- E. Restrained Joint Ductile Iron Pipe
 - 1. Restrained joint ductile iron pipe and fittings shall be provided as identified on the drawings and required for the application. Joint restraint for pipe shall be accomplished with an integral lock mechanism except as may be otherwise specified. Any such system

shall be a manufacturer's standard proprietary design, shall be as recommended by the manufacturer for the application, and shall be performance proven.

2. Restraining components for pipe shall be ductile iron in accordance with applicable requirements of ANSI/AWWA C110/A21.10 and/or C153/A21.53 with the exception of the manufacturer's proprietary design dimensions. Push-on joints for such fittings shall be in accordance with ANSI/AWWA C111/A21.11.

The following is the approved list of restrained joint systems:

- a. "Thrust-Lock", Pacific States Cast Iron Pipe Company
- b. "Fast Grip", American Cast Iron Pipe Company
- c. "TR FLEX", United States Pipe and Foundry Company
- d. "SNAP-LOK", Griffin Pipe Products Company
- e. "MEGALUG", EBAA Iron, Inc.
- f. "FIELD LOK", United States Pipe and Foundry Company
- g. "Super Lock", Clow Water Systems Company
- h. "Restrained Joint", McWane Cast Iron Pipe Company
- i. "MJ-TJ" pipe with "MEGALUGs", Pacific States Cast Iron Pipe Company
- j. "Flex-Ring", American Cast Iron Pipe Company

Where such a system may require "MEGALUGs" for restraint, "MEGALUGs" shall be provided in quantities as may be required and shall be considered incidental to the joint restraint system. Restrained piping shall be pressurized following installation and prior to completing piping tie-ins.

3. Restrained joints for pipe shall be designed for the test pressure as specified or for the lengths of pipe shown on the drawings.
4. Restrained joint for pipe shall be capable of being deflected after assembly as follows:

<u>Size</u>	<u>Maximum Deflection</u>
4	5.00°
6	5.00°
8	5.00°
10	5.00°
12	5.00°
14	3.25°
16	3.25°

18	3.00°
20	2.75°
24	2.25°
30	1.75°
36	1.50°
42	0.50°
48	0.50°
54	0.50°

2.3 Fittings and Specials

A. Fittings

1. Fittings used for joining ductile iron pipe shall be of the type, size and strength designated on the plans, elsewhere in the specifications, or in the proposal and, to the extent therein specified, shall conform to the appropriate specification in this section. Fittings shall have pressure ratings as specified above and as shown on the plans.
2. Fittings shall be mortar lined and seal coated. Mortar lining of fittings shall be factory installed only, unless otherwise directed by ENGINEER. All fitting lining interior surfaces shall be smooth finished.
3. Pipe fittings and specials used with ductile iron pipe shall be gray-iron or ductile iron and shall conform to AWWA Standard C110. Ductile iron (compact) fittings conforming to AWWA Standard C153 may be substituted in lieu of AWWA C110 fittings for fitting sizes 3-inches through 24-inches in diameter. Fittings shall be mechanical joint, push-on type, flanged or plain-end as required and shown on the plans. When fitting joints are to be restrained, pipe joint restraint systems as specified herein shall be used.
4. Fittings shall have the following information cast upon them:
 - a. Manufacturer's identification
 - b. Country of manufacture
 - c. Pressure rating
 - d. Number of degrees or fractions of a circle (bends)

The OWNER may require additional metallurgical documentation or other certifications.

B. Flanges

Threaded flanges shall meet the requirement of AWWA Standard C115 and shall be installed only on pipe with a minimum Class 53 wall thickness. All flanged fittings shall be provided with bolts and gaskets as specified herein. Flanges shall have flat faces and shall be attached with bolt holes straddling the vertical axis of the pipe unless otherwise shown. CONTRACTOR shall coordinate with pipe, valve and fitting suppliers to make certain that pipe, valve and fitting flanges match in bolt pattern.

C. Gaskets

Gaskets for flanged joints (excluding insulating flange joints) shall be as follows:

1. Pipe sizes up to 24-inch: Gaskets shall be full face gaskets, EPDM rubber 1/8-inch thickness, Garlock 98206, or equal.
2. Pipe sizes 24-inch and greater: Gaskets shall be ring gaskets, EPDM rubber, 1/8-inch thickness, Garlock 98206, or equal.

D. Bolts and Nuts

Bolts and nuts shall be carbon steel and shall conform to the requirements of ASTM A307 or ASTM A193 grade B7 with ASTM A194 grade 2H heavy hex nuts. Bolts for mechanical type pipe joints shall be domestic Cor-Ten or ductile iron tee-head bolts.

Contractor shall limit torque applied to bolts and nuts installed on cast iron flanges in order to avoid damage to these flanges.

E. Flexible Couplings and Insulated Flexible Couplings

See Specification Section 15000 – Piping, General.

F. Insulating Flanged Joints

See Specification Section 13989 - Corrosion Monitoring System For Ductile Iron Pipe.

G. Flexible Expansion Joints

Flexible expansion joints shall be installed in the locations indicated on the drawings and shall be manufactured of ductile-iron conforming to the material

properties of ANSI/AWWA C153/A21.53. Flexible joints shall be provided with end connections as shown on the plans. All flexible expansion joints shall consist of an expansion joint designed and cast as an integral part of a ball and socket type flexible joint, having a minimum of 15 degree deflection per ball and 4-inch expansion. Actual expansion and deflection requirements will be as shown on the drawings. Each flexible expansion joint shall be hydrostatically tested to the manufacturer's published pressure rating prior to shipment. All pressure containing parts shall be lined with a minimum of 15 mils of fusion bonded epoxy conforming to the applicable requirements of ANSI/AWWA C213 and shall be holiday tested with a 1,500 volt spark test conforming to said specification. All flexible-expansion joints shall be Flex-Tend as manufactured by EBAA Iron, Inc. or approved equal.

H. Tapping Sleeves and Tapping Saddles

See Specification Section 15000 – Piping, General.

I. Tracer Wire

Detectable tracer wire shall be No. 12 AWG stranded copper wire with high molecular weight polyethylene (HMWPE) insulation. The HMWPE insulated cover shall be blue and shall have a minimum thickness of 45 mils. The wire shall be UL rated for 140⁰ F. Joints or splices in wire, where authorized by the ENGINEER, shall be waterproof.

J. Marking Tape

Marking tape shall consist of inert polyethylene plastic that is impervious to all known alkalis, acids, chemical reagents and solvents likely to be encountered in the soil. The tape shall be a minimum of 6-inches in width. The tape shall be blue and shall be imprinted continuously over its entire length in permanent black ink with the words "Caution Buried Water Line Below"

PART 3 EXECUTION

3.1 General

- A. All materials, workmanship and installation shall conform to referenced AWWA Standards and other requirements of these specifications. The methods employed by the CONTRACTOR in the storage, handling, and installation of pipe, fittings, valves, hydrants, equipment and appurtenances shall be such as to insure that the material, after it is placed, tested and permanently covered by backfilling is in as good a condition as when it was

shipped from the manufacturer's plant. Should any damage occur to the material, repairs or replacement shall be made to the satisfaction of the ENGINEER.

- B. Ductile iron pipe shall be installed in accordance with AWWA Standard C600, except as modified elsewhere in these specifications. Trench excavation and backfill of ductile iron piping system shall conform with the requirements of Section 02222, Excavating, Backfilling and Compacting for Utilities.
- C. Sanitary Sewer Separation: CONTRACTOR shall furnish all labor, equipment and materials required to replace sections of existing sanitary sewers or encase existing sanitary sewers in reinforced concrete as required to comply with Oregon State Health Division requirements for minimum separation from sanitary sewers.

3.2 Thrust Restraint

Where indicated on the drawings, specified elsewhere or directed by the ENGINEER, restrain all joints at valves, bends, tees, dead ends, crosses and all pipe joints within the indicated or specified distance on each side of the valves, bends, tees, dead ends and crosses. Install joint restraint systems as specified and in accordance with manufacturer's instructions.

3.3 Tracer Wire

- A. Tracer wire is to be installed on all ductile iron pipelines for future locating purposes. Tracer wire shall be installed on the top centerline of the pipe. The 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. The tracer wire shall be routed through all valve boxes (including isolation valves, air release valves, blowoffs and drain valves), meter boxes, fire hydrants and vaults to provide access to terminal ends of the wire. All locations of tracer wire intersections shall be soldered to provide electrical continuity and protected from adverse soil conditions with the use of shrink tubes or other approved waterproof connector devices. The result of the tracer wire installation shall be a continuous wire circuit electrically isolated from ground. Where there is an extended length of pipeline without surface access for the tracer wire, additional valve boxes and covers shall be installed as needed and as directed by the ENGINEER. The distance between tracer wire access locations shall not exceed 1,000 feet. Valve boxes and covers shall be identical to that shown on the valve box detail on the drawings.
- B. Tracer wire shall be installed in conjunction with all service lines. Tracer wire shall be accessible from within the meter box and shall have electrical

continuity with any tracer wire laid in conjunction with the waterline to which the service is tapped.

- C. Leave slack in mainline tracer wire equivalent to a 12-inch diameter loop at each valve box and at each service tap to facilitate splicing, soldering and waterproofing.
- D. Test for continuity and isolation from ground in the wire after all work has been completed on the test section. Perform intermediate testing after backfilling operations and prior to surface restoration work. Test continuity between access locations by use of a temporary wire connecting test points in-line with an ohmmeter. Measure resistance 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 for each 500 feet of location wire being tested. Measure isolation from ground with an approved 1,000 volt Megger, applied for one minute. The isolation of a test section will be accepted if the isolation resistance of the test section is at least 10 megohms. Locate and repair all breaks or defects in the wire and re-test until specified results are obtained.

3.4 Marking Tape

Marking tape shall be installed over all ductile iron pipelines. Marking tape shall be installed approximately 1 foot above the top of the pipe for its full length with the written warning words facing up.

3.5 Polyethylene Encasement of Buried Metallic Items in Transmission Main System

All buried ductile iron piping, valves, fittings, and appurtenances shall be polyethylene encased as described in Paragraph 2.2 above with 8 mil linear low-density polyethylene film manufactured of virgin linear low-density polyethylene material per AWWA C105.

3.6 Testing and Disinfection of Ductile Iron Pipe Mains

- A. Testing and disinfection of ductile iron pipe mains shall be done in accordance with Section 01650, Pipeline Testing and Disinfection, AWWA Standard 600, and AWWA Standard 651.
- B. All chlorinated water used in disinfection of the water main shall be dechlorinated to limits acceptable by the Oregon State Department of Environmental Quality (DEQ) prior to discharge into the storm drainage system or open drainageway. No chlorinated water shall be discharged into storm drainage system or open drainageway without a dechlorination plan

meeting DEQ's requirements. Discharge to a public sanitary sewer system will not be acceptable.

END OF SECTION

SECTION 02800

STEEL FENCES AND GATES

PART 1 GENERAL

1.1 Description

This Section covers all work necessary to construct new steel fencing and gates as shown on the Plans or specified elsewhere. All fences and gates shall be furnished with top rails and knuckled periphery edges, as well as barbed wire.

1.2 Submittals

Submit shop drawings for steel fences and gates, including plan layout and details illustrating fence height, location, and sizes of posts, rails, braces, gates and footings, appurtenances, hardware list and erection procedures.

1.3 Reference Specifications, Codes and Standards

Comply with the standards of the Chain Link Fence Manufacturer's Institute for "Galvanized Steel Chain Link Fence Fabric", and "Industrial Steel Specifications for Fence-Posts, Gates and Accessories", and as specified herein. Requirements stated herein take precedence. Provide each type of steel fence and gate as a complete unit produced by a single manufacturer, including necessary erection accessories, fittings and fastenings.

PART 2 PRODUCTS

2.1 Materials

A. Fabric

Fabric shall be continuous chain link fence, height as shown on the plans, having a 2-inch mesh, #9 gauge copper bearing steel wire. Top and bottom selvage shall be knuckled finish. It shall be galvanized after weaving and the zinc coating shall not be less than 1.2 ounces per square foot. All mesh shall have knuckled periphery to eliminate sharp appendages.

B. Line Posts

Line posts shall be hot dipped galvanized 2.375" O.D. hot dipped galvanized pipe, weighing 3.65 pounds per lineal foot. Line posts shall be spaced not further than 10-foot on-center.

C. Terminal Posts

End, corner and pull posts shall be hot dipped galvanized pipe 2.875 inches O.D. and weighing not less than 5.79 pounds per lineal foot.

D. Top Rail

Top rail shall be hot dipped galvanized 1.660 inch O.D. pipe, weighing 1.806 pounds per lineal foot and shall be furnished in random lengths of approximately 20 feet. They shall be jointed using a pressed steel or malleable sleeve, not only allowing for expansion and contraction, but also providing a continuous brace from end to end of each stretch of fence.

E. Tension Wire

Bottom tension wire shall be #7 gauge heavy galvanized high carbon steel coil spring wire, securely fixed to the fabric, line posts and terminal posts.

F. Braces

All terminal posts shall be braced with 1.660 inch O.D. horizontal pipe bracing of the same material as the top rail, securely attached to the terminal and first line post with malleable iron fittings. They shall be truss braced from the first line post to the bottom of the terminal post, with a 3/8-inch galvanized truss rod assembly. Corner posts shall be braced in both directions.

G. Fittings

Hot dip galvanized. All fittings to be malleable, cast iron or pressed steel.

H. Fabric Ties

#11 gauge galvanized wire ties shall be used to tie the fabric to the line posts and rails. Space ties at 14 inches on-center (O.C.).

I. Gates – NOT REQUIRED.

Gate frames to be made of heavy galvanized 1.90 inch O.D. pipe, weighing 2.72 pounds per lineal foot. Corner fittings, ball and socket hinges, catch stops and center rest to be heavy galvanized malleable iron. Hinges as required. Provide diagonal cross-bracing. Gates shall have 3-inch clearance above ground surface and sized for the application shown.

J. Gate Posts – NOT REQUIRED.

Posts shall be hot dipped galvanized pipe 2.875-inch O.D. weighing 5.79 pounds per lineal foot, and coated with 10 to 15 mils of PVC, colored black.

K. Framework Material

All posts, rails and braces to be heavy galvanized.

L. Lock Assembly and Gate Stop – NOT REQUIRED.

Provide for each gate one (1) double-hasp drive gate drop rod lock assembly set in concrete and one (1) gate stop set in concrete. All lock assemblies and gate stops shall be fabricated from heavy galvanized malleable iron. Provide one vandal-proof keyed lock and 3 keys for each gate assembly.

PART 3 EXECUTION

3.1 Installation

- A. All materials and workmanship shall be first class in all respects and shall be done in a neat and workmanlike manner. Installation shall be conducted in accordance with the requirements of the Chain Link Fence Manufacturers Institute and these plans and specifications.
- B. All line, terminal, gate stops, gate drop, and gate posts shall be fixed with a minimum of 3-foot embedment in concrete poured into a 1-foot diameter hole and plumb upon curing of the concrete.

END OF SECTION

SECTION 13989

CORROSION MONITORING SYSTEM FOR DUCTILE IRON PIPE

PART 1 GENERAL

1.1 Description

- A. This section covers the work necessary to furnish and install a corrosion monitoring system on buried ductile iron water pipelines and appurtenances complete, including pipeline isolation joints (insulated flexible couplings and insulated flanges), bonds on the pipeline, valves and fittings between isolation joints to form an electrically continuous pipeline, and corrosion monitoring test stations.
- B. The CONTRACTOR shall furnish all labor, equipment and materials as required for the complete installation of the corrosion monitoring system specified herein. The corrosion monitoring system shall include the appropriate isolation joints, pipe bonding, valve and fitting bonding (including retainer glands), test stations, backfill material, cables, fittings and all necessary items of equipment and materials for the completed system. It is the intent of these Specifications that the CONTRACTOR furnish and install all materials and equipment and provide all labor required and necessary to complete the work shown on the drawings or specified herein and elsewhere, and all other work items not specifically mentioned but reasonably inferred for a complete installation.

1.2 General

Like items of materials provided hereunder shall be the end product of one manufacturer to achieve standardization for appearance, maintenance, and replacement.

1.3 Definitions

- A. **Ferrous Metal Pipe/Fitting:** Any pipe and/or fitting made of steel or iron and pipe containing steel or iron as a principle structural material, except reinforced concrete.
- B. **Lead, Lead Wires, Fitting Bonds, Cable:** Insulated copper conductor; the same as wire.

1.4 Submittals

- A. The CONTRACTOR shall submit for approval the following items:
 - 1. A complete list of equipment and material to be furnished, including name and manufacturer, catalog number, size, finish and other pertinent data necessary for proper identification and to determine conformance with Specifications.
 - 2. A certified compliance report with an independent laboratory analysis the reference anode material meets the requirements of this specification.
 - 3. Certification by the cable manufacturer-covering conformance of cable insulation to designated specification.
 - 4. Thermite welder's certification.
 - 5. Resume for Corrosion Engineer or Cathodic Protection Specialist.
- B. Upon completion of the cathodic protection system, and as a condition of its acceptance, deliver, for use by the OWNER and ENGINEER, four complete bound sets of the following information:
 - 1. Components of corrosion monitoring system, including copies of all Product Data and list of corrosion monitoring equipment suppliers with addresses and phone numbers;
 - 2. Copies of all test reports, including test forms, general record keeping, and interpretation of results;
 - 3. Copy of complete set of drawings showing where all reference anodes, fitting bonds and test stations are located.

1.5 Quality Control

- A. A qualified Corrosion Engineer specializing in cathodic protection or a Cathodic Protection (CP) Specialist certified with the National Association of Corrosion Engineers (NACE) shall perform all testing on the corrosion monitoring system.
- B. It is to the CONTRACTOR's benefit to perform continuity tests on all bonded pipe and fittings throughout each sequence of construction.

C. Continuity Tests

1. All bonded buried and submerged pipe and fittings shall be tested by the CONTRACTOR for electrical continuity after all connections have been made. The approved Corrosion Engineer or CP Specialist shall conduct testing. The Corrosion Engineer or CP Specialist shall be subject to approval by the ENGINEER.
2. If electrical continuity is not achieved as required, the CONTRACTOR shall complete the necessary repairs and retest to prove electrical continuity. Records of all test results, including test locations and equipment used for testing shall be submitted to the ENGINEER, prior to burial, for evaluation and acceptance or recommendations.

D. Final Tests

The CONTRACTOR shall install all test station equipment with one end of the current measuring shunt (where required) disconnected. After installation of all corrosion monitoring facilities is complete, the Corrosion Engineer or CP Specialist shall connect the current measuring shunt (where required) and energize, test, to assure that all Specifications and Plans have been complied with. After completion of all tests and inspections, a detailed report describing any deficiencies detected will be submitted to the CONTRACTOR and the ENGINEER. The CONTRACTOR shall make all repairs necessary to correct these deficiencies at its own expense. The system shall then be retested prior to Final Acceptance. The CONTRACTOR shall pay for all retests made necessary by the corrections. A Final Report documenting the successful test results shall be submitted to the ENGINEER.

- E. Skilled personnel who have had adequate experience in the methods and materials to be used shall do all thermite welding. The Corrosion Engineer or CP Specialist shall qualify thermite welder personnel prior to commencing work on the pipeline. Equipment similar to that used in the work shall be used in qualification tests. The CONTRACTOR shall furnish all material and bear the expense of qualifying thermite welders. The Corrosion Engineer or CP Specialist shall provide a photograph and name of all personnel that are certified to perform the thermite welding to the ENGINEER for approval.

PART 2 PRODUCTS

2.1 General

- A. All materials shall conform to the requirements set forth herein or as designated on the drawings, unless otherwise specified. All materials must be

new, free from defects and shall be of the best commercial quality for the purpose specified. All necessary items and accessories not shown on the drawings or specified herein, but which are required to fully carry out the specified intent of the work, shall be furnished without additional cost to the OWNER.

- B. The CONTRACTOR is responsible to coordinate material compatibility. All components and materials may not be supplied by the same manufacturer; therefore, the CONTRACTOR shall supply the necessary dimensions and materials characteristics to the respective material supplier to insure the finished product is free of defects and irregularities that could occur from unmatched components.
- C. The use of a manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired only. Products of other manufacturers will be considered in accordance with the contract documents.

2.2 Material Suppliers

Suppliers listed below can usually supply the types of materials specified in this section. Alternate suppliers will be considered, subject to approval of the ENGINEER. The cities and phone number listed is best current information on the manufacturer's/supplier's nearest representative office to the project site.

- Cathodic Protection Engineering, West Linn, OR; 503/720-3220
- Corrpro Corporation, Santa Fe Springs, CA; 562/944-1636
- Corrosion Control Products, Everett, WA; 452/290-8832
- Corrosion Protection Services; Oregon City, OR; 503/655-9488
- Farwest Corrosion Control, Everett, WA; 425/290-8832
- Mesa Products, Huntington Beach, CA; 714/963-6202
- Matcor, Inc., Doylestown, PA; 800/523-6692

2.3 Bond Wires

General: Fitting bond wires shall be No. 2 single-conductor, stranded copper wire with 600-volt HMWPE insulation. Supply all fitting bonds complete with a formed copper sleeve on each end of the wire.

2.4 Corrosion Monitoring Test Station

- A. Flush Mounted Test Station (Standard):
 - 1. Test Station Box: Concrete body cast with a cast iron ring with a minimum weight of the body and ring of 55 pounds, an inside diameter

of 6-3/4-inches, and a height 12-inches. Furnish with a 12-pound cast iron lid with the letters “TS” or words “Test Station” cast into the lid. Test station box shall be Brooks Products Co. Model 1RT or approved equal.

2. Terminal Block: Plastic or glass-reinforced, 1/4- inch thick laminate terminal board with minimum dimensions of 5-inches by 6-inches. Furnish terminal block with a minimum of twelve (12) terminals. Terminal nuts and studs shall be 1/4-inch with double nuts for securing the studs to the terminal board. Terminal nuts, studs, flat and lock washers shall be nickel-plated brass, bronze, or Series 300 stainless steel.
3. Shunt: If required for the installation, shunts for test stations shall be 0.01 ohm minimum 6 amp capacity; Holloway Type RS manganin wire; Cott (yellow); Tinker & Rasor (yellow); or approved equal. Furnish the required amount (0 to 3) for each test station. See Drawings.
4. Buss Bar: If required for the installation, buss bars shall be nickel-plated braze, bronze, or series 300 stainless steel, length long enough to connect two terminals, and have a minimum of 6 amp capacity. Furnish the required amount (0 to 3) for each test station. See Drawings.

2.5 Test Station Wires

- A. Wire: Single-conductor, No. 8 and No. 12 AWG stranded copper with 600-volt THWN, or THHN insulation (test stations) and single-conductor.
- B. Insulation Color:
 - New Pipe (N/W) – white
 - New Pipe (S/E) – white/blue
 - Reference electrode – yellow

2.6 Permanent Reference Electrodes (Prepackaged Zinc Reference Electrodes)

- A. Material: ASTM B418, Type II.
- B. Dimensions: 1.4 inches by 1.4 inches by 9 inches.
- C. Wire: No. 12 AWG stranded copper wire with yellow, 600-volt TW, THWN, OR THHN insulation. The wire shall be 25 feet long minimum and attached to the electrode core by the manufacturer’s standard connection. Connection shall be stronger than the wire.

- D. Backfill: 50 percent gypsum, 50 percent bentonite, in a permeable cloth bag, or approved equal.
- E. Packaging: Provide electrode packaged in a plastic or heavy paper bag of sufficient thickness to protect the electrode, backfill, and cloth bag during normal shipping and handling.

2.7 Thermite Weld Materials

- A. General: Thermite weld materials shall consist of wire sleeves, welders, and weld cartridges according to the weld manufacturer's recommendations for each wire size and pipe or fitting size and material. All welding materials and equipment shall be the product of a single manufacturer. Interchanging materials of different manufacturers will not be acceptable.
- B. Molds: Graphite. Ceramic "One-Shot" molds will not be acceptable.
- C. Cartridges: Cast iron thermite weld cartridges shall be used for all cast and ductile iron pipe and fittings. Maximum cartridge size shall be 25 grams for steel and 32 grams for cast and ductile iron materials, respectively.
- D. Welders and Cartridges: Provide the thermite weld materials for attaching copper wire to the pipe material using the appropriate types recommended by manufacturer.
- E. Acceptable Suppliers: Erico Products Inc. (Cadweld), Cleveland, OH; Continental Industries, Inc. (Thermo-weld), Tulsa, OK; or equal.

2.8 Wire Connectors

- A. Test Station: One-piece, tin-plated crimp-on lug connector as manufactured by Burndy Co., Thomas and Betts, or equal.
- B. Anode Connection: Copper split-bolt service connectors as manufactured by Burndy Co., or equal.

2.9 Insulating Joints

- A. Insulating Joints: Flanges or couplings.
 - 1. Complete assembly shall have an ANSI rating equal to or higher than that of the joint and pipeline.
 - 2. Materials shall be resistant for the intended exposure, operation temperatures, and products in the pipeline.

B. Flange Insulating Kits:

1. Gaskets: Gaskets shall be full face and conform to ANSI B16.21, suitable for the operating and test pressures of the pipe system. Gaskets shall be non-asbestos and non-phenolic. Gaskets shall be Garlock Gylon 3505, or approved equal.
2. Insulating Sleeves: Full-length fiberglass reinforced epoxy (NEMA G-10 grade).
3. Insulated Washers: Fiberglass reinforced epoxy (NEMA G-10 grade).
4. Steel Washers: Plated, hot-rolled steel, 1/8-inch thick.
5. Manufacturers:
 - a. Pacific Seal, Inc., Burbank, CA.
 - b. Central Plastics Co., Shawnee, OK.
 - c. Accurate Plastics, Inc., multiple locations

C. Flexible Insulated Couplings:

1. Flexible insulated couplings shall have center rings of beveled, flared or formed carbon steel with a minimum yield of 30,000 psi. Minimum thickness shall be ¼-inch and minimum length shall be 7-inches. End rings shall be contoured rolled mill section carbon steel. Thickness shall be as required for the pipe diameter and pressure rating. Gaskets and insulating boot shall be compounded for water service and shall meet the requirements of AWWA C219 and ASTM D2000. The couplings shall be coated and lined with fusion bonded epoxy. Bolts and nuts shall be high strength, low alloy corrosion resistant steel per AWWA C111. One boot will be provided with each coupling. Couplings shall be Style 400 (IC or RC as required) with EPDM insulating boot, Fabricated Steel Insulating Coupling, as manufactured by Romac Industries, Inc. or approved equal.

2.10 Electrical Tape

Linerless rubber high-voltage splicing tape suitable for moist and wet environments, such as Scotch 130C and Scotch 88, as manufactured by 3M Products, or equal.

2.11 Wire Insulation Repair

Wires shall be handled with care. Splices for damage to the wire insulation shall be required by spirally wrapping (50 percent overlay, minimum) with two coats of high-voltage rubber splicing tape and two layers of vinyl electrical tape. Wire splices shall

be made with suitable sized compression connectors as specified under PRODUCTS, this section, or mechanically secured and soldered with rosin cored 50/50 solder. The ENGINEER shall approve all splices.

PART 3 EXECUTION

3.1 General

- A. The installation of the facilities herein specified and described shall conform to the latest applicable rules and requirements as set forth herein. Equipment or materials damaged in shipment or in the course of installation shall be replaced.
- B. All materials and equipment associated with pipe, fitting and valve bonding and test stations, as shown and specified herein shall be furnished and installed by the CONTRACTOR. The ENGINEER shall review any changes in design or method of installation of an item as specified.
- C. All materials, workmanship and installation shall conform to all requirements of the legally constituted authority having jurisdiction. These authorities include, but are not limited to, the National Electric Code, General Construction Safety Orders of the Industrial Accident Commission; and all other applicable State, County, or City codes and regulations.
- D. Whenever the requirements of the specifications or drawings exceed those of the codes or manufacturer's instructions, the requirements of the specifications or drawings shall prevail. Where a larger size or better grade of material or a higher standard of workmanship is required, the most stringent requirement shall apply. Nothing in the Drawings or Specifications is to be construed to permit work not conforming to these regulations and codes. The CONTRACTOR shall be responsible for obtaining any required permits and inspections.
- E. All materials and equipment to be used in construction shall be stored in such a manner to be protected from detrimental effects from the elements. If actual storage cannot be affected, materials and equipment shall be stacked well above ground level and protected from the elements as appropriate.

3.2 Pipe Bonding

- A. Electrically bond the joints of buried ductile iron pipe, including valves, fittings, and restrained joints, except joints specified to be threaded, welded, or insulated.
- B. Install two joint bond wire assemblies at each joint that requires bonding.

- C. Use the thermite weld process for electrical connection of wires to pipe and fittings.
- D. Test each bonded joint for continuity.

3.3 Test Station Installation

- A. The general locations of the test stations are shown on the Drawings. The CONTRACTOR shall determine the location of the test stations based on actual site conditions and as approved by the ENGINEER.
- B. Test stations shall be installed under this project at the following locations:

Alignment 'A'

1. Flange of buried 24-inch butterfly valve at connection to existing cross assembly on embankment slopes south of Reservoir Nos. 1 and 2.

Alignment 'B'

2. New buried insulated flexible coupling connection to existing 24-inch OD steel fabricated tee at Reservoir No. 7's inlet.

- C. Test wires shall be attached to the pipe as specified under WIRE CONNECTIONS, this section.
- D. In paved roadways, locate the flush-mounted test stations on roadway centerline. In unpaved roadways, locate flush-mounted test station off of the gravel roadway and shoulder at locations as directed by the ENGINEER. In off-roadways locations, install a water facility marker supplied by the OWNER.
- E. Test and reference electrode wires shall be buried a minimum of 36 inches below finished grade.
- F. Wire connections to test station terminals shall be with crimp-on spade lug terminals, except where solid wire is specified or terminal strips with tubular clamps are used.

3.4 Wire Connections

- A. The electrical connections of copper wire to steel, ductile, and cast iron surfaces shall be by the thermite weld method. Observe proper safety precautions, welding procedures, thermite weld material selection, and surface preparation as recommended by the welder manufacturer. Assure that the pipe

or fitting wall thickness is of sufficient thickness that the thermite weld process will not damage the integrity of the fitting wall or protective lining.

- B. Before the connection is made, the surface shall be cleaned to bare metal by making a 2-inch by 2-inch window in the coating, and then filing or grinding the surface to produce a bright metal finish. All grinding shall be with a vitrified type-grinding wheel; the use of a resin, rubber, or shellac-impregnated type grinding wheels will not be acceptable. The prepared metal surface shall be dry.
- C. Wire sleeves shall be installed on the ends of the wires before welding to the metal surface. Thermite welding shall be performed in strict accordance with the manufacturer's written instructions. After the weld connection has cooled, remove slag and physically test wire connection by hitting with a hammer while pulling on the wire at a 45° angle; remove and replace any defective connections.
- D. Coat wire connection with a thermite weld cap.

3.5 Reference Electrode Installation

The reference electrode shall be submerged in water for one hour prior to installation. Remove plastic or paper wrapper and place reference electrode within the pipeline trench excavation 6 inches from below the centerline of the pipe in a vertical or horizontal position. Install the reference electrode within 18 inches of pipeline. Reference electrodes shall be back-filled with native trench material. Terminate wires in the test stations.

3.6 Surface Restoration

Surface restoration shall be as approved by ENGINEER.

3.7 Field Testing

- A. Test Equipment: Before construction begins, obtain the test equipment necessary for testing:
 - 1. Model RF-IT radio frequency insulator tester, as manufactured by Tinker and Razor, or equal
 - 2. A Wavetek Model HD-110B, Fluke Model 77-3, or equal
 - 3. Two Model 6B Copper-Copper Sulfate reference electrodes, as manufactured by Tinker and Razor, or equal
 - 4. 1 quart of copper sulfate anti-freeze solution

5. ½-pound of copper sulfate crystals.
- B. Store test equipment at the Project site and maintain in accurately calibrated, working condition. The test equipment shall be available to the ENGINEER for testing purposes. Upon completion of the Project, the test equipment listed above shall be turned over to the OWNER in clean, accurate, and fully functional condition, along with operation manuals, test wires, and cases supplied with the equipment.
- C. Electrical Continuity Testing

Furnish all necessary equipment and materials and make all electrical connections to the pipe as required to test continuity of bonded joints.

Conduct a continuity test on all buried joints that are required to be bonded. Test the electrical continuity of joint bonds after the bonds are installed but before backfilling of the pipe.

The CONTRACTOR's Cathodic Protection Specialist shall test electrical continuity of completed joint bonds using either a digital low resistance ohmmeter or by the Calculated Resistance Method at the CONTRACTOR's option. The equipment and test procedures for the two methods are described herein.

Digital Low Resistance Ohmmeter Method:

1. Furnish the following equipment and materials:
 - a. One Biddle Model 247001 digital low resistance ohmmeter
 - b. One set of duplex helical current and potential hand spikes, Biddle Model No. 241001, cable length as required.
 - c. One calibration shunt rated at 0.001 ohms, 100 amperes, Biddle Model No. 249004.
2. Test Procedure: Measure the resistance of joint bonds with the low resistance ohmmeter in accordance with the manufacturer's written instructions. Use the helical hand spikes to contact the pipe on each side of the joint, without touching the thermite weld or the bond. The contact area shall be cleaned to bright metal by filing or grinding and without any surface rusting or oxidation. Record the measured joint bond resistance on test form described herein. Repair any damaged pipe coating in accordance with WIRE CONNECTIONS, this section.

Calculated Resistance Method:

1. Furnish the following equipment and materials:
 - a. One dc ammeter (meter or clamp-on) with full scale reading of 100 amperes and a minimum resolution of 1 ampere or a 100-ampere shunt with a voltmeter as specified herein.
 - b. One high-resistance electronic voltmeter with a dc low range of 200 millivolt full scale to a dc high range of 20 volts full scale and capable of a minimum resolution of 1 millivolt (two voltmeters are required if a shunt is used for item a. above).
 - c. One knife switch, safety switch, or time controlled relay suitable for test current.
 - d. Two electrical probes for the voltmeter.
 - e. Insulated wire suitable for carrying the test current, length as required.
 - f. One dc power supply with a steady capacity of 50 amperes minimum; storage batteries are not an acceptable power supply.
2. Test Procedure:
 - a. The test setup shall be as shown at the end of this section. Current wire connections shall be either tightly clamped or thermite welded to the pipe at the CONTRACTOR's option. Wire size shall be determined by the CONTRACTOR and shall be sized for the test current, and shall not exceed 1,000 feet in length.
 - b. Apply a minimum direct current of 50 amperes.
 - c. Measure the voltage drop across each joint with a voltmeter by contacting the pipe on each side of the joint. Voltmeter connections to the bond wire or thermite welds will not be acceptable.
 - d. Measure the current applied to the test span and the voltage drop across the joint simultaneously.
 - e. Record the measured voltage drop and current for each joint on the test form described herein and calculate the bond resistance in accordance with the following formula:

$$R = E/I$$

Where:

R = Resistance of the joint bond, in ohms

E = Measured voltage drop across the joint, in volts

I = Test current applied to the pipe test span, in amperes

D. Joint Bond Acceptance:

1. Joint bond resistance shall be less than or equal to the maximum allowable bond resistance values shown in the following table.

Joint Type	Max. Allowable Resistance (Two Bonds/Joint)	Assumed Bond Wire Length, inches
Push-On or Mechanical	0.000169 ohm	18
Flexible Coupling	0.000219 ohm	24

2. The CONTRACTOR shall replace any joint bond, which exceeds the allowable resistance or add additional joint bonds, at its option. Replacement joint bonds and/or additional bonds shall be retested for compliance with the specified bond resistance.
3. The CONTRACTOR shall repair defective joint bonds discovered during the energizing and testing procedure.

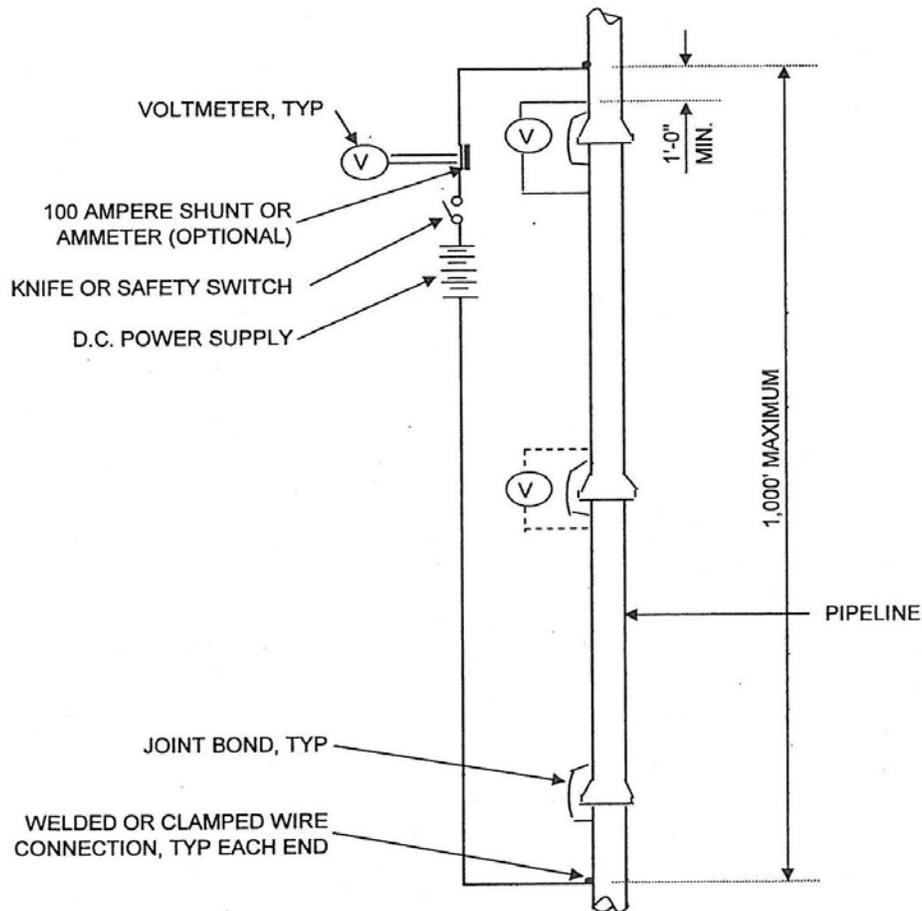
E. Record Test of Each Bonded Pipeline:

1. Description and location of the pipeline tested
2. Starting location and direction of test
3. Date of test
4. Joint type
5. Test current and voltage drop across each joint and calculated bond resistance (Calculated Resistance Method only)
6. Measured joint bond resistance (Digital Low Resistance Ohmmeter method only)

- F. Insulated Joint Testing: Test each joint after assembly with the insulator tester in accordance with the manufacturer's written instructions. Cathodic Protection Specialist shall monitor the test. Replace damaged or defective insulation parts. Provide the ENGINEER with 3 days of advance notice before beginning tests.

G Testing:

After the installation of the corrosion monitoring system is complete and utilizing the new test stations installed under this project, the CONTRACTOR's Engineer or CP specialist will make sufficient tests throughout the network of protected pipelines, valves and fittings to ensure proper installation of the corrosion monitoring system on the pipelines installed under this project. Upon completion of such tests, the Engineer who conducted the tests shall tabulate the data recorded. The CONTRACTOR shall at its sole expense correct any construction defects located during testing. Provide the ENGINEER with 3 days of advance notice before beginning tests. All test data shall be recorded and submitted to the ENGINEER.



JOINT BOND CONTINUITY TEST SCHEMATIC

END OF SECTION

SECTION 15000

PIPING, GENERAL

PART 1 GENERAL

1.1 Description

Work under this Section applies to the furnishing and installation of piping inside a building, structure, enclosure piping and miscellaneous yard piping. All work shall conform to the standard construction specifications except as modified herein. In the case of discrepancy, the more stringent provision shall apply.

1.2 Requirements

- A. The CONTRACTOR shall furnish and install all piping systems shown and specified, in accordance with the requirements of the Contract Documents. Each system shall be complete with all necessary fittings, hangers, supports, anchors, expansion joints, flexible connectors, valves, accessories, heat tracing, insulation, lining and coating, testing, disinfection, excavation, backfill and encasement, to provide a functional installation.
- B. The piping shown is intended to define the general layout, configuration, routing, method of support, pipe size, and pipe type. The mechanical drawings are not pipe construction or fabrication drawings. It is the CONTRACTOR's responsibility to develop the details necessary to construct all mechanical piping systems, to accommodate the specific equipment provided, and to provide and install all spools, spacers, adapters, connectors, etc., for a complete and functional system.

1.3 Reference Specifications, Codes and Standards -- Comply with the provisions of the following Codes, Specifications and Standards, Except as otherwise shown or specified.

Commercial Standards

ANSI/ASME B1.20.1 Pipe Threads, General Purpose (inch)

ANSI B16.5 Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and other Special Alloys

ANSI/AWWA C207 Steel Pipe Flanges for Water Works Service, Sizes 4 in through 144 in.

ANSI/AWWA C606 Grooved and Shouldered Joints

ANSI/AWS D1.1 Structural Welding Code

ASTM A 307 Specification for Carbon Steel Bolts and Studs, 6,000 psi Tensile

ASTM A 325 Specification for High-Strength Bolts for Structural Steel Joints

ASTM D 792 Test Methods for Specific Gravity and Density of Plastics by Displacement

ASTM D 2000 Classification System for Rubber Products in Automotive Applications

1.4 Submittals

- A. The CONTRACTOR shall submit complete shop drawings and certificates, test reports, affidavits of compliance, of all piping systems, in accordance with the contract documents and as specified in the individual piping sections. The shop drawings shall include all necessary dimensions and details on pipe joints, fittings, fitting specials, valves, appurtenances, design calculations, and material lists. The submittals shall include detailed layout, spool, or fabrication drawings which show all pipe spools, spacers, adapters, connectors, fittings, couplings, and pipe supports necessary to accommodate the equipment and valves provided in a complete and functional system.
- B. All expenses incurred in making samples for certification of tests shall be borne by the CONTRACTOR.
- C. The CONTRACTOR shall submit as part of the shop drawings a statement from the pipe fabricator certifying that all pipes will be fabricated subject to a recognized Quality Control Program. An outline of the program shall be submitted to the ENGINEER for review prior to the fabrication of any pipe.

1.5 Quality Assurance

- A. Inspection -- All pipe shall be subject to inspection at the place of manufacture. During the manufacture of the pipe, the ENGINEER shall be given access to all areas where manufacturing is in progress and shall be permitted to make all inspections necessary to confirm compliance with the Specifications.
- B. Tests -- Except where otherwise specified, all materials used in the manufacture of the pipe shall be tested in accordance with the applicable

Specifications and Standards. Welds shall be tested as specified. The CONTRACTOR shall perform all tests at no additional cost to the OWNER.

- C. Welding Requirements -- All welding procedures used to fabricate pipe shall be prequalified under the provisions of ANSI/AWS D1.1. Welding procedures shall be required for, but not necessarily limited to, longitudinal and girth or spiral welds for pipe cylinders, spigot and bell ring attachments, reinforcing plates and ring flange welds, and plates for lug connections.
- D. Welder Qualifications -- Skilled welders, welding operators, and tackers who have had adequate experience in the methods and materials to be used shall do all welding. Welders shall be qualified under the provisions of ANSI/AWS D1.1 by an independent local approved testing agency prior to commencing work on the pipeline. Machines and electrodes similar to those used in the WORK shall be used in qualification tests. The CONTRACTOR shall furnish all material and bear the expense of qualifying welders.

1.6 Material Delivery, Storage and Protection

All piping materials, fittings, valves, and accessories shall be delivered in a clean and undamaged condition and stored off the ground, to provide protection against oxidation caused by ground contact. All defective or damaged materials shall be replaced with new materials.

PART 2 PRODUCTS

2.1 General

Unless specified otherwise or indicated differently on the plans, all piping systems and process piping materials shall be as listed in the table below or as shown on the drawings:

Service Conditions

<u>Service</u>	<u>Material</u>
Drainage/Sanitary Sewer	As shown on Drawings.
Exposed \geq 4"	Class 52 Ductile Iron or Heavy Wall Welded Steel
Buried \geq 4"	Class 52 Ductile Iron
Submerged/Buried < 4"	Stainless Steel - Type 316 Schedule 40 Threaded - ASTM A 312 Fittings Welded or Threaded
Exposed < 4"	Brass - ASTM B 43, Fittings - Bronze - ASTM B 62 Threaded - ANSI/ASME B 16.15
Buried < 4"	Copper Tubing - ASTM B88 Type K Soft - Fittings - Wrought Copper - ANSI B16.22, Joints- Soldered or as shown on Drawings.
Miscellaneous Pipelines	As shown on Drawings

2.2 Performance Requirements

- A. Ductile Iron Pipe and Fittings – See Specification Section 02620, Ductile Iron Pipe, Fittings and Special Items.
- B. Welded Steel Pipe and Fittings -- All welded steel pipe shall conform to the current provisions of AWWA C200 (Grade C, ASTM A283 steel plate). The pipe shall be heavy walled steel pipe. The wall thickness of welded steel pipe shall be 1/2-inch for 24-inch diameter and smaller unless shown otherwise on the drawings. Pipe shall be furnished to the indicated outside diameter unless shown otherwise on the drawings. Pipe shall be furnished with ends as shown on the plans or as required for the conditions of installation if not shown. Provide weldolets for taps where shown or required.

Steel fittings for pipe 24 inches in diameter and less shall be forged steel conforming to ANSI B16.9 and ASTM A234, Grade B. Mitered fittings will be permitted only where shown on the drawings. Fabricated elbows 0-30 degrees shall be two-piece, 30-60 degrees shall be three-piece, and 60-90 degrees shall be four piece unless shown otherwise on the drawings. All steel fittings shall be of schedule or wall thickness to match the pipe wall thickness. Mitered fittings shall be fabricated in accordance with the dimensions as shown in AWWA C208 if dimensions are not shown on the drawings.

Where design pressure is 150 psi or less, flanges shall conform to either ANSI/AWWA C207 Class D or ANSI B16.5 150-pound class. Where design pressure is greater than 150 psi, up to a maximum of 275 psi, flanges shall conform to either ANSI/AWWA C207 Class E, Class F, or ANSI B16.5 150-pound class. Where design pressure is greater than 275 psi, up to a maximum of 300 psi, flanges shall conform to ANSI/AWWA C207 Class F. AWWA

flanges shall not be exposed to test pressures greater than 125% of rated capacity.

Flanges for steel pipe 24 inches in diameter and less shall be welding neck or slip-on forged steel conforming to ANSI B16.5 and ASTM A181, Grade 1, flat-faced, as adjacent pipe and fittings may dictate. Slip-on flanges shall not be used adjacent to forged fittings unless the fitting is the long-tangent type.

Flanges for steel pipe larger than 24-inch diameter shall be fabricated in accordance with AWWA C207. Flanges shall be attached with bolt holes straddling the vertical axis unless otherwise shown. Gaskets for flanged pipe shall be full-faced gaskets equal to Garlock Gylon Style 3505, or approved equal.

Pipe shall be shop-fabricated to the extent possible. Any field welding shall conform to the current provisions of AWWA C206. Forged fittings shall be used for all line size laterals and tees unless otherwise shown on the drawings. Field welds shall be lap-welded slip joint, welded inside and outside, double-butt weld joint, or butt strap joint.

The interior of all welded steel pipes shall be given a white-metal blast cleaning conforming to SSPC-SP5 by the pipe manufacturer and given the protective coating specified hereinafter. Exterior of "wet" exposure piping shall be prepared per SSPC-SP5, white metal blast. Exterior of "dry" exposure piping shall be prepared per SSPC-SP10, near white metal blast. Exterior coating to be as described below.

Unless other linings or coatings are required elsewhere in the specifications or on the plans, steel pipe shall be lined and coated as follows (confirm per ENGINEER):

Lining	Fusion-bonded epoxy lined, AWWA C213 or liquid epoxy lined, in accordance with AWWA C210
Coating (Exposed)	Per Section 09800
Coating (Buried)	Per Section 09800

Before starting fabrication, the CONTRACTOR shall submit to the ENGINEER shop drawings for review. The shop drawings shall include a marking plan and details of standard pipe sections, special fittings, and bends. Dimensions, plate size, coating, and lining and other pertinent information shall be shown. The marking plan shall show the location of each pipe section and each special with each piece numbered or otherwise designated in

sequence. All outlets and bends shall be attached on standard lengths of pipe or made up into special lengths so that, when installed, they will be located as indicated. The CONTRACTOR shall furnish the pipe fabricated and designated so that, when installed according to the marking plan, the location of all outlets and specials will correspond to the details of the construction plans. Each pipe and fitting shall be marked on the outside to indicate the class of pipe and location number on the marking plan. Calculations supporting collar, crotch plate, and other reinforcing sizes shall also be submitted. Fitting and reinforcing design shall conform to AWWA manual M11, latest edition.

- C. Copper Pipe and Fittings -- Copper pipe unless specified elsewhere shall be Type "L", hard drawn, conforming to ASTM B88. Copper pipe under floor slabs, underground or cast in concrete shall be Type "K".

Connection of copper tubing to steel or other metallic piping shall be made using insulating couplings or fittings such as to provide complete electrical isolation. Care shall be taken that copper tubing or fittings are not permitted to come in contact with steel or other metallic piping, reinforcing steel, or other steel at any location. Electrical checks shall be made between copper tubing and metallic elements to assure that isolation is maintained. Wherever electrical contact is demonstrated by such tests, the CONTRACTOR shall locate the point or points of contact and correct this condition.

- D. Polyvinyl Chloride (PVC) Water Pipe and Fittings -- PVC pipe 4 inches and smaller shall be schedule 40, Type 1 Grade I normal impact PVC pipe conforming to ASTM D1785 and D2467 and shall be solvent welded.
- E. Flexible Tubing -- Flexible plastic pipe shall be standard weight polyethylene thermoplastic tubing conforming to ASTM D-1248 Type 1, Class A, Category 4, Grade E5.
- F. Galvanized Steel Pipe and Fittings -- Galvanized steel pipe shall be seamless, or electric resistance welded, ASTM A120, Schedule 40. Joints for galvanized steel pipe shall be threaded. Fittings shall be threaded, 150 lb. malleable iron, galvanized, ASTM A197 or ASTM A47, dimensions conforming to ANSI B16.3; Unions, 300 lb. malleable iron, galvanized with dimensions conforming to ANSI B16.3, brass to iron seat. Thread lubricant shall be Teflon tape or joint compound that is insoluble in water.
- All buried galvanized pipes shall be spirally wrapped with polyvinyl chloride or polyethylene pressure sensitive tape, applied with a suitable primer. The wrap shall have a nominal thickness of 20 mils, consisting of either one layer of 20-mil tape or two separate layers of 10-mil tape.

Before the primer and wrap is applied, the piping shall be thoroughly cleaned so that all surfaces shall be dry and free of dirt, dust, rust, oil scale, oil, grease, or other foreign matter. Any solvents used shall be totally volatile so as to leave no trace of oil. Weld spatters, burrs, or sharp points and edges shall be removed by chiseling, ball peening or filing. After thorough cleaning, the piping shall be coated with a primer applied in accordance with the tape manufacturer's recommendations. Spiral wrappings shall be applied with an overlap of at least 1-inch.

2.3 Couplings and Specials

A. Flexible Couplings

1. Flexible Couplings and Flanged Coupling Adapters -- Flexible couplings or flanged coupling adapters where shown on the drawings or where required shall be of the gasketed sleeve type with diameter to properly fit the pipe.
2. Flexible couplings for steel pipe and ductile iron pipe shall be provided where shown and shall be steel middle ring with steel followers. For exposed service, the coupling shall be lined with material equal to pipe lining material. Coupling shall be coated with primer compatible with the pipe painting system. For buried or inaccessible service, the coupling shall be fusion bonded epoxy coated and lined. Couplings shall be Dresser Style 38, Ford FICA series, Romac or Smith-Blair.
3. Flexible couplings for PVC pipe shall be Romac Model 501 or approved equal.
4. Flanged coupling adapters for steel piping shall be Dresser Style 128 or approved equal.
5. Couplings shall be assembled on the job in a manner to insure permanently tight joints under all reasonable conditions of expansion and contraction. Gasket and O-ring material to be as recommended by manufacturer for intended service.
6. All flexible couplings and flange coupling adapters as shown on the drawings shall be suitably harnessed or blocked. The flexible coupling harnesses shall be installed to allow the flexible coupling to be pushed clear of the joint and as detailed in the AWWA Manual M11, 2nd Ed. and approved by the ENGINEER. Flexible couplings shall have center pipe stop where noted on drawings. Flanged coupling adapters shall be harnessed as shown on drawings and details. Flexible couplings and

flange coupling adapters shall be provided with stainless steel bolts where submerged.

7. All tie bolt diameters shall be designed using ASTM A7 or A373 steel. Design pressure shall be 150 psi.
8. CONTRACTOR is responsible for selecting sleeve lengths appropriate to application, recognizing longer sleeves allow larger deflections and may ease installation.
9. Flexible Insulated Couplings – see Specification Section 13989, Corrosion Monitoring System for Ductile Iron Pipe.

B. Tapping Sleeves and Tapping Saddles

1. Tapping Sleeves - Tapping sleeves shall be stainless steel conforming to 18-8 Type 304 stainless steel with a CF 8 cast stainless steel flanged end with ANSI 150 pound drilling. Bolts and hardware to be Type 304 stainless steel and the branch outlet shall be heavy stainless steel pipe. The gasket shall be full circumferential gasket. Tapping sleeve shall be JCM 432 or approved equal. Valve for tapping sleeve shall be cast iron body with fusion bonded epoxy coating. Tapping valve shall be AFC Series 500 NRS resilient wedge valve or approved equal. Provide insulated flange joint between tapping sleeve and valve.
2. Tapping Saddles – Saddle shall be ductile iron body, nylon coated with dual stainless steel straps, Romac Style 202NS, or approved equal.

C. Restrained Flange Adapters for Ductile Iron Pipe

Restrained flange adapters for ductile iron pipe shall conform to the following specifications:

1. Restrained flange adapters shall be made of ductile iron conforming to ASTM A536 and have flange bolt circles that are compatible with ANSI/AWWA C115/A21.15. Restraint for the flange adapter shall consist of a plurality of individually actuated gripping wedges to maximize restraint capability. Torque limiting actuating screws shall be used to insure proper initial set of the gripping wedges.
2. The flange adapters shall be capable of deflection during assembly or permit lengths of pipe to be field cut to allow a minimum 0.6-inch gap between the end of the pipe and the mating flange without affecting the

integrity of the seal. For ductile iron pipe, the flange adapter shall have a safety factor of 2:1 minimum.

3. Restrained flange adapters for ductile iron pipe shall be EBAA Iron Series 2100 Megaflange - flange adapter or approved equal.

D. Flanged Insulating Joints

Insulating flanged joints shall conform to the following specifications:

1. Flanged joints shall be assembled, lined, and coated in shop. The joint assembly shall be delivered to the job site as a complete unit.
2. After assembly, the joint shall be tested for continuity. Electrical resistance between flanges and between each bolt and each flange shall be not less than 100,000 ohms.
3. Each complete insulating flange set shall include a full faced gasket, a full length insulating sleeve for each flange bolt, and two insulating washers and two steel washers for each bolt. Insulating sleeves and washers to be G-10 glass epoxy as manufactured by Accurate Plastics, Inc., or approved equal.
4. Gaskets shall be per Section 13989, Corrosion Monitoring System for Ductile Iron Pipe.
5. Insulating washers shall be 3mm (1/8-inch) thick G-10 epoxy glass. Insulating washers shall fit within the bolt facing on the flange over the outside diameter of the sleeve, grind as necessary. Insulating sleeves shall extend the full width of both flanges, except where one flange hole is threaded where the sleeve shall extend through one flange and the gasket.
6. Washers shall be cadmium plated steel where buried and stainless steel where submerged. Washers shall fit within the bolt facing on the flange, grind as necessary.
7. The complete assembly shall have an ANSI/AWWA pressure rating equal to or greater than that of the flanges between which is installed.

- E. Where required copper pipe to copper pipe connections shall be made with compression couplings. Couplings shall be Ford or approved equal.

- F. Cast-In Wall Pipe -- Cast-in wall pipe shall be cast ductile iron, or steel with pipe diameter and end types as shown on the plans.
- G. Cast-In Wall Sleeve -- Cast-in wall sleeves shall be fabricated from Schedule 40 galvanized steel pipe. The inside surface of all wall sleeves shall be coated with coal-tar. The annular space between the penetrating pipe and the wall sleeve shall be filled with an approved permanently flexible sealant. Diameter of wall sleeve shall be as shown on the plans.
- H. Cast-In Floor Pipe -- Cast-in floor pipe shall cast ductile iron or steel pipe as required by the plans and the intended service. Pipe diameter shall be as shown on the plans.
- I. Cast-in Floor Sleeves -- Cast-in floor sleeves shall be fabricated from Schedule 40 galvanized steel pipe. Sleeve diameter shall be as shown on the plans. The annular space between the penetrating pipe and the sleeve shall be filled with an approved permanently flexible sealant.
- J. Cast-In Wall Sleeve -- Interior Wall Penetrations: Cast-in wall sleeves for interior wall penetrations shall be fabricated from 16-gauge galvanized steel. Sleeve diameter shall be as shown on the plans. The annular space between the penetrating pipe and the sleeve shall be filled with an approved permanently flexible sealant.
- K. Seep Rings -- Seep rings shall be fabricated from 3/8-inch thick steel plate conforming to ASTM A36 unless otherwise noted. The inside diameter of the seep ring shall be equal to the outside diameter of the pipe or sleeve to which it is attached plus 1/4-inch. The outside diameter of the seep ring shall be as shown on the plans. The seep ring shall be attached to the pipe or sleeve by means of a continuous seal weld located on both sides of the ring.
- L. Flexible Expansion Joints -- Flexible expansion joints shall be installed in the locations indicated on the drawings and shall be manufactured of ductile-iron conforming to the material properties of ANSI/AWWA C153/A21.53. Flexible joints shall be provided with end connections as shown on the plans. All flexible expansion joints shall consist of an expansion joint designed and cast as an integral part of a ball and socket type flexible joint, having a minimum of 15 degrees deflection per ball and 4-inch expansion. Actual expansion and deflection requirements will be as shown on the drawings. Each flexible expansion joint shall be hydrostatically tested to the manufacturer's published pressure rating prior to shipment. All pressure containing parts shall be lined with a minimum of 15 mils of Fusion Bonded Epoxy conforming to the applicable requirements of ANSI/AWWA C213 and shall be holiday tested with a 1500 volt spark test conforming to said

specification. All flexible-expansion joints shall be Flex-Tend as manufactured by EBAA Iron, Inc. or approved equal.

M. Flexible expansion joints for piping 2-inch and smaller shall be Brass Flex-Tend manufactured by EBAA Iron, Inc. or approved equal.

N. Insulating Union

Where required, insulating unions shall conform to the following specifications:

Insulating unions shall be galvanized malleable iron with a ground joint. Iron pipe threads shall conform to ANSI B2.1. Joint connections to copper alloy pipe and tube shall be copper solder or threaded brass ground joints. Insulations shall be nylon, which is bonded and molded onto the metal body. Union shall be rated for the operating and test pressures of the pipe system.

O. Pipe to Structure Flexible Connector

A flexible pipe to manhole connector shall be used in the connection of sanitary and drain sewer pipe to precast manholes and buildings. The connector shall be the sole element relied on to insure a flexible watertight seal of the pipe to the manhole. No adhesives or lubricants shall be employed in the installation of the connector to the manhole. The rubber for the connector shall comply with ASTM C923 and consist of EPDM and elastomers designed to be resistant to ozone, weather elements, chemicals, including acids, alkalis, animal and vegetable fats, oils and petroleum products from spills. The connector shall be Kor-N-Seal or approved equal.

All stainless steel elements of the connector shall be totally non-magnetic, Series 304 Stainless, excluding the worm screw for tightening the steel band around the pipe which shall be Series 305 Stainless. The worm screw for tightening the steel band shall be torqued by a break away torque wrench available from the precast manhole supplier and set for 60-70 inch/lbs.

The connector shall be installed in the manhole wall by activating the expanding mechanism in strict accordance with the recommendation of the connector manufacturer.

The connector shall be of a size specifically designed for the pipe material and size being utilized on the project.

Rubber seals used in concrete sewer pipe and culvert joints must meet the requirements given in ASTM specification C923.

P. Rubber Expansion Joints

Rubber expansion joints (single size or concentric reducer style) shall be arched rubber type with full face flanges and retaining rings drilled to 150# ANSI standards. Materials of construction may include Butyl or other elastomer tube and cover with multiple plies of polyester or nylon cord. Rubber expansion joints shall be suitable for the pressure, movement and temperature conditions of service. Minimum working pressure rating shall be 190 psi for the single size type. Concentric reducer style shall have a minimum working pressure rating of 140 psi. Rubber expansion joints shall be Ultraspool as manufactured by Flexicraft Industries, Metrasphere as manufactured by The Metraflex Company, or approved equal.

Q. Dismantling Joints

Dismantling joints shall be a self-contained flanged restrained joint fitting, including both flanged components and sufficient harness bars to withstand the imposed thrust. The dismantling joint will allow for a minimum of 2 inches of longitudinal adjustment. The pressure rating will be determined by the flange configuration, and all commonly used flanges shall be available. As standard, flanges in accordance with AWWA C207 Class D shall be used. Where test pressures are 151 psi to 275 psi, flanges shall be in accordance with the specification for AWWA C207 Class E flanges.

The dismantling joint shall be furnished as a complete assembly consisting of spigot piece, flange adaptor, tie bars and gasket. The dismantling joint shall be designed so that no part of the restraint system extends outside the flange diameter. The internal bore shall match that of the pipe system.

The spigot piece shall be of steel to ASTM A283 Grade C. The flange adaptor shall be either steel meeting ASTM A283 Grade C or ductile iron meeting ASTM A536 Grade 65-45-12. Tie bars shall be ASTM A193 Grade B7 threaded rod with rolled threads. MB7 may be used as an alternative. Tie bars, nuts and washers shall be zinc coated. Gaskets shall be EPDM Grade E. The dismantling joint shall be supplied with a fusion bonded epoxy or Rilsan nylon coating applied by fluidized bed method. The coating shall comply with the requirements of NSF 61 and AWWA C550 as applicable. As an alternative, a shop-coat primer suitable for field applied-coatings can be supplied.

The dismantling joint shall comply with AWWA C219 where applicable. The design pressure rating shall be equal to or greater than the mating flanges. The gasket seal and compression stud and nut arrangement shall be independent of the tie rod restraint system. Tie rod diameter shall be compatible with the

corresponding bolt diameter of the mating flange. The tie rod restraint system shall be capable of withstanding the full pressure thrust that the pipe system can develop at no more than 50% of the yield strength of tie rod material. The dismantling joint shall be Style DJ400 Dismantling Joint as manufactured by Romac Industries or approved equal.

R. Mid-Span Restraints for Ductile Iron Pipe

Mid-span restraints for ductile iron pipe to be cast into reinforced concrete thrust walls shall be constructed of ASTM A536 ductile iron. The restraints shall be split for ease of installation. The split restraint rings shall grip the pipe and provide for restraint by incorporating a plurality of individually-actuating gripping surfaces (wedges). The restraint unit shall be designed for a minimum resisting force of 200 psi dead end thrust on the pipe to be restrained and with a minimum 2:1 safety factor. The restraints shall be wrapped in polyethylene wrap prior to being cast within concrete thrust walls. Where two units are provided to provide pipe restraint in both directions, the restraint units shall be installed flush with each other. Mid-span restraints for ductile iron pipe shall be Series 1100SDB as manufactured by EBAA Iron, Inc. without exception. The restraints shall be furnished with a MEGA-BOND coating system.

2.4 Pipe Coatings/Tape Wrap for 2" Piping

Pipe coatings to be as specified herein or elsewhere within these specifications.

All small diameter buried metallic piping (2") for ARV assemblies and blow-offs shall be spirally-wrapped with polyvinyl chloride or polyethylene pressure sensitive tape, applied with a suitable primer. The wrap shall have a nominal thickness of 20 mils, consisting of either one layer of 20-mil tape or two separate layers of 10-mil tape.

Before the primer and wrap is applied, the piping shall be thoroughly cleaned so that all surfaces shall be dry and free of dirt, dust, rust, oil scale, oil, grease, or other foreign matter. Any solvents used shall be totally volatile so as to leave no trace of oil. Weld spatters, burrs, or sharp points and edges shall be removed by chiseling, ball peening or filing. After thorough cleaning, the piping shall be coated with a primer applied in accordance with the tape manufacturer's recommendations. Spiral wrappings shall be applied with an overlap of at least 1-inch.

PART 3 EXECUTION

3.1 General

Pipe shall be installed in accordance with good trade practice. The methods employed in handling and placing of pipe, fittings, and equipment shall be such as to insure that after installation and testing they are in good condition. Should damage occur to the pipe, fitting or equipment, repairs satisfactory to the ENGINEER shall be made. The backfilling of buried pipe is specified in Division 2.

All piping and appurtenances shall be installed in the position and to accurate lines, elevations, and grades as shown on the plans or specified herein. Where possible, piping shall be sloped to permit complete drainage. Where grades are not shown, pipe shall be laid to grade between control elevations shown on the plans.

All buried non-ferrous piping shall be installed with detectable tracer tape. Tape shall be buried 12 inches below the ground and 12 inches above the top of the pipe or as recommended by manufacturer. Tape shall be continuous and labeled the same as the piping system.

3.2 Handling and Storage of Pipe

During loading, transportation and unloading, every precaution shall be taken to prevent injury to the pipe or pipe lining. Any damaged pipe shall be replaced or repaired to the satisfaction of the ENGINEER. Where pipe is placed in stockpiles, it shall be neatly piled and blocked with strips between tiers.

3.3 Pipe Supports and Hangers

- A. All pipe shall be secured in place by use of blocking, hangers, brackets, clamps or other approved methods, and the weight thereof shall be carried independently of pump casings or equipment. Special hangers and supports are shown on the drawings. The CONTRACTOR shall be responsible for determining the location of and providing all additional supports.
- B. Supports for exposed piping shall conform to the latest requirements of the ANSI Code for Pressure Piping B31.10 and MSS Standard Practice SP-58, except as supplemented or modified by the requirements of this specification. Designs generally accepted as exemplifying good engineering practice by use of stock or production parts shall be utilized wherever possible.
- C. Hanger supports shall be as noted below with at least one support adjacent to the joint for each length of pipe, at each change in direction and at each branch connection. Sufficient hangers shall be provided to maintain proper slope

without sagging. Support spacing shall not exceed manufacturer's recommendations, nor as listed below.

<u>Pipe</u>	<u>Maximum Support Spacing (Feet)</u>
Steel Pipe	
Under 3 inches	6
3 inches and Over	12
Cast or Ductile Iron	
Under 4 inches	6
4 inches and Over	12
Stainless Steel and Galvanized Iron	
Under 1-1/2 inches	4
1-1/2 inches to 4 inches	6
Over 4 inches	12
Copper Pipe	6
PVC Pipe	
Under 2-1/2 inches	4
2-1/2 inches and Over	6

- D. Spacing of clamps for support of vertical piping shall be close enough to keep the pipe in alignment as well as to support the weight of the piping and contents unless other vertical support is shown, but in no case shall be more than 12-feet.
- E. Provide adjustable hangers for all pipes, complete with adjusters, swivels, rods, etc. Size hangers to clear insulation and guide where required, as well as support piping. All rigid hangers shall provide a means of vertical adjustment after erection. Hanger rods shall be machine-threaded. Continuous threaded rods will not be allowed.
- F. Clevis or band-type hangers (B-Line FIG B3100) or approved equal shall be provided by CONTRACTOR. Strap hangers not permitted.
- G. Provide floor stands, wall bracing, concrete piers, etc., for all lines running near the floors or near walls and which can not be properly supported or suspended by the walls or floors. Pipe lines near concrete or masonry walls may also be hung by hangers carried from wall brackets at a higher level than pipe. Hanging of any pipe from another is prohibited.
- H. Equipment shall be positioned and aligned so that no strain shall be induced within the equipment during or subsequent to the installation of pipe work.

- I. When temporary supports are used, they shall be sufficiently rigid to prevent any shifting or distortion of the piping or related work.
- J. In erecting the pipe, a sufficient number of screwed unions or flanged joints shall be used to allow any sections or runs of pipe to be disconnected without taking down adjacent runs. Flexible couplings shall be installed where shown on the drawings and at such other points as may be required for ease of installation or removal of the pipe, subject to approval of the ENGINEER. Flexible couplings shall be of the positive lock type where necessary to prevent separation of pipe due to internal pressures.

3.4 Installation at Concrete Walls and Footings

- A. Whenever a pipe line of any material terminates at, or through a structural wall or sump, the CONTRACTOR shall install in advance of pouring of concrete the fittings or special casting required for the particular installation.
- B. Plastic pipe shall not be cast in concrete or masonry walls.
- C. Pipe other than concrete, to be cast in water-bearing walls or more than four feet below grade shall have seep rings.
- D. All buried piping entering structures shall have a flexible connection installed less than two feet outside the structure line or as close to the wall as practical.

3.5 Detailed Installation Requirements

- A. Mechanical Joint Ductile Iron Pipe -- Mechanical joints shall be made as follows: Gland shall be placed on spigot end of pipe with lip extension toward the joint. The rubber gasket shall then be slipped on the pipe with its thick edge toward the gland. The gasket and joint surfaces shall then be slipped on the pipe with its thick edge toward the gland. The gasket and joint surfaces shall then be thoroughly wetted using a soapy solution made with vegetable soap or similar soap as recommended by the manufacturer. The spigot end of the pipe shall then be inserted to full depth on the mechanical joint socket and the gasket pressed firmly into place in the bell in order to obtain an even "set" all around the joint. The gland shall then be moved into place, the bolts inserted, and the nuts taken up tightly with fingers. The nuts shall then be tightened gradually by a wrench, a half turn at a time, moving wrench from one nut to another repeating until all nuts are uniformly tight. Final tightness shall be with a torque wrench to the torque recommended by the pipe supplier. Retainer gland wedge screws shall be tightened in a similar fashion until nuts are twisted off.

- B. Flanged Pipe -- Flanged joints shall be made up square, with even pressure on the gaskets, and shall be watertight. Gaskets shall be non-asbestos and non-phenolic compressed sheet packing, best-quality full-face, one-eighth - (1/8) inch thick, conforming to ANSI B16.21 suitable for the operating and test pressures of the pipe system and equal to the gasket specified.
- C. Threaded Joints -- Threaded joints shall be made using the best quality TFE thread seal tape. All screwed joints shall be made tight with tongs and wrenches; caulking of any kind will not be permitted. Use of thread cement or caulking to make joints tight is prohibited. All cut ends shall be reamed to full bore before assembly.
- D. Welded Joints -- Pipe to be joined by welding shall have beveled ends or other suitable ends for welded joints as approved by the ENGINEER. Qualified welders certified in accordance with the latest requirements of the American Welding Society "Standard Qualifications Procedures" shall complete all welding in a workmanlike manner.

Where welded joints are in pipe with protective coating inside pipe, any coating damaged by welding shall be replaced to a condition equivalent to the factory-applied coating to the maximum practicable extent. When pipe is too small to enter, couplings shall be welded into pipe near ends to be welded to provide access for replacing protective coating inside pipe. The protective coating shall be replaced with a similar and equal coating. External protective coatings and wrapping shall be provided at joints similar and equal to the factory-applied pipe coating. Welded joints shall be wire-brushed and free of all scale and loose material before applying protective coating.

- E. Copper Piping -- Pipe joints shall be soldered with 95-5 wire solder, ASTM B32, Grade 95 TA, or as required by the UPC. Low temperature solder or screw joints permitted only at equipment subject to damage from heat or high temperature soldering. In making screwed joints, tin male threads with soft solder. Dielectric unions or insulated flanges shall be used for all connections between copper and ferrous materials.
- F. PVC Piping -- solvent cementing unless otherwise shown or described herein shall make Pipe joints. Connecting surfaces of pipe and fittings shall be cleaned with methyl ethyl ketone or acetone and then coated with solvent cement and joined. Joints shall be held together until cement takes hold and pipe shall be bottomed in fittings. Sufficient solvent shall be used so that a bead of cement is formed between the pipe and fitting at the socket entrance. Installation shall be in strict conformance with the manufacturer's recommendations.

- G. The joining of pipe lines other than specified above shall be by approved first class methods, using applicable procedures outlined above and/or manufacturer's recommended practices.

3.6 Testing

Testing of all water and field plant piping systems shall be performed as specified elsewhere in this document.

END OF SECTION

SECTION 15100

VALVES, GENERAL

PART 1 GENERAL

1.1 Description

- A. The CONTRACTOR shall provide all tools, supplies, materials, equipment, and labor necessary for furnishing, installing, adjusting, and testing of all valves and appurtenant work, complete and operable, in accordance with the requirements of the Contract Documents. Where buried valves are shown, the CONTRACTOR shall install valve boxes to grade, with covers, and extensions.
- B. The provisions of this Section shall apply to all valves and valve operators specified in the various Sections of Division 15 of these Specifications except where otherwise specified in the Contract Documents. Valves and operators in particular locations may require a combination of units, sensors, limit switches, and controls specified in other Sections of these Specifications.

1.2 Reference Specifications, Codes, and Standards

A. Commercial Standards

ANSI B16.1	Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800
ANSI B16.5	Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and other Special Alloys
ANSI/ASME B1.20.1	General Purpose Pipe Threads (Inch)
ASTM A 36	Specification for Structural Steel
ASTM A 48	Specification for Gray Iron Castings
ASTM A 126	Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
ASTM A 536	Specification for Ductile Iron Castings
ASTM B 61	Specification for Steam or Valve Bronze Castings

ASTM B 62	Specification for Composition Bronze or Ounce Metal Castings
ASTM B 148	Specification for Aluminum Bronze Castings
ASTM B 584	Specification for Copper Alloy Sand Castings for General Applications
ANSI/AWWA C500	Gate Valves for Water and Sewerage Systems
ANSI/AWWA C502	Dry-Barrel Fire Hydrants
ANSI/AWWA C503	Wet-Barrel Fire Hydrants
ANSI/AWWA C504	Rubber-Seated Butterfly Valves
ANSI/AWWA C507	Ball Valves 6 Inches Through 48 Inches
AWWA C508	Swing-Check Valves for Waterworks Service, 2 Inches Through 24 Inches NPS
ANSI/AWWA C509	Resilient-Seated Gate Valves for Water and Sewerage Systems
ANSI/AWWA C511	Reduced-Pressure Principle Backflow-Prevention Assembly
AWWA C550	Protective Interior Coatings for Valves and Hydrants
SSPC-SP1	Solvent Cleaning
SSPC-SP3	Power Tool Cleaning
SSPC-SP6	Commercial Blast Cleaning

1.3 Submittals

- A. Shop Drawings -- Shop drawings of all valves and operators including associated wiring diagrams and electrical data, shall be furnished as specified in the contract documents and if specified in the individual valve sections.

- B. Valve Labeling -- The CONTRACTOR shall submit a schedule of valves to be labeled indicating in each case the valve location and the proposed labeling for the label.
- C. Lining and coating data
- D. Manufacturer's handling, delivery, storage and installation requirements.
- E. Applicable material certifications and testing certifications and testing certificates.

1.4 Quality Assurance

- A. Valve Testing -- Unless otherwise specified, each valve body shall be tested under a test pressure equal to twice its design water-working pressure.
- B. Bronze Parts -- Unless otherwise specified, all interior bronze parts of valves shall conform to the requirements of ASTM B 62, or, where not subject to dezincification, to ASTM B 584.
- C. Certification -- Prior to shipment, the CONTRACTOR shall submit for all valves over 12 inches in size, certified, notarized copies of the hydrostatic factory tests, showing compliance with the applicable standards of AWWA, ANSI, ASTM, etc.
- D. Unless otherwise noted, all water works materials provided for the project shall be new, of first class quality and shall be made by reputable manufacturers. All material of a like kind shall be provided from a single manufacturer unless otherwise approved by the ENGINEER. All material shall be carefully handled and installed in good working order free from defect in manufacture, storage and handling. Where an item is to be used but does not have its quality specified herein, it shall be equal to that specified in the appropriate American Water Works Association (AWWA) Standard Specification.

1.5 Material Delivery, Storage and Protection

All valves and accessories shall be delivered in a clean and undamaged condition and stored off the ground, to provide protection against oxidation caused by ground contact. All defective or damaged materials shall be replaced with new materials at no cost to the OWNER.

PART 2 PRODUCTS

2.1 General

- A. Valve Flanges -- The flanges of valves shall be in accordance ANSI B16.1, ANSI B16.5 and ANSI/AWWA C115/A21.15 as required. CONTRACTOR shall coordinate with pipe, valve and fitting suppliers to make certain that pipe, valve and fitting flanges match in bolt pattern.
- B. Valve Boxes -- White, Schedule 40, 8-inch Polyvinyl Chloride, (PVC), and valve box covers as shown on details installed as part of buried valve installations.
- C. Protective Coating -- The valve manufacturer shall certify in writing that the required coating has been applied and tested in the manufacturing plant prior to shipment, in accordance with these Specifications. Flange faces of valves shall not receive protective coatings.
- D. Valve Operators -- Valve operators shall be as shown or as specified for a valve type. Provide operator extensions that place the operating nut 12 inches below grade where depth to valve exceeds three (3) feet.
- E. Valve Labeling -- If required by the drawings and/or these specifications, a label shall be provided on all exposed (not buried) shut-off valves exclusive of hose bibbs. The label shall be of 1/16-inch plastic or stainless steel, minimum two (2) inches by four (4) inches in size, and shall be permanently attached to the valve or on the wall adjacent to the valve as directed by the ENGINEER.
- F. Bolts, Gaskets, Glands and Nuts -- Bolts, gaskets, glands, retainer glands, nuts and miscellaneous accessories required to install all valves shall be furnished and installed. Bolts and nuts for flanged connections shall be as specified elsewhere with American Standard regular unfinished square or hex heads. Gaskets for flanged connections shall be as specified elsewhere. Jointing materials for mechanical joints shall conform to AWWA C111.
- G. Actuators -- Unless otherwise indicated, all valves and gates shall be furnished with manual actuators. Valves in sizes up to and including four (4) inches shall have direct acting lever or handwheel actuators of the manufacturer's best standard design. Larger valves and gates shall have gear-assisted manual actuators, with an operating pull of maximum 60 pounds on the rim of the handwheel. Actuators shall be sized for the valve design pressure in accordance with AWWA C504. All gear-assisted valves that are buried, submerged or located in below grade vaults and all gates shall have the actuators hermetically-sealed and grease-packed. All valves six (6) inches to

30 inches in diameter may have traveling-nut actuators, worm-gear actuators, spur- or bevel-gear actuators, as appropriate for each valve. All buried valves shall be provided with 2-inch square operating nuts.

PART 3 EXECUTION

3.1 Valve Installation

- A. General -- All valves, gates, operating units, stem extensions, valve boxes, and accessories shall be installed in accordance with the manufacturer's written instructions and as shown and specified. All gates shall be adequately braced to prevent warpage and bending under the intended use. Valves shall be firmly supported to avoid undue stresses on the pipe. Stem extensions shall be braced at no greater than 10 feet intervals and be provided with double universal joints to allow for misalignment.
- B. Access -- All valves shall be installed to provide easy access for operation, removal, and maintenance and to avoid conflicts between valve operators and structural members or handrails.
- C. Valve Accessories -- Where combinations of valves, sensors, switches, and controls are specified, it shall be the responsibility of the CONTRACTOR to properly assemble and install these various items so that all systems are compatible and operating properly. The relationship between interrelated items shall be clearly noted on shop drawing submittals.
- D. Valve Boxes -- All buried valves shall be furnished with valve boxes. Valves installed out of paved or otherwise hard surfaced areas shall be set in a concrete pad at finished grade. Concrete valve box pads shall be 18 inches square and be not less than 6 inches thick. Valve boxes, except those of special design as required by the plans, shall be of cast iron of the two-piece extension type with a cast iron cover. Valve boxes shall have walls not less than 3/16-inch thick at any point, and the internal diameter shall be not less than 5 inches. Valve box covers shall have the word "WATER" cast into them as appropriate to their place of use. Valve box covers shall be of design and construction which prevents dislodging and rotation from traffic and shall be of the type which allows a hand held pry bar to be applied for easy removal. Valve boxes shall be constructed of high quality castings and shall be the product of a manufacturer approved by the ENGINEER and/or OWNER.

END OF SECTION

SECTION 15101

GATE VALVES

PART 1 GENERAL

1.1 Description

The CONTRACTOR shall furnish and install gate valves, complete and operable, as shown and specified herein, including coatings and linings, appurtenances, operators, and accessories, in accordance with the requirements of the Contract Documents.

1.2 Submittals

As required by Section 15100

PART 2 PRODUCTS

2.1 General

Gate valves shall be furnished and installed as shown and as specified herein.

2.2 Materials & Manufacturers

A. Gate Valves, 2 Inches and Under

Unless specified or shown otherwise, gate valves two inches and under shall be bronze-bodied non-rising stem, solid wedge disc, unless otherwise specified. Valve pressure ratings for various end conditions shall be as follows:

Threaded Ends -- Pressure Class 125, threaded bonnet, Stockham Fig. No. B-103, Nibco Fig. No. T-113, or approved equal.

For Buried Service with Threaded Ends -- NRS, with 2" Square Operating Nut – Tested to AWWA C509 Pressure Class 250, Series 03/39X NPT, American AVK Resilient seated ductile iron gate valve, or approved equal.

B. Gate Valves, 3 Inches to 12 Inches

Gate valves for buried service shall be the resilient-seat type, all ductile iron (body, bonnet, stuffing box and gate), non-rising stem, bolted bonnet, left opening and shall conform to AWWA Standard C509 or C515. Rated working

pressure shall be 250 psig. Wedge shall be encapsulated in EPDM rubber. Coatings and/or linings shall conform to AWWA Standard C550 and shall be suitable for potable water service. Valve ends shall be as shown on the plans. The CONTRACTOR, as specified elsewhere, shall furnish a valve box and cover, with all buried service valves installed. Gate valve stem extensions shall be furnished and installed on deep buried valves as specified in Section 15100.

Acceptable manufacturers are as follows:

1. American Flow Control, Series 2500
2. American AVK Series 45
4. Or approved equal

C. In-Plant Service

Gate valves for in-plant or exposed service shall meet the above specifications and shall be furnished with handwheel operators.

PART 3 EXECUTION

3.1 General

Valve installation shall be in accordance with Section 15100 and manufacturer's requirements.

END OF SECTION

SECTION 15102

BUTTERFLY VALVES

PART 1 GENERAL

1.1 Description

The CONTRACTOR shall furnish and install butterfly valves, complete, as shown and specified herein, including coatings and linings, appurtenances, operators, and accessories, in accordance with the requirements of the Contract Documents.

1.2 Submittals

As required by Section 15100 and Section 01300.

PART 2 PRODUCTS

2.1 General

- A. Butterfly valves furnished under this section shall be of the rubber seated, tight-closing type. Metal to metal seating surfaces shall not be used. Butterfly valves shall be bubble-tight at the rated pressure with flow in either direction, and shall be satisfactory for operation following long periods of inactivity. Valve discs shall rotate a full 90 degrees from the open position to closed position. Class 150 valves shall meet the full requirements of AWWA Standard C504 for Class 150B. Class 250 valves shall conform to the requirements of AWWA Standard C504 subject to the requirements herein.
- B. Valve shafts shall consist of the one-piece type or "stub-shaft" type. "Stub-shaft" type valve shafts shall be inserted a minimum of one and one-half (1-1/2) shaft diameters into the valve disk hub. Valve shafts shall have a minimum diameter extending through the valve bearings and into the valve disc, as specified in AWWA Standard C504. Valve shafts shall be full size for that portion of the shaft extending through the valve bearings, valve disc and shaft seal. Any portion of the shaft turned down for any reason shall have fillets with radii equal to the offset to minimize stress concentrations at the junction of the different shaft diameters. The turned down portion of the shaft shall be capable of transmitting the maximum operator torque without exceeding a torsional steel stress of 11,500 pounds per square inch (psi). Valve shafts shall be constructed of wrought stainless steel, malleable iron or carbon-steel, with stainless steel journals. When carbon-steel shafts and stainless steel

journals are used, static seals shall be provided to isolate the interior of the disc and the shaft from water.

- C. Valve discs shall be of cast design with no external ribs transverse to the flow. The design shall be such to sustain full differential pressure across the closed valve disc without exceeding a working stress to one fifth of the tensile strength of the disc material. Valve discs shall be constructed from cast iron, alloy cast iron or ductile iron.
- D. Rubber seats shall be constructed from new, natural or synthetic rubber, secured to the valve body only, designed to provide tight shut-off, and shall allow for removal and replacement at the site. Rubber seats shall mate with the following acceptable surfaces: stainless steel, monel, bronze Grade A, D or E, or alloy cast iron. Rubber seats penetrated by the valve shaft shall be adequately reinforced and clamped, mechanically secured, bonded or vulcanized to the valve body to prevent the seat from being inflated by pressure behind the valve seat. Rubber seats shall be resistant to microbiological attack, copper poisoning and ozone attack.
- E. Valve bearings shall be of the sleeve type contained in the hubs of the valve body. Sleeve bearings fitted into the valve body shall be of self-lubricating materials approved for use with potable water.
- F. Valve shaft seals shall be designed for the use of standard split-v type packing, standard "O" ring seals or for pull down packing. "O" rings used for shaft seals shall be contained in a removable corrosion-resistant recess. Shaft seals shall be designed to allow seal replacement without removal of the valve shaft.
- G. Valve operators for in-plant valves shall conform to AWWA C504 and be of the manual type with handwheel operator unless specified otherwise below. Manual operators shall have all gearing totally enclosed and designed to produce the specified torque with a maximum pull of 60 pounds on the handwheel or chainwheel. Stop-limiting devices shall be provided in the operators for the open and closed positions. All operator components between the input and these stops shall be designed to withstand, without damage, a pull of 200 pounds for handwheel or chainwheel operators. All valves shall be equipped with adjustable mechanical stop limiting devices to prevent over-travel of the valve disc in the open and closed positions.
- H. Manual operators for buried service valves and valves in below grade vaults shall be of the traveling nut, self-locking type and shall be designed to hold the valve in any intermediate position between full open and fully closed without creeping or fluttering. For buried services, operators shall be equipped with a 2-inch square-operating nut (left opening) and shall be fully gasketed and grease-packed. For valves in below grade vaults, operators shall

be equipped with a handwheel and shall be fully gasketed and grease-packed. A valve position indicator, if specified or shown, shall be furnished for all valves for installation in a valve box. The valve indicator shall be hermetically sealed for installation inside a cast iron valve box, and shall show valve-disc position, direction of rotation and number of turns from full open to full close. The valve manufacturer shall provide the indicator.

- I. Hydraulic Cylinder Actuators -- Cylinder actuators shall move the valve to any position from full open to fully closed when a maximum of 125 psi or a minimum of 60 psi is applied to the cylinder. All wetted parts of the cylinder shall be corrosion resistant and cylinder rods shall be chromium-plated stainless steel. Cylinders furnished with enclosed operating mechanisms shall have all wetted parts constructed of non-metallic materials except the cylinder rod which shall be chromium-plated stainless steel. Rod seats shall be of the non-adjustable wear-compensating type. A rod wiper for removing deposits inside the cylinder shall be provided in addition to the external dirt wiper. Cylinder actuators of this type shall be Pratt MDT with Dura-Cyl cylinder. Cylinder actuator shall come prepiped with speed controls, bleed cocks and solenoid valves required to open and close the valve. Actuator shall be supplied with a limit switch assembly for remote indication of open or closed valve position.
- J. All surfaces of the valve shall be clean, dry and free from grease before painting. For in-plant service, the valve surfaces except for disc, seating and finished portions shall be evenly coated with a primer compatible with paint systems specified elsewhere. For buried service valves and valves in below grade vaults, the interior and exterior valve surfaces shall be epoxy coated in accordance with AWWA Standard C550.
- K. Acceptable Butterfly Valve manufacturers are as follows:
 - 1. Pratt
 - 2. Mueller
 - 3. Dezurik
 - 4. Or approved equal

2.2 Class 150 Butterfly Valves

- A. Valve bodies shall be constructed of cast iron conforming to ASTM A-126 Class B (with integrally cast flanged or mechanical joint ends). Flange drilling shall be in accordance with ANSI/B16.1 standard for cast iron flanges. Two trunnions for shaft bearings shall be integral with each valve body. Body thickness shall be in strict accordance with AWWA C504.

- B. Valve shafts shall be turned, ground and polished. Valve shafts shall be constructed of 18-8 Type 304 or Type 316 stainless steel. Shaft diameters must meet minimum requirements established by AWWA C504 for Class 150B.

2.3 Class 250 Butterfly Valves – NOT USED

- A. Valve bodies shall be constructed of cast iron conforming to ASTM A-126 Class B (with integrally cast flanged or mechanical joint ends). Unless otherwise shown, Class 250 butterfly valve flanges shall have the same drilling as ANSI B16.1, Class 125 cast iron flanges and mechanical joint ends shall conform to ANSI 21.11. Two trunnions for shaft bearings shall be integral with each valve body.
- B. Valve shafts shall be turned, ground and polished. Valve shafts shall be constructed of stainless steel, ASTM A-564, Type 630 or 18-18 Type 304.

PART 3 EXECUTION

3.1 General

Valve installation shall be in accordance with Section 15100 and manufacturer's requirements.

3.2 Testing

All valves 24-inches in diameter or larger, and all in-line transmission main valves, shall be pressure and leakage tested at the project site and shall pass the field testing prior to installation. Valves shall be tested at 1.5 times normal operating pressure, 150 psi minimum. No valve shall be accepted for installation that fails to pass the field pressure test. Any valves failing field pressure tests shall be replaced by CONTRACTOR at no additional cost to OWNER.

END OF SECTION

SECTION 15107

MISCELLANEOUS VALVES

PART 1 GENERAL

1.1 Description

- A. The CONTRACTOR shall furnish and install miscellaneous valves complete, as shown on the drawings and/or specified herein, including coating and lining, appurtenances, operators, and accessories.
- B. Miscellaneous valves include non-freeze wall hydrant, combination air and vacuum valves, strainers, small swing check valves.

1.2 Submittals

As required by Section 15100

PART 2 PRODUCTS

2.1 Materials and Manufacturers

A. Combination Air/Vacuum Valves

Air and vacuum valves shall be of the Combination Air Valve (CAV) type with features of both an air release valve and an air & vacuum valve. Combination air valve shall be ARI Series D-040, or approved equal.

- B. Flap Valves -- Flap valves shall be of ASTM A-126 cast iron construction with a bronze seat and bronze hinge pin. The valve shall be provided with a flanged body as shown on the drawings. Flanged flap valves shall have 125 pound flanged ends unless otherwise noted on the drawings. The valve shall have two pivot points. Valves 16-inches and larger shall have the hinge pin secured with nuts. Valves 14-inches and smaller shall have the hinge pin secured with cotter pins. Flap valves shall be Waterman F-25, or approved equal.

PART 3 EXECUTION

3.1 General

- A. Valve installation shall be in accordance with Section 15100 and manufacturer's requirements.
- B. Unless otherwise indicated, strainers shall be provided ahead of any control valves, regulators, and where shown, and shall be preceded by shut-off valves.

END OF SECTION

SUPPLEMENTARY INFORMATION

Asbestos Information for Those Who Work with AC Water Pipe

If you work with asbestos-containing (AC) water pipe you need to be aware of several rules that may affect your ability to maintain, remove, and dispose of AC pipe. DEQ and Lane Regional Air Protection Agency (LRAPA) have specific rules regarding the handling and disposal of asbestos-containing materials (ACM). Depending on the type, amount, and condition of the ACM, you may be subject to some or all of these rules.

Asbestos fibers in the air pose a significant health threat to employees, the public, and the environment. DEQ/LRAPA regulates the removal and disposal of ACM to prevent asbestos fiber release and exposure.

In general, there are two types of ACMs:

- **Friable** ACM will easily release fibers when crushed. When AC pipe is mishandled or damaged, all rules pertaining to friable ACM apply. Only DEQ licensed asbestos abatement contractors and certified asbestos workers can remove and dispose of friable ACM. DEQ has specific training courses available that meet these certification needs. A list of DEQ licensed asbestos abatement contractors and training information can be found online <http://www.deq.state.or.us/aq/asbestos/>
- **Non-friable** ACM have a binder that holds the asbestos fibers within a solid matrix and will not allow asbestos fibers to release easily, unless mishandled, damaged, or in badly worn or weathered condition. AC water pipe in good condition and removed properly is considered a non-friable material.

You do not need to be a DEQ licensed asbestos abatement contractor or a certified asbestos worker to perform non-friable asbestos abatement. **However, non-friable materials must remain in non-friable condition (predominantly whole pieces) during the removal and disposal process.** If you remove non-friable AC water pipe, follow the DEQ guidance document. In addition, a non-friable project notification and fee are required to be submitted to DEQ five (5) days prior to the start

date of the project. The waiting period can be waived by DEQ on a case by case basis under certain conditions. A copy of the guidance document and project notification can be obtained by contacting a regional office listed below.

Asbestos rules prohibit abandoning AC water pipe in the ground once exposed. There are special cases that allow AC water pipe to be left in the ground (i.e. AC pipe under an existing roadway or AC pipe under a building). Call DEQ to determine if your project qualifies. If AC water pipe is removed, the asbestos-containing waste material (ACWM) must be adequately wet. DEQ recommends the ACWM be packaged in leak-tight containers

The ACWM must be disposed of at a landfill authorized to handle asbestos waste and should be accompanied by a waste shipment report (ASN-4) at the time of disposal. Contact the landfill before delivering the ACWM. Landfills can be more stringent than DEQ and may only accept ACWM by appointment. A copy of the waste shipment report and the list of authorized landfills can be obtained by contacting a regional office listed below.

Maintenance and comparable activities limited to less than three (3) linear or three (3) square feet of ACM, provided the removal is part of a needed repair operation, may be exempt from certain rules. Contact a regional office for more information.

If you disturb or mishandle ACM and cause employees, the public or the environment to be potentially exposed to asbestos fibers, you can be liable for clean-up costs and enforcement action for rule violations. An enforcement action may include a civil penalty assessment.

Copies of the guidance document, abatement contractor and landfill lists, notifications and waste shipment form can be found on the DEQ web page: <http://www.deq.state.or.us/aq/asbestos/>



State of Oregon
Department of
Environmental
Quality

Air Quality Asbestos

811 SW 6th Avenue
Portland, OR 97204
Phone: (503) 229-5388
(800) 452-4011
Fax: (503) 229-5675
Contact: Cory-Ann Wind
www.oregon.gov/DEQ/

Contact information

Clackamas, Clatsop, Columbia, Multnomah, Tillamook and Washington Counties, call the Gresham office at 503-667-8414 ext. 55022.

Benton, Lincoln, Linn, Marion, Polk and Yamhill Counties, call the Salem office at 503-378-5086 or 800-349-7677.

Lane County, call the Lane Regional Air Protection Agency at 541-736-1056 ext. 222.

Jackson, Josephine and Eastern Douglas Counties, call the Medford office at 541-776-6107 or 877-823-3216.

Coos, Curry and Western Douglas Counties, call the Coos Bay office at 541-269-2721 ext. 222.

Crook, Deschutes, Harney, Hood River, Jefferson, Klamath, Lake, Sherman, and Wasco Counties, call the Bend office at 541-633-2019.

Baker, Gilliam, Grant, Malheur, Morrow, Umatilla, Union, Wallowa, and Wheeler Counties, call the Pendleton office at 541-278-4626 or 800-304-3513.

Alternative Formats

DEQ is committed to accommodating people with disabilities. Please notify DEQ of any special physical or language accommodations or if you need information in large print, Braille or another format.

To make these arrangements, contact DEQ Communications and Outreach in Portland at 503-229-5696 or call toll-free in Oregon at 800-452-4011; fax to 503-229-6762; or email deqinfo@deq.state.or.us.

People with hearing impairments may call 711.

Asbestos Program

How to Remove Nonfriable Asbestos Cement Water Pipe

A Guide for Meeting DEQ Rules

Purpose

The Department of Environmental Quality (DEQ) regulates the removal, handling and disposal of asbestos-containing materials during construction, remodeling, and demolition. This document provides guidance for removing nonfriable asbestos cement (AC) water pipe.

Before you start

Contact one of the DEQ regional offices (see contact information below) for information on complying with Oregon's asbestos program regulations.

Oregon Occupational Safety and Health Administration (OR-OSHA) also has rules for working with asbestos-containing materials. Contact OR-OSHA at 503-378-3272 for current rule and policy information.

How to determine if a material contains asbestos

The only way to determine if a material contains asbestos is to take a sample and have it analyzed by an accredited laboratory.

What is asbestos cement pipe?

Asbestos cement (AC) pipe was used widely in the mid-1900's in potable water distribution systems. Since the lifetime of this product is approximately 70 years, many projects to update this infrastructure involve removal of this product. The cement acts as a binder that holds the asbestos fibers within a solid matrix. This will prevent asbestos fibers from being released easily, unless mishandled, damaged, or in badly weathered condition. In most cases, AC pipe is considered nonfriable.

Removing nonfriable AC pipe

The removal of nonfriable asbestos-containing materials in good condition is exempt from some DEQ rules. You **do not** need to be a DEQ licensed asbestos contractor or a DEQ certified asbestos worker to do nonfriable asbestos removal. If you remove AC pipe following this guide, they should remain in a nonfriable condition.

Notification

File a DEQ notification form ASN-6 for removal of nonfriable asbestos materials and pay the applicable fee. The notification must be received by the DEQ Business Office at least 5 days prior to starting the removal project.

Options for removing nonfriable AC water pipe

AC water pipe must be removed, handled and disposed of in a manner that keeps the material in predominantly whole pieces to be considered nonfriable. Sanding, sawing, grinding, chipping, or the use of power tools is not allowed. The tiles must be kept wet during removal. Wetting minimizes asbestos fibers from being released.



State of Oregon
Department of
Environmental
Quality

Air Quality Asbestos

811 SW 6th Avenue
Portland, OR 97204

Phone: 503-229-5696

800-452-4011

Fax: 503-229-6762

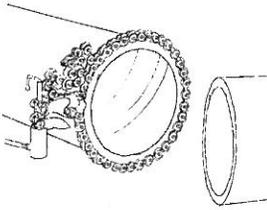
Contact: Cory Ann Wind

www.oregon.gov/DEQ

*DEQ is a leader in
restoring, maintaining and
enhancing the quality of
Oregon's air, land and
water.*

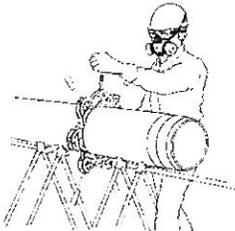
DEQ recommends that you use the following methods to remove AC pipe.

1. Snap cutters



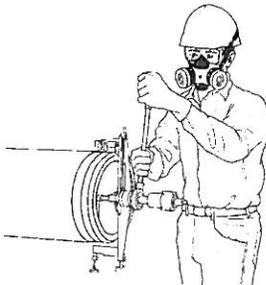
Snap cutters (“squeeze-and-pop” equipment) operate by means of cutting wheels mounted in a chain wrapper around the pipe barrel. Hydraulic pressure, applied by means of a remote, pneumatically, or manually operated pump, squeezes the cutting wheels into the pipe wall until the cut is made.

2. Carbide-tipped blade cutters



Blade cutters are frame adjustable to the circumference of the pipe and have a number of self-tracking rollers that align one or more carbide-tipped cutting blades. Because of the relatively low mechanical input and clean cutting action, hand operated blade cutters do not produce significant amounts of airborne asbestos dust.

3. Manual field lathes



Manual field lathes are designed to end-trim and re-machine rough pipe barrels to factory-machined end profiles. The lathe consists of an adjustable, self-aligning arbor inserted into the pipe bore (which acts as a mandrel upon which the turning handle operates), a screw-fed turning frame, carbide machining blades, and manual (hand or ratchet) turning handles.

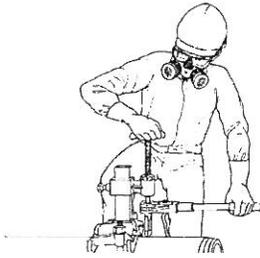
4. Wet tapping AC pressure pipe



Pressure or “wet” tapping for service connections is performed in the trench while the pipe is under pressure. The equipment (manual driven) is affixed to the pipe by means of a chain yoke. A combination boring-and-inserting bar drills and taps the pipe wall and inserts a corporation stop or pipe plug. The pressure chamber, which protects against water leakage, also catches the asbestos-cement chips, so this is essentially a dust-free operation.

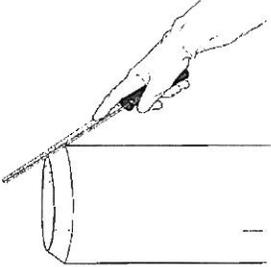
5. Dry tapping ACD pressure pipe

Non-pressure or “dry” tapping for service connections may be performed in or out of the trench. The equipment is affixed to the pipe by means of a chain yoke. Separate drills and taps or a combination tool is used to drill and tap the pipe wall. Corporation stops or other connections may then be affixed to the pipe.



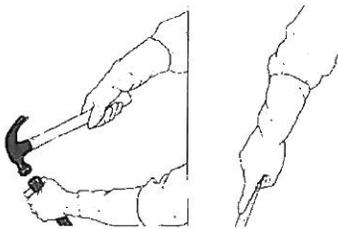
6. Manual rasp

Short lengths of AC pipe, machined-end exclusively (MEE) and machined overall (MOA), can be cut to make closures and repairs and to locate fittings exactly. Field-cut ends may be re-beveled with a coarse wood rasp to form a taper approximating the profile of the factory-beveled end.



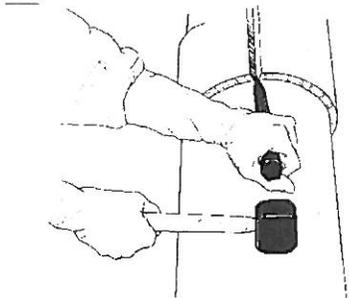
7. Chisel and rasp

Holes may be cut into AC pipe with a hammer and chisel. The edge of a plumber’s wood chisel is used to cut completely around the hole outline, about $\frac{1}{4}$ in. (7 mm) from the prescribed line. The operation is repeated and the cut deepened until through. The edges of the hole are then dressed with a coarse wood rasp.



8. Hammer and chisel

Replacement of damaged pipe may necessitate excavation, exposure and removal. AC coupling removal may be accomplished by gradually splitting the coupling lengthwise using a chisel and hammer. After the top of the coupling has been split, a crowbar or similar tool is used as a lever to split the bottom of the coupling.



Waste Disposal

Place the AC pipe in a leak-tight container and mark it with the warning statement “DANGER ASBESTOS-CONTAINING MATERIAL”. Locate a landfill that is authorized to accept asbestos waste and be sure to inquire about hours of operation and any special packaging requirements they might have. Fill out a DEQ waste shipment report ASN-4 and give it to the landfill upon arrival.

If the material becomes friable

If the AC pipe becomes shattered, damaged, or is badly weathered, it is considered friable and may release asbestos fibers. If the tiles become friable, stop work immediately and promptly contact a DEQ licensed asbestos abatement contractor. Friable asbestos materials must be removed by a **DEQ licensed asbestos contractor using DEQ certified workers.**

All asbestos abatement rules under OAR 340-248-0005 through -0280 must be followed. A DEQ notification form ASN-1 for the removal of friable asbestos and the applicable fee must be filed.

The notification must be received by the DEQ Business Office at least 10 days prior to starting the removal project. For emergency situations a waiver of the 10-day period may be granted by the DEQ. For more information contact DEQ.

For more information

Please contact the office nearest to where the project is occurring:

Clackamas, Clatsop, Columbia, Multnomah, Tillamook and Washington Counties:

Contact Susan Patterson, Gresham office at 503-667-8414 x 55022.

Benton, Lincoln, Linn, Marion, Polk and Yamhill Counties:

Contact Dottie Boyd, Salem office at 503-378-5086 or 800-349-7677.

Lane County:

Contact Tom Freeman, Lane Regional Air Protection Agency at 541-736-1056 x 222.

Jackson, Josephine and Eastern Douglas Counties:

Contact Steve Croucher, Medford office at 541-776-6107 or 877-823-3216.

Coos, Curry and Western Douglas Counties:

Contact Martin Abts, Coos Bay office at 541-269-2721, extension 222.

Crook, Deschutes, Harney, Hood River, Jefferson, Klamath, Lake, Sherman, and Wasco Counties:

Contact Frank Messina, Bend office at 541-633-2019.

Baker, Gilliam, Grant, Malheur, Morrow, Umatilla, Union, Wallowa, and Wheeler Counties:

Contact Tom Hack, Pendleton office at 541-278-4626 or 800-304-3513.

Accessibility information

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To make these arrangements, contact DEQ Communications and Outreach in Portland at 503-229-5696 or call toll-free in Oregon at 800-452-4011; fax 503-229-6762; email: deqinfo@deq.state.or.us.

People with hearing impairments may call 711.

ASN 6



**DEQ NOTIFICATION FORM
For Nonfriable Asbestos Removal**

For DEQ use only	
Date Received:	_____
Amount Received:	_____
Check Number:	_____
Project Number:	_____

ATTENTION!

CONTRACTORS: This notification is not complete unless it is accompanied by the required \$100.00 fee and is submitted 5 days prior to the start date. All notifications where the 5-day period has been waived are subject to a fee increase of 50%. To inquire about a waiver of the 5-day notification period or for other information call 1-800-452-4011 for the phone number of your local regional DEQ office.

◆◆◆(PLEASE TYPE OR PRINT CLEARLY)◆◆◆

Is this a revision to a previous notification? Yes No If Yes, enter Revision #

Start date of project: End date of project:

Days of week and hours to be worked:

Project site name: Building Owner:

Project address:

City: (Include Apt #, Floor #, Bldg #, school name or any other pertinent site location information) County: State: OR Zip:

Was a survey performed: Yes: No: By whom?

Type of non-friable material to be removed:

Amount of non-friable asbestos material to be removed. Square footage:

Contractor name: Phone:

Contractor address:

City: County: State: Zip:

CCB registration number: Competent Person:

Waste disposal site:

Site address:

City: County: State: Zip:

Waste hauler: Phone:

Sign below and send this form with the appropriate fee to The DEQ Business Office at 811 SW 6th Ave., Portland, Oregon 97204. Make checks payable to "DEQ"

Name of owner, operator or contractor:

Name: Phone:

(PLEASE PRINT)

Signature: _____ Date:

CAUTION! If the material being removed is handled in a manner that causes it to become friable (shattered, pulverized, or reduced to dust), then only a DEQ licensed asbestos abatement contractor may perform the removal work. Submit nonfriable notifications and fees in accordance with OAR 340-248-0260. Revisions to notifications may be **faxed** to Gresham NWR at (503) 674-5148, Bend ER at (541) 388-8283, Salem WR at (503) 378-4196, or Medford WR at (541) 776-6262.

ASN 4

ASBESTOS WASTE SHIPMENT REPORT FORM



PLEASE PRINT OR TYPE! If you have questions, contact your local DEQ Regional Office in Gresham at (503) 667-8414 x 55018, Salem at (503) 378-5086, Medford at (541) 776-6010 ext. 235, or Bend at (541) 388-6146 ext. 226, Pendleton (541) 278-4626, **OR** call (800) 452-4011 for the location of your local regional DEQ office.

WASTE GENERATOR: (Contractor, Facility, or Operator)

1. Asbestos removal site name and address: _____

 Street City/State County Zip
 Contact person: _____ Phone: _____

2. Operator's name and address: _____ Phone: _____

 Street City/State County Zip

3. Waste disposal site: _____ Phone: _____

 Street City/State County Zip

4. Describe asbestos materials: _____

5. Containers: Number: _____ Type: _____

6. Total quantity (cubic yards): _____

7. **OPERATOR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packaged, marked and labeled, and are in all respects in proper condition for transport according to all government regulations. All movement of this asbestos-containing material is recorded on this Waste Shipment Record Form.

Name: _____ Company: _____
 Signature: _____ Date: _____

TRANSPORTER(S):

8. Transporter #1: (Acknowledgment of receipt of materials)
 Agent: _____ Company: _____
 Address: _____ Phone: _____
 Signature: _____ Date: _____

9. Transporter #2: (Acknowledgment of receipt of materials)
 Agent: _____ Company: _____
 Address: _____ Phone: _____
 Signature: _____ Date: _____

DISPOSAL: (Certification of receipt of asbestos materials covered by this manifest, except as noted in item 11 below.)

10. Waste Disposal Site: _____
 Name and Title: _____ Date: _____
 Signature: _____ Phone: _____

11. **DISCREPANCY SPACE:** (Add attachments as needed)



OREGON LANDFILLS ACCEPTING ASBESTOS WASTES

The following is a list of landfills authorized by the Oregon DEQ to accept asbestos wastes. OAR 340-248-0280(6) requires that you notify the landfill prior to disposal. DEQ suggests you contact the landfill at least a 24 hours before disposal in order to allow the landfill operator time to prepare a site for burial.

<u>LANDFILL NAME</u>	<u>COUNTY</u>	<u>ADDRESS/PHONE</u>
NORTHWEST REGION		
Hillsboro Landfill	Washington	Waste Management Inc. 3250 SE Minter Bridge Road Hillsboro, OR 97123 (503) 640-9427
LANE COUNTY		
Short Mountain Landfill	Lane	Lane Co. Public Service Division 125 East 8th Avenue Eugene, OR 97401 (541) 746-6228
WESTERN REGION		
Brown's Island Landfill	Marion	2895 Faragate St., S. Salem, OR 97306 (503) 588-5064
Coffin Butte Landfill	Benton	Valley Landfills, Inc. 28972 Coffin Butte Road Corvallis, OR 97330 (541) 745-2018
Dry Creek Landfill	Jackson	Rogue Disposal Service, Inc. 135 West Main Medford, OR 97501 (541) 826-4949
Roseburg Landfill	Douglas	Dept. of Public Works 1036 SE Douglas Roseburg, OR 97470 (541) 440-4271



<u>LANDFILL NAME</u>	<u>COUNTY</u>	<u>ADDRESS/PHONE</u>
EASTERN REGION		
Crook County Landfill	Crook	Prineville Disposal Inc. PO Box J Prineville, OR 97754 (541) 447-5208
Knott Pit Landfill	Deschutes	Dept. of Public Works 61150 SE 27th Street Bend, OR 97702 (541) 388-6581
Klamath Falls Landfill	Klamath	Dept. of Solid Waste Mgmt. 343 Main Street Klamath Falls, OR 97601 (541) 883-4696
Northern Wasco County Landfill	WASCO	2550 Steele Road The Dalles, OR 97058 (541) 296-4082
Chemical Waste Management of the Northwest Landfill	Gilliam	Hazardous Waste Landfill 17629 Cedar Springs Lane Arlington, OR 97812 (541) 454-3218
Baker City Landfill	Baker	Baker Valley Enterprises PO box 169 Baker City, OR 97814 (541) 523-2626
Columbia Ridge Landfill & Recycling	Gilliam	Waste Management Inc. Star Route, Box 6 Arlington, OR 97812 (541) 454-2030
Finley Butte Landfill	Morrow	PO Box 350 Boardman, OR 97818 (541) 481-2233
Fox Hill Landfill	Union	Grande-Ronde Recovery, Inc. 1202 Willow La Grande, OR 97850 (541) 963-5459

