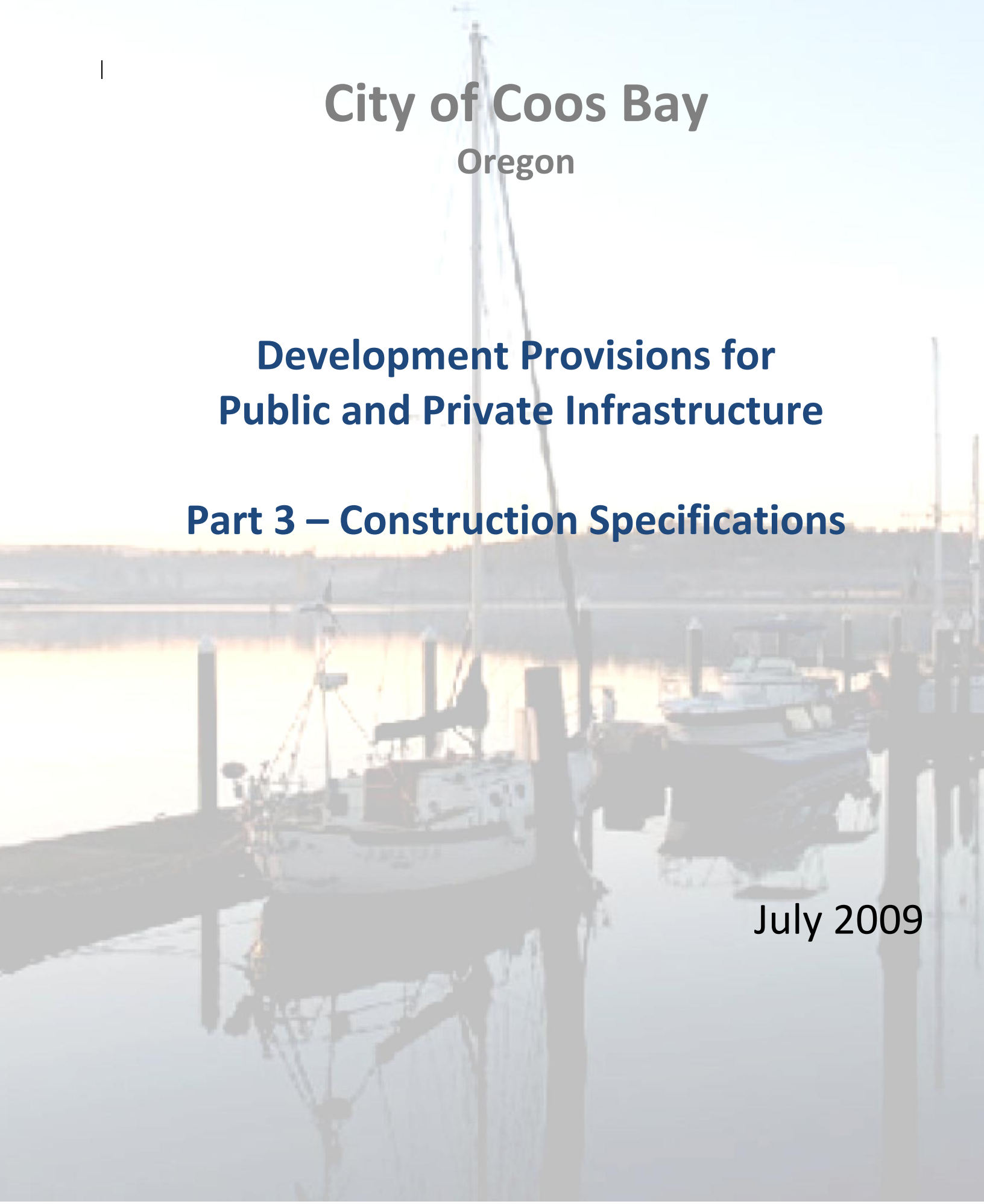
City of Coos Bay

Oregon



Development Provisions for Public and Private Infrastructure

Part 3 – Construction Specifications

July 2009

Table of Contents

DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS 00-1

00 70 00 Conditions of the Contract 00-1

00 71 00 Contracting Definitions 00-1

00 72 00 General Conditions 00-5

Article 1 – Preliminary Matters 00-5

Article 2 – Contract Documents: Intent, Amending, Reuse 00-7

Article 3 – Availability of Lands; Subsurface and Physical Conditions; Hazardous Environmental Conditions; Reference Points 00-9

Article 4 – Bonds and Insurance 00-14

Article 5 – Contractor's Responsibilities 00-20

Article 6 – Other Work at the Site 00-34

Article 7 – Owner's Responsibilities 00-35

Article 8 – Engineer's Status During Construction 00-37

Article 9 – Changes in the Work; Claims 00-39

Article 10 – Cost of the Work; Allowances; Unit Price Work 00-41

Article 11 – Change of Contract Price; Change of Contract Times 00-44

Article 12 – Tests and Inspections; Correction, Removal or Acceptance of Defective Work 00-46

Article 13 – Payments to Contractor and Completion 00-50

Article 14 – Suspension of Work and Termination 00-57

Article 15 – Dispute Resolution 00-59

Article 16 – Miscellaneous 00-60

DIVISION 01 – GENERAL REQUIREMENTS 01-1

01 00 00 General Requirements 01-1

01 20 00 Price and Payment Procedures 01-1

01 22 00 Unit Prices 01-1

01 23 00 Lump Sums 01-1

01 25 00 Substitution Procedures 01-2

01 26 00 Contract Modification Procedures 01-2

01 29 00 Progress Payment Procedures 01-3

01 30 00 Administrative Requirements 01-3

01 31 00 Project Management and Coordination 01-4

01 32 00 Construction Progress Documentation 01-4

01 33 00 Submittal Procedures 01-4

01 40 00 Quality Requirements 01-5
01 45 00 Quality Control 01-6
01 50 00 Temporary Facilities & Controls 01-6
01 51 00 Temporary Utilities 01-6
01 52 00 Construction Facilities 01-7
01 53 00 Temporary Construction 01-7
01 55 00 Vehicular Access and Parking 01-7
01 56 00 Temporary Barriers and Enclosures 01-8
01 57 00 Temporary Controls 01-8
01 58 00 Project Identification 01-8
01 60 00 Product Requirements 01-9
01 65 00 Product Delivery Requirements 01-9
01 66 00 Product Storage and Handling Requirements 01-9
01 70 00 Execution and Closeout Requirements 01-10
01 71 00 Examination and Preparation 01-10
01 73 00 Execution 01-10
01 74 00 Cleaning and Waste Management 01-11
01 75 00 Startup and Adjustment 01-11
01 76 00 Protecting Installed Construction 01-11
01 77 00 Closeout Procedures 01-12
01 78 00 Closeout Submittals 01-12
01 78 13 Certificates and Correction List 01-12
01 78 36 Warranty 01-12
01 78 39 Project Record Documents 01-13
01 79 00 Demonstration and Training 01-13
DIVISION 02 – EXISTING CONDITIONS 02-1
02 00 00 Existing Conditions 02-1
DIVISION 03 – CONCRETE 03-1
03 00 00 Concrete 03-1
03 10 00 Concrete Forming & Accessories 03-1
03 11 00 Concrete Forming 03-1
03 15 20 Premolded Expansion Joint Fillers 03-6
03 20 00 Concrete Reinforcement 03-8
03 30 00 Cast-In-Place Concrete 03-13
03 60 00 Grout 03-23
DIVISION 31 – EARTHWORK 31-1
31 10 00 Site Clearing 31-1

31 11 00 Clearing and Grubbing 31-1
31 20 00 Earth Moving 31-3
31 23 00 Excavation, Bedding and Backfill 31-3
DIVISION 32 – EXTERIOR IMPROVEMENTS 32-1
32 10 00 Bases, Ballasts, and Paving 32-1
32 11 00 Base Courses 32-1
32 12 00 Asphalt Concrete Paving 32-2
32 13 00 Rigid Concrete Paving 32-8
32 13 10 Reinforced Concrete Pavement 32-8
32 13 20 Sidewalks and Plain Concrete Flatwork 32-10
32 15 00 Aggregate Surfacing 32-12
32 16 00 Curbs and Gutters 32-13
DIVISION 33 – UTILITIES 33-1
33 31 00 Sanitary Sewer Piping 33-1
33 34 00 Sanitary Sewer Force Mains 33-9
33 34 50 Sanitary Sewer Force Main Appurtenances 33-17
33 39 00 Sanitary Sewer Manholes, Frames, and Covers 33-23
33 39 50 Manhole Rehabilitation 33-27
33 41 00 Storm Drain Pipe & Culverts 33-33
33 44 00 Storm Drain Inlet Structures 33-35
33 49 00 Storm Drain Manholes, Frames, and Covers 33-38

DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS

00 70 00 CONDITIONS OF THE CONTRACT

00 71 00 Contracting Definitions

A. Wherever used in the Bidding Requirements or Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.

1. *Addenda* – Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.

2. *Agreement* – The written instrument which is evidence of the agreement between Owner and Contractor covering the Work.

3. *Application for Payment* – The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

4. *Asbestos* – Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.

5. *Bid* – The offer or proposal of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

6. *Bidder* – The individual or entity who submits a Bid directly to Owner.

7. *Bidding Documents* – The Bidding Requirements and the proposed Contract Documents (including all Addenda).

8. *Bidding Requirements* – The Advertisement or Invitation to Bid, Instructions to Bidders, bid security of acceptable form, if any, and the Bid Form with any supplements.

9. *Change Order* – A document recommended by Engineer which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.

10. *Claim* – A demand or assertion by Owner or Contractor seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.

11. *Contract* – The entire and integrated written agreement between the Owner and Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

12. *Contract Documents* – Those items so designated in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents. Approved Shop Drawings, other Contractor's submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents.

13. *Contract Price* – The moneys payable by Owner to Contractor for completion of the Work in accordance with the Contract Documents as stated in the Agreement.

14. *Contract Times* – The number of days or the dates stated in the Agreement to: (i) achieve Milestones, if any, (ii) achieve Substantial Completion; and (iii) complete the Work so that it is ready for final payment as evidenced by Engineer's written recommendation of final payment.

15. *Contractor* – The individual or entity with whom Owner has entered into the Agreement.

16. *Drawings* – That part of the Contract Documents prepared or approved by Engineer which graphically shows the scope, extent, and character of the Work to be performed by Contractor. Shop Drawings and other Contractor submittals are not Drawings as so defined.

17. *Effective Date of the Agreement* – The date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.

18. *Engineer* – The individual or entity retained by the City to provide design, construction management, or other services necessary for the construction of the proposed public facilities or improvements.

    a. *Engineer's Consultant* – An individual or entity having a contract with Engineer to furnish services as Engineer's independent professional associate or consultant with respect to the Project and who is identified as such.

19. *Field Order* – A written order issued by Engineer which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.

20. *General Requirements* – Sections of Division 1 of the Specifications. The General Requirements pertain to all sections of the Specifications.

21. *Hazardous Environmental Condition* – The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto in connection with the Work.

22. *Hazardous Waste* – The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.

23. *Laws and Regulations; Laws or Regulations* – Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

24. *Liens* – Charges, security interests, or encumbrances upon Project funds, real property, or personal property.

25. *Milestone* – A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

26. *Notice of Award* – The written notice by Owner to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the conditions precedent listed therein, Owner will sign and deliver the Agreement.

27. *Notice to Proceed* – A written notice given by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work under the Contract Documents.

28. *Owner* – The individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.

29. *PCBs* – Polychlorinated biphenyls.

30. *Petroleum* – Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.

31. *Project* – The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.

32. *Radioactive Material* – Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.

33. *Related Entity* – An officer, director, partner, employee, agent, consultant, or subcontractor.

34. *Resident Project Representative* – The authorized representative of Engineer who may be assigned to the Site or any part thereof.

35. *Samples* – Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.

36. *Schedule of Submittals* – A schedule, prepared and maintained by Contractor, of required submittals and the time requirements to support scheduled performance of related construction activities.

37. *Schedule of Values* – A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

38. *Shop Drawings* – All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.

39. *Site* – Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.

40. *Specifications* – That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.

a. *Standard Specifications* – Those Specifications contained in this Part 3 of the Development Provisions for Public and Private Infrastructure and adopted by the City of Coos Bay as standard material and workmanship requirements.

b. *Special Provisions* – Any non-standard Specification required for a project and included in the Contract Documents.

41. *Subcontractor* – An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.

42. *Substantial Completion* – The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer as evidenced by issuance of a Certificate of Substantial Completion, it is 100% complete in accordance with the Contract Documents with the exception of minor and specific corrective items that would normally be itemized on a final punch list and completed before final acceptance; or if no such certificate is issued, when the Work is complete and ready for final payment as evidenced by Engineer's written recommendation of final payment. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

43. *Successful Bidder* – The Bidder submitting a responsive Bid to whom Owner makes an award.

44. *Supplier* – A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or any Subcontractor.

45. *Underground Facilities* – All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

46. *Unit Price Work* – Work to be paid for on the basis of unit prices.

47. *Work* – The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.

48. *Work Change Directive* – A written statement to Contractor issued on or after the Effective Date of the Agreement and signed by Owner upon recommendation of the Engineer ordering an addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

B. *Terminology* – The following words or terms are not defined but, when used in the Bidding Requirements or Contract Documents, have the following meaning.

1. *Day* – The word "day" means a calendar day of 24 hours measured from midnight to the next midnight.

2. *Defective* – The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it:

   a. does not conform to the Contract Documents, or

   b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents, or

   c. has been damaged prior to Engineer's recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion).

3. Furnish, Install, Perform, Provide

   a. The word "furnish," when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

   b. The word "install," when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

   c. The words "perform" or "provide," when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.

   d. When "furnish," "install," "perform," or "provide" is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, "provide" is implied.

00 72 00 General Conditions

C.

ARTICLE 1 – PRELIMINARY MATTERS

1.01 *Delivery of Bonds and Evidence of Insurance*

A. When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.

B. *Evidence of Insurance:* Before any Work at the Site is started, Contractor and Owner shall each deliver to the other, with copies to each additional insured identified in the Special Provisions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which Contractor and Owner respectively are required to purchase and maintain.

1.02 *C*

opies of Documents

A. Owner shall furnish to Contractor up to six printed or hard copies of the Drawings and Contract Documents. Additional copies will be furnished upon request at the cost of reproduction.

1.03 *Commencement of Contract Times; Notice to Proceed*

A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Agreement.

1.04 *Starting the Work*

A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to the date on which the Contract Times commence to run.

1.05 *Before Starting Construction*

A. *Preliminary Schedules:* Within 10 days after the Effective Date of the Agreement, unless otherwise specified by the Engineer, Contractor shall submit for review and approval the following**:**

1. Preliminary Construction Schedule; and

2. Preliminary Schedule of Submittals.

3. a preliminary Schedule of Values (when applicable) for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

1.06 *Preconstruction Conference*

A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work, the project schedule, procedures for handling submittals, processing Applications for Payment, and maintaining required records.

1.07 *Initial Acceptance of Schedules*

A. At least 10 days before submission of the first Application for Payment a conference attended by Contractor, Engineer, and others as appropriate will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 1.05.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.

1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work nor interfere with or relieve Contractor from Contractor's full responsibility therefor.

2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.

B. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to component parts of the Work.

ARTICLE 2 – CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

2.01 *Intent*

A. The Contract Documents are complementary; what is required by one is as binding as if required by all.

B. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that may reasonably be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the intended result will be provided whether or not specifically called for at no additional cost to Owner.

C. Clarifications and interpretations of the Contract Documents shall be issued in writing by Engineer.

2.02 *Reference Standards*

A. Standards, Specifications, Codes, Laws, and Regulations

1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

2. No provision of any such standard, specification, manual or code, or any instruction of a Supplier shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees from those set forth in the Contract *Documents*. No such provision or instruction shall be effective to assign to Owner, or Engineer, or any of their Related Entities, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

2.03 *Reporting and Resolving Discrepancies*

A. Reporting Discrepancies

1. *Contractor's Review of Contract Documents Before Starting Work*: Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy which Contractor may discover and shall obtain a written interpretation or clarification from Engineer before proceeding with any Work affected thereby.

2. *Contractor's Review of Contract Documents During Performance of Work*: If, during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents or between the Contract Documents and any provision of any Law or Regulation applicable to the performance of the Work or of any standard, specification, manual or code, or of any instruction of any Supplier, Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed

with the Work affected thereby (except in an emergency) until an amendment or supplement to the Contract Documents has been issued by Engineer.

3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor knew or reasonably should have known thereof.

B. Resolving Discrepancies

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:

   a. the provisions of any standard, specification, manual, code, or instruction (whether or not specifically incorporated by reference in the Contract Documents); or

   b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

2. Where a discrepancy occurs between or within the standards, specifications, and drawings, the more stringent or higher quality requirements shall apply. The precedence of the Construction Documents is in the following sequence:

   a. Addenda and modifications to the Drawings and Specifications take precedence over the original construction documents.

   b. In the Drawings, the precedence shall be Drawings of a larger scale over those of a smaller scale, noted dimensions over scaled dimensions, and noted materials over graphic indications.

   c. Should there be a conflict within the Specifications, on the Drawings, or between the Drawings and the Specifications, the Engineer shall decide which stipulation will provide the best installation and his decision shall be final.

3. Before executing the Agreement, the Contractor shall thoroughly familiarize itself with all specified products and submit written notice to Engineer if it objects to the proposed use of any product.

2.04 *Amending and Supplementing Contract Documents*

A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof by either a Change Order or a Work Change Directive.

B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by one or more of the following ways:

1. A Field Order;

2. Engineer's approval of a Shop Drawing or Sample; or

3. Engineer's written interpretation or clarification.

2.05 *R*

euse of Documents

A. Contractor and any Subcontractor or Supplier shall not:

1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or Engineer's consultants, including electronic media editions; or

2. reuse any of such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaption by Engineer.

B. The above prohibition will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

2.06 *E*

lectronic Data

A. Copies of data furnished by Owner or Engineer to Contractor or Contractor to Owner or Engineer that may be relied upon are limited to the printed (hard) copies. Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.

B. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60 days, after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by the transferring party.

C. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

ARTICLE 3 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS; REFERENCE POINTS

3.01 *A*

vailability of Lands

A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work. Owner will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities.

B. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

3.02 *Subsurface and Physical Conditions*

A. *Reports and Drawings* – Any reports of explorations and tests of subsurface conditions at or contiguous to the Site and any drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) that Engineer has used in preparing the Contract Documents shall be available to Contractor upon request.

B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the general accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Special Provisions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their Related Entities with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information.

C. Copies of reports and drawings (if any) that are not included with Bidding Documents may be examined at the office of the Engineer during regular business hours. Any such reports and drawings are not part of the Contract Documents, but the "technical data" contained therein upon which the Contractor may rely as identified and established above are incorporated therein by reference. Contractor is not entitled to rely upon other information and data utilized by Engineer and Engineer's Consultants in the preparation of the Drawings and Specifications.

3.03 *Differing Subsurface or Physical Conditions*

A. *Notice:* If Contractor believes that any subsurface or physical condition at or contiguous to the Site that is uncovered or revealed either:

1. is of such a nature as to establish that any "technical data" on which Contractor is entitled to rely as provided in Paragraph 3.02 is materially inaccurate; or

2. is of such a nature as to require a change in the Contract Documents; or

3. differs materially from that shown or indicated in the Contract Documents; or

4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

5. then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

B. *Engineer's Review*: After receipt of written notice of differing subsurface or physical conditions, Engineer will promptly review the pertinent condition, determine the necessity of Owner's obtaining additional exploration or tests with respect thereto, and advise Owner in writing (with a copy to Contractor) of Engineer's findings and conclusions.

C. Possible Price and Times Adjustments

1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

    a. such condition must meet any one or more of the categories described in Paragraph 3.03.A; and

    b. with respect to Work that is paid for on a Unit Price Basis, any adjustment in Contract Price will be subject to the provisions of Paragraphs 8.07 and 10.03.

2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times if:

    a. Contractor knew of the existence of such conditions at the time Contractor made a final commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract; or

    b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such final commitment; or

    c. Contractor failed to give the written notice as required.

3.04 *U*

nderground Facilities

A. *Shown or Indicated:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Special Provisions:

1. Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data; and

2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:

    a. reviewing and checking all such information and data,

    b. locating all Underground Facilities shown or indicated in the Contract Documents,

    c. coordination of the Work with the owners of such Underground Facilities, including Owner, during construction, and

d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

3. Oregon law requires Contractor to follow rules adopted by the Oregon Utility Notification Center (OUNC). These rules are set forth in OAR 952-001-0010 through 952-001-0090. OUNC can be contacted at 1-800-332-2344 or 811 and copies of the rules can be obtained from the center.

B. Not Shown or Indicated

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer. Engineer will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

2. If Engineer concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An equitable adjustment shall be made in the Contract Price or Contract Times, or both, to the extent that they are attributable to the existence or location of any Underground Facility that was not shown or indicated or not shown or indicated with reasonable accuracy in the Contract Documents and that Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated.

3.05 *Reference Points*

A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

B. Contractor shall take precautions as necessary to preserve existing centerline and property monuments.

3.06 *Hazardous Environmental Condition at Site*

A. *Reports and Drawings:* The Special Provisions identify any reports and/or drawings relating to Hazardous Environmental Conditions at the Site, if any, that have been utilized by the Engineer in the preparation of the Contract Documents.

B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the general accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Special Provisions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their Related Entities with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions or information.

C. Contractor shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. Contractor shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible.

D. If Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, Contractor shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency); and (iii) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any.

E. Contractor shall not be required to resume Work in connection with such condition or in any affected area until after Owner has obtained any required permits related thereto and delivered to Contractor written notice: (i) specifying that such condition and any affected area is or has been rendered safe for resuming Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, either party may make a Claim therefor.

F. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor. Owner may have such deleted portion of the Work performed by Owner's own forces or others.

G. Subject to the provisions of the Oregon Constitution, applicable laws and regulations, and to the limits of the Oregon Tort Claims Act, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition: (i) was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be included within the scope of the Work, and (ii) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this paragraph shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

H. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, partners, employees, agents, consultants, and

subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this paragraph shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

I. The provisions of Paragraphs 3.02, 3.03, and 3.04 do not apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

3.07 *H*

istorical or Archaeological Finds

A. Where historical objects of archaeological or paleontological nature are encountered during the course of construction, including but not limited to ruins, sites, buildings, artifacts, human remains, and fossils, the Contractor shall suspend operations in the area, preserve all such objects from disturbance and shall notify the Engineer of the nature and location of such finds. The Engineer will arrange for the disposition of all finds and shall notify the Contractor when to proceed with construction in the affected area.

ARTICLE 4 – BONDS AND INSURANCE

4.01 *P*

erformance, Payment, and Other Bonds

A. Contractor shall furnish performance and payment bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all of Contractor's obligations under the Contract Documents. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period (if applicable), whichever is later, except as provided otherwise by Laws or Regulations or by the Contract Documents. Contractor shall also furnish such other bonds as are required by the Contract Documents.

B. All bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All bonds signed by an agent must be accompanied by a certified copy of the agent's authority to act.

1. Bonds and insurance shall be written by companies licensed to do business in the State of Oregon and satisfactory to the Owner.

C. If the surety on any bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in the state where the Project is located or it ceases to meet the requirements of Paragraph 4.01.B, Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety meeting these requirements.

4.02 *L*

icensed Sureties and Insurers

A. All bonds and insurance required by the Contract Documents to be purchased and maintained by Owner or Contractor shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds or insurance policies for the limits and coverages so required.

4.03 *C*

ertificates of Insurance

A. Contractor shall deliver to Owner, with copies to each additional insured as required for the Project, certificates of insurance (and other evidence of insurance requested by Owner or any other additional insured) which Contractor is required to purchase and maintain.

B. Owner shall deliver to Contractor, with copies to each additional insured as required for the Project, certificates of insurance (and other evidence of insurance requested by Contractor or any other additional insured) which Owner is required to purchase and maintain.

C. Failure of Owner to demand such certificates or other evidence of full compliance with these insurance requirements or failure of Owner to identify a deficiency from evidence provided shall not be construed as a waiver of Contractor's obligation to maintain such insurance.

D. By requiring such insurance and insurance limits herein, Owner does not represent that coverage and limits will necessarily be adequate to protect Contractor, and such coverage and limits shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner in the Contract Documents.

4.04 *C*

ontractor's Liability Insurance

A. Contractor shall purchase and maintain such liability and other insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable:

1. claims under workers' compensation, disability benefits, and other similar employee benefit acts;

2. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;

3. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;

4. claims for damages insured by reasonably available personal injury liability coverage which are sustained:

    a. by any person as a result of an offense directly or indirectly related to the employment of such person by Contractor, or

    b. by any other person for any other reason;

5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and

6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.

B. The policies of insurance required by this Paragraph 4.04 shall:

1. with respect to insurance required by Paragraphs 4.04.A.3 through 4.04.A.6 inclusive, include as additional insureds (subject to any customary exclusion regarding professional liability) Owner and Engineer, and any other individuals or entities identified in the Special Provisions, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, partners, employees, agents, consultants and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;

    a. Other parties to be named as additional insured include the following:

        1) Subcontractors (if not separately insured)

2. include at least the specific coverages and be written for not less than the limits of liability provided in the Special Provisions or required by Laws or Regulations, whichever is greater;

3. include completed operations insurance;

4. include contractual liability insurance covering Contractor's indemnity obligations under Paragraphs 5.11 and 5.20;

5. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured to whom a certificate of insurance has been issued;

6. remain in effect at least until final payment and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work; and

7. with respect to completed operations insurance, and any insurance coverage written on a claims-made basis, remain in effect for at least two years after final payment.

    a. Contractor shall furnish Owner and each other additional insured to whom a certificate of insurance has been issued, evidence satisfactory to Owner and any such additional insured of continuation of such insurance at final payment and one year thereafter.

C. The limits of liability for the insurance required by Paragraph 4.04 shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations:

1. Workers' Compensation:

a.	State	Statutory
b.	Applicable Federal (e.g. Longshoremen's)	Statutory
c.	Employer's Liability	$500,000
d.	Each Accident	$100,000
e.	Disease – Policy Limit	$500,000
f.	Disease – Each Employee	$100,000

Contractor shall require all subcontractors to purchase and maintain Workman's Compensation Insurance, including Occupational Disease and Employer's Liability Insurance, in the amounts and coverage as required by all applicable Federal, State or other laws.

2. Contractor's General Liability, which shall include completed operations and product liability coverages and eliminate the exclusion with respect to property under the care, custody, and control of the Contractor:

a. General Aggregate $1,000,000

b. Products - Completed Operations Aggregate $1,000,000

c. Personal and Advertising Injury $500,000

d. Each Occurrence (Bodily Injury and Property Damage) $500,000

e. Fire Damage (any one fire) $50,000

f. Excess Liability – Aggregate $1,000,000

g. Property Damage liability insurance will provide Explosion, Collapse, and Underground coverages where applicable.

3. Contractual Liability shall be provided as part of the Contractor's General Liability Coverage.

4. Comprehensive Automotive:

a. Bodily Injury (Each Person) $500,000

b. Bodily Injury (Each Accident) $1,000,000

c. Property Damage (Each Accident) $500,000

d. Combined Single Limit $500,000

4.05 *Property Insurance*

A. Contractor shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof (Contractor shall be responsible for any deductible or self-insured retention.). This insurance shall:

1. include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Special Provisions, and the officers, directors, partners, employees, agents, consultants and subcontractors of any of them, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured;

2. be written on a Builder's Risk "all-risk" or open peril or special causes of loss policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage (other than caused by flood), and such other perils or causes of loss as may be specifically identified in the Special Provisions;

3. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);

4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by Engineer;

5. allow for partial utilization of the Work by Owner;

6. include testing and startup; and

7. be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor, and Engineer with 30 days written notice to each other additional insured to whom a certificate of insurance has been issued.

B. Contractor shall purchase and maintain such boiler and machinery insurance or additional property insurance as may be required by Laws and Regulations which will include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Special Provisions, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured.

C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with Paragraph 4.05 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with Paragraph 4.06.

4.06 *Waiver of Rights*

A. Owner and Contractor intend that all policies purchased in accordance with Paragraph 4.05 will protect Owner, Contractor, Subcontractors, and Engineer, and all other individuals or entities identified in the Special Provisions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or additional insureds thereunder. Owner and Contractor waive all rights against each other and their respective officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors, and Engineer, and all other individuals or entities identified in the Special Provisions to be listed as insured or additional insured (and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them) under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Contractor as trustee or otherwise payable under any policy so issued.

B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them for:

1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and

2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial utilization after Substantial Completion or after final payment.

C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 4.06.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them.

4.07 *R*

eceipt and Application of Insurance Proceeds

A. Any insured loss under the policies of insurance required by Paragraph 4.05 will be adjusted with Contractor and made payable to Contractor as fiduciary for the insureds, as their interests may appear, subject to the requirements of any applicable mortgage clause and of Paragraph 4.07.B. Contractor shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof.

B. Contractor as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within 15 days after the occurrence of loss to Contractor's exercise of this power. If such objection be made, Contractor as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, Contractor as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, Contractor as fiduciary shall give bond for the proper performance of such duties.

4.08 *A*

cceptance of Bonds and Insurance; Option to Replace

A. If either Owner or Contractor has any objection to the coverage afforded by or other provisions of the bonds or insurance required to be purchased and maintained by the other party in accordance with Article 5 on the basis of non-conformance with the Contract Documents, the objecting party shall so notify the other party in writing within 10 days after receipt of the certificates (or other evidence requested) required by Paragraph 1.01.B. Owner and Contractor shall each provide to the other such additional information in respect of insurance provided as the other may reasonably request. If either party does not purchase or maintain all of the bonds and insurance required of such party by the Contract Documents, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent bonds or insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

1. Owner reserves the right to review, investigate, and reject Insurance companies proposed to be used by Contractor if they are determined inadequate to provide necessary coverages as specified in these documents.

4.09 *P*

artial Utilization, Acknowledgment of Property Insurer

A. If Owner finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work, no such use or occupancy shall commence before the insurers providing the property insurance pursuant to Paragraph 4.05 have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

ARTICLE 5 – CONTRACTOR'S RESPONSIBILITIES

5.01 *S*
upervision and Superintendence

A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction. Contractor shall not be responsible for the negligence of Owner or Engineer in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents.

B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances. The superintendent will be Contractor's representative at the Site and shall have authority to act on behalf of Contractor. All communications given to or received from the superintendent shall be binding on Contractor.

5.02 *L*
abor; Working Hours

A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.

B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours. Contractor will not permit the performance of Work on a Saturday, Sunday, or any legal holiday without Owner's written consent (which will not be unreasonably withheld) given after prior written notice to Engineer.

5.03 *S*
ervices, Materials, and Equipment

A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start-up, and completion of the Work.

B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

1. Contractor agrees to prefer goods or services that have been manufactured or produced in the United States of America if price, fitness, availability or quality are otherwise equal.

C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

5.04 *Progress Schedule*

A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 1.07 as it may be adjusted from time to time as provided below.

1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 1.07) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times. Such adjustments will comply with any provisions of the General Requirements applicable thereto.

2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 11. Adjustments in Contract Times may only be made by a Change Order.

5.05 *Substitutes and "Or-Equals"*

A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to Engineer for review under the circumstances described below.

1. *"Or-Equal" Items:* If in Engineer's sole discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by Engineer as an "or-equal" item, in which case review and approval of the proposed item may, in Engineer's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this paragraph, a proposed item of material or equipment will be considered functionally equal to an item so named if:

a. in the exercise of reasonable judgment Engineer determines that:

1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;

3) it has a proven record of performance and availability of responsive service; and

b. Contractor certifies that, if approved and incorporated into the Work:

1) there will be no increase in cost to the Owner or increase in Contract Times, and

2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

2. Substitute Items

a. If in Engineer's sole discretion an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item under Paragraph 5.05.A.1, it will be considered a proposed substitute item.

b. Contractor shall submit sufficient information as provided below to allow Engineer to determine that the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by Engineer from anyone other than Contractor.

c. The procedure requirements for review by Engineer will be as set forth in Paragraph 5.05.A.2.d, and as Engineer may decide is appropriate under the circumstances.

d. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:

1) shall certify that the proposed substitute item will:

a) will perform adequately the functions and achieve the results called for by the general design,

b) be similar in substance to that specified, and

c) be suited to the same use as that specified;

2) will state:

a) the extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time;

b) whether or not use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item; and

c) whether or not incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty;

3) will identify:

a) all variations of the proposed substitute item from that specified , and

b) available engineering, sales, maintenance, repair, and replacement services;

4) and shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change.

e. Contractor responsible to insure that any approved substitute items fit within the space and envelope of the originally specified item. Contractor shall make necessary field measurements to ascertain space requirements, including those for connections, and shall order such sizes and shapes of equipment that upon installation shall suit the true intent and meaning of the project as expressed by the Plans and Specifications. Where approved substitute equipment

requires a different arrangement of connections from those shown on the Plans, Contractor shall be responsible to install the equipment to operate properly and in harmony with all other new and existing equipment, to fully satisfy the intent of the project as expressed by the Plans and Specifications, and to make all necessary changes in the work required by the different arrangement of connections at no additional cost to the Owner.

B. *Substitute Construction Methods or Procedures:* If a specific means, method, technique, sequence, or procedure of construction is expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by Engineer. Contractor shall submit sufficient information to allow Engineer, in Engineer's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents.

C. *Engineer's Evaluation:* Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 5.05.A and 5.05.B. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No "or equal" or substitute will be ordered, installed or utilized until Engineer's review is complete, which will be evidenced by either a Change Order for a substitute or an approved Shop Drawing for an "or equal." Engineer will advise Contractor in writing of any negative determination.

D. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

E. *Engineer's Cost Reimbursement*: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor pursuant to Paragraphs 5.05.A.2 and 5.05.B. Whether or not Engineer approves a substitute item so proposed or submitted by Contractor, Contractor shall reimburse Owner for the charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

F. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute or "or-equal" at Contractor's expense.

5.06 *C*

oncerning Subcontractors, Suppliers, and Others

A. Contractor shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to Owner as indicated in Paragraph 5.06.B), whether initially or as a replacement, against whom Owner may have reasonable objection. Contractor shall not be required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom Contractor has reasonable objection.

1. In accordance with the Instructions to Bidders, Contractor shall list subcontractors on the Proposed Subcontractor List, sign, and submit the completed form to Owner within two working hours of the time and at the place for receipt of Bids. Criteria for listing subcontractors shall be in accordance with ORS 279C.370 and are as follows:

    a. Only public improvement projects with an estimated contract value in excess of $100,000 are required to list first tier subcontractors.

    b. Only first tier subcontractors need to be listed.

c. Any first tier subcontractor that will be furnishing labor or labor and materials on the Bid, if awarded, shall be listed if the subcontract value would be equal to or greater than:

(1) Five percent of the total Bid amount, but at least $15,000; or

(2) $350,000, regardless of the percentage of the total Bid amount.

d. If there are no subcontractors who meet the criteria stated 5.06.A.1.a, b and c, Bidder must state "none" on each page of the form provided and submit it to Owner as stated in 5.06.A.1.

e. The Proposed Subcontractor List must be submitted in a separate sealed envelope. The form may be submitted with the Bid or anytime within two working hours following the Bid opening.

f. Failure to submit a subcontractor list in accordance with the instructions herein will result in the Bid being rejected as non-responsive in accordance with ORS 279C.370 (3).

B. If the Special Provisions require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to Owner in advance for acceptance by Owner by a specified date prior to the Effective Date of the Agreement, and if Contractor has submitted a list thereof in accordance with the Special Provisions, Owner's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of Owner or Engineer to reject defective Work.

1. Once a subcontractor and supplier list has been submitted and approved by the Owner (or Owner makes no objection thereto), Contractor shall not substitute any subcontractor or supplier without the written approval of Owner.

C. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents:

1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier or other individual or entity, nor

2. shall anything in the Contract Documents create any obligation on the part of Owner or Engineer to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

D. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.

E. Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with Engineer through Contractor.

F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

G. All Work performed for Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer. Whenever any such agreement is with a Subcontractor or Supplier who is listed as an additional insured on the property insurance provided in Paragraph 4.05, the agreement between the Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against Owner, Contractor, and Engineer, and all other individuals or entities identified in the Special Provisions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same.

1. Contractor agrees to make all provisions of the contract with the Owner applicable to any Subcontractor performing work under the contract.

2. Contractor and all first tier Subcontractors and Suppliers must comply with prompt payment provisions pursuant to ORS 279C.515. Contractor shall include in each subcontract for property, materials or services:

    a. a payment clause which obligates the Contractor to pay such Subcontractor or Supplier within 30 days of receiving payment from the Owner;

    b. an interest penalty clause which obligates the Contractor to pay the Subcontractor an interest penalty on delinquent payments; and

    c. a clause which requires first tier Subcontractors or Suppliers to include similar payment and interest penalty clauses in lower tier subcontracts.

3. The clauses and the rights and obligations described in Paragraph 5.06.G.2 shall conform to the requirements of ORS 279C.515.

H. Contractor shall comply with ORS 279C.580 regarding all relations with Subcontractors.

5.07 *Patent Fees and Royalties*

A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if to the actual knowledge of Owner or Engineer its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.

B. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including

but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

5.08 *Permits*

A. Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

1. Owner may, at its discretion, waive any pertinent permits or permit fees for portions of the Work under its jurisdiction.

5.09 *Laws and Regulations*

A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.

B. If Contractor performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work. However, it shall not be Contractor's primary responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 2.03.

C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work shall be the subject of an adjustment in Contract Price or Contract Times. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 9.05.

D. *Payment of Prevailing Wage Rates for Public Works:* The Contractor and all persons doing or contracting to do any of the work contemplated by the Contract shall comply with all Federal and State Laws in employment and payment of labor. Contractor shall comply with all provisions of said laws (and pay all related fees), not only in regard to the payment of prevailing wage rates, but also in the matter of the necessary certificates and affidavits required to accompany each request for payment. No payment, progress or otherwise, will be paid unless accompanied by the necessary certificates and affidavits pertaining to prevailing wages.

1. Contractor shall comply with the provisions of ORS 279C.800 through 279C.870 in regards to the payment of prevailing wages including fringe benefits for the various classes of workers employed on the project. Prevailing rates shall be in accordance with the most current version (or as it is modified by addendum) of the "Prevailing Wage Rates for Public Works Contracts in Oregon" as published by the Oregon Bureau of Labor and Industries. Such publications can be obtained from the Bureau of Labor and Industries and a copy of the most current version is to be supplied to the Owner with the first pay

request. If a dispute arises as to what is the prevailing wage rate for any class of workers, and a dispute cannot be settled by the parties involved, it may be referred to the Commissioner of Labor, State of Oregon, for final determination.

2. For Federally funded or assisted construction projects, or when otherwise required by the Contract, Contractor shall comply with applicable provisions of the Code of Federal Regulations, Title 29, Parts 1, 3, 5, 6, and 7 regarding payment of Federal prevailing wages in accordance with the Davis-Bacon and related Acts. If Davis-Bacon wages are required for a project, it shall be specifically noted in the Instructions to Bidders.

3. If Owner determines at any time that the prevailing rate of wage has not or is not being paid as required for a project, it may retain from moneys due to Contractor an amount sufficient to make up the difference between the wages actually paid and the prevailing rate of wages, and may also cancel the Contract. Liquidated damages for failure to pay the rate of wage required herein shall be an additional amount equal to the unpaid premium, over and above the liability of the Contractor, any Subcontractor, or surety to pay said unpaid minimum to any workers affected.

E. Under the provisions of Oregon Law, ORS 279C.845, the wage certification form on public works contracts must be provided: Once within fifteen (15) days of the date the Contractor or Subcontractor first began work on the project and once before the final inspection of the project by the public contracting agency: In addition, for projects exceeding ninety (90) days, submissions are to be made at 90-day intervals. Payroll information is to be filed with both the public contracting agency and the Wage and Hour Division, Bureau of Labor and Industries, 1400 S.W. 5th Avenue, Portland, Oregon 97201. This payroll information must be kept by the Contractor and/or Subcontractor for three (3) years.

F. Contractor shall strictly observe and obey all of the terms and provisions of ORS 279 pertaining specifically, but not exclusively, to the furnishings of Workers Compensation Insurance, payment of laborers and materialmen, the withholding of State and Federal income and other taxes, hours of labor, and all other regulations provided in said chapter, and shall hold Owner harmless on account thereof.

G. Contractor shall employ no person for more than eight hours in any one day, or 40 hours in any one week, except in cases of necessity, emergency or where the public policy absolutely requires it. In such cases, Contractor shall pay the laborer at least time and a half pay for all overtime in excess of eight hours a day and for work performed on any legal holiday specified in ORS 279C.520. When specifically agreed to in a written labor-management negotiated labor agreement, a laborer may be paid at least time and a half pay for work performed in any legal holiday specified in ORS 187.010 and 187.020 and not listed in ORS 279C.540(1). Contractor to comply with ORS 279C.540 to 279C.545 and ORS 653.268 to 653.269 regarding hours of labor and overtime.

H. Contractor shall comply with ORS 279C.530 and shall make payment promptly, as due, to any person, partnership, association, or corporation furnishing medical, surgical, hospital, or other needed care of attention incident to sickness or injury to the employees of Contractor of all sums which the Contractor agreed to pay or collected or deducted from the wages of employees pursuant to any law, Contractor or agreement for the purpose of providing payment for such service.

I. Contractor, or its Subcontractors, if any, and all employers working under this Contract are subject employers under Oregon Workers' Compensation Law and shall comply with ORS 656.017, which requires them to provide Workers' Compensation for all their subject workers as defined under ORS chapter 656 (ORS 279C.530(2)).

J. Contractor shall comply with all federal, state, and local laws and regulations dealing with the prevention of environmental pollution and the preservation of natural resources that affect the performance of the Contract. If new or amended statutes, ordinances, or regulations are adopted, or the Contractor

encounters a condition not referred to in the bid document not caused by the Contractor and not discoverable by reasonable site inspection which requires compliance with federal, state, or local laws or regulations dealing with the prevention of environmental pollution or the preservation of natural resources, both the Owner and the Contractor shall have all the rights and obligations specified in ORS 279C.525 to handle the situation.

K. Contractor and all Subcontractors shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, handicap, marital status, age or national origin. Such action shall include, but not be limited to: employment, upgrading, demotion or transfer, recruitment, advertising, layoff or termination, rates of pay or other forms of compensation and selection for training, including apprenticeship.

1. Contractor shall post in conspicuous places available to employees and applicant for employment, notices setting forth the provisions of this nondiscrimination clause. Contractor's and Subcontractor's solicitations and advertisements for employees shall state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, handicap, marital status, age or national origin.

L. Contractor certifies that all subcontractors performing work described in ORS 701.005(2) (i.e. construction work) will be registered with the Construction Contractors Board or licensed by the State Landscape Contractors Board in accordance with ORS 701.035 to 701.055 before the subcontractors commence work under the Contract.

5.10 *Taxes*

A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

1. Contractor and any Subcontractor shall pay to the Department of Revenue all sums withheld from employees pursuant to ORS 316.167.

2. Contractor shall pay promptly all contributions or amounts to the State Industrial Accident Fund and the State Unemployment Compensation Fund from Contractor or any Subcontractor in connection with the performance of the contract.

5.11 *Use of Site and Other Areas*

A. Limitation on Use of Site and Other Areas

1. Contractor shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.

2. Should any claim be made by any such owner or occupant because of the performance of the Work, Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.

3. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused by or based upon Contractor's performance of the Work.

B. *Removal of Debris During Performance of the Work:* During the progress of the Work Contractor shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

C. *Cleaning:* Prior to Substantial Completion of the Work, Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

D. *Loading Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

5.12 *Record Documents*

A. Contractor shall maintain in a safe place at the Site one record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, and written interpretations and clarifications in good order and annotated to show changes made during construction. These record documents together with all approved Samples and a counterpart of all approved Shop Drawings will be available to Engineer for reference. Upon completion of the Work, these record documents, Samples, and Shop Drawings will be delivered to Engineer for Owner.

5.13 *Safety and Protection*

A. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

1. all persons on the Site or who may be affected by the Work;

2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and

3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect

them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.

C. All damage, injury, or loss to any property referred to in Paragraph 5.13.A.2 or 5.13.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or , or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

D. Contractor's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 13.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

5.14 *Safety Representative*

A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

5.15 *Hazard Communication Programs*

A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

5.16 *Emergencies*

A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

5.17 *Shop Drawings and Samples*

A. Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the acceptable Schedule of Submittals (as required by Paragraph 1.05). Each submittal will be identified as Engineer may require.

1. Shop Drawings

    a. Submit number of copies specified in the General Requirements.

b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 5.17.D.

2. Samples

a. Submit number of Samples specified in the Specifications.

b. Clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 5.17.D.

B. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

C. Submittal Procedures

1. Before submitting each Shop Drawing or Sample, Contractor shall have determined and verified:

a. all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;

b. the suitability of all materials with respect to intended use, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work;

c. all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto; and

d. shall also have reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents.

2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal.

3. With each submittal, Contractor shall give Engineer specific written notice of any variations, that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separate from the Shop Drawings or Sample submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to Engineer for review and approval of each such variation.

D. Engineer's Review

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

3. Engineer's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 5.17.C.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer's review and approval shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 5.17.C.1.

E. Resubmittal Procedures

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.

5.18 *C*

ontinuing the Work

A. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by Paragraph 14.04 or as Owner and Contractor may otherwise agree in writing.

5.19 *C*

ontractor's General Warranty and Guarantee

A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its Related Entities shall be entitled to rely on representation of Contractor's warranty and guarantee.

B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or

2. normal wear and tear under normal usage.

C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:

1. observations by Engineer;

2. recommendation by Engineer or payment by Owner of any progress or final payment;

3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;

4. use or occupancy of the Work or any part thereof by Owner;

5. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by Engineer;

6. any inspection, test, or approval by others; or

7. any correction of defective Work by Owner.

5.20 *Indemnification*

A. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable.

B. In any and all claims against Owner or Engineer or any of their respective consultants, agents, officers, directors, partners, or employees by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 5.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

C. The indemnification obligations of Contractor under Paragraph 5.20.A shall not extend to the liability of Engineer and Engineer's officers, directors, partners, employees, agents, consultants and subcontractors arising out of:

1. the preparation or approval of, or the failure to prepare or approve, maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or

2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

5.21 *Delegation of Professional Design Services*

A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable law.

B. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such

services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.

C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.

D. Pursuant to this Paragraph 5.21, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 5.17.D.1.

E. Contractor shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents.

ARTICLE 6 – OTHER WORK AT THE SITE

6.01 *R*

elated Work at Site

A. Owner may perform other work related to the Project at the Site with Owner's employees, or via other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then written notice thereof will be given to Contractor prior to starting any such other work. If such other work results in delays or extra costs to Contractor, then Contractor and Owner shall negotiate as to the amount or extent, if any, of adjustment in the Contract Price or Contract Times.

B. Contractor shall afford each other contractor who is a party to such a direct contract, each utility owner and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and shall properly coordinate the Work with theirs. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering their work and will only cut or alter their work with the written consent of Engineer and the others whose work will be affected. The duties and responsibilities of Contractor under this Paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of Contractor in said direct contracts between Owner and such utility owners and other contractors.

C. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 6, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

6.02 *Coordination*

A. If Owner intends to contract with others for the performance of other work on the Project at the Site, the following will be set forth in Special Provisions:

1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;

2. the specific matters to be covered by such authority and responsibility will be itemized; and

3. the extent of such authority and responsibilities will be provided.

B. Unless otherwise provided in the Special Provisions, Owner shall have sole authority and responsibility for such coordination.

6.03 *Legal Relationships*

A. Paragraphs 6.01.A and 6.02 are not applicable for utilities not under the control of Owner.

B. Each other direct contract of Owner under Paragraph 6.01.A shall provide that the other contractor is liable to Owner and Contractor for the reasonable direct delay and disruption costs incurred by Contractor as a result of the other contractor's actions or inactions.

C. Contractor shall be liable to Owner and any other contractor for the reasonable direct delay and disruption costs incurred by such other contractor as a result of Contractor's action or inactions.

ARTICLE 7 – OWNER'S RESPONSIBILITIES

7.01 *Communications to Contractor*

A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

7.02 *Replacement of Engineer*

A. In case of termination of the employment of Engineer, Owner shall appoint an engineer to whom Contractor makes no reasonable objection, whose status under the Contract Documents shall be that of the former Engineer.

7.03 *Furnish Data*

A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

7.04 *Pay When Due*

A. Owner shall make payments to Contractor when they are due as provided in Paragraphs 13.02.C and 13.07.C.

7.05 *L*

ands and Easements; Reports and Tests

A. Owner's duties in respect of providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 3.01 and 3.05. Paragraph 3.02 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of subsurface conditions and drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site that have been utilized by Engineer in preparing the Contract Documents.

7.06 *I*

nsurance

A. Owner's responsibilities, if any, in respect to purchasing and maintaining liability and property insurance are set forth in Article 4.

7.07 *C*

hange Orders

A. Owner is obligated to execute Change Orders as indicated in Paragraph 9.03.

7.08 *I*

nspections, Tests, and Approvals

A. Owner's responsibility in respect to certain inspections, tests, and approvals is set forth in Paragraph 12.03.B.

7.09 *L*

imitations on Owner's Responsibilities

A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

7.10 *U*

ndisclosed Hazardous Environmental Condition

A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 3.06.

7.11 *E*

vidence of Financial Arrangements

A. If and to the extent Owner has agreed to furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents, Owner's responsibility in respect thereof will be as set forth in the Special Provisions.

ARTICLE 8 – ENGINEER'S STATUS DURING CONSTRUCTION

8.01 *O*

wner's Representative

A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract Documents and will not be changed without written consent of Owner and Engineer.

8.02 *V*

isits to Site

A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 8.09. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

8.03 *P*

roject Representative

A. If Owner and Engineer agree, Engineer will furnish a Resident Project Representative to assist Engineer in providing more extensive observation of the Work. The authority and responsibilities of any such Resident Project Representative and assistants will be as provided in the Special Provisions, and limitations on the responsibilities thereof will be as provided in Paragraph 8.09. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Special Provisions.

8.04 *A*

uthorized Variations in Work

A. Engineer may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on Owner and also on Contractor, who shall perform the Work involved promptly. If Owner or Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, then Owner and Contractor shall negotiate to determine mutually agreeable adjustments.

8.05 *R*

ejecting Defective Work

A. Engineer will have authority to reject Work which Engineer believes to be defective, or that Engineer believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Engineer will also have authority to require special inspection or testing of the Work as provided in Paragraph 12.04, whether or not the Work is fabricated, installed, or completed.

8.06 *S*

hop Drawings, Change Orders and Payments

A. In connection with Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, see Paragraph 5.17.

B. In connection with Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, see Paragraph 5.21.

C. In connection with Engineer's authority as to Change Orders, see Articles 9, 10, and 11.

D. In connection with Engineer's authority as to Applications for Payment, see Article 13.

8.07 *D*

eterminations for Unit Price Work

A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of Paragraph 9.05.

8.08 *D*

ecisions on Requirements of Contract Documents and Acceptability of Work

A. Engineer will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. All matters in question and other matters between Owner and Contractor arising prior to the date final payment is due relating to the acceptability of the Work, and the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, will be referred initially to Engineer in writing within 30 days of the event giving rise to the question.

B. Engineer will, with reasonable promptness, render a written decision on the issue referred. If Owner or Contractor believes that any such decision entitles them to an adjustment in the Contract Price or Contract Times or both, a Claim may be made under Paragraph 9.05. The date of Engineer's decision shall be the date of the event giving rise to the issues referenced for the purposes of Paragraph 9.05.B.

C. Engineer's written decision on the issue referred will be final and binding on Owner and Contractor, subject to the provisions of Paragraph 9.05.

D. When functioning as interpreter and judge under this Paragraph 8.08, Engineer will not show partiality to Owner or Contractor and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity.

8.09 *Limitations on Engineer's Authority and Responsibilities*

A. Neither Engineer's authority or responsibility under this Article 8 or under any other provision of the Contract Documents nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 13.07.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with the Contract Documents.

E. The limitations upon authority and responsibility set forth in this Paragraph 8.09 shall also apply to the Resident Project Representative, if any, and assistants, if any.

ARTICLE 9 – CHANGES IN THE WORK; CLAIMS

9.01 *Authorized Changes in the Work*

A. Without invalidating the Contract and without notice to any surety, Owner may order additions, deletions, or revisions in the Work by a Change Order or a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).

B. If Owner and Contractor are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in Paragraph 9.05.

9.02 *Unauthorized Changes in the Work*

A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented as provided in Paragraph 2.04, except in the case of an emergency as provided in Paragraph 5.16 or in the case of uncovering Work as provided in Paragraph 12.04.B.

9.03 *Execution of Change Orders*

A. Owner and Contractor shall execute appropriate Change Orders recommended by Engineer covering:

1. changes in the Work which are: (i) ordered by Owner pursuant to Paragraph 9.01.A, (ii) required because of acceptance of defective Work under Paragraph 12.08.A or Owner's correction of defective Work under Paragraph 12.09, or (iii) agreed to by the parties;

2. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and

3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by Engineer pursuant to Paragraph 9.05; provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, Contractor shall carry on the Work and adhere to the Progress Schedule as provided in Paragraph 5.17.A.

9.04 *Notification to Surety*

A. If notice of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times) is required by the provisions of any bond to be given to a surety, the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

9.05 *Claims*

A. *Engineer's Decision Required*: All Claims, except those waived pursuant to Paragraph 13.09, shall be referred to the Engineer for decision. A decision by Engineer shall be required as a condition precedent to any exercise by Owner or Contractor of any rights or remedies either may otherwise have under the Contract Documents or by Laws and Regulations in respect of such Claims.

B. *Notice:* Written notice stating the general nature of each Claim shall be delivered by the claimant to Engineer and the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. The responsibility to substantiate a Claim shall rest with the party making the Claim. Notice of the amount or extent of the Claim, with supporting data shall be delivered to the Engineer and the other party to the Contract within 60 days after the start of such event (unless Engineer allows additional time for claimant to submit additional or more accurate data in support of such Claim). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 11.01.B. A Claim for an adjustment in Contract Time shall be prepared in accordance with the provisions of Paragraph 11.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to Engineer and the claimant within 30 days after receipt of the claimant's last submittal (unless Engineer allows additional time).

C. *Engineer's Action*: Engineer will review each Claim and, within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any, take one of the following actions in writing:

1. deny the Claim in whole or in part,

2. approve the Claim, or

3. notify the parties that the Engineer is unable to resolve the Claim if, in the Engineer's sole discretion, it would be inappropriate for the Engineer to do so. For purposes of further resolution of the Claim, such notice shall be deemed a denial.

D. In the event that Engineer does not take action on a Claim within said 30 days, the Claim shall be deemed denied.

E. Engineer's written action under Paragraph 9.05.C or denial pursuant to Paragraphs 9.05.C.3 or 9.05.D will be final and binding upon Owner and Contractor, unless Owner or Contractor invoke the dispute resolution procedure set forth in Article 15 within 30 days of such action or denial.

F. No Claim for an adjustment in Contract Price or Contract Times will be valid if not submitted in accordance with this Paragraph 9.05.

ARTICLE 10 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

10.01 *Cost of the Work*

A. *Costs Included:* The term Cost of the Work means the sum of all costs, except those excluded in Paragraph 10.01.B, necessarily incurred and paid by Contractor in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to Contractor will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by Owner, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall include only the following items, and shall not include any of the costs itemized in Paragraph 10.01.B.

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time at the Site. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.

3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be

determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 10.01.

4. Costs of special consultants (including but not limited to Engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.

5. Supplemental costs including the following:

    a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.

    b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

    c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.

    d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, imposed by Laws and Regulations.

    e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

    f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.

    g. The cost of utilities, fuel, and sanitary facilities at the Site.

    h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the Site, expressages, and similar petty cash items in connection with the Work.

    i. The costs of premiums for all bonds and insurance Contractor is required by the Contract Documents to purchase and maintain.

B. *Costs Excluded:* The term Cost of the Work shall not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch

office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 10.01.A.1 or specifically covered by Paragraph 10.01.A.4, all of which are to be considered administrative costs covered by the Contractor's fee.

2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.

3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.

4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraphs 10.01.A and 10.01.B.

C. Contractor's Fee: When all the Work is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 11.01.C.

D. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to Paragraphs 10.01.A and 10.01.B, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

10.02 *Allowances*

A. Contractor shall include in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.

B. Cash Allowances

1. Contractor agrees that:

a. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

b. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

C. Contingency Allowance

1. Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.

D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

10.03 *Unit Price Work*

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.

B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by Engineer subject to the provisions of Paragraph 8.07.

C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

D. Owner or Contractor may make a Claim for an adjustment in the Contract Price in accordance with Paragraph 9.05 if:

1. the Bid price of a particular item of Unit Price Work amounts to more than 5 percent of the Contract Price and the variation in the quantity of that particular item of Unit Price Work performed by Contractor differs by more than 25 percent from the estimated quantity of such item indicated in the Agreement; and

2. there is no corresponding adjustment with respect to any other item of Work; and

3. Contractor believes that Contractor is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 11 – CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES

11.01 *Change of Contract Price*

A. The Contract Price may only be changed by a Change Order. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 9.05.

B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:

1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 10.03); or

2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.01.C.2); or

3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under Paragraph 11.01.B.2, on the basis of the Cost of the Work (determined as provided in Paragraph 10.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.01.C).

C. Contractor's Fee: The Contractor's fee for overhead and profit shall be determined as follows:

1. a mutually acceptable fixed fee; or

2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:

a. for costs incurred under Paragraphs 10.01.A.1 and 10.01.A.2, the Contractor's fee shall be 15 percent;

b. for costs incurred under Paragraph 10.01.A.3, the Contractor's fee shall be five percent;

c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraph 11.01.C.2.a is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under Paragraphs 10.01.A.1 and 10.01.A.2 and that any higher tier Subcontractor and Contractor will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;

d. no fee shall be payable on the basis of costs itemized under Paragraphs 10.01.A.4, 10.01.A.5, and 10.01.B;

e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and

f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 11.01.C.2.a through 11.01.C.2.e, inclusive.

11.02 *C*

hange of Contract Times

A. The Contract Times may only be changed by a Change Order. Any Claim for an adjustment in the Contract Times shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 9.05.

B. Any adjustment of the Contract Times covered by a Change Order or any Claim for an adjustment in the Contract Times will be determined in accordance with the provisions of this Article 11.

11.03 *D*

elays

A. Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in Paragraph 11.02.A. Delays beyond the control of Contractor shall include, but not be limited to, acts or neglect by Owner, acts or neglect of utility

owners or other contractors performing other work as contemplated by Article 6, fires, floods, epidemics, abnormal weather conditions, or acts of God.

1. Abnormal weather conditions are further defined as the occurrence of more than 1.5 inches of rain in a 24-hour period on a normal workday or 1.0 inch of snow in a 24-hour period on a normal workday.

B. If Owner, Engineer, or other contractors or utility owners performing other work for Owner as contemplated by Article 6, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

C. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal weather conditions, acts of God, acts or failures to act of utility owners not under the control of Owner, or other causes not the fault of and beyond control of Owner and Contractor, then Contractor shall be entitled to an equitable adjustment in Contract Times, if such adjustment is essential to Contractor's ability to complete the Work within the Contract Times.

D. Owner, Engineer and the Related Entities of each of them shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of Engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

E. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.

ARTICLE 12 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

12.01 *N*

otice of Defects

A. Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor. All defective Work may be rejected, corrected, or accepted as provided in this Article 12.

12.02 *A*

ccess to Work

A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and governmental agencies with jurisdictional interests will have access to the Site and the Work at reasonable times for their observation, inspecting, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's Site safety procedures and programs so that they may comply therewith as applicable.

12.03 *T*

ests and Inspections

A. Contractor shall give Engineer timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

1. Timely notice for inspections, tests, or approvals shall mean not less than 24 hours prior to the time when inspection, test, or approval is required.

B. Owner shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:

1. for inspections, tests, or approvals covered by Paragraphs 12.03.C and 12.03.D below;

2. that costs incurred in connection with tests or inspections conducted pursuant to Paragraph 12.04.B shall be paid as provided in said Paragraph 12.04.C; and

3. as otherwise specifically provided in the Contract Documents.

C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

D. Contractor shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to Owner and Engineer.

E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, it must, if requested by Engineer, be uncovered for observation.

F. Uncovering Work as provided in Paragraph 12.03.E shall be at Contractor's expense unless Contractor has given Engineer timely notice of Contractor's intention to cover the same and Engineer has not acted with reasonable promptness in response to such notice.

12.04 *U*

ncovering Work

A. If any Work is covered contrary to the written request of Engineer, it must, if requested by Engineer, be uncovered for Engineer's observation and replaced at Contractor's expense.

B. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment.

C. If it is found that the uncovered Work is defective, Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 9.05.

D. If, the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure,

observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, Contractor may make a Claim therefor as provided in Paragraph 9.05.

12.05 *Owner May Stop the Work*

A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

12.06 *Correction or Removal of Defective Work*

A. Promptly after receipt of notice, Contractor shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by Engineer, remove it from the Project and replace it with Work that is not defective. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others and including all Owner's engineering costs associated with correction of the defective Work and re-inspection of the corrected Work).

B. When correcting defective Work under the terms of this Paragraph 12.06 or Paragraph 12.07, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

12.07 *Correction Period*

A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents) or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for Contractor's use by Owner or permitted by Laws and Regulations as contemplated in Paragraph 5.10.A is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

1. repair such defective land or areas; or

2. correct such defective Work; or

3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and

4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom.

B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals

and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor.

C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.

D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this Paragraph 12.07, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

E. Contractor's obligations under this Paragraph 12.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 12.07 shall not be construed as a substitute for or a waiver of the provisions of any applicable statute of limitation or repose.

12.08 *Acceptance of Defective Work*

A. If, instead of requiring correction or removal and replacement of defective Work, Owner (and, prior to Engineer's recommendation of final payment, Engineer) prefers to accept it, Owner may do so. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness) and the diminished value of the Work to the extent not otherwise paid by Contractor pursuant to this sentence. If any such acceptance occurs prior to Engineer's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and Owner shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 9.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by Contractor to Owner.

12.09 *Owner May Correct Defective Work*

A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work or to remove and replace rejected Work as required by Engineer in accordance with Paragraph 12.06.A, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, Owner may, after seven days written notice to Contractor, correct or remedy any such deficiency.

B. In exercising the rights and remedies under this Paragraph 12.09, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, take possession of Contractor's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this Paragraph.

C. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 12.09 will be charged against Contractor, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, Owner may make a Claim therefor as provided in Paragraph 9.05. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 12.09.

ARTICLE 13 – PAYMENTS TO CONTRACTOR AND COMPLETION

13.01 *Schedule of Values*

A. The Schedule of Values, when required and established as provided in Paragraph 1.07.A, will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed.

13.02 *Progress Payments*

A. Applications for Payments

1. On the last working day of each month, or on such other date as established in the Agreement, Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.

    a. *Conditions Concerning Payment, Contributions, Liens, Withholding, and Drug Testing*: In accordance with ORS 279C.505, the Contractor shall make payment promptly, as due, to all persons supplying to the Contractor labor or material for the performance of the Work provided for in the Contract; pay all contributions or amounts due the Industrial Accident Fund from the Contractor or subcontractor incurred in the performance of the Contract; not permit any lien or claim to be filed or prosecuted against Owner on account of any labor or material furnished; and pay to the Department of Revenue all sums withheld from employees under

ORS 316.167. In addition, the Contractor shall demonstrate that an employee drug testing program is in place.

b. *Payment of Claims by the Owner:* If the Contractor fails, neglects, or refuses to make prompt payment of any Claim for labor or services furnished to the Contractor or a subcontractor by any person in connection with the Contract as the Claim becomes due, whether said services and labor be performed for the Contractor or a subcontractor, then in such event, the Owner may pay such Claim to the person furnishing the labor or services and charge the amount of the payment against funds due or to become due to the Contractor by reason of the Contract. The payment of a Claim in such manner shall not relieve the Contractor or his Surety from his or its obligation with respect to any unpaid claims. If the Owner is unable to determine the validity of any Claim for labor or material furnished, the Owner may withhold from any current payment due Contractor an amount equal to said Claim until its validity is determined, and the Claim, if valid, is paid by the Contractor or the Owner. There shall be no final acceptance of the work under the Contract until all such Claims have been resolved.

1) If the Contractor or a subcontractor fails, neglects or refuses to make payment to a person furnishing labor or materials in connection with the Contract, the person may file a complaint with the Construction Contractors Board, unless payment is subject to a good faith dispute as defined in ORS 279C.580.

3. A percentage of the amount requested on each Application for Payment will be withheld as retainage until final acceptance of the Work by the Owner. Retainage shall be at a rate of 5% of the amount requested on each Application for Payment unless otherwise stipulated in the Agreement. Owner shall pay all retained sums due Contractor within 30 days following final acceptance of the Work or Contractor will be entitled to interest on the retained sums as identified in ORS 279C.570 (8).

4.

B. Review of Applications

1. Engineer will, within 10 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to Owner or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.

2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations on the Site of the executed Work as an experienced and qualified design professional and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

a. the Work has progressed to the point indicated;

b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, to the results of any subsequent tests called for in the Contract Documents, to a final determination of quantities and classifications for Unit Price Work under Paragraph 8.07, and to any other qualifications stated in the recommendation); and

c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.

3. By recommending any such payment Engineer will not thereby be deemed to have represented that:

    a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract Documents; or

    b. that there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:

    a. to supervise, direct, or control the Work, or

    b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or

    c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or

    d. to make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price, or

    e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.

5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 13.02.B.2. Engineer may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in Engineer's opinion to protect Owner from loss because:

    a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;

    b. the Contract Price has been reduced by Change Orders;

    c. Owner has been required to correct defective Work or complete Work in accordance with Paragraph 12.09; or

    d. Engineer has actual knowledge of the occurrence of any of the events enumerated in Paragraph 14.02.A.

C. Payment Becomes Due

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended will (subject to the provisions of Paragraph 13.02.D) become due, and when due will be paid by Owner to Contractor.

a. The Owner and Contractor are bound by the rights and responsibilities of the prompt payment policies and shall comply with the procedures for prompt payment as stated in ORS 279C.515, 279C.570 and ORS 279C.580.

D. Reduction in Payment

1. Owner may refuse to make payment of the full amount recommended by Engineer because:

a. claims have been made against Owner on account of Contractor's performance or furnishing of the Work;

b. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;

c. there are other items entitling Owner to a set-off against the amount recommended; or

d. Owner has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 13.02.B.5.a through 13.02.B.5.c or Paragraph 14.02.A.

e. Third party claims filed or evidence indicating probable filing of such claims.

f. Failure of Contractor to make payments properly or promptly to subcontractors for material, labor, or equipment.

g. Damage to Owner or others.

2. If Owner refuses to make payment of the full amount recommended by Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, when Contractor corrects to Owner's satisfaction the reasons for such action.

3. If it is subsequently determined that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 13.02.C.1.

13.03 *Contractor's Warranty of Title*

A. Contractor warrants and guarantees that title to all Work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to Owner no later than the time of payment free and clear of all Liens.

13.04 *Substantial Completion*

A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete (except for items specifically listed by Contractor as incomplete) and request that Engineer issue a certificate of Substantial Completion.

1. Substantially complete is further defined and clarified as being 100% complete in accordance with the Contract Documents with the exception of minor and specific corrective items that will be itemized by the Engineer on a final punch list and completed before final acceptance. Final completion of the Work shall be no later than the time indicated on the Certificate of Substantial Completion. If no date is

indicated, then fifteen (15) calendar days from the date of Substantial Completion will be considered maximum. If final completion is not accomplished within the time allowed, Owner will be entitled to liquidated damages as defined in the Agreement beginning at the indicated date of completion and continuing until final completion or a time extension is granted.

2. *Liquidated Damages:* Should the Contractor fail to achieve Substantial Completion or final acceptance in the time agreed upon in the Contract or within such extra time as may be allowed by extensions granted as provided in the Contract, the Contractor shall reimburse the Owner for the additional expense and damage for every day that the Work remains incomplete after the agreed date of completion. Owner is authorized to deduct the amount of such liquidated damages from any monies due the Contractor for work performed or material furnished under this Contract, and the Contractor and his sureties shall be liable for any excess. Liquidated damages include only costs and expenses incurred by the Owner for delay of completion beyond the agreed to Contract times. Liquidated damages do not include any other cost, expense or claim Owner may have against Contractor for any other reason.

B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make a prefinal inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.

C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a tentative Certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the tentative certificate during which to make written objection to Engineer as to any provisions of the certificate or attached list. If, after considering such objections, Engineer concludes that the Work is not substantially complete, Engineer will within 14 days after submission of the tentative certificate to Owner notify Contractor in writing, stating the reasons therefor. If, after consideration of Owner's objections, Engineer considers the Work substantially complete, Engineer will within said 14 days execute and deliver to Owner and Contractor a definitive Certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as Engineer believes justified after consideration of any objections from Owner.

D. At the time of delivery of the tentative certificate of Substantial Completion, Engineer will deliver to Owner and Contractor a written recommendation as to division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless Owner and Contractor agree otherwise in writing and so inform Engineer in writing prior to Engineer's issuing the definitive certificate of Substantial Completion, Engineer's aforesaid recommendation will be binding on Owner and Contractor until final payment.

E. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to complete or correct items on the tentative list.

13.05 *P*

artial Utilization

A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions.

1. Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to be ready for its intended use and substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor will certify to Owner and Engineer that such part of the Work is substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.

2. Contractor at any time may notify Owner and Engineer in writing that Contractor considers any such part of the Work ready for its intended use and substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.

3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 13.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 4.09 regarding property insurance.

13.06 *F*

inal Inspection

A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner, and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

13.07 *F*

inal Payment

A. Application for Payment

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance certificates of inspection, marked-up record documents (as provided in Paragraph 6.12), and other documents, Contractor may make application for final payment following the procedure for progress payments.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:

    a. all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by Paragraph 4.04.B.7;

    b. consent of the surety, if any, to final payment;

    c. a list of all Claims against Owner that Contractor believes are unsettled; and

    d. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work.

3. In lieu of the releases or waivers of Liens specified in Paragraph 13.07.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner or Owner's property might in any way be responsible have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien.

4. Final payment will not be made to the Contractor until Contractor files with the Owner a notarized affidavit containing the following statements:

    a. "I (we) hereby certify that all work has been performed and material supplied in accordance with the plans, specifications, and Contract Documents for the above work;

    b. No less than the prevailing rates of wages as ascertained by the governing body of the contracting agency has been paid to laborers and workers employed on this work (a signed State-approved Wage Certification Form certifying that Contractor has paid not less than the prevailing rate of wages as required by law);

    c. No subcontract was assigned or transferred or performed by any subcontractor other than the original subcontractor, without prior notice having been submitted to the Engineer together with the names of all subcontractors;

    d. All suppliers and subcontractors connected with the Work have been paid in full;

    e. All claims for material and labor and other services performed in connection with these specifications have been paid; and

    f. All monies due the State Industrial Accident Fund, the State Unemployment Compensation Trust Fund, the State Tax Commission, hospital associations and/or others have been paid."

B. Engineer's Review of Application and Acceptance

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract Documents have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of payment and present the Application for Payment to Owner for payment. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable subject to the provisions of Paragraph 13.09. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. Payment Becomes Due

1. Thirty days after the presentation to Owner of the Application for Payment and accompanying documentation, the amount recommended by Engineer, less any sum Owner is entitled to set off against Engineer's recommendation, including but not limited to liquidated damages, will become due and will be paid by Owner to Contractor.

13.08 *Final Completion Delayed*

A. If, through no fault of Contractor, final completion of the Work is significantly delayed, and if Engineer so confirms, Owner shall, upon receipt of Contractor's final Application for Payment (for Work fully completed and accepted) and recommendation of Engineer, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by Owner for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if bonds have been furnished as required in Paragraph 4.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by Contractor to Engineer with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims. The remaining balance of any sum included in the final Application for Payment but held by Owner for Work not fully completed and accepted will become due when the Work is fully completed and accepted.

13.09 *Waiver of Claims*

A. The making and acceptance of final payment will constitute:

1. a waiver of all Claims by Owner against Contractor, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 13.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from Contractor's continuing obligations under the Contract Documents; and

2. a waiver of all Claims by Contractor against Owner other than those previously made in accordance with the requirements herein and expressly acknowledged by Owner in writing as still unsettled.

ARTICLE 14 – SUSPENSION OF WORK AND TERMINATION

14.01 *Owner May Suspend Work*

A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by notice in writing to Contractor and Engineer which will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be granted an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if Contractor makes a Claim therefor as provided in Paragraph 9.05.

14.02 *Owner May Terminate for Cause*

A. The occurrence of any one or more of the following events will justify termination for cause:

1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule established under Paragraph 1.07 as adjusted from time to time pursuant to Paragraph 5.04);

2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;

3. Contractor's disregard of the authority of Engineer; or

4. Contractor's violation in any substantial way of any provisions of the Contract Documents.

B. If one or more of the events identified in Paragraph 14.02.A occur, Owner may, after giving Contractor (and surety) seven days written notice of its intent to terminate the services of Contractor:

1. exclude Contractor from the Site, and take possession of the Work and of all Contractor's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion),

2. incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and

3. complete the Work as Owner may deem expedient.

C. If Owner proceeds as provided in Paragraph 14.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this Paragraph Owner shall not be required to obtain the lowest price for the Work performed.

D. Notwithstanding Paragraphs 14.02.B and 14.02.C, Contractor's services will not be terminated if Contractor begins within seven days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure within no more than 30 days of receipt of said notice.

E. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability.

F. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 5.01.A, the termination procedures of that bond shall supersede the provisions of Paragraphs 14.02.B, and 14.02.C.

14.03 *Owner May Terminate For Convenience*

A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):

1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;

3. all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and

4. reasonable expenses directly attributable to termination.

B. Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

14.04 *Contractor May Stop Work or Terminate*

A. If, through no act or fault of Contractor, (i) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (ii) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (iii) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the Contract and recover from Owner payment on the same terms as provided in Paragraph 14.03.

B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this Paragraph 14.04 are not intended to preclude Contractor from making a Claim under Paragraph 9.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this Paragraph.

ARTICLE 15 – DISPUTE RESOLUTION

15.01 *Methods and Procedures*

A. Owner and Contractor may mutually request mediation of any Claim submitted to Engineer for a decision under Paragraph 9.05 before such decision becomes final and binding. The mediation will be governed by the Construction Industry Mediation Rules of the American Arbitration Association in effect as of the Effective Date of the Agreement. The request for mediation shall be submitted in writing to the American Arbitration Association. Timely submission of the request shall stay the effect of Paragraph 9.05.E.

B. Owner and Contractor shall participate in the mediation process in good faith. The process hall be concluded within 60 days of filing of the request. The date of termination of the mediation shall be determined by application of the mediation rules referenced above.

C. If the claim is not resolved by mediation, Engineer's action under Paragraph 9.05.C or a denial pursuant to Paragraphs 9.05.C.3 or 9.05.D shall become final and binding 30 days after termination of the mediation unless, within that time period, Owner or Contractor:

1. elects in writing to invoke any dispute resolution process provided for in the Special Provisions, or

2. agrees with the other party to submit the Claim to another dispute resolution process, or

3. gives written notice to the other party of their intent to submit the Claim to a court of competent jurisdiction.

ARTICLE 16 – MISCELLANEOUS

16.01 *G*
iving Notice

A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:

1. delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or

2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

16.02 *C*
omputation of Times

A. When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

16.03 *C*
umulative Remedies

A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract Documents. The provisions of this Paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

16.04 *S*
urvival of Obligations

A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

16.05 *C*
ontrolling Law

A. This Contract is to be governed by the law of the state in which the Project is located.

16.06 *H*
eadings

A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

16.07 *R*

eassignment of the Contract

A. Neither party to the Contract shall assign the Contract or sublet it as a whole without the written consent of the other, nor shall the Contractor assign any moneys due or to become due hereunder, without the previous written consent of the Owner.

DIVISION 01 – GENERAL REQUIREMENTS

01 00 00 GENERAL REQUIREMENTS

A. General

1. The Contractor shall furnish all labor, equipment, and materials necessary to complete all work in accordance with the Contract Documents.

2. The work shall be performed within the City of Coos Bay, Coos County, Oregon.

01 20 00 Price and Payment Procedures

A. General

1. Wherever in the Specifications an article, device or piece of equipment is referred to in singular, such reference shall include as many such items as are shown on the Drawings or required to complete the installation.

2. Miscellaneous items required in the project that do not have a corresponding section on the Bid Form are to be considered incidental costs to the project. Compensation for such items and/or work shall be incorporated into other related bid items or total costs. No separate measurement and payment will occur for such incidental costs.

3. Monthly progress payments and final payment will be made in accordance with the Contract, the General Conditions, and the Special Provisions. A portion of all progress payments will be withheld as "retainage" in accordance with the General Conditions.

4. Additional detail on measurement and payment may be found in other Sections detailing specific items.

01 22 00 Unit Prices

A. Payments on Unit Price contracts will be determined as the product of the quantity of individual items (units) incorporated and installed on the Project and the corresponding prices provided by the Contractor on the accepted Bid Form. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor.

01 23 00 Lump Sums

A. Payments on lump sum contracts and/or bid items will be made based on the percentage of work complete at the end of the particular payment period.

B. Percentage of work complete will be recorded and submitted by the Contractor and estimated by the Engineer based on inspection. Payment will be based on the approved Schedule of Values as submitted by the Contractor.

C. When so required by the Owner, Contractor shall provide copies of the subcontracts or other data acceptable to the Owner substantiating the sums described.

01 25 00 Substitution Procedures

A. Summary – This Section describes procedures for securing approval of proposed product substitutions.

B. Product Options

1. The Contract is based on standards of quality established in the Contract Documents.

2. In agreeing to the terms and conditions of the Contract, the Contractor has accepted the responsibility to verify that the specified products will be available and to place orders for all required materials in such a timely manner as is needed to meet his agreed construction schedule.

3. The Owner has not agreed to the substitution of materials or methods called for in the Contract Documents, except as they may specifically otherwise state in writing.

4. Where materials and methods are specified by naming one single manufacturer or model number, without stating that equal products will be considered, only the material and method named is approved for incorporation into the Work.

5. Where materials and methods are specified by name or product number, followed by the words "or equal approved in advance", materials and methods proposed by the Contractor to be used in lieu of the named materials and methods shall in all ways be equal or exceed the qualities of the named materials or methods. For consideration as an "equal approved in advance", complete detailed submittals (4 copies) must be received by the Engineer at least fourteen (14) days prior to the Bid Opening. Approved substitute items will be listed by Addendum prior to Bid Opening.

6. Where the phrase "or equal," or "or approved equal," occurs in the Contract Documents, Contractor shall not assume that proposed materials, equipment or methods will be approved as equal unless the item has been specifically approved for the Work. Prepare detailed submittal and submit to Engineer. Substitutes will not be incorporated into the work unless submittal is approved by the Owner via the Engineer.

7. Submittals shall include all technical information and diagrams as necessary to allow Engineer to evaluate the proposed substitution. Any/all differences between the Specifications or specified equipment and the proposed substitution shall be clearly noted in the submittal.

C. Delays

1. Delays in construction arising because of the time required for approval of substitution requests will not be considered by the Owner as justification for an extension of Contract Times.

01 26 00 Contract Modification Procedures

A. The following subsections include interpretation or clarification of the Contract Documents or Project intent, as well as changes in the Work, the Contract Price, the Contract Times, or any combination thereof.

B. Also see applicable sections of the General Conditions and applicable portions of any Special Provisions.

C. Requests for Interpretation – Contractor may request interpretation of the Contract Documents when the intent of the Project is unclear. Requests for interpretation shall be in writing with copies provided to Owner and Engineer.

D. Clarification Notices – The Engineer will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work completed. When applicable, Clarification Notices will be issued by the Engineer to clarify any issues arising during Contractor's performance of the Work.

E. Minor Changes in the Work – Engineer may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in Contract Price or Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order issued by the Engineer.

F. Field Orders – Field Orders as issued by the Engineer will be binding on Owner and Contractor. Contractor shall perform the Work involved promptly. No change in Contract Price or Contract Times shall be allowed for changes in the Work as directed within a Field Order.

G. Change Order Requests – Contractor may request that the Owner consider a Change Order by sending a written Change Order Request to both Owner and Engineer.

H. Change Orders

1. Change Orders will be numbered in sequence and dated. The Change Order will describe the changes and will be signed by the Owner, Engineer and the Contractor. Request for estimates for possible changes are not to be considered Change Orders or direction to proceed with the proposed changes.

2. Change Orders will be prepared by the Engineer and forwarded to Owner and Contractor for signature. Change Orders shall not be considered effective until all signatures have been obtained.

01 29 00 Progress Payment Procedures

A. Monthly progress payments will be made as set forth in the Agreement, in accordance with the General Conditions and Special Provisions.

B. At the stated day of the month, Contractor shall submit a monthly payment request in accordance with the General Conditions and Special Provisions. Base request on actual quantities installed and completed, and/or approved Schedule of Values with percent complete of each item. Show payment requested for each item, and total payment requested.

C. Engineer will review payment requests and compare with inspection records to verify quantities and completed items. Engineer will recommend payment amounts for Owner approval and payment.

01 30 00 ADMINISTRATIVE REQUIREMENTS

01 31 00 Project Management and Coordination

A. Work shall be restricted to public rights-of-way, public utility easements, or City owned or controlled sites on which the Work is planned. Staging and/or storage of materials or equipment may be conducted on private property with the written consent of the owner of the subject property. Contractor shall supply evidence of owner consent upon request of the Engineer.

B. Permit and maintain access for the Owner to any adjacent facilities that are not part of Work included within the Project.

C. Coordinate with Owner or the appropriate utility company as necessary to determine the locations of underground piping, vaults, valves and other items that could be damaged during construction.

D. Contractor shall be responsible to comply with all laws and rules adopted by the Oregon Utilities Coordinating Council. Contractor shall call the Oregon Utility Notification Center at 1-800-322-2344 or 811 at least 24 hours in advance of any digging.

01 32 00 Construction Progress Documentation

A. Provide a progress schedule indicating the times for starting and completing the various stages of work, including any Milestones.

B. As work progresses, Contractor shall prepare and submit updated progress schedules as necessary.

C. Within 10 days after the date of the Agreement (Contract), submit a proposed Construction Schedule to the Owner and Engineer for approval.

01 33 00 Submittal Procedures

A. Technical submittals are generally not required when materials conforming to and as called out in the Standard Specifications are used on a Project. For any proposed material substitutions or deviations from the applicable Standard Specification, submittals must be provided by the Contractor. Submittals are required for any specialty or non-standard items covered in the Special Provisions. A full set of technical submittals will be required on all building projects and those of a mechanical nature.

B. Technical submittals, when required, shall be provided as follows:

1. Contractor shall submit four (4) copies of all submittal material to Engineer for review.

2. Submittals shall include manufacturer's information, shop drawings, test procedures, test results, samples, request for substitutions and miscellaneous work related submittals. Submittals shall include, but not be limited to, all materials, fabricated items, and piping details as applicable to the project.

3. Contractor's Responsibilities:

   a. The Contractor shall furnish all drawings, specifications, descriptive data, certifications, samples, tests, methods, schedules and manufacturers installation and other instructions as required by the contract documents to demonstrate fully that the materials to be furnished and the methods of work comply with the provisions and intent of the Contract Documents.

b. The Contractor shall be responsible for the accuracy and completeness of the information contained in each submittal and shall assure that the material, equipment or method of work shall be as described in the submittal. The Contractor shall verify that all features of all products conform to the specified requirements.

c. The Contractor shall ensure that there is no conflict with other submittals and notify the Engineer in each case where his submittal may affect the work as shown on the Plans.

d. The Contractor shall coordinate submittals among his subcontractors and suppliers.

e. Submittals shall coordinate with the work so that work will not be delayed. Coordinate and schedule different categories of submittals, so that one will not be delayed for lack of coordination with another. No extension of time will be allowed because of failure to properly schedule submittals.

f. The Contractor shall not proceed with work related to a submittal until the submittal review process is complete.

g. The Contractor shall certify on each submittal document that he has reviewed the submittal, verified final conditions and complied with the contract documents. The Contractor may authorize in writing a material or equipment supplier to deal directly with the Engineer. This interaction shall be limited to contract interpretations to clarify and expedite the work.

C. Review Requirements

1. Review shall not extend to means, methods techniques, sequences or procedures of construction, or to verify quantities, dimensions, weights or gages, or to fabrication processes, except when specifically indicated or required by the contract documents, or to safety precautions or programs.

2. Engineer shall review and mark up all four (4) copies of submittal materials provided by Contractor. Upon final approval, two (2) copies will be returned to the Contractor. If a submittal or portion thereof is rejected, all four (4) copies will be returned to the Contractor with deficiencies noted. Contractor shall resubmit four (4) copies of all rejected submittals to Engineer. Charges will be documented and the Contractor will be charged for review of multiple non-conforming submittals for any one (1) item in excess of two (2) times.

3. Unless otherwise specified, within 21 calendar days after receipt of submittal, the Engineer will return the marked-up copies. The Contractor shall take appropriate action if the submittal needs to be resubmitted.

01 40 00 QUALITY REQUIREMENTS

A. This Section describes general quality requirements for products and equipment incorporated into the Work.

B. Specific requirements for manufacturing, supply, scheduling, installation, and testing of products and equipment shall be covered in the applicable specification for such products and equipment.

01 45 00 Quality Control

A. Work shall conform to the Specifications, any applicable Special Provisions, and the standards of quality contained and/or referenced herein.

B. Only new items of recent manufacturer and quality specified, free from defects, will be permitted on the Work, unless items are specifically noted as existing to be reutilized. Remove rejected items immediately from the Work and replace with items of quality specified. Failure to remove rejected materials and equipment shall not relieve the Contractor from responsibility for quality and character of items used, nor from any other obligation imposed by the Contract.

C. No work defective in construction or quality, or deficient in any requirement of the drawings and specifications will be acceptable in consequence of the Owner's or the Engineer's failure to discover or to point out defects or deficiencies during construction; nor will the presence of Resident Project Representatives on the work relieve the Contractor from responsibility for securing the quality and progress of work as required by the Contract. Defective work revealed within the time required by guarantees shall be replaced by the Contractor by work conforming to the intent of the Contract. No payment, whether partial or final, shall be construed as an acceptance of defective work or improper materials.

D. Testing

1. All final testing of materials and equipment installed on the project shall be performed in the presence of the Engineer.

2. Schedule testing with Engineer at least 24-hours in advance.

3. Contractor shall ensure all systems are properly functioning and meet the specified performance requirements prior to scheduling inspection for final testing.

01 50 00 TEMPORARY FACILITIES & CONTROLS

A. This Section includes temporary utilities, temporary construction, safety requirements, traffic control, temporary environmental facilities, and other temporary controls.

B. Submittals: The following submittals shall be required for each Project:

1. Traffic control plan (see Section 01 55 00).

2. Staging area plan and notification of any obstructions encountered during mobilization.

3. Plans for disposal of waste materials and excavated materials not required for fill, including permits as required.

01 51 00 Temporary Utilities

A. Electric Power and Telephone – Electrical power, if required, shall be the soul responsibility of the Contractor. Phone service, if required, shall also be the soul responsibility of the Contractor.

B. Water – Contractor shall make arrangements with the Coos Bay-North Bend Water Board (267-3128) if water service is required for the project.

01 52 00 Construction Facilities

A. Sanitary Facilities – Contractor shall provide chemical toilets of suitable type and maintain them in a sanitary condition at all times, conforming to code requirements and acceptable to the health authorities. They shall be of watertight construction so that no contamination of the area can result from their use. Arrangements shall be made for frequent emptying of the toilets. Upon completion of the Work, toilets shall be removed and the area restored to its original condition.

B. The following number of chemical toilets shall be required:

1. Minimum one (1) toilet to be located as necessary at each separate construction site. One additional toilet shall be provided at each site for each multiple of 10 workers greater than 10 (i.e. two toilets for 11-20 workers; three toilets for 21-30 workers, etc.).

2. For sites greater than 400 feet in length, at least one toilet shall be provided within 200 feet of all active work areas.

01 53 00 Temporary Construction

A. If any temporary piping, bypass facilities, or other temporary construction not shown on the Plans is required in order to complete the Work, Contractor shall submit a plan to the Engineer for review and approval prior to installation or construction.

B. All temporary piping, bypass facilities, and other temporary construction shall be completely removed from the site following completion of the Work. Any damage to existing improvements, whether public or private, that occurs as a result of temporary construction or removal thereof shall be corrected at the sole expense of the Contractor.

01 55 00 Vehicular Access and Parking

A. General

1. Contractor shall comply with all City, County, and State rules and regulations regarding the closing, detouring, and loading of any public street in and around the work zone. In general, a Right-of-Way Use Permit is required from the City of Coos Bay for any work within a public right-of-way.

2. Contractor shall prepare, and submit for approval a Traffic Control Plan to the Engineer and City of Coos Bay, or other appropriate governing body of such road.

3. Contractor shall, at all times, conduct the work so as to assure the least possible obstruction to traffic and normal commercial pursuits. The convenience of the general public and residents, safety, and the protection of property is of prime importance and shall be provided for by the Contractor in an adequate and satisfactory manner. Contractor shall furnish all flaggers, lights, signs, etc. as required to comply with regulations and provide safety.

B. Street/Lane Closure – For work within the public right-of-way, it is assumed that temporary closure of lanes in and around the project site will be required at various times in order to complete the Work. All

lane closure, detour route, and road closure signs shall be placed and maintained as necessary to facilitate safe and efficient traffic flow around the work area. Flaggers shall be used to direct traffic through the work zone for any lane closure on a two lane street.

C. Whenever the Contractor's operations create a hazardous condition, Contractor shall furnish flagmen and guards as necessary, or as directed, to give adequate warning to the public of any dangerous conditions to be encountered. Contractor shall furnish, erect, and maintain approved fences, barricades, lights, signs, and any other devices that may be necessary to prevent accidents and to avoid damage and injury to the public. Flaggers and guards, while on duty and assigned to give warning to the public, shall be equipped with approved red wearing apparel and a red flag which shall be kept clean and in good repair. Signs, flags, lights, and other warning and safety devices shall meet the requirements of the current ODOT safety manual affecting the location of construction, or to applicable City/County standards.

D. Traffic Control Plan – Contractor shall submit a Traffic Control Plan to the Engineer and City of Coos Bay for review at least one week prior to beginning work. Contractor shall seek to minimize inconvenience to public by posting detour signs where practical. Flaggers shall be provided to direct traffic through the work zone when it is necessary to close a lane and no practical detour route is available.

01 56 00 Temporary Barriers and Enclosures

A. All barricades, barriers, fences, and other safety and warning devices shall meet safety requirements of the Oregon Department of Transportation.

B. The Contractor shall at his own expense furnish, install and maintain suitable barricades, barriers, fences, signs, lights, signals, and other protective devices as may be necessary or as directed by the Engineer to insure the safety of the public and those connected with the work.

C. Failure of the Engineer to notify the Contractor to maintain barricades, barriers, fences, signs, lights, signals, and other protective devices shall not relieve the Contractor from this responsibility. All barricades and obstructions shall be protected at night by signal lights which shall be suitably distributed and kept lit from sunset to sunrise. Barricades shall be of substantial construction and shall be suitably painted to increase their visibility at night.

01 57 00 Temporary Controls

A. Temporary Environmental Controls – The Contractor shall maintain affected areas from his construction free from environmental pollution that would be in violation of federal, state or local regulations.

B. Air Pollution Control – Minimize air pollution likely to occur from construction operations by wetting down bare soils to control dust and requiring proper combustion emission control devices on construction vehicles.

01 58 00 Project Identification

A. When required by Funding Agencies, Contractor shall furnish and install a project sign at the site in accordance with Agency requirements. Sign design and language shall be as directed or approved by the subject Agency.

01 60 00 PRODUCT REQUIREMENTS

A. Protect materials and equipment scheduled for use in the Work by means as described in this Section and as recommended by the manufacturer.

01 65 00 Product Delivery Requirements

A. Except as otherwise approved by the Owner, determine and comply with manufacturer's instructions regarding product packaging, handling, and protection during delivery.

B. Delivery and Protection

1. Contractor shall arrange for delivery of all materials and equipment by appropriate trucks or other means in order to prevent damage during transport to the project site.

2. Secure materials and equipment to the delivery vehicle in accordance with the manufacturer's recommendations and as necessary to prevent movement or damage.

3. Cover and protect materials and equipment in accordance with manufacturer's recommendations and as otherwise necessary to prevent damage.

01 66 00 Product Storage and Handling Requirements

A. Contractor shall provide or arrange for appropriate equipment to unload all materials and equipment at the project site.

B. Packaging

1. Deliver products to the job site in their manufacturer's original container, with the labels intact and legible.

2. Maintain packaged materials with seals unbroken and labels intact until time of use.

3. Promptly remove damaged material and unsuitable items from the job site, and promptly replace with material meeting the specified requirements at no additional cost to the Owner.

4. The Owner may reject as non-complying such material and products that do not bear identification satisfactory to the Owner as to the manufacturer, grade, quality and other pertinent information.

C. Storage and Protection

1. Store materials on-site in coordination with the Owner to provide suitable site access and clearance.

2. Do not store unnecessary materials that will not be incorporated into the work.

3. Protect stored materials from moisture and temperature, and unauthorized handling.

4. Provide protection for finished surfaces.

5. Maintain finished surfaces clean, unmarred and suitably protected until accepted by the Owner.

6. Provide proper protection for all workers.

D. Repairs and Replacements

1. In event of damage, promptly make replacements and repairs to the approval of the Owner and at no additional cost to the Owner.

2. Additional time required to secure replacements and to make repairs will not be considered by the Owner to justify an extension of the Contract Time of Completion.

3. Repair all scratches and damage to painted surfaces promptly with proper color and material.

01 70 00 EXECUTION AND CLOSEOUT REQUIREMENTS

01 71 00 Examination and Preparation

A. It is the intent of these Contract Documents that the progress of the Work proceed in a systematic manner so that a minimum of inconvenience to the public results in the progression of the Work.

B. Contractor shall thoroughly examine the Contract Documents and site conditions prior to commencement of Work in order to ensure that the Work can be completed in a timely manner. Suitable equipment will be required to properly execute the Work with the least amount of disruption to services and access. Contractor shall contain operations to within the designated public rights-of-way and within construction easements obtained for the project.

C. Order and schedule delivery of materials in ample time to avoid delays in construction. If an item is found to be unavailable, notify the Engineer immediately to permit the Engineer's selection of suitable substitute. Timely delivery of all materials and equipment is Contractor's responsibility. No extensions in Contract Time will be allowed due to delays caused by late delivery of items. Availability of items should be determined during bidding.

01 73 00 Execution

A. Contractor shall protect the work and materials from damage due to the nature of the work, the elements, carelessness of others, or from any other cause until the completion and final acceptance of the work. All loss or damages arising out of the nature of the work to be done under the Contract Documents, or from any unseen obstruction or defects which may be encountered in the execution of the work, or from the action of the elements, shall be sustained by the Contractor.

B. Contractor shall remove completely all materials designated for removal, to the extent specified and/or indicated in the Drawings. For such materials, removal, hauling, disposal (including providing disposal location), and applicable precautions are entirely the Contractor's responsibility. Allow no excess accumulation of non-reusable material at job site(s).

C. Contractor to perform all necessary testing in presence of Engineer in order to document test results. Comply with Section 01 45 00 and other applicable sections related to specific materials and/or equipment installed on the project.

01 74 00 Cleaning and Waste Management

A. Upon completion of any portion of the work, promptly remove temporary facilities generated by that portion of the work, including surplus materials, equipment and machinery unless directed otherwise by the Engineer or the Owner. All construction work by the Contractor shall be clean and free of rubbish, dirt, overspray, and extraneous materials to the satisfaction of the Engineer before acceptance of the work.

B. All roadways affected during construction shall be cleaned and restored. All ditches and culverts shall be cleaned and regraded for proper drainage.

01 75 00 Startup and Adjustment

A. When applicable, Contractor, supplier, manufacturer, or other person having responsibility for equipment furnished and installed under the Contract shall provide complete startup and field adjustment procedures to ensure a properly functioning system.

B. Startup and adjustment shall include the following:

1. Verify proper function of all valves, actuators, mechanical devices, and electrical components.
2. Test all electrical and process system functions at maximum or worst case operating conditions.
3. Verify specified capacity requirements are met during operation.
4. Program all required set points or other limiting conditions for automated equipment or processes.
5. Test complete integrated systems where multiple pieces of equipment contribute to a process or function.
6. Test all telemetry and SCADA components, recording equipment, and shutdown and alarm functions.
7. Other, as directed by the Engineer or Owner.

01 76 00 Protecting Installed Construction

A. Contractor responsible for the protection of all existing improvements that are to remain in place. This includes, but is not necessarily limited to: existing utilities, roads, driveways, sidewalks, curbs, drainage ditches, culverts, mail boxes, and all landscaping structures and vegetation. Temporary enclosures, walls, covers, or other protection shall be provided and maintained by the Contractor as required. Contractor shall cooperate with the owners of affected improvements and shall restore or replace damaged items as directed without additional expense to Owner or payments to Contractor.

B. Contractor responsible for the protection of installed materials and equipment, or portions threreof, during the course of construction. Any damage to installed materials or equipment prior to Final Acceptance shall be repaired or replaced at the sole expense of the Contractor.

01 77 00 Closeout Procedures

A. Contractor shall notify Engineer at such time as all work is substantially complete. The constructed system or improvements shall be capable of functioning for the intended purpose with all major components

B. Contractor shall provide written certification that all the Work has been fully completed in strict compliance with the Contract Documents, and requesting final inspection by the Engineer.

01 78 00 Closeout Submittals

01 78 13 Certificates and Correction List

A. Contractor shall provide the following certifications:

1. Written certification that all subcontractors and suppliers who have furnished work or materials as part of the project have been paid in full.

2. Written certification that Contractor will replace all materials and workmanship that prove defective within one-year after the date of Final Acceptance. Date Owner signs Final Payment Certificate is date of Final Acceptance and starts the Contractor's one-year guarantee period.

3. Signed State or Federal approved Wage Certification Form guaranteeing that Contractor has paid not less than the Prevailing Wage Rate as required by law (if required), and that Contractor has timely submitted the required payroll certificates to the appropriate state or federal wage division.

B. Within 24-hours of receiving Contractor's request for final inspection, Engineer will perform final walkthrough inspection of the project taking note of any and all items that do not meet Specifications or otherwise satisfy project requirements. If the Work appears to generally meet Specifications and satisfy all project requirements, the Engineer will prepare and sign a Certificate of Substantial and forward it to the Contractor and Owner for signature. Engineer will provide a written "Punch List" of corrective items that must be addressed prior to Final Acceptance.

01 78 36 Warranty

A. Warranty requirements shall be as follows:

1. Installed Materials Warranties. Prior to 75% completion and payment for work under this Contract, the Contractor shall furnish the Owner through the Engineer, all warranty and/or guarantee forms normally furnished by the manufacturer of equipment. Warranty form shall include the specific equipment installed, the duration of the warranty, details of the warranty, and the installer's name, address and phone number. Installation date will be filled in by the Owner and will coincide with date of substantial completion of the work under this contract. All such warranties shall name the Owner as the warranted party.

2. Contractor shall guarantee the Work for a period of one (1) year from the date of Final Acceptance. All materials and workmanship that prove defective within the one-year guarantee period shall be promptly replaced or corrected with no additional cost to the Owner. Written certification that Contractor will replace all materials and workmanship that prove defective within one-year after the date of Final Acceptance is required for project close-out and shall

accompany application for Final Payment. The Contractor's Performance Bond shall remain in full effect for the entire warranty period as required by these contract documents.

B. One-Year Warranty Inspection. In the 11th month following final project completion and acceptance, Contractor shall be available to be present during an on-site warranty inspection. Any defects identified in materials or workmanship shall be corrected within 30 days by the Contractor at his own expense.

01 78 39 Project Record Documents

A. Contractor shall keep and markup or "Redline" one complete set of Plans, including any shop drawings, approved plans or details for alternate construction, or other items not covered in the Project Documents throughout the duration of the project and submit markups to the Engineer prior to Final Acceptance. Markups shall include complete dimensions for any existing items differing from the project Plans, as well as any approved substitute materials or methods incorporated into the project.

B. Engineer will utilize Contractor's markups to produce complete Record Drawings to issue to Owner.

01 79 00 Demonstration and Training

A. When applicable, Contractor, supplier, manufacturer, or other person having responsibility for equipment furnished and installed under the Contract shall provide complete training for operations personnel and others, as necessary, for the use of the equipment.

B. Training shall include instruction on operation, maintenance, adjustment, and cleaning requirements for equipment and/or system. Training shall include demonstration of automated systems, user controls, recording equipment, operating set point adjustment, and alarm monitoring and programming.

C. Contractor or his supplier or manufacturer shall furnish complete Operation and Maintenance manuals when specified for equipment furnished under the Contract.

DIVISION 02 – EXISTING CONDITIONS

02 00 00 EXISTING CONDITIONS

PART 1 - GENERAL

1.01 SUMMARY

A. Existing conditions and any required subsurface investigations, demolition, structure moving, site remediation, contaminated or hazardous material removal shall be covered in the project Special Provisions.

DIVISION 03 – CONCRETE

03 00 00 CONCRETE

1.01 SUMMARY

A. Where required or directed, Contractor shall furnish and place concrete and/or precast concrete structures in accordance with the Contract Documents.

B. All labor, equipment and materials necessary for forming, reinforcing, placing, and finishing concrete to complete the Work shall be the responsibility of the Contractor. Where precast concrete structures are used, Contractor shall provide adequate equipment to move and accurately place structures as shown on the Plans.

03 10 00 CONCRETE FORMING & ACCESSORIES

03 11 00 Concrete Forming

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Concrete formwork required for all project structural concrete.
B. Formwork design, placement, proper securing and support, and removal.
C. Coordination for various wall and slab penetration locations and sizes including sleeve positioning for casting in place.
D. Positioning of anchor bolts, grating and vault lid frames, and other imbedded items.

1.02 RELATED SECTIONS

A. Section 03 30 00 – Cast-In-Place Concrete
B. Section 03 20 00 – Concrete Reinforcement
C. Section 03 15 00 – Concrete Accessories

1.03 REFERENCES

A. American Concrete Institute (ACI) 318, Chapter 6 – Formwork, Embedded Pipes, and Construction Joints.
B. ACI 347R-88 – Guide to Formwork for Concrete.

1.04 QUALITY ASSURANCE

A. Forms shall be constructed by laborers experienced in concrete formwork erection.
B. Ensure that forms are smooth, vertically plumb or horizontally flat as applicable, and properly spaced to provide finished concrete structures as shown on the drawings.
C. Resulting work which is not in conformance with applicable contract specifications shall be promptly removed and replaced.

1.05 DELIVERY, STORAGE AND HANDLING

A. Protect form materials from damage that may affect finish appearance or form stability.
B. Keep forms clean and free from deleterious materials.

1.06 PROJECT CONDITIONS

A. Refer to drawings to estimate quantities and locations involved.
B. All exposed edges shall be properly formed and chamfered where shown.
C. Conduct required excavation and provide excavation support as necessary.

PART 2 - PRODUCTS

2.01 FORM MATERIALS

A. Lumber Plank
   1. Species: Douglas Fir or Hemlock
   2. Casting Face Texture: Smooth
   3. Casting Face Appearance: No loose Knots or Knot Holes; maximum Knot size 1-1/2 inch and well scattered
   4. Size: Support Concrete at rate poured
   5. Extent of Work: Provide at Footing. Flatwork perimeters, curbing, and Pedestals, unless otherwise indicated.

B. Plywood Forms
   1. Material: APA B-B Plyform grade Plywood Class 1
   2. Thickness: As required by Concrete placement rate
   3. Extent of Work: Provide at all other Concrete Work

C. Steel

2.02 ACCESSORIES

A. Form Ties
   1. Manufacturer: Bowman, Burke, Dayton, JEF, or approved
   2. Type: Plastic Cone as recommended by Manufacturer for conditions of use
   3. Break-back Distance from Concrete Face: 1-inch
   4. Do not use wire ties and wood spacers

B. Form Release Agents
   1. Non-staining, VOC compliant, water-based Form Release Compound. Should be opaque in color to aid in full coverage.
   2. W.R. Meadows “Duogard II”, or approved equal.

C. Form Joint Caulking
   1. Manufacturer and Brand: Sonneborn Sonolac, Dap Acrylic Latex, or approved

PART 3 - EXECUTION

3.01 PREPARATION

A. Ensure that reinforcing steel is properly placed according the spacing and tolerances required, and that proper inspection has been conducted.

B. Ensure waterstops are installed as required when placed prior to formwork.

C. Review plans for wall and slab penetrations and imbedded items.

D. Remove debris and foreign matter from formwork. Clean form contact surfaces. Replace with new material when necessary or when directed.

E. Remove loose rust and foreign matter from reusable hardware prior to installation into Formwork.

F. Re-use Forms only when contact surfaces equal original use and forms have been adequately cleaned.

3.02 INSTALLATION

A. Comply with ACI 318 and ACI 347.

B. Carefully conform to the shapes, lines and dimensions of the drawings. Ensure that edges are chamfered where shown. Form any Surface Indentations shown on the Drawings.

C. Arrange to provide concrete cold joints as indicated on the drawings.

D. At forms for exposed concrete, fill form panel joints with Form Joint Caulking Compound, and strike compound flush with panel on face adjacent to exposed Concrete, or cover joints with thin, smooth, plastic, pressure-sensitive tape.

E. At forms for exposed concrete, seal Form Ties against leakage with Form Joint Caulking Compound.

F. Make form joints tight to prevent leakage. Minimize the number of form joints used.

G. Ensure that formwork is properly supported, tied, and braced to prevent deflection and maintain shape (see allowable tolerances for formwork).

1. Provide bracing as required to meet load requirements.
2. Protect against undermining or settlement when placed on ground.
3. Anchor as required to prevent upward or lateral Formwork movement during Concrete placement.
4. Locate ties equidistant and symmetrical. Align vertically and horizontally.

H. Provide Access Openings as required for cleaning and inspection of Forms and Embedded Items prior to placing Concrete. Locate where not exposed to view.

I. Provide Openings and Chasings of Slabs and Walls for Mechanical and Electrical Work. Sizes and locations are directed by Mechanical and Electrical Trades and Drawings.

J. Anchor Bolts: Set with templates to assure accurate bolt positioning

K. During Concrete placement, in areas where Formwork develops weakness, settlement, or distortion, stop concrete placement, remove placed concrete, and remove or strengthen Formwork.

L. Reposition to true alignment prior to, during, and after Concrete placement, if necessary.

3.03 ALLOWABLE TOLERANCES FOR FORMWORK

A. Variation from Plumb: 1/4 inch in 10 feet maximum

B. Variation of Building Lines: 1/4 inch in any Bay or 20 feet maximum

C. Variation in Cross-Sectional Dimensions: Minus 1/8 inch; plus 1/4 inch

D. Variation in Surface Tolerance: 1/8 inch in any 10 feet measured with 10-foot straightedge.

E. Maximum Deflection of Form facing between Supports: 0.00025 x Span

F. Wall Locations: Accurately size and locate within 1/8 inch.

3.04 FORM TREATMENT

A. All forms shall be adequately treated with form release agent to prevent concrete damage during form removal.

B. Prior to each use: Apply form coating to contact surfaces in accordance with Manufacturer's instructions. Conduct surface preparation in accordance with manufacturer's instructions prior to coating forms.

C. When treating previously set forms, carefully prevent coatings from covering reinforcing steel, waterstops, imbedded items, or existing concrete.

D. Prevent coatings from collecting in puddles.

3.05 FORM REMOVAL

A. Leave forms and shoring in place until concrete has attained sufficient strength to safely support own weight and imposed loads.

B. Remove forms at time and in manner to insure safety of structure, and without concrete surface damage.

C. At exposed concrete, form removal time shall be uniform to avoid color differences.

D. Remove top forms from any sloping concrete surfaces as soon as concrete is self-supporting. Repair and finish, if necessary, and cure immediately.

3.06 CLEANING AND REPAIRING

A. Including Work of other Trades, clean, repair, and touch-up, or replace when directed, products which have been soiled, discolored, or damaged by Work of this Section.

B. Remove debris from Project Site upon Work completion, or sooner if directed.

PART 4 - SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT – Costs associated with concrete formwork shall be included as a portion of the lump sum or unit price costs for the associated items as stated on the Bid Form. No separate measurement or payment for these items will occur.

03 15 20 Premolded Expansion Joint Fillers

PART 1 - GENERAL

1.01 SECTION INCLUDES – Premolded Expansion Joint Fillers.

1.02 REFERENCES

A. ASTM D 1751 – Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction
B. ASTM D 1752
C. AASHTO M 213
D. Corps of Engineers: CRD-C 508
E. FS – Federal Specification

1.03 RELATED SECTIONS

A. Section 03 30 00 – Cast-In-Place Concrete

1.04 QUALITY ASSURANCE

A. Manufacturer shall demonstrate five years (minimum) continuous, successful experience in production of items covered in this section.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Store materials in a clean dry area indoors in accordance with manufacturer's instructions. Keep containers sealed until ready to use.

C. Protect materials during handling and installation to prevent damage or contamination.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Fiber Expansion Joint
   1. Resilient, flexible, nonextruded, expansion-contraction joint filler. Cellular fibers securely bonded together, uniformly saturated with asphalt.
   2. Compliance: ASTM D 1751; AASHTO M 213; FS HH-F-341 F, Type I.
   3. Recovery when compressed to half width: 70% minimum
   4. Use: exterior expansion joints in sidewalks, drives, and between adjoining structures.

B. Flexible Foam Expansion Joint
   1. Synthetic isomeric polymer foam, closed-cell, non-gassing. Gray in color.
   2. Compliance: ASTM D 5249; ASTM D1752 5.1-5.4.
   3. Recovery: 99% minimum
   4. Use: interior expansion joints.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions at locations shown on the drawings and as directed.

B. Position joint filler against forms, at interrupting objects, and against abutting structures before placing concrete.

C. Install joint filler ½-inch below concrete surface.

D. Seal with flexible joint sealant.

E. Protect from traffic or damage until sealant has fully cured.

PART 4 - SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Cost for expansion joint fillers shall be included as a portion of the lump sum or unit price costs for the associated items as stated on the Bid Form. No separate measurement or payment for these quantities will occur.

03 20 00 CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes reinforcement for concrete including deformed steel bars, welded-wire-fabric, and fiber reinforcement.

B. Supply, detail shop drawings, and place reinforcement.

C. Provide reinforcing to the sizes and dimensions shown on the drawings and according to approved shop drawings for rebar placement.

1.02 RELATED SECTIONS

A. Section 03 11 00 – Structural Cast-In-Place Concrete Forms

B. Section 03 30 00 – Cast-In-Place Concrete

1.03 REFERENCES

A. American Standards for Testing and Materials (ASTM), latest edition
   1. ASTM A 615 – Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

2. ASTM A 185 – Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
3. ASTM A 82 – Specification for Steel Wire, Plain, for Concrete Reinforcement

B. American Concrete Institute (ACI), latest edition
1. ACI 315 – Details and Detailing of Concrete Reinforcement
2. ACI 318 – Building Code Requirements for Reinforced Concrete

C. Uniform Building Code (UBC) – As amended to the "Oregon Structural Specialty Code" by the Oregon Building Codes Division, year 2000 amendments.

D. Concrete Reinforcing Steel Institute (CRSI)
1. CRSI Manual of Standard Practice, 1997
2. CRSI Reinforcing Bar Detailing, 1999
3. CRSI 63 – Recommended Practice for Placing Reinforcing Bars
4. CRSI 65 – Recommended Practice for Placing Bar Supports

1.04 SUBMITTALS

A. Certified Mill Test Reports for steel.

B. Detail and placement drawings. Submit in accordance with Section 01300 at least 14 days prior to reinforcement fabrication.

1. Reinforcing steel shall be detailed in accordance with the "ACI Detailing Manual" (SP-66), ACI Committee 315; CRSI; and in conformance with the project drawings.
2. Shop drawings shall include sufficient plan, section, and elevation drawings of all beams, walls, slabs, footings, columns, and other shapes to clearly show all reinforcement details, spacing, and sizes.
3. Bends, splices, hooks, ties and all other details shall be shown. Drawings shall indicate any fieldwork required.
4. Shop drawings shall show steel specifications and conformances.

C. Samples of all proposed bar supports with a written description of where each support is proposed to be used.

1.05 QUALITY ASSURANCE

A. Coordinate with other Trades affecting or affected by Work of this Section.

B. Bends, hooks, laps, splices, cover, and other details shall conform to UBC, Chapter 19; and ACI 318, except where more stringent requirements are shown in the drawings or specified herein.

C. Perform reinforcement work in accordance with CRSI Documents 63 and 65.

D. Conduct field measurements as necessary prior to fabrication. Conform to the approved detail and placement drawings.

E. All materials shall be new, unused, specifically manufactured for the intended purpose.

F. Any welding shall be conducted by persons with Welder Certification in accordance with AWS D1.4.

1.06 DELIVERY, STORAGE AND HANDLING

A. Materials shall be delivered properly bundled and labeled to show grade, size and location. Deformed bars shall be marked with the letter "S" per ASTM A 615. Deliver with suitable hauling and handling equipment.

B. Properly store to protect from moisture. Cover steel with waterproof covering and store so that materials are not against unprotected earth.

C. Handle material carefully to protect from cuts, nicks, kinks, deformation, and other damage. Ensure worker safety.

PART 2 - PRODUCTS

2.01 REINFORCEMENT MATERIALS

A. Reinforcing Bars for Concrete
1. All structural reinforcement shall be deformed bars.
2. Deformed billet steel; ASTM A 615, Grade 60 or Grade 40

B. Welded Wire Fabric
1. Use only where shown.
2. Supply flat sheets; ASTM A 185 with wire conforming to ASTM A 82
3. 6-inch by 6-inch mesh spacing
4. Wire Size: W1.4, unless otherwise shown on drawings.

2.02 ACCESSORIES

A. Provide all Accessories necessary for proper Reinforcement placement, spacing, support, and fastening. Bricks, broken CMU, spalls, rocks or similar materials shall not be used for support of reinforcing steel.

B. Tie Wire: 16-gauge minimum, black annealed steel; acceptable patented system.

C. Bar Supports, Bolsters, Chairs and Spacers

1. Sized and shaped for strength and support of reinforcement during installation and placement of concrete. Use only approved materials.
2. High density concrete dobies. Compressive strength equal or greater than concrete to be placed. No plastic or low cement content dobies accepted.
3. Chairs: Stainless steel. With plastic tips when used at surfaces that will be exposed to view.
4. Spacers: Plastic wheel type. Preco Barspan Wheels, or approved equal.
5. Plastic Shims may be used to support plastic spacers.

PART 3 - EXECUTION

3.01 PREPARATION

A. Verify that surfaces to receive Reinforcement are accurately sized and located, square, plumb, rigid, secure, and otherwise accurately prepared.

B. Prior to starting Work, notify General Contractor about defects requiring correction.

C. Reinforcement shall be free from mud, oil or other nonmetallic coatings that decrease bond.

D. Remove surface rust and mill scale with wire brush. Heavily rusted bars shall not be used.

E. Do not start Work until conditions are satisfactory.

3.02 PLACEMENT

A. Perform reinforcement work in accordance with CRSI Documents 63 and 65, and fabricate in compliance with ACI 315.

B. Conform to approved placement and detail drawings and specified tolerances herein.

C. Reinforcement shall be accurately placed and adequately supported before concrete is placed, and shall be secured against displacement within the tolerances of this section.

D. All reinforcement shall be bent cold unless otherwise permitted by the Engineer.

E. Reinforcement partially embedded in concrete shall not be field bent unless approved by the Engineer.

F. Do not weld splices, crossing bars, or other locations.

G. Splices: Locate splices not indicated on the drawings at points of minimum stress. Development length and splices shall conform to UBC Section 1912. At wire mesh, lap one full mesh plus 2-inches. Clear distance between spliced bars shall conform to UBC Section 1907.6. Splices of adjacent bars shall be staggered. Use greater splice lengths where shown in the drawings.

H. Spacing: Comply with UBC Section 1907.6, contract drawings, and approved shop drawings.

I. Protective Concrete Cover: Comply with UBC Section 1907.7.1 minimums. Provide greater cover where shown in the drawings.

J. Bars in slabs shall be supported on well-cured concrete blocks or approved metal chairs.

K. Tolerances:

1. Concrete Cover: Plus or minus ¼ inch.
2. Spacing Between Bars: ¼ inch.

L. Bar relocation to avoid interference with other reinforcement, conduits or embedded items: 1 bar diameter, unless otherwise approved by Engineer.

M. Reinforcement Around Openings: Unless otherwise shown on the drawings, place at least double the area of steel removed by the opening around the opening and extend on each side sufficiently to develop bond in each bar. At square or rectangular openings, place at least one diagonal bar at each corner.

3.03 PROTECTION

A. Protect other Work against damage and discoloration caused by Work of this Section.

B. Protect placed reinforcement from subsequent movement and inclement weather until concrete is placed.

3.04 FIELD QUALITY CONTROL

A. The Engineer shall be notified when reinforcing steel is ready for inspection. Inspection must occur before any concrete is placed.

B. Notify Engineer at least 48 hours in advance and allow sufficient time for inspection.

PART 4 - SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Cost for concrete reinforcement work shall be included as a portion of the lump sum or unit price costs for the associated items as stated in the Bid Form. No separate measurement or payment for these quantities will occur.

03 30 00 CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes work required to supply, place, finish and cure cast-in-place concrete, including mix design, certifications, submittals and testing.

B. Furnish and install vapor barrier and sand base under floor slabs-on-grade.

C. Installation of inserts, sleeves, anchor bolts, grounding cable and other items embedded in concrete, but furnished under other sections.

D. Rinsing out of transit mix trucks, washing or wetting of concrete, site cleanup, or other activity related to water at the site shall be in conformance with all EPA requirements for the prevention of water runoff to storm water sewers or creeks.

1.02 RELATED SECTIONS

A. Section 03 11 00 – Structural Cast-In-Place Concrete Forms
B. Section 03 15 20 – Premolded Expansion Joint Fillers
C. Section 03 20 00 – Concrete Reinforcement

1.03 REFERENCES

A. American Standards for Testing and Materials (ASTM), latest editions
   1. ASTM C31 – Standard Specification for Making and Curing Concrete Test Specimens in the Field
   2. ASTM C33 – Specification for Concrete Aggregate
   3. ASTM C39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
   4. ASTM C94 – Standard Specification for Ready-Mixed Concrete
   5. ASTM C143 – Standard Test Method for Slump of Hydraulic Cement Concrete
   6. ASTM C150 – Standard Specification for Portland Cement
   7. ASTM C231 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
   8. ASTM C260 – Standard Specification for Air Entrained Admixtures for Concrete
   9. ASTM C309 – Standard Specification for Liquid Membrane – Forming Compounds for Curing Concrete
   10. ASTM C494 – Standard Specification for Chemical Admixtures for Concrete
   11. ASTM C618 – Standard Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete

B. American Concrete Institute (ACI), latest editions
   1. ACI 301 – Standard Specification for Structural Concrete in Buildings
   2. ACI 304R – Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.
   3. ACI 305R – Recommended Practice for Hot Weather Concreting
   4. ACI 306R – Recommended Practice for Cold Weather Concreting
   5. ACI 309R – Guide for Consolidation of Concrete
   6. ACI 318 – Building Code Requirements for Reinforced Concrete
   7. ACI SP-15 – Field Reference Manual *(have copy on-site)*

1.04 SUBMITTALS

A. Contractor is responsible for the design of the concrete mix that shall conform to ASTM C94 and the requirements of this section.

B. Certified Mix Design: Prior to delivery of concrete, and allowing sufficient time for review, submit three copies of mix design, for each type of concrete, showing all materials used and proportions matching units specified. Submittal shall allow for easy comparison to the specifications and shall show all material compliances. Submittal shall clearly identify the mix as proposed for this project, with project name shown.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301.
B. Conform to ACI 305R in hot weather.
C. Conform to ACI 306R in cold weather.
D. Installer Qualifications: Concrete work shall be finished by persons with at least 5 years experience with work of similar scope and quality.
E. No chloride containing admixtures shall be used.
F. On-Site water addition to concrete will not be permitted.
G. Conduct field-testing as specified.
H. Admixtures shall be added in strict conformance with the manufacturer's instructions.

1.06 DELIVERY

A. Concrete shall be scheduled and delivered in a timely manner in accordance with ASTM C94 and ACI 304R. Ensure that forms and reinforcement are complete and ready to accept concrete prior to scheduling delivery.

B. When installing a continuous pour section, ensure that trucks arrive and concrete is placed with no greater than 45 minutes elapsing between lifts.

PART 2 - PRODUCTS

2.01 PORTLAND CEMENT

A. Conforming to ASTM C150. Type I and Type II where designated.

B. Use same brand and source of cement throughout the project.

2.02 WATER

A. Water used for mixing shall be clean and potable.

2.03 AGGREGATE

A. Aggregates shall be natural materials conforming to ASTM C33 as modified herein.

B. Aggregates shall be nonreactive as defined in ASTM C33 and tested per ASTM C289.

C. Aggregate shall contain no soil, friable particles, organic matter, or other deleterious materials. Aggregate shall be washed prior to use in the concrete mix.

D. Aggregate shall contain no chert, limestone, or shale.

E. Coarse Aggregate:

1. Use coarse aggregate from only one source for exposed concrete in a single structure.
2. Coarse aggregate shall be smooth, rounded and uniform. No more than 15% shall be elongated (max. dimension 5 times min. dimension).
3. Coarse aggregate shall be durable, sound and hard.
4. Maximum Size: 1-inch, but not more than one-fifth of narrow dimension between sides of Formwork, one-fourth depth of slab, nor three fourths of narrowest distance between Reinforcing Steel.

F. Fine Aggregate:
1. Use fine aggregate from only one source for exposed concrete in a single structure.
2. Fine aggregate shall not exceed 40% by weight of combined aggregate total, except when coarse aggregate maximum size is ½-inch or less.
3. Fine aggregate shall be durable, sound, clean and hard.
4. Sand Equivalent of 75 minimum per ASTM D2419.

G. Combined (Coarse and Fine) Gradation per ASTM C136:

US Standard Sieve	***% Passing by Weight***
1½-inch	100
1-inch	90-100
3/8-inch	45-75
No. 4	33-50
No. 8	28-44
No. 16	23-38
No. 30	10-22
No. 200	0-2

2.04 ADMIXTURES

A. General:
1. When two or more admixtures are used, they shall be certified by the manufacturer(s) to be compatible.
2. Chlorides are not permitted in any form.
3. Air Entraining and Water Reducer admixtures are required.
4. All admixtures shall be added at the batch plant, unless otherwise specified.

B. Fly Ash:
1. Conforming to ASTM C618, Class F except maximum ignition loss shall not exceed 30% by weight.
2. Fly ash may be used to replace up to 15% by volume of the Cement content, provided that the mix strength is substantial by test data.
3. Fly ash shall be produced from a single known and consistent source.

C. Midrange Water Reducer:
1. Shall conform to ASTM C494, Type A and F.
2. Master Builders, Inc. “PolyHeed” Series; or approved equal.

D. High-Range Water Reducer (Superplasticizer):
   1. Shall conform to ASTM C494, Type F or G; and ASTM C1017, Type I or II.
   2. Master Builders, Inc. "Rheobuild"; or approved equal.

E. Air-Entraining Admixture:
   1. Shall conform to ASTM C260.
   2. Master Builders, Inc. "MicroAir", "MB-AE 90"; or approved equal.

F. Fibrous Concrete Reinforcement: Shall be "Fibermesh MD" added at a minimum of 1.5 pounds per cubic yard. Use where specified or shown on the drawings.
   1. Others: Only as approved and deemed necessary.

2.05 BONDING AGENT

A. Required where new concrete is poured against existing concrete, and on embedded items with less than 1½-inches of cover.

B. 100% solids, two component epoxy bonding compound meeting ASTM C881, Type II, Grade 2, Class B or C materials except as modified herein.

C. Properties:

   1. Bond Strength @ 14 days (ASTM C882) – 1800 psi minimum
      a. Tensile Strength @ 7 days (ASTM D638) – 4400 psi minimum
      b. Tensile Elongation @ 7 days (ASTM D638) – 1.49% maximum

D. Master Builders, Inc. "Concresive Liquid PL"; or approved equal.

2.06 CURING COMPOUNDS AND SEALERS

A. Evaporation Reducer: Spray applied monomolecular film that reduces the rate of surface moisture evaporation, minimizes plastic shrinkage, and does not effect the cement hydration process. Master Builders, Inc. "Confilm"; WR Meadows "Sealtight Evapre"; or approved equal.

B. Exterior Use Liquid Membrane-Forming Curing Compound: Shall conform to ASTM C309, Type I, Class B and ASTM C1315, Type 1, Class A. WR Meadows "CS-309-25"; or approved equal.

C. Interior Use Liquid Membrane-Forming Curing Compound: Water-base acrylic curing and sealing compound conforming to ASTM C309, Type I, Class B and ASTM C1315, Type 1, Class A. WR Meadows "Vocomp-25-1315"; or approved equal.

D. Concrete Sealer: Non-yellowing, acrylic co-polymer solution meeting ASTM C309, Type 1, Class B and ASTM C1315, Type 1, Class A. WR Meadows "TIAH 1315"; or approved equal.

2.07 CONCRETE HARDENERS

A. Liquid concrete densifier and hardener, chemical resistant, colorless, with 100% active chemicals. WR Meadows "Liqui-Hard"; or approved equal.

2.08 VAPOR BARRIER

A. ASTM D2103 – Polyethylene Film and Sheeting, 6 mils thickness.

2.09 JOINT SEALANTS

A. Single Component, Self-Leveling Polyurethane Sealant: ±25% movement capability for horizontal joints; ASTM C 920, Type S, Grade P, Class 25, Use T and M; FS TT-S-00230C, Type I, Class A; USDA approved. Sonneborn "Sonolastic SL 1"

B. Two Component, Self-Leveling Polyurethane Sealant: ±25% movement capability for horizontal joints; ASTM C 920, Type M, Grade P, Class 25, Use T and M; FS TT-S-00227E, Type I, Class A; USDA approved. Sonneborn "Sonolastic SL 2"

C. Poured Flexible Epoxy Joint Filler: Sonneborn "Epolith-P"; two component 100% solids epoxy joint filler with flexible, pourable, self-leveling properties.
   1. Shore A Hardness: 85 ± 5.
   2. Shore D Hardness: 34.
   3. Elongation: 75%.
   4. Tensile Strength: 655 psi (4.5 MPa) ±10 psi (0.07 MPa).
   5. Mixing Ratio: 1 to 1 by volume.
   6. Pot Life: 40 to 55 minutes at 75 degrees F (24 degrees C).
   7. Cure Time, Foot Traffic: 4 hours.
   8. Cure Time, Vehicular Traffic: 24 hours.
   9. Application Temperature: Minimum 55 degrees F (13 degrees C).

2.10 STRUCTURAL REPAIR MORTAR

A. Shrinkage compensated, rheoplastic, one-component, cementitious based, hand or low velocity spray applied material suited for repairing distressed horizontal, vertical or overhead concrete.
   1. Compressive Strength @ 24 hours (ASTM C109) – 3500 psi min.
   2. Flexural Strength @ 28 days (ASTM C348) – 1300 psi min.
   3. Freeze Thaw Resistance @ 300 cycles (ASTM C666-A) – 90% RDF min.
   4. Modulus of Elasticity @ 28 days (ASTM C469) – 4.3×10^6 psi

B. Master Builders, Inc. “Emaco S” Series; or approved equal.

2.11 STANDARD CONCRETE MIX

A. Use: Footings, Interior Slabs, Exterior Walks, Buried Structures (unless otherwise specified)

B. Mix Design Requirements:

   1. Cement: Portland Cement, Type I or II, ASTM C150
   2. Water / Cementitious Materials Ratio: 0.45-0.50 by weight
   3. Strength: 3,500 psi minimum, ASTM C39
   4. Air Content: 2.5-3% by volume, ASTM C231
   5. Water Reducer: Mid or High-Range
   6. Maximum slump at time of placement: 8-inches

2.12 HIGH-PERFORMANCE CONCRETE MIX

A. Use: All water-holding structures and adjoining structures, equipment pads, exterior walks, and others not designated for standard concrete. May be used in place of standard concrete except for interior slabs where a smooth trowel finish is required.

B. Mix Design Requirements:

1. Cement: Portland Cement, Type II, ASTM C150.
2. Water / Cementitious Materials Ratio: 0.35-0.45 by weight
3. Strength: 4500 psi minimum, ASTM C39 (expected to be higher due to w/c ratio)
4. Slump before plasticizer: 1.5 to 3-inches, ASTM C143
5. Air Content: 5.5-7% by volume, ASTM C231
6. Water Reducer: High-Range
7. Maximum slump at time of placement: 10-inches (with rheoplastic admixture)

PART 3 - EXECUTION

3.01 PREPARATION

A. Examine all reinforcement, formwork, waterstops, premolded joint fillers, and other embedded items to ensure they are accurately placed, properly secured and cleaned.

B. Ensure that inspection of reinforcement is complete and installation approved.

C. Ensure concrete mix design and test certifications have been submitted and approved.

D. Ensure that all required materials and equipment are on-site and operable.

E. Ensure that subgrade and base rock are properly placed and compacted. Place vapor barrier and leveling sand at slab-on-grade locations. Sprinkle subgrades and other porous surfaces with water to reduce adsorption.

F. Apply form release agent to formwork.

G. Apply bonding agent where required.

H. Notify General Contractor of work requiring correction. Do not start work until conditions are satisfactory.

I. Review for various locations to receive different types of concrete mixes.

J. Notify Engineer at least 24 hours in advance of concrete placement.

3.02 VAPOR BARRIER AND SAND COVER

A. Place vapor barrier on top of rock base under all interior slabs-on-grade. Barrier shall be continuous under construction joints. The edges of the vapor barrier shall be lapped and taped, and all projections through it shall be taped and sealed.

B. The vapor barrier shall be covered with a sand cover, 2-inches thick or as shown on the drawings. At the time of placing concrete, the sand shall be damp but excess water shall not be trapped on top of the vapor barrier.

3.03 CONCRETE PLACEMENT

A. Comply with ACI 304 and ASTM C94, and ACI 305R and 306R as required.

B. Convey and place by methods with will prevent material separation, segregation, and loss.

C. Deposit concrete continuously or in layers so that no concrete will be placed on concrete that has hardened sufficiently to cause the formation of seams or other planes of weakness. Where seams are unavoidable, provide construction joints as directed.

D. Do not convey pneumatically placed concrete through aluminum pipe.

E. Do not retemper concrete, or add water on-site for other reasons.

F. Use trunks or tremies when pouring walls to ensure concrete does not drop or fall more than 4 feet. Place in layers not exceeding 2 feet in depth.

G. Screed all slabs to true levels or slopes, true within ¼ inch per 10 feet. Evenly slope to any drain at 3/16 inch per foot, unless otherwise shown on Drawings.

H. When mean temperature exceeds, or is expected to exceed 80°F during placement and finishing operations, steps shall be taken in accordance with ACI 305R to reduce concrete temperature and water evaporation. Slabs will be fog sprayed from the completion of screeding until curing is begun (except during troweling). Submit detailed hot weather concreting procedure to Engineer for approval at least 2 days prior to planned placement.

I. When mean temperature falls below, or is expected to fall below 40°F, comply with ACI 306R. Concrete shall be protected from freezing by means acceptable to the Engineer. Submit detailed cold weather concreting procedure to Engineer for approval at least 2 days prior to planned placement.

3.04 CONSOLIDATION

A. Employ mechanical, high frequency vibrators to consolidate concrete around reinforcement, into corners and angles of formwork, and to exclude rock pockets, air bubbles and honeycomb.

B. Vibration shall be in accordance with ACI 309. Vibrator frequency shall be between 8000 and 12000 rpm.

C. Hold Vibrator in one spot no longer than 15 seconds; keep in constant motion, insert and withdraw at points approximately 18 inches o.c.

D. Maintain vibrator in vertical position when penetrating concrete walls. At slabs, hold vibrator perpendicular to the surface at all times.

E. Vibrate each successive lift. Extend vibrator into previous lift to avoid seams.

F. Transporting concrete with vibrator is not permitted.

G. Maintain spare vibrator at jobsite during concrete placement.

3.05 CONTROL JOINTS

A. Form to true, straight lines, with adjacent slab sections flush at Joints. Make panels as close to square as possible.

B. Conform to ACI 302 and the Project Drawings. If not shown, submit control joint layout plan to Engineer for approval.

C. Joints shall be formed by tooling into fresh concrete. The joint shall be perpendicular to the concrete surface and ¼ of the thickness of the slab. Zip strips not allowed.

D. Extend Reinforcement through Joints, unless otherwise shown on Drawings.

E. If necessary, and approved by Engineer, joint may be saw cut as soon as concrete has sufficiently hardened to prevent dislodging of aggregates. Saw continuous slots perpendicular to surface and ¼ of slab thickness. Must be complete within 12 hours of concrete placement.

F. Fill joints according to following schedule:

1. Control and expansion joints in sidewalks and exterior pavements.
   a. Sealant:
      i. Two component self-leveling polyurethane.
      ii. Single component self-leveling polyurethane.

2. Control and expansion joints in interior floors where floor covering will be installed:
   a. Sealant:
      i. Two component self-leveling polyurethane.
      ii. Single component self-leveling polyurethane.

3. Control joints in interior floors where floor covering will not be installed:
   a. Surface preparation: Freshly saw-cut or blast-clean joints; blow with oil-free compressed air.
   b. Sealant: Epoxy Joint Filler.
      i. Pour flush with adjacent surface in 2 pours in accordance with manufacturer's instructions.

3.06 FINISHES

A. Rough Form Finish
1. Finish resulting after form removal with fins or projections exceeding ¼-inch removed, and with tie holes and defective areas repaired and patched.
2. Location: Formed concrete surfaces not exposed to view in the finished structure.

B. Standard Smooth Finish
1. As-cast surface with all fins and projections completely removed and smoothed, and with all tie holes and defective areas repaired and patched for a uniform, smooth appearance.
2. At unformed surfaces, such as tops of walls, strike-off smooth and finish with a texture matching adjacent surfaces.
3. Location: Formed surfaces exposed to view in the finished structure.

C. Float Finish
1. After placing slabs, do not work the surface until ready for floating. Begin floating when the surface water has disappeared or when the concrete has stiffened sufficiently to permit the operation of a power-driven float, or by hand-floating if area is small or inaccessible to power units.
2. Check the level of the surface plane to a tolerance not exceeding ¼-inch in 10 feet when tested with a 10-foot straightedge placed on the surface in not less than two different angles from a reference point. Cut down high spots and fill low spots. Uniformly slope surfaces to drain where shown on the drawings.
3. Immediately after leveling, refloat the surface to a uniform, smooth, granular texture. Do not overfinish.
4. Location: Monolithic slab surfaces that are to receive a trowel finish and other finishes.

D. Trowel Finish
1. After floating, begin the first trowel finish operation using a power driven trowel. Consolidate the concrete surface by the final hand troweling operation, free of trowel marks, uniform in texture and appearance, and with a surface plane tolerance not exceeding 1/8-inch in 10 feet when tested with a 10-foot straightedge.

2. Do not absorb wet spots with neat cement or cement-sand mixture, and do not use chemical dryers.
3. Location: Monolithic slab surfaces exposed to view, or to be covered with resilient floor covering, or to receive liquid hardener treatment.

E. Nonslip Broom Finish
1. After concrete has received floating finish specified above, provide light brushing with fiber-bristle broom perpendicular to traffic flow.
2. Location: Exterior walks and other horizontal walking surfaces.

3.07 CONCRETE SURFACE REPAIRS

A. After removal of forms, repair and patch defective areas with specified repair mortar.

B. In honeycomb and rock pocket areas, saw cut area and remove material down to solid concrete. Saw cut edges perpendicular to the concrete surface. Thoroughly clean out loose material, saturate area with water to a saturated surface dry condition and brush-coat the area to be patched with a slurry coat of structural repair mortar. Place additional mortar to patch the area before the slurry coat has dried. Smooth and blend to surrounding surface. Do not feather edges.

3.08 CONCRETE CURING AND PROTECTION

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Protect concrete from rapid moisture loss before and during finishing operations with a fog spray or evaporation reducer. Apply evaporation reducer in accordance with manufacturer's instructions after screeding and bull floating, but before power floating and troweling.

B. Curing shall begin as soon as the finishing operation has been completed and the surface will not be damaged by the curing method. Curing shall be maintained for not less than 7 days.

C. Curing Methods: Perform curing of concrete by curing compound, by moist curing, by moisture-retaining cover curing, or combinations thereof, as specified herein.

1. Moist Curing. Use one of the following methods
   a. Keep concrete surface continuously wet by covering with water
   b. Use continuous water-fog spray
   c. Cover concrete with absorptive cover (burlap cloth, 9 oz./s.y.), thoroughly saturate with water, and keep continuously wet. Completely cover all concrete and lap edges 4-inches. Place moisture retaining cover (polyethylene film) over absorptive cover.

2. Moisture-Retaining Cover. Cover all surfaces completely with polyethylene sheets, lap edges at least 3-inches, and seal with waterproof tape. Immediately repair any holes or tears with sheet material and tape.
3. Curing Compound. Use specified compound and apply in accordance with manufacturer's instructions. Apply within 1 hour of final finishing operations or form removal. Maintain continuity of coating and protect from damage during curing period. If finish materials are to be applied later, follow manufacturer's instructions for compound removal.

D. Exterior Structural Concrete: Cure for 7 days with moist cure or moisture-retaining cover. After 7 day period, apply specified or approved sealing compound to surfaces that will be exposed in the finished structure.

E. Exterior Sidewalks and Ramps: Cure for 7 days with moist cure or moisture-retaining cover. After 7 day period, apply specified or approved sealing compound to surfaces that will be exposed in the finished structure. Or; cure for 7 days using specified or approved exterior curing/sealing compound.

F. Interior Slabs to be Covered (with resilient flooring): Cure for 7 days with moist cure or moisture-retaining cover. Or; cure for 7 days using specified or approved interior curing/sealing compound. Ensure compound compatibility with adhesives.

G. Interior Slabs Exposed and Other Exposed Interior Concrete: At interior slab locations that will remain uncovered, interior curbs, equipment pads, etc., cure for 7 days with moist cure or moisture-retaining cover. After 7days, or as recommended by the manufacturer, apply liquid chemical hardener. Follow manufacturer's instruction for hardener application. Apply at least two coatings unless otherwise recommended by the manufacturer and approved. Protect adjoining work from overspray and remove all excess hardener from surface of floor slab.

H. Protect all surfaces from damage until curing is complete and sealers and hardeners have dried.

3.09 CORRECTION OF DEFECTIVE WORK

A. Remove and replace any concrete which shows excessive cracks or severe damage. Remove and replace slabs which do not drain properly, or are improperly finished, and other defective concrete as directed.

B. Should concrete fail to meet the minimum specified 28 day strength as determined by tests on both the regular and spare cylinders, the concrete will be deemed defective and shall be removed and replaced. Contractor shall bear the entire cost of such testing, removal, redesign, and replacing of defective concrete.

C. Concrete which has improper water/cement ratios, and/or improper air contents shall be removed and replaced as directed.

D. Contractor shall bear all costs for removal and replacement of defective work.

PART 4 - SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Cost for concrete and other work in this section shall be included as a portion of the lump sum bid item for the Control Building, as stated in the Bid Form. No separate measurement or payment for these quantities will occur.

03 60 00 GROUT

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes various types of grout as may be required for the project as shown on the Drawings and as required.

B. Work includes supply, preparation, mixing, application, finishing and curing of grout.

1.02 RELATED SECTIONS

A. Section 03 20 00 – Concrete Reinforcement
B. Section 03 30 00 – Cast-In-Place Concrete

1.03 REFERENCES

A. ASTM C1107 - Standards Specification for Packaged Hydraulic-Cement Grout (Nonshrink)
B. ASTM C109 - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars – Modified
C. ASTM C1090 - Standard Test Method for Measuring Changes in Height of Cylindrical Specimens from Hydraulic Cement Grout
D. ASTM C939 - Standard Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method)
E. ASTM C827 – Test Method for Early Volume Change of Cementitious Mixtures
F. ASTM C882 – Test Method for Bond-Strength of Epoxy-Resin Systems Used with Concrete.
G. ACI 351 - Grouting for Support of Equipment and Machinery

1.04 SUBMITTALS

A. Submit list of each type of grout proposed for each location to be grouted. Include manufacturer's specifications, use recommendations, surface preparation and application instructions, and protection of adjacent surfaces.

B. Submit three copies of submittal package. Grout shall be approved prior to use.

1.05 QUALITY ASSURANCE

A. Grout Manufacturer shall be consulted when questions arise during selection of a particular grout for application. Grout used shall be as recommended by the manufacturer for each type of application.

B. Grout shall be mixed, placed and cured in strict conformance to the manufacturer's instructions. Surfaces to be grouted shall be carefully prepared according to the manufacturer's instructions. Improper surface preparation and curing are the most common causes of grout failure and problems.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's sealed containers with contents clearly labeled.

B. Store materials in a dry area at a temperature between 40 and 100°F.

PART 2 - PRODUCTS

2.01 STANDARD NON-SHRINK GROUT

A. Non-metallic, non-bleeding, cement based non-shrink grout meeting ASTM C1107, Grades B or C. Pumpable and pourable with positive expansion per ASTM C827.

B. Compressive Strength at Flowable Consistency per ASTM C109: 2500 psi at 1 day, 5000 psi at 3 days, and 8000 psi at 28 days (minimums).

C. Use: Grouting around pipe and conduit penetrations in concrete slabs, and other locations where non-shrink grout is called for and other specified grouts are not required.

D. Manufacturers: Dayton Superior Corp. "1107 Advantage Grout"; ThoRoc "621 Construction Grout; EUCO "NS Grout"; or approved equal.

2.02 PRECISION NON-SHRINK GROUT

A. High performance, non-metallic, non-bleeding, non-gaseous, chloride-free, cement based non-shrink grout meeting ASTM C1107, Grade C. Pumpable and pourable, vibration resistant, and heat and thermal shock resistant. Positive expansion per ASTM C827 and ASTM C1090.

B. Expansion: 0.01-0.07% at 1 day and 0.02-0.07% at 28 days when tested per ASTM C1107 in Fluid State.

C. Compressive Strength at Fluid Consistency per ASTM C1107: 4000 psi at 1 day, 6000 psi at 3 days, and 9000 psi at 28 days (minimums).

D. Use: Under base plates of equipment and other items where grout base is shown in the drawings or required.

E. Manufacturers: Dayton Superior Corp. "Sure-Grip High Performance Grout", "1107 Advantage Grout"; EUCO "Hi-Flow Grout"; or approved equal.

2.03 DRY PACK GROUT

A. Cement based, non-shrink, noncorrosive, non-metallic, high density, high strength grout for dry pack applications. Meets COE CRD-C-621.

B. Compressive Strength per ASTM C109: 3000 psi at 1 day, 6500 psi at 7 days, and 8000 psi at 28 days (minimums) at damp pack consistency.

C. Use: Pipe penetration patches in precast concrete, overhead applications and other areas where poured or pumped grout use is not practical.

D. Manufacturers: Dayton Superior Corp. "Sure-Grip Grout Dri-Pak"; W.R. Meadows "Pac-It"; EUCO "Dry Pack Grout"; or approved equal.

2.04 EPOXY GROUT

A. Multi-component, pre-proportioned epoxy grout. High impact and vibration resistance.

B. Compressive Strength per ASTM D695 at 50°F: 9200 psi at 1 day and 12000 psi at 14 days

C. Tensile Strength per ASTM D638 at 10 days: 2600 psi minimum

D. Flexural Strength per ASTM D790 at 14 days: 5000 psi minimum

E. Bond Strength per ASTM C882 at 14 days: 2200 psi minimum (to concrete)

F. Water Absorption per ASTM D570: 0.3%

G. Use: Deep pour applications (more than 4-inch thick), grouted rods and anchor bolts.

H. Manufacturers: Dayton Superior Corp. "Sure-Grip Epoxy Grout"; or approved equal.

2.05 ACCESSORIES

A. Aggregate: Washed pea gravel, maximum 3/8-inch size.

B. Water: Clean potable water.

C. Curing Compound: Water based, acrylic as recommended by grout manufacturer.

PART 3 - EXECUTION

3.01 MIXING

A. Mix materials in accordance with the manufacturer's instructions.

B. Where grout depth will exceed 2-inches, add aggregate at a maximum rate of 25 pounds per 55 pound bag.

C. Do not retemper mix.

3.02 PREPARATION

A. Carefully prepare all surfaces to be grouted in accordance with the manufacturer's recommendations and as specified. Concrete must be cured for 28 days before placing grout.

B. Clean surfaces to remove loose and foreign material by waterblasting, mechanical abrasion, or sandblasting. Surface shall be free of dirt, oil, curing compounds and laitance.

C. Remove unsound concrete by chipping or grinding. Grind or sandblast steel surfaces to remove all rust, mill scale and paint.

D. Install forms to contain liquid grout. Seal joints and corners.

3.03 INSTALLATION – CEMENTITIOUS GROUTS

A. Follow manufacturer's instructions.

B. Just prior to grouting, thoroughly saturate concrete surfaces for 24 hours; remove excess water.

C. Place grout continuously by most practical means. Work from one side to avoid entrapped air.

D. Grout may be rodded or tamped, but do not vibrate.

E. Apply curing compounds to exposed grout in accordance with manufacturer's instructions or cure with wet burlap for 3 days. Curing shall commence immediately after placement.

3.04 INSTALLATION – EPOXY GROUTS

A. Follow manufacturer's instructions.

B. Allow surfaces to dry completely before grouting.

C. Place grout continuously by most practical means. Work from one side to avoid entrapped air.

D. For grout depths exceeding 3 inches, place grout in maximum 3-inch lifts; allow each lift to cure before placing next lift.

E. Consolidate material to eliminate voids and air pockets.

F. Lightly mist exposed grout with solvent, then steel trowel to smooth surface. Do not apply curing compounds.

PART 4 - SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Cost for grout work shall be included as a portion of the lump sum or unit price costs for the associated items as stated in the Bid Form. No separate measurement for these quantities will occur.

DIVISION 31 – EARTHWORK

31 10 00 SITE CLEARING

31 11 00 Clearing and Grubbing

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The work to be performed under this section shall include all labor, equipment, and materials necessary for the removal of vegetation and organic matter including, trees, logs, stumps, roots, shrubs, brush, grass and other organic materials as specified herein and as necessary to complete the proposed improvements. This work shall also include the preservation and protection from injury or defacement of all vegetation and objects designated to remain, hauling and disposal of all resulting materials, backfilling of all voids resulting from clearing and grubbing operations, and grading of areas along the project alignment which are not included elsewhere in grading.

B. Clearing and grubbing work shall be performed in strict compliance with all City, County, State and Federal laws and requirements pertaining to clearing, disposal, erosion control, and other related operations.

C. Extra care shall be taken when construction occurs on private property. For areas within easements the Contractor shall coordinate with the Owner and private property owners prior to removal or trimming of any vegetation.

D. Clearing and grubbing shall include all work necessary to remove shrubs and other vegetation within the City right-of-way as required to facilitate access to the sewer main and lateral pipes designated for replacement. Contractor shall supply all labor and equipment required to perform the work.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 CLEARING

A. Clearing shall consist of the felling, trimming or cutting of trees, stumps, shrubs, brush and branches, and the clearing of downed timber, vines, grass and other vegetation to the limits specified herein, with the exception of items designated either on the Plans or within these Specifications to remain. The ground surface shall be cleared completely of all growth and organic matter as specified.

B. Merchantable timber, shrubs and other vegetation of value occurring within areas designated for clearing or resulting from the clearing work shall become the property of the Contractor unless otherwise specified.

C. Trees of which less than one-half (1/2) of the lower portion of the trunk is within the area to be cleared may be left in place unless they are so situated that they interfere with other work to be completed under this contract, in which case they shall be removed.

D. Trimming

1. Tree branches hanging within the zone extending from the ground surface to 13-feet above the finished roadway grade, or 9-feet above other areas, shall be cut off to the boles in a workmanlike manner in conformance with tree surgeon practice, as directed.

2. The Contractor shall remove additional tree branches as directed by the Engineer in such a manner that the tree presents a balanced appearance.

3. Scars resulting from trimming of branches shall be treated with an approved tree sealant.

E. Clearing Limits – Clearing shall be performed within designated rights-of-way and easements on a 15-foot-wide strip centered over pipelines installed on this project, and as directed.

3.02 GRUBBING

A. Grubbing shall consist of the removal of all embedded wood and other organic matter. Materials to be removed include stumps, trunks, buried logs, roots one-inch (1") in diameter and larger and other objectionable material.

B. Grubbing Limits

1. Grubbing shall be performed within all clearing area limits, as specified above, to a depth of six-inches (6") below the ground surface, or subgrade, whichever is deeper.

2. At all trenches and other excavations, grubbing shall be conducted to six-inches (6") outside the exposed sides of the excavation. All stumps shall be completely removed to firm undisturbed soils.

3.03 DISPOSAL

A. All materials and debris resulting from clearing and grubbing operations shall become property of the Contractor at the place of origin, and shall be hauled away and disposed of by the Contractor.

B. Materials resulting from clearing and grubbing operations shall not be disposed of on lands owned or controlled by the Owner except by written permission. If so permitted, the Contractor shall place materials only at locations and in such manner as directed by the Owner.

C. The Contractor shall obtain written permission from the owner of any property upon which clearing and grubbing materials are to be disposed. Copies of the agreement between the property owner and the Contractor shall be furnished to the Owner and Engineer.

D. No burning of materials shall be allowed at the project site unless approved by the Owner in writing. No excess accumulation of materials shall be allowed at the project site.

3.04 PRESERVATION OF EXISTING VEGETATION

A. The Contractor shall protect from injury all trees, shrubs, vines, plants, grasses and other vegetation outside of areas to be cleared and grubbed, or which are designated by the Engineer to

be preserved. Operations which may damage such vegetation to remain shall be conducted in areas where damage will not result.

B. The Contractor shall give reasonable notice to occupants or owners of affected properties to permit them to salvage or relocate plants designated for removal.

C. All items designated to remain which are damaged by the Contractor's operations shall be restored or replaced by the Contractor to as nearly as possible original condition and location at no cost to the Owner.

3.05 COMPLIANCE WITH LAWS AND REGULATIONS

A. The clearing and grubbing work shall be performed in strict compliance with all City, County, State and Federal laws and requirements pertaining to clearing, hauling, disposal, erosion control, and related operations.

3.06 BACKFILLING AND GRADING

A. Stump holes and other excavations which result from clearing and grubbing operations shall be backfilled with suitable material and compacted in accordance with Section 31 23 00.

B. Holes in areas to be excavated or trenched at a later time may be temporarily backfilled or covered as approved to provide for public safety until completion of final backfill.

C. Areas subject to Clearing and Grubbing shall be smoothed and reshaped to blend to surrounding grades.

PART 4 - SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Payment for Clearing & Grubbing shall be made on a lump sum basis at the price stated on the Bid Form. Payment shall include compensation for all labor and equipment required to complete the work described herein.

31 20 00 EARTH MOVING

31 23 00 Excavation, Bedding and Backfill

PART 1 - GENERAL

1.01 SUMMARY

A. This work consists of furnishing all labor, materials, incidentals and equipment, as well as performing all work required for trench excavation, foundation stabilization, pipe bedding, pipe zone material, trench backfill, compaction, final grading, hauling and disposal of material resulting from the construction of water mains, services, and all related appurtenances. Included also is the locating and protecting of existing utilities and other improvements, shoring, bracing, and

dewatering of excavations, excepting only such work as is covered and included under other Sections of these Specifications.

B. Excavation must be in accordance with ORS 757.541 to 757.571 and all other applicable laws and regulations.

C. General excavation, if required on a project, will be as described in the Special Provisions. The general requirements pertaining to placement, compaction, and testing of fill materials will be as described herein unless otherwise specified.

1.02 REFERENCES

A. Oregon Standard Specifications (OSS) – The joint Oregon Department of Transportation/APWA Oregon Chapter Standard Specifications for Construction.

1.03 DEFINITIONS

A. Trench Excavation – Trench excavation consists of the removal of all material encountered in the trench to the limits shown on the Plans or as directed. Trench excavation shall be classified as either common excavation or rock excavation.

1. Common excavation is defined as the removal of all material as required to complete the planned improvements, regardless of type, nature or condition of materials encountered, except that which is designated as rock excavation.

2. Rock excavation is defined as the removal of boulders composed of igneous, sedimentary or metamorphic stone material which have a least dimension of 36-inches or more, or a displacement of one cubic yard or more; or the removal of solid ledge rock which, in the opinion of the Engineer, requires for its removal drilling and blasting, wedging, sledging, barring or breaking with power operated tools.

a. No soft or disintegrated rock; hard-pan or cemented gravel that can be removed with a hand pick or power operated excavator or shovel; no loose, shaken, or previously blasted rock or broken stone in rock fillings or elsewhere; and no rock outside of the minimum limits of measurement allowed, which may fall into the excavation, will be measured or allowed.

b. When solid rock layers have an overburden of non-rock material (common material) which cannot practically be stripped and handled separately, and/or when solid rock is interspersed with non-rock material, the entire mass will be classified as solid rock if the actual solid rock fraction exceeds 85% of the entire volume.

B. Trench Foundation – Trench foundation is defined as the bottom of the trench on which the pipe bedding is to lay and which provides support for the pipe.

C. Foundation Stabilization – Foundation stabilization is defined as the furnishing, placing and compacting of specified materials for any unsuitable material removed from the bottom of an excavation, as directed by the Engineer, to provide a firm trench foundation.

D. Pipe Bedding – Pipe bedding is defined as the furnishing, placing and compacting of specified materials on the trench foundation so as to uniformly support the barrel of the pipe. The total bedding depth shall be a minimum of 6-inches below the outside bell of the pipe, in accordance with the appropriate Standard Detail Drawing and these Specifications.

E. Pipe Zone – Pipe zone is defined as the furnishing, placing and compacting of specified materials for the full width of the trench and extending from the top of the bedding to a level as specified above the top outside surface of the barrel of the pipe. Specified zone material to be placed in this region in conformance with these Specifications and/or as shown on the Standard Detail Drawings.

F. Trench Backfill – Trench backfill is defined as the furnishing, placing and compacting (except CLSM) of material in the trench extending from the top of the pipe zone to the bottom of pavement base, ground surface or surface material. Class "B" Backfill is required for all areas located under paved or graveled surfaces, unless otherwise noted on the Plans. CLSM required where shown on the Plans or where required by ODOT. See the Plans for specific locations of the required backfill classes.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Trench Foundation – The trench foundation shall be undisturbed native material when suitable. Where ground water or other unstable conditions exist and the native material cannot properly support the pipe, additional excavation may be required. The trench shall be stabilized with foundation stabilization material when such conditions are present in the opinion of the Engineer.

B. Foundation Stabilization – Foundation Stabilization: 1½"-0 or 2"-0 aggregate base rock meeting 2002 Oregon Standard Specifications Sections 00641 and 02630. Required when native trench foundation material contains groundwater, or is unsuitable to provide a firm foundation in the opinion of the Engineer.

C. Pipe Bedding and Zone – ¾"-0 dense-graded aggregate, uniformly graded from coarse to fine and meeting OSS Section 02630.10.

D. Trench Backfill

1. Class "A" Backfill: Native or common excavated material, free from organic or other deleterious material, free from rock larger than 3-inches, and which meets the characteristics required for the specific surface loading or other criteria of the backfill zone in the opinion of the Engineer. If stockpiled material becomes saturated or unsuitable, Class B, C or D Backfill shall be substituted. Engineer must approve material prior to use.

2. Class "B" Backfill: ¾"-0 dense-graded aggregate, uniformly graded from coarse to fine and meeting OSS Section 02630.10.

3. Class "C" Backfill: Clean sand with no particles larger than ¼-inch.

4. Class "D" Backfill: Pit run or bar run material, well graded from coarse to fine, with maximum aggregate size of 3 inches.

5. Class "E" Backfill (CLSM or CDF): Controlled Low-Strength Material (cement slurry) conforming to OSS Section 00442.

PART 3 - EXECUTION

3.01 GENERAL

A. Remove, haul, and dispose of all formations and materials, natural or man-made, irrespective of nature or conditions encountered, within lines and grades shown on the Plans or defined herein, and as necessary for completion of the proposed improvements. The method of excavation shall be as determined by the Contractor, and as required for special protection of existing improvements. Special care shall be taken to avoid overexcavation below subgrades. Store and protect materials suitable for use as backfill where applicable. Clearing and Grubbing and Removal of Structures and Obstructions to be completed prior to excavation.

B. When the precise location of subsurface structures and/or utilities is unknown, locate such items by hand excavation prior to utilizing mechanical excavation equipment. Use hand excavation when mechanical equipment might damage existing improvements which are to remain undisturbed. See Division 1 for other requirements.

C. Incidental to excavation shall be the furnishing, installing and removal of all shoring, sheeting, bracing and dewatering equipment as required to support adjacent earth banks and structures, keep excavations free from excess water, and to provide for the safety of the public and all personnel working in excavations.

3.02 EXCAVATION

A. Excavate to the lines and grades shown on the project Plans, allowing for forms, shoring, working space and gravel base. Provide minimum 6-inch clearance around pipe barrel in all directions or greater in accordance with the standard trench detail drawing.

B. Shoring and Bracing

1. Sheet and brace excavation as necessary to prevent caving and to protect adjacent structures, property, workers and the public.

2. All sheeting, shoring and bracing shall conform to safety requirements of OSHA and other Federal, State and local agencies.

C. Dewatering

1. Furnish, install and operate all necessary machinery, appliances and equipment to keep excavations free from water during digging and initial backfilling. Dispose of water in such a manner as to prevent damage to public or private property, or nuisance or menace to the public.

2. At all times have on hand sufficient pumping equipment and machinery in good working condition for all ordinary emergencies, including power outage. Have available, at all times, competent workers for operation of the equipment.

3. Control surface runoff to prevent entry or collection of water within excavations. All excavations shall be kept free of water during placement of backfill and/or concrete placement.

4. Comply with all laws regarding stormwater runoff, protection of natural resources, and other applicable laws and regulations.

3.03 FOUNDATION STABILIZATION

A. The contractor shall overexcavate the trench to firm undisturbed soils or rock when, in the opinion of the Engineer, the trench foundation materials are not suitable for the support of the pipe. Foundation stabilization materials, as specified in Section 02030-2.01.B, shall be placed and compacted in lifts not exceeding 6-inches in compacted thickness to the required grade. Each lift shall be compacted to at least 95% relative compaction in accordance with AASHTO T99.

3.04 DISPOSAL OF EXCESS MATERIALS

A. Excavated materials not suitable or required for backfill shall be hauled away and disposed of on approved sites arranged by the Contractor. No site shall be used for disposal of materials without written approval of the property owner. All costs associated with the hauling and disposal of materials shall be bourn by the Contractor. The Contractor shall be entitled to any proceeds received from the sale of excess materials.

3.05 TEMPORARY STOCKPILING

A. Place excavated materials suitable for use as backfill (and not excess material) only within construction easements, right-of-way, or approved work area. Stockpiles shall be placed in such manner as to provide the minimum inconvenience to the public.

B. The Contractor shall obtain written permission from any property owners prior to placement of stockpiles on private property. Provide copies to the Owner and Engineer. Remove stockpiles as soon as possible and restore sites to affected property owners' satisfaction.

C. Access to all fire hydrants, water valves and meters shall be maintained. Stockpiles shall not be permitted to block any stormwater drainage ditches, gutters, drain inlets, culverts or natural water courses.

D. Protect stockpiled material which is to be later incorporated into the work so that excessive wetting or drying of the material does not occur. Material shall be brought to near optimum moisture content prior to placement and compaction. Depending on the moisture content of stockpiled materials, necessary processing may include aeration, mixing and/or wetting. No additional payment will be allowed for protecting or preparing native backfill materials.

E. If approved native materials become unsuitable (too wet or mixed with unsuitable materials) due to negligence by the Contractor, then imported granular materials may be required for backfilling at the subject location at no additional cost to the Owner.

F. Provide necessary protection for stockpiled materials so that silt-laden runoff does not occur during rain events and to prevent wind-blown dust from stockpiles.

3.06 TRENCH BACKFILL

A. Place and compact pipe bedding material before placing pipe in the trench. Dig depression for pipe bells to provide uniform bearing along the entire pipe length. Thoroughly compact bedding material.

B. Place materials in the pipe zone in layers not greater than 6 inches thick and in a manner that equalizes the pressure on the pipe and minimizes stress. As required under the haunches of pipe and areas not accessible to mechanical tampers or to testing, compact with hand methods to ensure thorough contact between the material and the pipe. Before placing the pipe zone material, condition, aerate, or wet the material so that the moisture content of each layer is within minus 4% to plus 2% of optimum moisture content.

C. Contractor shall backfill the trench above the pipe zone in successive lifts not exceeding 12-inches in loose thickness. Do not allow the backfill to free-fall into the trench until at least 3 feet of cover is provided over the top of the pipe. Each lift shall be compacted, using suitable mechanical or pneumatic equipment, to a minimum of 95% of the maximum dry density as determined by AASHTO T99. If the specified compaction is not obtained, the Contractor may be required to use a modified compaction procedure and/or reduce the thickness of lifts. If approved materials meeting the specifications cannot be compacted to the required density regardless of compactive effort or method, the Engineer may reduce the required density or direct that alternate materials be used. In no case shall excavation and pipe laying operations proceed until the Contractor is able to compact the backfill to the satisfaction of the Engineer.

D. CLSM. When CLSM Backfill is required, backfill above pipe zone with CLSM material. If the CLSM is to be used as a temporary surfacing, backfill to top of the trench and strike off to provide a smooth surface. If CLSM is not to be used as a temporary surface, backfill to bottom of the proposed resurfacing. Use steel plates to protect the CLSM from traffic a minimum of 24 hours.

E. When backfilling is complete, the Contractor shall finish the surface area as specified. In paved or graveled areas the Contractor shall maintain the surface of the trench backfill level with existing adjacent grades with ¾”-0 crushed rock until pavement replacement is completed and accepted by Owner.

3.07 COMPACTION TESTING

A. The Contractor shall retain and pay for the service of an approved, recognized independent testing laboratory to conduct laboratory tests on materials and field testing to determine the relative compaction of trench backfill, subgrades, embankments, gravel surfacing, aggregate base and asphalt concrete pavement, as indicated. The approved Testing Agency shall recommend methods of compaction to Contractor and issue final report to the Owner, through the Engineer, regarding compaction testing results and material compliance with the specifications.

B. Approved testing agencies include the following:

1. Foundation Engineering; 820 N.W. Cornell Ave; Corvallis, OR 97330; (541) 757-7645

2. Western Testing; 3329 N.E. Stephens; Roseburg, OR 97470; (541) 957-1233

3. Western Testing; 2455 Maple Leaf, Bay #4; North Bend, OR 97459; (541)266-9875

C. Field Testing

1. Testing to determine the relative compaction of materials placed and compacted by the Contractor shall be performed a short distance behind construction. Tests shall be taken on each lift of the material prior to placement of the succeeding lift to ensure proper compaction is obtained. The Testing Agency shall perform testing at such locations and elevations as to be representative of the entire material and area being compacted. The Engineer shall have authority to require testing at times and locations he deems necessary.

2. A sufficient number of density tests shall be taken on the first section of subgrade and trench backfill placed by the Contractor to establish the effectiveness of the Contractor’s compactive efforts. If tests indicate that the specified relative compaction for a given material is not being

achieved, the Contractor shall modify compaction methods in order to obtain the specified results.

3. It is estimated that a minimum of two compaction tests will be required for this project to adequately verify backfill compaction within the trench and around manholes. Additional tests may be required by ODOT within the State right-of-way for backfill and/or asphalt.

D. Failing Tests – For areas failing to meet the specified compaction, the Contractor shall be responsible to perform all additional work necessary to achieve specified compaction at no additional cost to the Owner. Additional work may include further compactive effort, moisture treatment, other compaction methods, removal and replacement of failing materials, or other processes required to obtain the specified results.

E. Any subsequent settlement of backfilled areas during the one-year warranty period shall be considered to be the result of insufficient compaction, and shall be promptly repaired by the Contractor at no additional cost to the Owner.

PART 4 - SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Payment for Trench Excavation, Bedding and Backfill shall be included within the unit prices for sewer mains, service laterals, storm drains, culverts and associated appurtenance items. Price will include all such trench work and materials required for each backfill class and size and type of pipe as shown on the Bid Form. A separate payment will not be made for this item.

a. Payment for Foundation Stabilization will be made on a cubic yard basis, truck measure at the price stated on the Bid Form. Payment shall include all excavation, removal and disposal of excavated materials and placement of new foundation stabilization material.

b. Payment for Compaction Testing will be on a unit price basis per each test at the price stated on the Bid Form. Payment shall include all costs associated with in-place density testing, material sampling, and laboratory analysis as necessary to provide accurate analysis of the placed and compacted backfill materials.

c. Payment for Rock Excavation, if applicable, will be on a cubic yard basis at the price stated on the Bid Form. Measurement of rock quantities shall be the product of length, width, and depth of rock encountered during excavation, as measured by the Engineer.

DIVISION 32 – EXTERIOR IMPROVEMENTS

32 10 00 BASES, BALLASTS, AND PAVING

32 11 00 Base Courses

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes all work necessary for furnishing, placing, compacting and grading aggregate base and subbase materials on a prepared surface to the lines, grades, thicknesses and cross sections shown on the Plans or indicated.

1.02 REFERENCES

A. ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort

1.03 SUBMITTALS

A. Contractor shall furnish sample of proposed material for visual inspection by Engineer prior to importing to site.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Aggregate base shall be either 1" – 0 (25.0mm – 0) or ¾" – 0 (19.0mm – 0) as the Contractor elects. Use clean, hard, durable aggregates, reasonably well-graded from the maximum size to dust.

B. Aggregate subbase shall be 1½" – 0 (37.5mm – 0) angular crushed rock. Use clean, hard, durable aggregates, reasonably well-graded from the maximum size to dust.

C. Aggregate base and subbase shall be obtained from a source pre-approved by the Owner.

PART 3 - EXECUTION

3.01 WORKMANSHIP

A. Sequencing and Scheduling – Notify Engineer 48-hours prior to placement of aggregate base to permit inspection.

B. Preparation of Subgrade – Provide a firm subgrade surface on which aggregate base is to be placed. Scarify subgrade surface to provide bonding for aggregate base.

1. Subgrade Overexcavation & Replacement – Remove and dispose of any unstable or unsuitable materials as directed by the Engineer. Replace any excavated materials with successive lifts of aggregate subbase or other materials as directed by the Engineer. Grade and compact, as required, to provide a smooth surface that conforms to the surrounding grades.

C. Mixing – Mix to provide a homogeneous mixture of unsegregated and uniformly dispersed materials. Add water or aerate, as necessary, during mixing to achieve optimum moisture content ±2% during placement.

D. Placement

1. When, in the judgment of the Engineer, the weather is such that satisfactory results cannot be achieved, operations shall be suspended. Owner shall not be liable for damages or claims of any kind or description due to the suspension of operations by the Engineer.

2. Aggregate shall be deposited on the subgrade at a uniform quantity per linear foot so that the Contractor will not resort to spotting, picking up, or otherwise shifting material. Segregation of aggregates shall be avoided and material so spread shall be free of pockets of coarse or fine materials.

3. Place aggregate base such that when compacted and finish graded it will conform to the grades and sections shown on the Plans. Aggregate base shall be placed in maximum lifts of 4-inches, or as approved by the Engineer. Place each layer in spreads as wide as practical and to the full width of the course before a succeeding layer is placed.

E. Compacting and Shaping

1. Aggregate base shall be compacted by self propelled, smooth drum, static or vibratory rollers capable of achieving the specified compaction.

2. Shape and maintain the surface of each layer of aggregate base during compaction operations such the surface of each layer is parallel to the established grade and cross section for the finished surface within 0.05 foot.

3. Aggregate base shall be compacted to 95% relative density as determined by the ASTM D698 test method.

F. Comply with Section 31 23 00, Paragraph 3.07 – Compaction Testing.

PART 4 - SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Measurement and payment for Aggregate Base will be on a cubic yard basis at the unit price indicated on the Bid Form. Payment shall include compensation for materials, hauling, placing, compacting, and incidental work.

32 12 00 Asphalt Concrete Paving

PART 1 - GENERAL

1.01 SUMMARY

A. The work in this section includes furnishing all labor, materials, equipment and performing all work for the placement of hot mix asphalt concrete (HMAC) pavements to the lines and grades shown on the Plans.

B. If the work includes construction of HMAC pavement overlays, Contractor shall provide all labor, equipment, and materials necessary for preparation of existing pavement surfaces, including cleaning, cold planing, pavement removal and leveling, and tack coat application, as well as for placement and compaction of HMAC pavements.

C. HMAC pavement replacement along trenches shall conform to trench sections shown in the Standard Detail Drawings.

PART 2 - PRODUCTS

2.01 DEFINITIONS

A. Hot Mix Asphalt Concrete (HMAC) – Asphalt concrete is a hot mix of asphaltic cement; well graded, high quality aggregate; mineral filler and additives, as required; plant mixed into a uniformly coated mass, hot laid in on a prepared foundation, and compacted to a specified density.

B. Oregon Standard Specifications (OSS) – The joint Oregon Department of Transportation/APWA Oregon Chapter Standard Specifications for Construction.

2.02 MATERIALS

A. Unless otherwise specified herein, types, grades, quality and proportions of materials shall conform to specified and/or applicable sections of the current Oregon Standard Specifications (OSS) for Construction.

B. Asphalt Tack Coat shall consist of CSS-1 or CSS-1h emulsified asphalt (EA) conforming to OSS, Section 00730.

C. Asphalt Cement shall consist of PG 64-22 or PG 70-22 asphalt conforming to OSS, Section 00744.

D. Unless otherwise specified in the Contract Documents, Asphalt Concrete Pavement shall consist of the following mix types as defined in OSS, Section 00744:

1. For all streets classified as Collector or below – Level 2, ½-inch Dense Graded Mix.
2. For all streets classified as Arterial or above – Level 3, ½-inch Dense Graded Mix.

PART 3 - EXECUTION

3.01 WORKMANSHIP

A. Unless specified herein, base aggregate and asphalt concrete shall be mixed, processed, laid, compacted and finished in accordance with applicable sections of the Oregon Standard Specifications, latest update. Aggregate base shall be 1" – 0 (25.0 mm – 0) crushed rock

conforming to the requirements of Section 02630 of the Oregon Standard Specifications, unless otherwise noted.

B. Notify the Engineer at least 48-hours prior to placement of base aggregate and asphalt concrete pavement to permit inspection.

C. When, in the judgment of the Engineer, the weather is such that satisfactory results cannot be achieved, base aggregate and asphalt concrete paving operations shall be suspended. Owner shall not be liable for damages or claims of any kind or description due to the suspension of operations by the Engineer.

D. Adhere to all applicable State and/or OSHA regulations pertaining to road closure, traffic control, and other related safety precautions.

E. To provide for the convenience and safety of the traveling public, pavement replacement shall be performed immediately following the completion of backfilling operations. In the event that pavement replacement cannot be performed as such, the Contractor shall maintain the trench backfill on a daily basis, as directed, until pavement replacement has been completed.

F. Contractor shall maintain all surfaced areas for a period of one year from the date of final acceptance and shall furnish all required labor expediently, should any repairs be necessary within the one-year warranty period.

G. Subgrade and Aggregate Base

1. Prepare subgrade to ensure that all surfaces and materials on which gravel surfacing is to be placed are sound and compact.

2. Provide a homogeneous mixture of unsegregated and uniformly dispersed materials which will compact to not less than 95% at the optimum moisture content. Add water or aerate during mixing to produce the optimum water content, ±2% during placement.

3. Aggregate shall be initially placed on the subgrade at a uniform rate per lineal foot so that the Contractor will not resort to spotting, picking up, or otherwise shifting of gravel surfacing material. Segregation of aggregates shall be avoided and material so spread shall be free of pockets of coarse or fine materials.

4. Aggregate base shall be placed uniformly to a minimum depth of 8-inches. Place aggregate base in lifts not exceeding 4-inches and compact each layer to at least 95% of the maximum dry density as determined by the ASTM D698 test method.

H. Cold Plane Pavement Removal

1. Where called for on the Plans or directed by the Engineer, existing pavements shall be removed, lowered, and/or leveled by cold planing. Cold plane pavement removal shall be performed to the limits and depths identified on the Plans or as otherwise directed.

2. Furnish adequate number and size of trucks to receive grindings and allow cold planing to proceed in continuous, systematic manner without significant delay.

3. Dispose of all grindings at an approved site arranged by Contractor, unless otherwise directed.

I. Leveling Course Asphalt

1. Where called for on the Plans or directed, remove depressed or broken pavements to the extents indicated and restore to grade with compacted leveling course HMAC. Pavement removal shall be by cold planing or other approved means.

2. Perform leveling work as a separate operation from pavement overlays.

3. Spread leveling course HMAC with an approved paver unless otherwise allowed by the Engineer.

J. Tack Coat Asphalt

1. Contact surfaces of manholes, catch basins, gutters and existing pavements shall be treated with a layer of tack coat asphalt. Do not place on wet surfaces.

2. Joints between existing and new AC pavement shall be filled with tack coat asphalt.

3. Apply tack coat in conformance with OSS, Section 00730.

K. Preparation for HMAC Overlay

1. Treat all existing paved surfaces on and against which the HMAC overlay is to be placed with asphalt tack coat in accordance with the requirements of OSS, Section 00730.

2. Immediately before applying tack coat, clean and dry the surface to be tacked. Remove all loose or other material that will reduce adhesion of the tack by sweeping, air scour, pressure washing, or other approved methods.

3. Remove all existing traffic buttons.

4. Emulsified asphalt tack coat shall be applied at a rate between 0.05 and 0.20 gallons per square yard as directed with temperature between 140° F and 180° F as recommended by the manufacturer.

5. Protect all existing structures from the tack coat overspray or other damage. Check and clean as necessary.

L. Asphalt Concrete Pavement

1. Compacted depth of asphalt concrete pavement replacement shall be 4-inches on public streets. Comply with ODOT requirements regarding asphalt thickness within State rights-of-way. On non-public roads or driveways, match existing thickness, with a minimum thickness of 2-inches. Asphalt concrete pavement in excess of 2-inches thick shall be constructed in multiple lifts of approximately equal thickness. The maximum compacted thickness of any individual lift shall not exceed 2-inches.

2. Overlays of existing paved surfaces shall include nominal 2-inch thick compacted section of asphalt concrete pavement, unless otherwise specified. Preparation of existing paved surfaces shall be as specified above in Paragraph 3.01-H.

3. Pavement shall be placed, shaped, compacted and finished to match established grades and cross sections in compliance with Oregon Standard Specifications.

4. Minimum mix temperature at the time of placement shall be 250º F. Asphalt concrete shall not be placed when the ambient temperature is below 35º F.

5. Asphalt concrete pavement shall be compacted to a minimum of 92% relative compaction in accordance with the ASTM D1557 test method.

M. No traffic shall come in contact with any newly paved surface until surface has cooled and set sufficiently to prevent marking. The Contractor is responsible for traffic control.

N. Warranty

1. Contractor shall maintain all asphalt concrete paved areas and shall furnish all required materials and workmanship at no additional cost to the Owner for a period of one year following the Owner's acceptance of the complete project.

2. If any newly paved asphalt concrete surfaces settles, cracks, breaks, or becomes otherwise defective within the warranty period as described herein, then the deficiencies or damages in surfacing shall be immediately repaired by the Contractor upon request and in a manner approved by the Engineer.

3. All costs incurred in the repair of deficiencies or damages shall be borne by the Contractor, with no additional compensation allowed.

PART 4 - SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Cold Plane Pavement Removal

1. Measurement and payment for Cold Plane Pavement Removal shall be on a unit price basis per square foot or square yard at the price per corresponding quantity stated on the Bid Form. Payment shall include full compensation for all labor and equipment necessary to grind existing pavements to the extents indicated on the Plans or as directed by the Engineer.

2. The quantity paid shall be determined as the product of length and width to the nearest foot of all cold planed areas indicated on the Plans or directed by the Engineer. The Contractor and Engineer shall coordinate to measure cold planed areas prior to placement of overlays.

B. Leveling Course Asphalt

1. Measurement and payment for Leveling Course Asphalt shall be on a unit price basis per square foot or square yard at the price per corresponding quantity stated on the Bid Form. Payment shall include full compensation for all labor, equipment, and materials necessary to remove existing pavements to the extents indicated on the Plans or as directed by the Engineer and restore to grade with compacted HMAC.

2. The quantity paid shall be determined as the product of length and width to the nearest foot of all leveling course areas indicated on the Plans or directed by the Engineer. The Contractor and Engineer shall coordinate to measure leveling course areas prior to placement of overlays.

C. Asphalt Concrete Pavement

1. Measurement and payment for Asphalt Concrete Pavement shall be made on a tonnage basis at the unit price stated on the Bid Form. Payment shall include full compensation for all work necessary to prepare and construct the asphalt concrete pavement. There will be no separate measurement of bituminous cements or additives contained in the mixture or used otherwise in the work. Payment will be made only for material incorporated into the specified limits.

2. A separate ticket shall accompany each load delivered to the job site and shall be given to the Engineer before the load is spread. No ticket will be accepted unless it shows the date, ticket number, driver's name, project name, batch number, truck weight, gross weight and tonnage of asphalt.

3. All trucks shall be weighed at least once each day while unloaded and weighed while loaded for each trip. Platform scales furnished by the Contractor shall be tested and certified.

32 13 00 Rigid Concrete Paving

32 13 10 Reinforced Concrete Pavement

PART 1 - GENERAL

1.01 SUMMARY

A. This work in this section includes the furnishing of all labor, materials, and equipment, and performing all work required for the placement of reinforced concrete pavement to the lines and grades shown on the Plans or as otherwise directed by the Engineer. Work shall include, but not necessarily be limited to, all required formwork, reinforcing, finishing, and any other items incidental to construction of reinforced concrete pavement to the limits shown on the Plans.

1.02 RELATED SECTIONS

A. SECTION 03 11 00 – Concrete Forming
B. SECTION 03 20 00 – Concrete Reinforcement
C. SECTION 03 30 00 – Cast-In-Place Concrete

PART 2 - PRODUCTS

2.01 DEFINITIONS

A. Reinforced Concrete Pavement – Reinforced concrete pavement shall consist of Portland cement concrete placed wet to the lines, grades and thicknesses shown on the Plans, and properly finished and cured to achieve the design configuration and strength.

B. Portland Cement Concrete (PCC) – Portland cement concrete is a uniform mixture of water, cement and aggregates designed to achieve a specified strength when cured.

C. Oregon Standard Specifications (OSS) – The joint Oregon Department of Transportation/APWA Oregon Chapter Standard Specifications for Construction.

2.02 MATERIALS

A. Portland cement, aggregates, water and concrete admixtures shall be as defined in Section 03300.

B. Concrete shall be Standard Concrete Mix as specified in Section 03 30 33.

C. Expansion joint filler shall be poured joint filler from the ODOT Qualified Products List (QPL) and conforming to the requirements of AASHTO M 198 (ASTM D 1190).

D. Aggregate base shall be 1" – 0 (25.0 mm – 0) crushed rock conforming to the requirements of Section 02630 of the Oregon Standard Specifications, unless otherwise noted. Aggregate base for trench patches shall be Class "B" backfill as specified in Section 02320-2.01.D.2.

PART 3 - EXECUTION

3.01 WORKMANSHIP

A. Notify the Engineer at least 48-hours prior to placement of aggregate base and reinforced concrete pavement to permit inspection.

B. Adhere to all applicable State and/or OSHA regulations pertaining to road closure, traffic control, and other related safety precautions.

C. To provide for the convenience and safety of the traveling public, pavement replacement shall be performed immediately following the completion of backfilling operations. In the event that pavement replacement cannot be performed as such, the Contractor shall maintain the trench backfill on a daily basis, as directed, until pavement replacement has been completed.

D. Subgrade and Aggregate Base

1. Prepare subgrade to ensure that all surfaces and materials on which aggregate base is to be placed are sound and compact.

2. Provide a homogeneous mixture of unsegregated and uniformly dispersed materials which will compact to not less than 95% at the optimum moisture content. Add water or aerate during mixing to produce the optimum water content, ±2% during placement.

3. Aggregate base shall be placed uniformly to a minimum depth of 4-inches. Compact aggregate base to at least 95% of the maximum dry density as determined by the ASTM D698 test method.

E. Forms shall be of wood, metal or other suitable material which is straight and free from warp and has sufficient strength to resist the pressure of concrete without excessive deflection. Forms shall extend the full depth of the concrete.

F. Forms shall be cleaned and coated with an approved release agent prior to concrete placement.

G. Place and tie reinforcing bars at the spacing indicated on the Plans. Reinforcing bars should be supported on dobies during concrete placement.

H. Place concrete in forms without segregation. Tamp or mechanically vibrate wet concrete for thorough consolidation.

I. Concrete shall match existing pavement grades at limits of replacement.

J. Reinforced concrete pavements shall be broom finished in accordance with Section 03300.

K. No traffic shall come in contact with any newly paved surface until surface has cooled and set sufficiently to prevent marking. The Contractor is responsible for traffic control.

L. Warranty

1. Contractor shall maintain all reinforced concrete pavements and shall furnish all required materials and workmanship at no additional cost to the Owner for a period of one year following the Owner's acceptance of the complete project.

2. If any newly paved surfaces settles, cracks, breaks, or becomes otherwise defective within the warranty period as described herein, then the deficiencies or damages in surfacing shall be immediately repaired by the Contractor upon request and in a manner approved by the Engineer.

3. All costs incurred in the repair of deficiencies or damages shall be borne by the Contractor, with no additional compensation allowed.

PART 4 - SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Measurement and payment for Reinforced Concrete Pavement shall be on a unit price basis per square foot for each separate slab thickness indicated at the price stated on the Bid Form. Payment shall include all labor, equipment, and materials required for concrete placement including, formwork, reinforcing, finishing, and any other items incidental to the placement of pavements to the limits shown on the Plans.

B. Measurement and payment for Aggregate Base shall be as defined in Section 32 11 00.

32 13 20 Sidewalks and Plain Concrete Flatwork

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes all labor, equipment and materials required for construction of sidewalks, ADA ramps, and driveway aprons at the locations and to the limits shown on the Plans.

B. Where existing sidewalks or portions thereof are scheduled for removal, the limits of removal shall be as identified on the Plans or as otherwise directed by the Engineer.

C. Existing sidewalks not scheduled for removal which are damaged due to negligence on the part of the Contractor shall be replaced at the Contractor's expense.

1.02 RELATED SECTIONS

A. SECTION 03 11 00 – Concrete Forming
B. SECTION 03 30 00 – Cast-In-Place Concrete

PART 2 - PRODUCTS

2.01 MATERIALS

A. Concrete – Concrete shall be Standard Concrete Mix as specified in Section 03 30 00.

B. Expansion Joint Filler – Expansion joint filler shall be ½-inch thick preformed asphalt fiberboard conforming to ASTM D994.

C. Poured Joint Sealer – Poured joint sealer for expansion joints shall be polyurethane base, non-sag elastomeric sealant. Grey in color. Sika Corporation "Sikaflex-1a" or approved equal.

D. Curing Compound – Curing compound shall comply with Section 03 30 00.

E. Aggregate base shall be 1" – 0 (25.0 mm – 0) or ¾" – 0 (19.0 mm – 0) crushed rock conforming to the requirements of Section 02630 of the Oregon Standard Specifications for Construction, latest edition.

PART 3 - EXECUTION

3.01 WORKMANSHIP

A. New sidewalks shall be 4-inches thick, minimum.

B. Driveway approaches shall be 6-inches thick, minimum.

C. Place and compact aggregate base beneath new sidewalks. Depth of aggregate base shall be 4-inches, minimum. Aggregate base shall be compacted to at least 95% of the maximum dry density as determined by AASHTO T99.

D. Forms shall be of wood, metal or other suitable material which is straight and free from warp and has sufficient strength to resist the pressure of the concrete without excessive deflection.

E. Front and back forms shall extend for full depth of concrete being placed.

F. Forms shall be cleaned and coated with approved release agent prior to concrete placement.

G. Concrete shall be deposited in forms without segregation and tamped and spaded or mechanically vibrated for thorough consolidation.

H. Finishing – Sidewalks and driveway approaches shall be non-slip broom finished in accordance with Section 03 30 00-3.06.E.

I. Scored joints required on 5-foot centers. Expansion joints required on 15-foot centers, maximum.

J. Provide expansion joints around poles and other fixtures, which protrude through or against the structures and points of curvature.

K. Sidewalks shall match existing sidewalks at limits of replacement.

L. Comply with Section 03 30 00 for curing, protection and concrete testing.

PART 4 - SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Payment for Sidewalks shall be on a square foot basis at the price stated on the Bid Form. Payment shall include all materials, workmanship, and other activities required to complete the work. No additional payment will be made for this item.

B. Payment for Driveway Approaches shall be on a square foot basis at the price stated on the Bid Form. Payment shall include all materials, workmanship, and other activities required to complete the work. No additional payment will be made for this item.

C. Aggregate Base materials furnished and placed within sidewalk and driveway approach areas shall be included within the square footage price for the respective paving item. No additional compensation will be allowed.

32 15 00 Aggregate Surfacing

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes all work necessary to place, compact and grade aggregate surfacing where indicated on the Plans or directed by the Engineer.

B. When the Contractor's activities result in damage to existing aggregate surfacing outside the scheduled work area, new aggregate surfacing shall be provided at the Contractor's expense in order to restore the area to the satisfaction of the Engineer.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Aggregate surfacing material shall be 1" – 0 or ¾" – 0 clean, well-graded, angular crushed rock/gravel free of organic matter obtained from an approved quarry or river source. Acceptance of materials shall be by visual inspection by the Engineer.

B. When aggregate surfacing is used for shoulder rock on State highways, or where specifically indicated on the Plans, aggregate surfacing material shall consist of 1" – 0 or ¾" – 0 crushed rock conforming to Section 02640 of the Oregon Standard Specifications for Construction, latest edition.

PART 3 - EXECUTION

3.01 WORKMANSHIP

A. Sequencing and Scheduling – Notify Engineer 48-hours prior to placement of aggregate surfacing to permit inspection.

B. Preparation of Subgrade – ensure that all surfaces and materials on which aggregate surfacing is to be placed are sound and compacted. Grade and compact, as required, to smooth surface and remove potholes. Scarify existing surface to loosen material to provide bonding for new material.

C. Mixing – Mix to provide a homogeneous mixture of unsegregated and uniformly dispersed materials which will compact to not less than 95% relative compaction. Add water or aerate, as necessary, during mixing to achieve optimum moisture content ±2% during placement.

D. Placement

1. When, in the judgment of the Engineer, the weather is such that satisfactory results cannot be achieved, aggregate surfacing operations shall be suspended. Owner shall not be liable for damages or claims of any kind or description due to the suspension of operations by the Engineer.

2. Aggregate shall be deposited on the subgrade at a uniform quantity per linear foot so that the Contractor will not resort to spotting, picking up, or otherwise shifting of aggregate surfacing material. Segregation of aggregates shall be avoided and material so spread shall be free of pockets of coarse or fine materials.

3. Depth of new aggregate surfacing shall be equivalent to the depth of material on existing streets and private driveways, with a minimum required depth of 6-inches. Aggregate shall be placed in maximum lifts of 3-inches, or as approved by the Engineer. Final depth of aggregate surfacing shall be determined by the Engineer. Depths less than 6-inches may be allowed in areas with minimal aggregate surfacing.

4. For trench lines, the minimum width of aggregate surfacing shall be the trench width plus 2-feet. The Owner may elect to have the entire width of existing surfacing replaced.

PART 4 - SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Measurement and payment for Aggregate Surfacing shall be on a cubic yard basis, truck measure, and shall include the specified material, placement, shaping, and compacting. Payment will be made only for aggregate surfacing within the specified project limits. Replacement of aggregate surfacing required due to damage or alteration of existing aggregate surfaces due to the Contractor's operations shall be at the sole expense of the Contractor. No additional compensation will be allowed.

32 16 00 Curbs and Gutters

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes construction of Portland cement concrete curbs and gutters as shown on the Plans or directed by the Engineer.

B. Existing curb and gutter not scheduled for replacement that is damaged due to negligence on the part of the Contractor shall be replaced at the Contractor's expense.

1.02 RELATED SECTIONS

A. SECTION 03 11 00 – Concrete Forming
B. SECTION 03 30 00 – Cast-In-Place Concrete

PART 2 - PRODUCTS

2.01 MATERIALS

A. Concrete shall be Standard Concrete Mix as defined in Section 03 30 33.

B. Expansion and joint filler shall be ½-inch thick preformed asphalt fiberboard conforming to ASTM D994.

C. Poured joint sealer for expansion joints shall be polyurethane-base, non-sag elastomeric sealant, gray in color. Sika Corporation "Sikaflex-1A" or approved equal.

D. Aggregate base shall be 1" – 0 (25.0 mm – 0) or ¾" – 0 (19.0 mm – 0) crushed rock conforming to the requirements of Section 02630 of the Oregon Standard Specifications for Construction, latest edition.

PART 3 - EXECUTION

3.01 WORKMANSHIP

A. Curb and gutter shall be placed on compacted aggregate base. Aggregate base shall be to subgrade of the street section or 4-inches in depth, whichever is greater.

B. Forms shall have sufficient strength to resist the pressure of the concrete and to prevent leakage. Forms shall extend for the full depth of concrete and shall be adequately braced. Forms shall be cleaned and coated with an appropriate release agent.

C. Curbs and gutters shall be shaped to match existing structures. Joints shall be placed at appropriate intervals for the section replaced. Maximum spacing of control joints shall be 15-feet.

D. Finishing – Curbs and gutters shall be standard smooth finish as defined in Section 03 30 00-3.06.B.

E. Any existing curb and gutter that is removed shall be disposed of by the Contractor at an approved location arranged by the Contractor.

PART 4 - SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Payment for Curb and Gutter shall be on a lineal foot basis at the price stated on the Bid Form. Payment shall include all materials, workmanship, and other activities required to complete the work.

B. Aggregate Base materials furnished and placed in conjunction with curb and gutter construction shall be included within the unit price for Curb and Gutter. No additional compensation will be allowed.

DIVISION 33 – UTILITIES

33 31 00 SANITARY SEWER PIPING

PART 1 - GENERAL

1.01 SUMMARY

A. This section covers gravity sewer pipe materials for sewer mains and service laterals, including fittings, anchors, complete installation and testing.

B. All work shall conform to the latest version of the Oregon Standard Specifications (OSS) Part 00400, except as specified herein and shown on the Plans.

1.02 RELATED SECTIONS

A. Section 31 23 00 – Excavation, Bedding and Backfill

PART 2 - PRODUCTS

2.01 MATERIALS

A. All pipe, fittings and appurtenances shall be new and unused.

B. 4-inch through 15-inch PVC Gravity Sewer Pipe and Fittings

1. Unplasticized polyvinyl chloride (PVC) plastic gravity sewer pipe with integral wall bell and spigot joints for the conveyance of domestic sewage. Pipe shall be colored green for identification as sewer pipe. Pipe shall be furnished in 13 to 20-foot laying lengths, Contractor's preference. Pipe shall meet ASTM D3034 and have an SDR of 35.

2. PVC compounds shall meet the requirements of ASTM D1784, cell classification 12454-B.

3. Bells shall consist of an integral wall section with a solid cross-section rubber ring, factory assembled, and securely locked in place to prevent displacement during assembly. Spigot ends shall be supplied from the factory with beveled ends. Joints shall provide a tight flexible seal meeting the requirements of ASTM D3212. Material used for elastometric seal in push-on joints shall meet the requirements of ASTM F477.

4. All fittings and accessories shall be as manufactured and furnished by the pipe supplier, or approved equal, and shall have bell and/or spigot configurations compatible with that of the pipe. Fittings shall meet the same requirements as the pipe.

5. All fittings and appurtenances required to construct laterals and cleanouts shall be PVC and provided by or approved by the same manufacturer as the sewer piping. This shall include all tees, caps, wyes, couplings and other required fittings.

6. Pipe and fittings shall be Ring-Tite PVC Gravity Sewer Pipe and Fittings as manufactured by J-M Eagle; or approved equal.

C. Appurtenances

1. Transition couplings and same diameter couplings for new sewer lines, unless otherwise specified, shall be flexible rubber with stainless steel bands. Fernco, or approved equal. Rotate coupling so type and size wording is visible from top to allow for inspection.

2. PVC pipe connections to concrete manholes shall utilize appropriately sized flexible, watertight seal adapters designed for such use. Adapters shall be tested watertight to a minimum of 10.8 psi during factory testing. Adapters shall be for connections to precast concrete shall be KOR-N-SEAL as manufactured by NPC, Inc.; or approved equal. Adapters for connections at cast-in-place manhole bases shall be made with a rubber waterstop grouting ring. Ring shall clamp to pipe with stainless steel clamp and have waterstop ribs. Waterstop Grouting Ring by Press-Seal Gasket Corp., or approved equal

3. New service lateral connection to existing sewers shall utilize one of the following clamp on style saddles:

a. Molded PVC saddle with neoprene rubber seal to sewer main, gasket branch, and stainless steel straps; conform to ASTM D3034; GPK or approved equal.

b. Cast ductile iron saddle with virgin SBR gasket and adjustable 3½" wide stainless steel strap; Romac Style "CB" or approved equal.

4. Manufactured tees shall be required for service lateral connections to new mains and lateral reconnections to existing mains where use of saddles is not feasible. Tees shall conform to subsection 2.01.B. above.

D. Concrete shall conform to Oregon Standard Specifications Section 00440, Commercial Grade Concrete. Compressive field strength shall not be less than 3,000 psi at 28 days. Maximum aggregate size shall be 1½-inches. Slump shall be between 2 and 4 inches.

E. Non-Shrink Grout. Grout shall be Sika 212, Euco N-S, Five Star, or approved equal nonmetallic cementitious commercial grout exhibiting zero shrinkage per ASTM C827. Grout shall not be amended with cement or sand and shall not be reconditioned with water after initial mixing. Nonshrink grout shall be placed and packed only with the use of an approved commercial bonding agent. Unused grout shall be discarded after 20 minutes.

PART 3 - EXECUTION

3.01 PIPE INSTALLATION

A. PVC gravity pipe shall be installed, stored and handled in accordance with the manufacturer's installation guide, the Uni-Bell PVC Pipe Association Installation Guide for PVC Sewer Pipe, ASTM D2321, and these specifications.

B. Remove material from job site, which in the judgment of the Engineer is damaged, not as specified, or otherwise rejected. Payment will not be made for damaged or rejected materials, their removal, or for repairs to such materials.

C. Preparation of Trench – Excavate and prepare trench for pipe laying to the lines and grades as specified and shown on the Plans. Place any required foundation stabilization and compact pipe bedding prior to laying pipe. Stabilize trench as required and comply with OSHA safety provisions.

D. Place and compact pipe bedding material before placing pipe in the trench. Dig depression for pipe bells to provide uniform bearing along the entire pipe length. Thoroughly compact bedding material to prevent future bellies.

E. Prior to lowering pipe into the trench, the Engineer and/or City representative will check for damage to the pipe. The Contractor shall repair or replace, as directed, all damaged or flawed pipe prior to installation.

F. Thoroughly clean inside the pipe before laying. Prevent foreign material from entering the pipe while it is being placed in the trench. Remove all foreign material from the inside of the pipe and joint before the next pipe is placed. Keep debris, tools, rags or other materials out of the pipes at all times. When pipe laying is not in progress, seal the open end of the pipe with a watertight plug, or by other approved means to prevent the entry of trench water or other foreign materials into the pipe.

G. Lay pipe with bell ends facing the direction of laying. Face bells up-grade unless otherwise allowed by the Engineer. Thoroughly clean the ends of the pipe to remove all foreign matter from the pipe joint. Lubricate the bell and spigot ends with approved pipe lubricant, as recommended by the manufacturer.

H. Tolerance. For gravity pipelines, vertical deviation from true grade shall not exceed 0.02 feet (1/4 inch). Horizontal tolerance for deviation from line shall be 0.03 feet (3/8 inch). Depressions or bellies which create the potential for solids deposition are not allowed.

I. Care must be taken to ensure the pipe is not moved and the side support fill is not disturbed when moving sheeting or trench boxes.

J. Place materials in the pipe zone in layers not greater than 6 inches thick and in a manner that equalizes the pressure on the pipe and minimizes stress. As required under the haunches of pipe and areas not accessible to mechanical tampers or to testing, compact with hand methods to ensure thorough contact between the material and the pipe. Before placing the pipe zone material, condition, aerate, or wet the material so that the moisture content of each layer is within minus 4% to plus 2% of optimum moisture content.

K. Provide proper Backfill Class material as required. Backfill the trench above the pipe zone in successive lifts. Do not allow the backfill to free-fall into the trench until at least 3 feet of cover is provided over the top of the pipe. Modify the compaction as necessary to protect the pipe. Compact each lift to not less than 95% of the maximum density.

L. All pipes shall be thoroughly flushed with water prior to testing. Removal of water and debris shall be accomplished by exposing the pipe on the low end of the gravity main in each section and pumping water from the trench to the ground surface for disposal. The Contractor shall be responsible for the removal of all debris that enters into the sewer system from construction. All costs associated with removal of such debris shall be the responsibility of the Contractor and result in no additional costs to the Owner.

M. Service laterals shall be installed at a minimum 2% slope from the mainline or manhole to the connection with the existing lateral from the building, unless otherwise approved by the Engineer. Provide couplings for connection to existing service laterals. Coordinate with home-owner.

N. Service Lateral Connections

1. Service lateral connections shall include the connection of any new or existing service lateral to the main at locations shown on the Plans. Service laterals shall be connected to the main using new manufactured tees, or strap-on saddles when directed. In general, saddles will be used where new laterals are being added along existing mains or where existing laterals are being replaced and reconnected to the existing main. Reconnection to existing tees may be allowed when, in the Engineer's opinion, the condition of the tee is acceptable to provide for a durable, watertight seal. New manufactured tees will be required to connect laterals to new mains as well as to reconnect laterals to existing mains when the existing tees are unusable or damage to the mainline has occurred such that use of a saddle is impractical.

2. The Contractor shall install new PVC tees or saddles with manufactured bends as shown on the Standard Details. Service lateral piping shall be extended from the new saddle to the point where the existing service lateral crosses into the public right-of-way, and connected to the existing piping.

3. The Contractor shall provide a minimum of 1-hour notice to any existing user prior to cutting the user's service lateral and thereby disrupting service. Lateral replacement shall be completed within 4-hours or the Contractor will be required to provide bypass pumping for the affected user.

4. The Contractor shall be responsible for all exploratory excavation necessary to locate service laterals.

5. Service laterals shall be neatly cut at the property line and removed to the point of connection to the mainline. Reconnection to existing lateral piping shall be made using an appropriately sized transition coupling, as specified.

6. Where existing tees on the sewer main are cracked, broken, or otherwise unusable, the Contractor shall install a new tee and necessary mainline piping in order to provide a watertight connection for the lateral. Existing pipe shall be neatly cut in place in order to provide proper fit of the new tee and piping. Flexible clamp-down couplings (Fernco's) shall be used to seal the transitions.

O. After installation and compaction of backfill, all pipe shall be thoroughly flushed and then subject to either hydrostatic or low-pressure air testing. Pipe shall also be tested for deflection and video inspected. Contact the City of Coos Bay operations division (phone: 541/267-3966) to arrange flushing and video inspection.

3.02 MANHOLE CONNECTIONS

A. Where shown on the Plans or directed by the Engineer, the Contractor shall connect new sewer piping to existing manholes.

B. Core drill the manhole wall using appropriately sized core drill for the new pipe. Jack-hammering will not be allowed. Install pipe in accordance with Section 02535 using KOR-N-SEAL boot.

C. When an existing manhole has a poured-in-place base or other obstruction at the pipe level and core drilling is not feasible, contractor may jackhammer to provide penetration for new or replacement pipe. Install pipe in accordance with Section 33 39 00 using Waterstop Grouting Ring.

D. Connections to plastic manholes shall utilize appropriately sized flexible couplings between sewer pipes and preformed pipe stub-outs on the manhole base.

E. Install flexible transition couplings on all pipes within 2 feet of the outside walls of manholes. Provide a watertight connection.

F. Modify the base of the manhole in accordance with Section 33 39 00-3.03.

3.03 PLUG AND ABANDON PIPING/LATERALS

A. Where called for on the Plans or directed by the Engineer, install an appropriately sized mechanical plug at least 2-feet into the designated mainline or lateral pipe.

B. Concrete slurry for sealing sewer lines and laterals being abandoned shall consist of 2 sacks of Portland cement per cubic yard of cement sand. Water shall be added at such a ratio as to provide a 4-inch slump.

C. Concrete slurry shall be packed into the end of the pipe up to the mechanical plug and troweled flush with the end of the pipe.

3.04 LOW-PRESSURE AIR TESTING OF GRAVITY SEWER (per UNI-B-6-98 / ASTM F1417)

A. The Contractor shall furnish all equipment, materials and personnel required for properly conducting all required low-pressure air testing under observation of the Engineer. Pressure gauge shall have 0.10 psi increments and an accuracy of 0.0625-psi. Testing equipment must include a pressure relief device designed to relieve pressure at a maximum of 9 psi and must allow continuous monitoring of the test pressure to avoid excessive pressure. All air used shall pass through a single control valve. Only qualified personnel shall be permitted to conduct the test. The Time Pressure Drop Method shall be used.

B. Testing shall be performed in the presence of the Engineer or a City representative. Testing shall be conducted after backfilling and compaction has been completed to finish grade. Notify Engineer at least 2 working days in advance.

C. Initial Test – A test shall be conducted on the first section of pipe laid by each crew to establish that the pipeline installation is capable of preventing excessive infiltration. The section of pipeline tested shall be at least 300 feet in length. If the test indicates exfiltration exceeding the amount the amount hereinafter specified, all defective materials and/or workmanship shall be corrected and the test rerun until leakage is within the specified limits.

D. If, in the opinion of the Engineer, the water-tightness of the pipe is in question during installation, the Engineer may require the Contractor to test the pipe sections in question. Such testing shall not be considered adequate for final pipe testing, performed after the pipe is installed, backfilled, and cleaned. Thereafter all sewer pipe shall be tested as provided herein.

E. The Contractor may desire to make air tests prior to complete backfilling, for his own purposes; however, acceptance air test shall be made only after installation of all laterals and backfilling has been completed and compacted.

F. It is extremely important that all plugs, including end of service laterals, be installed and braced such that blowouts are prevented (ex. 250 lbs force is exerted on an 8" plug at 5 psig). Exercise care to prevent excessive pressures. Keep workers out of manholes until pressure is released.

G. Testing Procedure

1. Immediately following pipe cleaning, the pipe installation shall be tested with low pressure air. Each pipe section between manholes shall be tested. Service laterals from the main to the property line shall be included in the test.

2. Check the average height of ground water over the pipe invert. The test pressure required below shall be increased 0.433 psi for each foot of average water depth over the pipe (ex. If groundwater is 2.8 feet above pipe invert, add 1.2 psig to test pressures). Method used to determine groundwater depth shall be acceptable to the Engineer.

3. Air shall be slowly supplied to the plugged pipe until internal air pressure reaches 4.0 psi greater than the average back pressure of any ground water that may submerge the pipe. Do not exceed a total pressure of 9.0 psig.

4. After the internal test pressure is reached, at least two minutes shall be allowed for the air temperature to stabilize. After the stabilization period, disconnect the air supply.

5. The continuous monitoring pressure gauge shall then be observed while the pressure is decreased to no less than 3.5 psig (greater than average backpressure of any groundwater over the pipe). At a reading of 3.5 psig, or any convenient pressure between 3.5 psig and 4.0 psig (above groundwater pressure), timing shall commence with an accurate stop watch.

6. Acceptance - The tested section shall be considered acceptable if the required testing time has elapsed before a 1.0 psig pressure drop has occurred. If the pressure drops 1.0 psig before the minimum length of time has elapsed, the air loss rate is considered excessive and the section of pipe has failed the test.

7. Acceptance criteria is based on an allowable air loss of Q=0.0015 cfm per ft^2 of internal pipe surface area less than 625 ft^2. This results in a total allowable loss of 625Q = 0.94 cfm. The shortest time (T), in seconds, allowed for the air pressure to drop 1.0 psig is calculated with the following formula:

   a. T = 0.085 (DK/0.0015)

   b. K = 0.000419DL but not less than 1.0, D = pipe I.D. in inches, and L = length of pipe tested in feet.

8. Contractor shall record and document the testing procedure and results during the testing process. The UNI-Bell "Air Test Data Sheet" or similar approved equal shall be used and submitted to the Engineer. Record the diameter (in), length (ft), start and end manhole numbers, time, date, pressure drop, and groundwater level on inspection form.

Minimum Specified Time Required for 1.0 PSIG Pressure Drop

Pipe ø (in)	T_{min} (min:sec)	L for T_{min} (ft)	T for longer L (sec)	Specification Time for Length (L) Shown (min:sec)							
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
4	3:46	597	.380L	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	398	.854L	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	298	1.520L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	239	2.374L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	199	3.418L	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38

15	14:10	159	5.342L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	133	7.692L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19:50	114	10.470L	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:40	99	13.674L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33
27	25:30	88	17.306L	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48
30	28:20	80	21.366L	35:37	53:25	71:13	89:02	106:50	124:38	142:26	160:15

If no pressure drop (0 psig) has occurred after 1 hour, test may conclude and section passes

9. Service laterals shall be included in test however the length of service laterals may be ignored and the length of main line only used in the above table. If desired, length of service laterals included in test section may be included in the calculation by following the method outlined in UNI-B-6-98 Section 9.4.

3.05 HYDROSTATIC TESTING OF PIPE

A. Hydrostatic testing may be done in lieu of low-pressure air testing.

B. Contractor shall provide all hose, temporary piping, approved pipe plugs, tank trucks, and other equipment, labor and material required to make the hydrostatic tests, and shall pay for the water used, unless otherwise approved by the Engineer. Testing of the pipe shall be conducted in the presence of the Engineer. Testing shall be conducted after backfilling and compaction has been completed to finish grade. Notify Engineer at least 2 working days in advance.

C. Prior to making exfiltration leakage tests, contractor may fill the pipe with clear water to permit normal absorption into the pipe walls; provided however, that after filling the pipe, leakage testing shall be completed within twenty-four (24) hours after filling. When under test, allowable leakage shall comply with the following requirements:

1. Leakage shall not exceed 0.04 gallons per hour per inch diameter per one hundred (l00) feet of sanitary sewer pipe, with a minimum test pressure of six (6) feet of water column above the highest section of pipe (including service laterals), or above the active ground water table, whichever is higher as determined by the Engineer. The length of pipe tested shall be limited so that the pressure on the invert of the lower end of the section tested shall not exceed 28 feet of water column, and in no case shall be greater than 500 feet. All service connection footage shall be taken into account in computing allowable leakage. Test duration shall be at least 2 hours. Methods of imposing the water column and measuring the water loss shall be acceptable to the Engineer.

3.06 DEFLECTION TESTING OF FLEXIBLE PIPE

A. In addition to air or hydrostatic testing, the contractor shall conduct deflection tests of sanitary sewers constructed of flexible pipe. Testing will consist of pulling an approved mandrel through the completed pipeline after backfill and compaction to finish grade is complete. Testing shall be conducted in the presence of the Engineer.

B. Diameter of the mandrel shall be at least 95% of the pipe internal diameter. Mandrel shall have at least 6 vanes.

C. Testing shall be done from manhole to manhole. Pipe shall be thoroughly cleaned and flushed prior to pulling the mandrel. Mandrel shall pass smoothly through the pipe without excessive effort.

D. Testing shall be conducted only after at least 30 days have elapsed after backfill and compaction was completed. May be conducted concurrently with video inspection.

3.07 VIDEO INSPECTION OF GRAVITY SYSTEMS

A. All gravity sewer lines constructed as part of the project shall be televised and taped at the end of construction prior to acceptance. Taping shall be conducted after all backfill and compaction, but prior to final surface restoration. All pipes shall be thoroughly flushed by the Contractor immediately prior to the video inspection. A 1-inch target ball shall be placed in front of the camera. The video shall be recorded in color on VHS format. Sufficient light shall be provided to show detail. Camera speed shall not exceed 3 feet per second. Camera shall have a swivel head capable of looking up each service connection. A copy of the video tape and a written TV Inspection Report shall be furnished to the Engineer. Any sections of sewer pipe not meeting specifications or exhibiting defects shall, at the Contractor's expense, be corrected to meet specification. Repaired sections shall be re-televised. All repairs must be completed before acceptance of the project.

B. The sanitary sewer lines constructed as part of the project will also be video inspected near the end of the one year warranty period to determine if any defects exist in the system. The warranty video inspection will be conducted during a season of high groundwater as close to the end of the warranty period as possible. The warranty period will continue to be in effect, regardless of duration, until all video recordings are received and approved. All defects in the system will be corrected at the Contractor's expense.

C. The City of Coos Bay will provide video inspection at no cost to the Contractor for sewer lines constructed under Contract with the City. For sewer lines constructed in conjunction with private developments to become property of the City, the Developer or his Contractor is responsible to provide the specified video inspection.

PART 4 - SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Payment for Gravity Sewer Pipe & Fittings will be made on a lineal foot basis for each size and backfill class, regardless of depth, at the unit prices stated on the Bid Form. Payment shall include compensation for trench excavation, pipe zone, pipe, placement, backfill, anchors, fittings, transition couplings, appurtenances, testing, video inspection and all related work. Measurement will be made along the pipe centerline.

B. Payment for Sewer Service Reconnections will be made on a unit price basis per each, regardless of service lateral size, at the price stated on the Bid Form. Payment shall include compensation for furnishing and installing new manufactured tees (or saddles where allowed) and reconnection to existing laterals, regardless of depth and compensation for locating, demolition, trench excavation, removal and disposal of existing laterals as well new service lateral piping, pipe zone, backfill, fittings, cleanouts, appurtenances and all related work.

1. Where not specifically stated otherwise, the average length of sewer laterals within public roadways is assumed to be 15-feet and the average length of sewer laterals within alleys is assumed to be 7.5-feet. The cost of sewer lateral piping, including all excavation, labor, and materials required for complete installation, shall be included within the unit cost for Sewer Service Reconnection at the price stated on the Bid Form.

C. Payment for Connections to Existing Manholes will be made on a unit price basis per each, regardless of pipe size, at the price stated on the Bid Form. Payment shall include compensation for all materials, equipment and labor for a complete water-tight connection including: coring or jack-hammering, flexible rubber boot or water stop grout ring, transition coupling, and appurtenances for a complete installation.

1. Connections to existing plastic manhole stub-outs shall be considered incidental to the work and shall be included within the unit price of the pipe. No additional payment will be made for connection to existing plastic manhole stub-outs.

33 34 00 SANITARY SEWER FORCE MAINS

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes furnishing and installing sanitary sewer force main piping as shown on the Plans. Pipe material and sizes shall be as indicated on the plans.

1.02 RELATED SECTIONS

A. Section 31 23 00 – Excavation, Bedding & Backfill
B. Section 33 34 50 – Sanitary Sewer Force Main Appurtenances

1.03 QUALITY ASSURANCE

A. References: American National Standards Institute (ANSI)
   1. American Society for Testing and Materials (ASTM)
   2. Federal Specifications (FS)
   3. International Standards Organization (ISO)
   4. Manufacturer's Printed Recommendations

1.04 SUBMITTALS

A. Material list naming each product to be used identified by manufacturer and type number.

1.05 PRODUCT HANDLING

A. Handle pipe and fittings in accordance with manufacturer's recommendations and to insure delivery in a sound undamaged condition.

B. Store pipe on jobsite in an approved manner that prevents damage to pipe during construction. Protect stored pipe as necessary against vandalism.

PART 2 - PRODUCTS

2.01 HDPE PIPE

A. High Density Polyethylene (HDPE) Pipe shall be manufactured from a PE 3408 resin listed with the Plastic Pipe Institute (PPI) as TR-4. The resin material shall meet the specifications of ASTM D3350-99 with a cell classification of PE345464C. Pipe shall have a manufacturing standard of ASTM F714. Pipe shall be the size and dimensional ratio (DR) as specified on the plans. The pipe shall contain no recycled compounds except that generated in the manufacturer's own plant from resin of the same specification from the same raw material.

2.02 HDPE FITTINGS

A. Butt Fusion Fittings - Fittings shall be PE3408 HDPE, Cell Classification of 345464C as determined by ASTM D3350-99. Butt Fusion Fittings shall have a manufacturing standard of ASTM D3261. Molded & fabricated fittings shall have the same pressure rating as the pipe unless otherwise specified on the plans. Fabricated fittings are to be manufactured using a Data Logger. Temperature, fusion pressure and a graphic representation of the fusion cycle shall be part of the quality control records.

B. Electrofusion Fittings - Fittings shall be PE3408 HDPE, Cell Classification of 345464C as determined by ASTM D3350-99. Electrofusion Fittings shall have a manufacturing standard of ASTM F-1055. Fittings shall have the same pressure rating as the pipe unless otherwise specified on the plans.

C. Flanged and Mechanical Joint Adapters - Flanged and Mechanical Joint Adapters shall be PE 3408 HDPE, Cell Classification of 345464C as determined by ASTM D-3350. Flanged and Mechanical Joint

Adapters shall have a manufacturing standard of ASTM D-3261. Fittings shall have the same pressure rating as the pipe unless otherwise specified on the plans.

2.03 PVC PIPE

A. 4" – 12" Polyvinyl Chloride (PVC) Pipe

1. Rigid PVC pipe, 4-inch through 12-inch nominal diameter, shall be made from Class 12454-A or Class 12454-B virgin compounds, as defined in ASTM D1784. Pipe shall be designated for use as water supply and distribution pressure pipe, and shall conform to the outside diameters of cast iron pipe. Pipe furnished shall be Class 150 (DR 18) conforming to all requirements of AWWA C900, Polyvinyl Chloride Pressure Pipe.

2. Pipe shall be furnished in 20-foot laying lengths with integral wall-thickened bell ends. The bell shall consist of an integral wall section with a bonded-in elastometric gasket manufactured in conformance with the requirements of ASTM F477. The bell section shall be designed to be at least as hydrostatically strong as the pipe wall and meet the requirements of AWWA C900 and ASTM D3139. Certa-Lok VIP restrained rubber gasket joints are an approved substitution for slip joints.

3. Pipe shall be as manufactured by J-M Eagle, Certain-Teed, Northern Pipe Products, or approved equal.

B. 14" – 30" Polyvinyl Chloride (PVC) Pipe

1. Rigid PVC pipe, 14-inch through 30-inch nominal diameter, shall be made from quality PVC resin and shall have physical and mechanical properties that equal or exceed cell class 12454 as defined in ASTM D1784. Pipe shall be designated for use as pressure conduit, and shall conform to the outside diameters of cast iron pipe. Pipe furnished shall be Class 165 (DR 25) conforming to all requirements of AWWA C905, Polyvinyl Chloride Water Transmission Pipe.

2. Pipe shall be furnished in 20-foot laying lengths. Pipe bell shall consist of integral wall section with solid cross section elastomeric ring which meets the requirements of ASTM F477. The bell section shall be designed to be at least as hydrostatically strong as the pipe wall and meet the requirements of AWWA C905 and ASTM D3139.

3. Pipe shall be as manufactured by J-M Eagle, Northern Pipe Products, or approved equal.

2.04 DUCTILE IRON PIPE

A. Ductile iron pipe (4" – 12") shall be Class 52 minimum thickness, conforming to ANSI/AWWA C151/A21.51 under method of design outlined in ANSI/AWWA C150/A21.50. Pipe shall be cement mortar lined in accordance with ANSI/AWWA C104/A21.4. Pipe shall have an external asphaltic coating in accordance with ANSI/AWWA C151/A21.51. Use only where shown on the Plans.

PART 3 - EXECUTION

3.01 GENERAL

A. Pipe and Fittings: Size and material as indicated on the Plans. Install at locations shown on the Plans in accordance with manufacturer's recommendations.

3.02 HAULING, UNLOADING & DISTRIBUTING PIPE

A. Materials shall not be distributed on the job faster than can be used to good advantage. Sites shall be maintained clean and safe at all times. The Contractor shall supply all necessary signing and flagging to provide for a safe working environment.

B. During loading, transport and unloading, every precaution shall be taken to prevent damage to the pipe. Pipe shall not be dropped from trucks or allowed to roll down slides/ramps without proper retaining ropes.

C. During transportation each pipe shall rest on suitable pads, strips, skids or blocks securely wedged or tied in place.

D. Remove from the job site material which, according to the judgment of the Engineer, is damaged or otherwise has been rejected. Payment will not be made for damaged or rejected materials, their removal, or for repairs to such materials.

3.03 EXCAVATION AND TRENCHING

A. Excavate and prepare trenches as specified in Section 31 23 00. Place any required foundation stabilization and compact pipe bedding prior to laying pipe.

B. Where called for on the Plans, sewage force mains shall be installed by horizontal directional drilling. Furnish properly sized equipment for installation of the size and length of pipe indicated. Provide all necessary drilling fluids, drill rod, monitoring equipment, casing pipe and other incidental items required for successful pipe installation at the alignment and depth indicated on the Plans.

3.04 HDPE PIPE INSTALLATION

A. Fusion

1. Sections of polyethylene pipe should be joined into continuous lengths on the jobsite above ground. The joining method shall be the butt fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations. The butt fusion equipment used in the joining procedures should be capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to, temperature requirements of 400 degrees Fahrenheit, alignment, and an interfacial fusion pressure of 75 PSI. The butt fusion joining will produce a joint weld strength equal to or greater than the tensile strength of the pipe itself. All field welds shall be made with fusion equipment equipped with a Data Logger. Temperature, fusion pressure and a graphic representation of the fusion cycle shall be part of the Quality Control records.

2. Sidewall fusions for connections to outlet piping shall be performed in accordance with HDPE pipe and fitting manufacturer's specifications. The heating irons used for sidewall fusion shall have an inside diameter equal to the outside diameter of the HDPE pipe being fused. The size of heating iron shall be ¼ inch larger than the size of the outlet branch being fused.

3. Mechanical joining will be used where the butt fusion method can not be used. Mechanical joining will be accomplished by either using a HDPE flange adapter with a Ductile Iron back-up

ring or HDPE Mechanical Joint adapter with a Ductile Iron back-up ring. Method of mechanical joining shall be as indicated on the Plans.

4. Socket fusion, hot gas fusion, threading, solvents, and epoxies will not be used to join HDPE pipe.

B. Inspection – Inspect the pipe for defects before installation and fusion. Defective, damaged or unsound pipe will be rejected.

3.05 PVC PIPE INSTALLATION

A. PVC pipe shall be installed and handled in accordance with the Uni-Bell Plastic Pipe Association standards UNI-B-3, these specifications and the manufacturer's installation guide. The Contractor shall have on site all proper tools and equipment to properly and safely install the pipe.

B. Provide concrete thrust blocking at all bends and other fittings in accordance with the Plans, as required to prevent movement due to thrust.

C. Prior to lowering pipe into the trench, the Engineer will check for damage to the pipe. The Contractor shall repair or replace, as directed, all damaged or flawed pipe prior to installation.

D. Thoroughly clean inside the pipe before laying. Prevent foreign material from entering the pipe while it is being placed in the trench. Remove all foreign material from the inside of the pipe and joint before the next pipe is placed. Keep debris, tools, rags or other materials out of the pipe at all times. When pipe laying is not in progress, cover the exposed end of the pipe using a watertight expanding plug, or by other approved means to prevent entry of trench water or other foreign materials into the pipe.

E. Lay pipe with bell ends facing the direction of laying. For lines on an appreciable slope, face bells up-grade unless otherwise directed by the Engineer.

F. At no time shall pipe be deflected, either in the vertical or horizontal plane, in excess of the maximum deflection recommended by the pipe manufacturer. Deflection at any joint shall not exceed 2½º. Maximum deviation from grade shall not exceed ½-inch.

G. Pipe Jointing

1. Thoroughly clean the ends of the pipe to remove all foreign matter from the pipe joint. Lubricate the bell and spigot ends with pipe lubricant, as recommended by the manufacturer.

2. Furnish the gaskets required for the joint being assembled. Install the gasket with uniform tension around the joint groove before placing the pipe in the trench.

3.06 FILLING

A. After installation of piping, fill pipes slowly with potable water at a maximum rate of 10 cfs while venting all air. Take all required precautions to prevent entrapping air in the pipes.

B. An approved reduced pressure backflow prevention assembly shall be provided on the fill line to prevent backflow from the force main into the potable water system. Once the force main is filled, potable water piping shall be removed.

3.07 PRESSURE TESTING (HDPE PIPE)

A. General

1. Contractor shall test all segments of pipe installed under this Contract in accordance with these specifications prior to acceptance of the pipeline. All field tests shall be made in the presence of the Engineer. Except as otherwise directed, all pipelines shall be tested. All piping to operate under liquid pressure shall be tested in sections of approved length. The pressure testing of an HDPE line section shall be tested separately from PVC or DIP line sections. Where impractical, the HDPE test section shall include only a minimal amount of PVC or ductile iron pipe within the test section. If at all possible, the PVC and DIP test sections shall be left exposed during the pressure test for visual leakage observation. For the test, the Contractor shall furnish clean water, suitable temporary testing plugs or caps, suitable pressure gauge with increments no greater than 2 psi, and all other necessary equipment and labor.

2. Gauge used shall be of such scale that pressures tested will not register less than 10 percent or more than 90 percent of the gauge capacity.

3. Upon filling the section of pipe to be tested, all air shall be expelled. If sufficient air release valves or other outlets are not available at high points for releasing air, the Contractor shall provide taps and corporation stops as necessary to expel air. The cost of installing additional taps, and plugging them after a successful pressure test, shall be included in the unit price bid amount for the pipe.

B. Testing Criteria

1. Hydrostatic testing shall be conducted at 1.5 times the rated pressure of the pipe (i.e. 120 psi test pressure for 80 psi rated pipe), based on the elevation of the highest point of the section tested. Pressure shall be applied by means of a pump connected to the test section through a air release tap or other temporary tap on the pipe. The pump, connection hardware and all other necessary equipment shall be furnished by the Contractor and shall be subject to the Engineer's approval.

2. Maximum duration for pressure test, including initial and final phase of the test, shall not exceed eight (8) hours. If the test is not completed due to leakage, equipment failure, or other causes, depressurize the test section and then allow it to "relax" for at least eight (8) hours before bringing the test section up to test pressure again.

C. Procedure for Pressure Test

1. **Initial Phase:** The pressure test shall be completed after the line has backfilled and any thrust blocks have cured for at least seven (7) days. If possible, all flanged or mechanical joint valves and fittings shall be left exposed for visual leak inspection. If possible, all PVC and DIP test sections shall be left exposed for visual leak inspection. The test section shall initially be raised to approximately 10 psi over the calculated test pressure (i.e. 130 psi for 80 psi rated pipe), and the pipe allowed to stabilize for approximately 3 hours. No additional make-up water shall be applied to the test section during this 3-hour stabilization period unless the line pressure drops more than 10 psi below the calculated test pressure (i.e. below 110 psi for 80 psi rated pipe). In this case, make-up water shall only be applied to the test section to maintain a pressure equal to 10 psi less than the calculated test pressure.

2. **Test Phase:** The test phase shall involve applying make-up water to achieve a test pressure equal to 1.5 times the rated pressure of the pipe, or up to 5 psi over the calculated pressure. The test section shall then be allowed stand (no make-up water added) for a period of 2 hours. After this 2-hour period, make-up water shall be applied to restore the test pressure. The quantity of

water utilized to restore the test pressure shall be measured and compared to the allowable quantities as determined from the following table. If the quantity of make-up water used is equal to or less than the tabulated amount, the pressure test will be considered passing. If the quantity of make-up water exceeds the tabulated amount, the pressure test fails.

TABLE 1 – ALLOWABLE MAKE-UP WATER

Nominal Pipe Size (inches)	Make-up Water Allowance (U.S. Gallons /100 ft. of Pipe) 2-Hour Test
6	0.30
8	0.50
10	0.65
12	1.15
14	1.40
16	1.65
18	2.15
20	2.75
22	3.50
24	4.40
26	5.00
28	5.55
30	6.35
32	7.15
34	8.10
36	9.00
42	11.55
48	13.50
54	15.70

3. In the event a section fails to pass the pressure test, the Contractor shall complete all work necessary to locate and repair or replace the defective pipe, valves, fittings or joints. All visible leaks on new pipelines shall be repaired, regardless of the amount of leakage. Pipelines which fail to meet these criteria shall be retested as necessary until passing results are achieved. All costs associated with retesting shall be borne by the Contractor.

3.08 PRESSURE TESTING (PVC PIPE)

A. Hydrostatic pressure testing shall be conducted on all sections of new pipeline. Individual sections of pipeline may be tested separately at the Contractor's discretion.

B. Testing shall be conducted by the Contractor in the presence of the Engineer or his authorized representative. Engineer shall be notified at least 2 working days in advance.

C. Testing shall not be commenced until all thrust blocking has been in place for not less than 7 days and sufficient backfill has been placed to prevent pipe movement.

D. Furnish and operate all pumps, gauges, plugs, saddles, corporation stops, miscellaneous hose and piping, and measuring equipment necessary for performing the test. Provide certifications of accuracy for gauges from an approved laboratory when requested.

E. Test Procedure

1. The test section shall be filled with water and all air expelled from the pipe prior to testing.

2. All valves isolating the test section shall be securely closed and the specified test pressure applied by means of a pump connected near the lower end of the test section.

3. The test pressure shall be 150 psi and the duration shall be at least 2-hours at the test pressure. Provide additional pumping during the test period to continuously maintain pressure within 5 psi of that required. Use a clean container of potable water to supply the pump.

4. Accurately determine the quantity of water required to maintain and restore the required pressure at the end of the test by pumping through an approved positive displacement water meter.

5. The allowable leakage rate for the test section shall be determined from the following formula:

$$L = \frac{NDV\overline{p}}{7400}$$

L = allowable leakage (gph)
N = number of joints in length of pipe tested
D = nominal diameter of pipe (inches)
p = average test pressure during test (psi)

6. Compare the amount of water added during the test to the allowable leakage for the test section. If the amount of water added is less than the allowable leakage, then the section shall be considered to have passed hydrostatic testing and the Contractor may proceed with disinfection. If the amount of water added to the section exceeds the allowable leakage, the Contractor shall, at his own expense, determine the source of leakage, repair or replace the defective elements, and repeat the test until the pipeline withstands the test pressure and the allowable leakage requirements have been satisfied.

F. All visible leaks on new pipelines shall be repaired, regardless of the amount of leakage.

PART 4 - SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Payment for Sanitary Sewer Force Mains shall be made on a lineal foot basis for each size and type of pipe, and each backfill class at the prices stated in the Proposal. Quantities for payment shall be based on horizontal length of pipe installed. Payment shall include compensation for trench excavation, bedding, pipe, pipe zone, backfill, compaction, toning wire, warning tape, flushing, testing, and all other necessary equipment, labor, and materials necessary for complete installation of the piping.

1. Payment for associated fittings and appurtenances shall be as defined in Section 33 34 50.

B. Temporary end plugs and other materials required for flushing and testing are considered incidental and shall be included within the unit prices for Sanitary Sewer Force Mains.

33 34 50 Sanitary Sewer Force Main Appurtenances

PART 1 - GENERAL

1.01 SUMMARY

A. The work in this Section consists of furnishing all labor, materials, and equipment, and performing all work necessary for the proper installation of pipe fittings and appurtenances required for the completion of the proposed sanitary sewer force main as indicated on the Plans.

B. Pipe appurtenances may include, but are not necessarily limited to the following:

1. Fittings (bends, tees, etc.)
2. Valves and Valve Boxes
3. Concrete Thrust Blocking
4. Air & Vacuum Valve Assemblies
5. Route Marker Posts
6. Toning Wire Access Boxes
7. Pipeline Pigs

C. All fittings, valves and appurtenances shall be UL listed and FM approved.

D. Preference will be given to materials and items manufactured in the USA.

1.02 SUBMITTALS

A. Appurtenance Submittals – Four (4) copies of drawings and/or brochures for all appurtenances to be installed, whether as specified or a proposed substitution, shall be submitted to the Engineer for approval prior to installation.

B. Pipeline Pig – Submit four (4) copies of technical recommendation from pig manufacturer for Engineer approval. Included shall be manufacturer's rational for the type, material and design of pig recommended.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Gray and Ductile Iron Fittings – 3" to 24" diameter (for AWWA C900 and C905 PVC Pipe)

1. Special note shall be taken of the various end configurations (MJ, flange, etc.) of fittings, valves, and other appurtenances as indicated in the Plans for various installation connections to existing and new materials. Thrust blocking as specified shall be installed at all fittings. Contractor may use full body or compact mechanical joint fittings, provided that the minimum pressure rating and other specifications are met.

2. All bends, tees, reducers, caps, plugs, sleeves, connectors, and all other non-valve fittings shall be cement mortar lined in accordance with ANSI/AWWA C104/A21.4 Standard. External finish of all fittings shall be an asphaltic coating in accordance with ANSI/AWWA C151/A21.51.

3. Joints and gaskets for mechanical joint fittings shall conform to ANSI/AWWA C111/A21.11 Standard. Fittings shall conform to ANSI/AWWA C110/A21.10 Standard (full body), or ANSI/AWWA C153/A21.53 Standard (compact), with 250 psi working pressure minimum requirement. Furnish with ductile iron "T" head bolts and hexagonal nuts conforming to AWWA C111.

4. Flanged fittings shall be faced and drilled to standard 125-pound template per ANSI B16.1 Standard, unless otherwise specified, indicated, or required to connect to other materials.

Fittings shall conform to ANSI/AWWA C110/A21.10 and/or ANSI B16.1, Class 125, and be short-body style unless otherwise indicated. Flanged fittings shall have a 250 psi minimum pressure rating. Gasket material for flanged joints shall be commercial neoprene sheet conforming to ASTM D2000, SAE J200, 1 BC 609, 1/8-inch thick. Gasket shall be full-face cut with holes to pass bolts. Furnish with coarse thread cadmium plated nuts and bolts conforming to ANSI B18.2 and B1.1 American Standards for Class 2A and 2B fit.

5. Mechanical joint and flange joint fittings shall be as manufactured by Tyler Pipe; Union Foundry Company; Pacific States Pipe; U.S. Pipe; or approved equal.

6. Joint restrainers for MJ fittings shall be MEGA-LUG by EBAA Iron, or approved equal, designed specifically for pipe material used. Use where shown on the Plans or required by conditions.

B. PVC Fittings for IPS PVC Pipe – Fittings used with IPS solvent weld PVC pipe shall be schedule 40 or schedule 80 PVC solvent weld fittings conforming to ASTM D2466-90a and 2467-90, respectively.

C. Couplings – All couplings shall be supplied with cadmium plated bolts and other hardware conforming to nuts and bolts specified for flanged fittings. Contractor shall verify outside diameters (O.D.) of pipes to be connected prior to ordering couplings. Supply with standard shop coat enamel coating.

1. Transition, reducing, and straight couplings, 2-inch through 24-inch, shall have cast ductile iron or carbon steel body, and resilient gaskets. TPS Hymax 2000 Series; Romac 501; or approved equal.

2. Restrained flange coupling adapters, 3-inch through 24-inch, shall have ductile iron flange body meeting or exceeding ASTM A 536, Grade 65-45-12, with flange meeting the dimensional requirements of ANSI Class 125 and 150 bolt circles; gaskets compounded for water and sewer service in accordance with ASTM D 2000; ductile iron restraining bolts and lugs meeting or exceeding ASTM A 536; high strength low alloy steel T-head bolts with national coarse rolled thread and heavy hex nuts, all meeting AWWA C111 composition specifications; and Class 160 pressure rating. Romac RFCA-PVC; MEGAFLANGE by EBAA Iron; or approved equal.

3. Flange by mechanical joint (Flg x MJ) adapters, 3-inch through 24-inch, shall have ductile or cast iron bodies and joints conforming to applicable fitting specifications herein. Tyler; Union Foundry Co.; or other approved pipe/fittings manufacturer.

4. Couplings, ½-inch through 2-inch, for IPS pipe shall be compression type with rubber gaskets. Body shall be at least 3 ¾-inches long and constructed of galvanized carbon steel, with ASTM A47 malleable iron nuts. Smith-Blair 522; Romac 702; or approved equal.

D. Gate Valves

1. Gate valves, 2-inch through 12-inch, shall be iron body, resilient seat, non-rising stem (NRS), rubber encapsulated disc, wedge gate valves with O-ring seals. Valves shall be manufactured to open when the stem is rotated counterclockwise. Provide a 2-inch square operating nut unless otherwise specified. Valve end configurations and sizes shall be as shown on the Plans. All gate valves shall conform to AWWA C509. All valves shall be 200 psi working pressure, 400 psi test pressure. Furnish with standard shop coat enamel.

2. Buried valves shall be furnished with a cast iron valve box as specified herein, and shall have operators designed for direct bury service. Furnish with a stem extension such that the

operating nut is within 18-inches of the ground surface. Furnish handwheel operators for all non-buried valves, including valves in vaults.

3. Joint materials, nuts, and bolts for mechanical and flange joints shall be as specified in Section 02515-2.01.A.

4. Valves shall be as manufactured by Mueller; Clow; M&H; or approved equal.

E. Valve Boxes

1. Cast iron valve boxes shall be furnished and installed with all buried gate and/or butterfly valves.

2. Valve boxes shall consist of cast iron top section and separate cover. Valve box and cover shall be manufactured from ASTM A48, Class 30 cast iron and shall be rated for H20 traffic loading. Cover shall have "S" or "SEWER" formed in the casting.

3. Valve box top section shall be designed for use with a segment of 6-inch 3034 PVC pipe for the riser.

4. Cast iron valve boxes shall be Olympic Foundry, Inc. VB-910; or approved equal.

F. Thrust Blocks – Furnish and place thrust blocks, sized as shown on the Plans. Concrete shall conform to Oregon Standard Specifications Section 00440, Commercial Grade Concrete. Compressive field strength shall not be less than 3,000 psi at 28 days. Maximum aggregate size shall be 1½-inches. Slump shall be between 2 and 4 inches. Thrust blocking shall be placed between undisturbed earth and the fitting to be anchored in such a manner that the fitting is accessible for repair and nuts and bolts are not encased. 6 mil thick plastic sheeting shall be placed between fittings and poured concrete. Thrust blocks shall be neatly formed with plywood. Contractor shall install as required to prevent lateral movement and uplift.

G. Red brass pipe nipples shall be seamless, M.I.P. threaded, rated for 150 psi and conforming to ASTM B43-98 and ASTM B687-99. Bronze fittings shall meet the requirements of ASTM B62-02 with NPT threaded ends conforming to ANSI/ASME B16.15.

H. Tapping Saddles (3/4" – 2" taps on C900 PVC Pipe)

1. Tapping saddles with ¾-inch through 2-inch taps, on 4-inch through 12-inch C900 PVC pipe and 14-inch through 30-inch C905 PVC pipe shall have solid 85-5-5-5 bronze body and nuts per ASTM B62, wide stainless steel band, and Buna-N rubber gasket. Supply with F.I.P. taps. Saddles must be sized properly for pipe furnished on project and have fully factory contoured clamp to provide full support around pipe without distortion, and shall be leak free. Ford/Romac Style 202BS; or approved equal.

2. Corporation stops used with ¾-inch through 2-inch F.I.P. tapping saddles for combination air and vacuum valve assemblies shall be ball type, constructed of 85-5-5-5 red brass and shall conform to AWWA C800-84. M.I.P. inlet and F.I.P. outlet. Ford Meter Box Company Type FB1700 Ballcorp; McDonald 3149B; or approved equal.

I. Sewage Air & Vacuum Valves

1. Sewage air & vacuum valves shall allow unrestricted venting and reentry of air during filling or draining of the force main. An air gap shall be provided between the float and the shutoff valve to prevent solids from fouling or clogging the shutoff valve. All internals shall be easily removed through the top cover without removing the valve body from the force main.

2. Body, cover and baffle shall be cast iron conforming to ASTM A126 Grade B.

3. Floats and stem shall be stainless steel conforming to ASTM A240.

4. Valve seat shall be Buna-N rubber.

5. The complete valve shall withstand 500 psi pressure test.

6. Valve shall be designed for working pressures and total air volume expected in associated with the planned force main piping.

7. APCO Series 401 SAVV; or approved equal.

J. Pipeline Pigs

1. Pipeline pig shall be constructed from light weight, low density open-cell polyurethane foam.

2. Coating shall be as recommended by pig manufacturer and shall be appropriate for use with waste water.

3. Pipeline pig shall be equipped with a puling rope with a closed ring or loop suitable for retrieval by hook.

4. Pipeline pig shall be as manufactured by Pigs Unlimited, Pipeline Pigging Products; or approved equal.

PART 3 - EXECUTION

3.01 WORKMANSHIP

A. Fitting Installation – Install fittings at the location shown or as directed by the Engineer. Handle, clean, lubricate and install fittings as specified in the appropriate sections for laying pipe. Where a cut in the pipe is necessary for inserting fittings or closure pieces, cut the pipe mechanically without damaging it or its lining and leave a smooth end at right angles to the centerline of the pipe. Dress and bevel the cut end of the pipe to remove sharp edges and projections which may damage the gasket. Repair all damaged lining and coating to the satisfaction of the Engineer. On the pipelines, securely anchor all tees, plugs and elbows as shown or directed to prevent movement due to thrust. Achieve anchorage only by use of approved thrust blocking or approved joint restraint.

B. Valves – Set valves at locations indicated on the Plans. For flange connections, clean flange faces thoroughly before assembling; insert gaskets and tighten nuts uniformly around flange; and align pipe carefully on both sides of valve before final tightening of flanges to avoid stressing the valve body. For MJ connections carefully align valve and adjoining pipe; clean and lubricate pipe end and socket; lubricate the pipe end and valve socket; place gland and gasket on the pipe end; insert the pipe into the valve socket and press the gasket firmly and evenly into the gasket recess; push gland against gasket, center it, insert bolts and hand tighten nuts; tighten all bolts in a systematic

pattern ensuring that gland remains parallel to socket face; final torque on bolts should be equal and in the range of 75 to 90 foot-pounds. After installation, operate the valve from full open to full closed to ensure proper operation of the valve. Correct any malfunction in the operation of the valve.

C. Valve Boxes – Center valve boxes and set plumb over the operating nut of the valve. Set valve boxes so they do not transmit shock or stress to the valve. Set valve box covers flush with the surface of the finished pavement or such other level as may be directed. Adjust the extensions to the proper length as required for proper installation. Backfill shall be as specified for the connecting pipeline. Correct any misalignment of valve boxes without additional expense to the Owner. Run locator wire up within valve box and provide at least 18" slack for connection of toning locator.

D. Thrust Blocking – Provide thrust blocking, as shown or directed by the Engineer, using concrete as specified. Place the concrete blocking between undisturbed earth and the fitting to be anchored. The bearing surface shall be sized and located to adequately withstand the applied thrust force. Do not encase pipe joints or fittings with concrete. See the Plans for thrust block configurations.

E. Sewage Air & Vacuum Valve Assemblies – Construct sewage air & vacuum valve assemblies at the locations indicated on the Plans and at other locations as directed by the Engineer. Provide complete installation as indicated in the Standard Details including, sewage air & vacuum valve, service saddle, isolation valve, other piping and fittings, manhole structure and foundation. Adjust manhole frame and cover to match adjacent grades and restore surface to match surroundings.

F. Pipeline Pigs - Contractor shall clean new force mains following construction using a minimum of two (2) pipeline pigs. Force mains may be pigged in a single complete run or in sections provided the entire force main is pigged. Pigging shall be in accordance with the pig manufacturer's recommendations. Contractor shall provide water from an approved source for pigging new force mains and shall retrieve pigs from the discharge manhole or other appropriate location when only a portion of the force main is cleaned.

PART 4 - SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Measurement and payment for fittings, including but not limited to Elbows, Couplings, Adapters and Sleeves will be made on a unit price basis for each size and type of fitting called out on the Plans or approved by the Engineer, at the corresponding unit price stated on the Bid Form. No separate or additional payment will be made for nuts, bolts, washers and other fitting related hardware or supplies. Payment for fittings shall include compensation for thrust and resistance blocking and connection to existing piping where applicable.

1. No payment will be made for fittings installed by the Contractor but not shown on the Plans unless specifically approved by the Engineer. Fittings installed in order to facilitate ease of assembly on the Contractor's part shall be considered incidental to the Work.

B. Measurement and payment for Valves will be made on a unit price basis for each size and type of valve specified and installed, for the unit price stated on the Bid Form. No separate or additional payment will be made for nuts, bolts, washers, valve boxes, stem extensions, concrete blocking or other valve related hardware or supplies.

C. Measurement and payment for Sewage Air & Vacuum Valve Assemblies will be made on a unit price basis for each size and type at the price stated on the Bid Form. The unit price per each shall include compensation for excavation and backfill, saddle, piping, fittings, isolation valve, sewage air & vacuum valve, manhole and cover, foundation concrete and all other items necessary for a complete installation as shown in the Standard Details and specified herein.

D. Thrust Blocking shall be included as a portion of the unit price bid amount stated on the Bid Form for the various fittings and valves. No additional compensation will be allowed.

E. Payment for Pipeline Pigs shall be on a unit price basis per each at the amount stated on the Bid Form. Payment shall include compensation for all labor, equipment, and materials required to furnish two approved pipeline pigs and clean the entire force main prior to placing it in service.

33 39 00 SANITARY SEWER MANHOLES, FRAMES, AND COVERS

PART 1 - GENERAL

1.01 SUMMARY

A. This section covers manholes, frames, covers, adapters, and other manhole appurtenances not specifically paid for in other sections, used in the gravity sewer collection system and outfall line. See Standard Detail Drawings.

B. All manholes, frames and covers supplied under this contract shall be from the same manufacturer.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Manholes

1. Manhole riser sections shall be pre-cast reinforced concrete with a minimum wall thickness of 5 inches, conforming to ASTM C 478. Concrete used in forming the sections shall have a minimum compressive strength of 4000 psi at 28 days. Reinforcing steel shall be Grade 60.

2. Manholes shall have precast reinforced concrete bases with shelves, channels and slopes as specified. Precast bases shall have same wall thickness and reinforcement as riser sections.

3. Joints between manhole sections as well as base section shall be tongue and groove with an o-ring gasket or approved equal conforming to ASTM C-443. Preformed gaskets shall be Ram-Nek, Kent-Seal No. 2, or approved equal

4. Manholes shall have yard permeability tests passing ASTM C497-03 prior to delivery. Manhole steps shall be plastic with ½" grade 60 steel reinforcing bars encapsulated with injection molded copolymer polypropylene with serrated surfaces.

B. Frames and Covers

1. All frames and covers shall be heavy duty, gray cast iron designed for H20 traffic loading. Metal used in the castings shall conform to ASTM A48 Class 30. All castings shall be manufactured true to pattern, uniform in quality, free from blowholes, shrinkage, distortion or other defects. Component parts shall fit together in a satisfactory manner and shall have continuously machined bearing surfaces to prevent rocking and rattling. Castings shall be smooth and well cleaned by shotblasting at the factory.

2. Frames and covers shall have skid resistant surface of raised knobs or indentations. Cover shall have the word "SEWER" cast into it. Non-watertight lids shall have two vent holes.

3. Frames and covers shall be manufactured in accordance with the dimensions shown in the Standard Detail Drawings; Olympic Foundry, or approved equal.

C. Manhole Connections

1. Connections to precast manhole sections shall be accurately core-drilled and shall utilize a properly sized flexible rubber boot providing a watertight seal. Adapter shall be factory tested for watertightness up to 10.8 psi. Kor-N-Seal as manufactured by NPC, Inc. or approved equal.

2. Connections to cast-in-place concrete shall be made with a rubber waterstop grouting ring. Ring shall clamp to pipe with stainless steel clamp and have waterstop ribs. Waterstop Grouting Ring by Press-Seal Gasket Corp., or approved equal.

3. Connections to plastic manholes shall be made using appropriately sized flexible couplings and connecting to preformed pipe stub-outs, provided that stub-outs are not damaged.

D. Grout – Grout shall be non-shrink, Sika 212, Euco N-S, Five Star, or approved equal nonmetallic cementitious commercial grout exhibiting zero shrinkage per ASTM C827. Grout shall not be amended with cement or sand and shall not be reconditioned with water after initial mixing. Nonshrink grout shall be placed and packed only with the use of an approved commercial bonding agent. Unused grout shall be discarded after 20 minutes

PART 3 - EXECUTION

3.01 MANHOLE INSTALLATION

A. Prepare native soil and place and compact the crushed rock base to 95% maximum dry density as shown in the Standard Detail Drawings. Backfill material around manholes shall be as specified for trenches in Section 31 23 00.

B. Concrete base shall be carefully placed on the prepared bedding so as to be fully and uniformly supported at true grade and alignment.

C. Pipe penetrations shall be core drilled to the appropriate size for each pipe entering or exiting the manhole. Jackhammering will not be allowed. Install appropriately sized KOR-N-SEAL boot on each pipe and apply non-shrink grout to remainder of wall penetration to provide positive seal. Non-shrink grout shall be as specified.

D. Install transition couplings, per Section 33 31 00, within 2 feet of the outside wall of manholes on all pipes; or, a pipe bell shall be located a minimum of 1 foot to a maximum of 2 feet from the outside wall of manholes.

E. All flow channels within precast bases shall be constructed of non-shrink grout with a minimum depth of three-fourths (¾) the contributing pipe diameter. Inverts shall be true to line and grade with flow lines having a minimum drop of 0.2 feet from inlet to outlet. Sides of channels shall be troweled smooth to prevent solids deposition. Ledges or benches shall be sloped towards channel to drain. Provide fine broom finish on ledges.

F. Clean tongue and grooves of base and wall sections, prime and apply joint sealer prior to setting in place. Ensure that joint has fully seated. Use approved flexible joint sealant and same manufacturer's primer. The height of the lowest wall section shall be at least three (3) times the inside diameter of the largest sewer pipe entering the manhole and in no case less than 2-feet. Wall sections shall be plumb vertical.

G. Use eccentric cone top section for manholes greater than 6-feet deep. Use extension rings in accordance with the standard detail.

H. Frame and covers shall be installed so that the cover is exposed and flush with the existing surface. In no case will pavement be raised or lowered to meet the grade of installed manhole frames and covers. Where manholes are installed in sloping areas, the grade of the slope shall intersect the top rim of the cover on the uphill side. Manhole frame shall be sealed to the concrete manhole section with a bed of non-shrink grout on either side of bead of flexible joint sealant. In addition, the frame and cover shall be grouted to the outside of the concrete manhole section.

I. Manhole installations with tilted or otherwise defective bases, wall sections which are not plumb, covers which do not match existing grade properly, or are otherwise not in specification compliance shall be removed by the Contractor and replaced until acceptable.

3.02 MANHOLE VACUUM TESTING

A. Precast concrete manholes shall be tested in accordance with the following procedure. Manhole installations which fail the testing shall be repaired or replaced until passing results are obtained. If flexible joint sealant is pulled out during testing, it shall be repaired. No payment to the Contractor will be made for such repair and/or replacement.

B. Testing shall be done in the presence of the Engineer. Notify Engineer at least 2 working days in advance.

C. All manholes shall be tested for acceptance after the trench has been backfilled, compaction requirements have been met, road base rock has been installed, paving is complete, and concrete manhole collars have been installed. If manhole has passed test and the castings have later been disturbed, manhole shall be re-tested.

D. Thoroughly clean all manholes prior to testing. Remove all debris and do not allow foreign material to enter downstream piping.

E. Contractor shall provide all necessary equipment and personnel to conduct the testing, including vacuum equipment and indicating devices.

F. Procedure:

1. Plug all pipes entering manhole. Secure all plugs to prevent movement while vacuum is being drawn.

2. Testing shall include the joint between the manhole cone or riser ring(s) and the manhole cover frame.

3. Installation and operation of vacuum equipment and indicating devices shall be in accordance with the manufacturer's specifications and instructions.

4. Withdraw air from the manhole until a measured vacuum of 10-inches of mercury (10" Hg) is established in the manhole interior.

5. Record the time it takes for the vacuum to drop to 9-inches of mercury (9" Hg). Acceptance standards are based on this 1-inch of mercury change in negative pressure. Time measured for the 1" Hg pressure change shall be equal to or greater than the values in the following table:

Vacuum Testing Requirements (minimum test times, seconds)

Manhole Depth (ft)	Manhole Diameter (in)				
	42"	48"	54"	60"	72"
8' or less	17	20	23	26	33
10	21	25	29	33	41
12	25	30	35	39	49
14	30	35	41	46	57
16	34	40	46	52	67
18	38	45	52	59	73
20	42	50	53	65	81
22	46	55	64	72	89

6. Hydrostatic testing of manholes may be allowed. Test shall be in accordance with ASTM C497 as modified here. Test will consist of plugging all inlets and outlets and filling the manhole with water to the rim. Leakage in each manhole shall not exceed 0.2 gallons per hour per foot of head above the invert. Leakage will be determined by refilling to the rim using a calibrated or known volume container. Testing duration shall be at least 2 hours. Testing results shall be recorded on a form approved by the Engineer.

3.03 MODIFY EXISTING MANHOLE BASE

A. Modify or reconstruct manhole bases as required by hand forming channels with non-shrink grout to provide smooth flow surfaces from all inlets to the outlet. Non-shrink grout shall be as specified.

B. All flow channels shall be constructed with a minimum depth of three-fourths (¾) the contributing pipe diameter. Inverts shall be true to line and grade with flow lines having a minimum drop of 0.2 feet from inlet to outlet.

C. Shape flow channels to conform to connecting pipe surfaces. Ledges or benches shall be sloped towards channel to drain.

D. Remove all rough sections or sharp edges that might obstruct flow or cause snags.

E. Form base channels in conformance with the standard detail drawings.

PART 4 - SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Payment for Standard Manholes up to an overall depth of 8-feet will be made on a unit price basis per each, at the price stated on the Bid Form. Payment will include all materials, labor, and equipment required for complete installation, including excavation and backfill around manholes, all precast components, grouting and shaping of base channels, pipe adapters, testing, temporary hard surfacing, and all else related to this item not paid under other sections.

1. Payment for Extra Manhole Depth will be made on a unit price basis per foot for each foot over the standard 8-foot depth. Payment shall be in addition to the price of one Standard Manhole for each manhole over 8 feet deep and shall cover all costs related to extra materials, labor, and equipment necessary to construct manholes to depths indicated on the Plans or directed by the Engineer. Depth measurement shall be from the lowest pipe invert (flowline) to the manhole rim. The quantity for payment shall be the actual measured depth minus 8 feet and shall be rounded up to the nearest whole foot for any fractional amount over a given footage depth (i.e. 8.1 feet measured depth rounds up to 9 feet; payment item is 1 foot Extra Manhole Depth).

B. Payment for Flat Top Manholes, where called for on the Plans or allowed by the Engineer, will be made on a unit price basis per each, at the price stated on the Bid Form. Payment will include all materials, labor, and equipment required for complete installation, including excavation and backfill around manholes, all precast components, grouting and shaping of base channels, pipe adapters, testing, temporary hard surfacing, and all else related to this item not paid under other sections.

C. Payment for Outside Drop Manhole Connections shall be made on a unit price basis per each at the price stated on the Bid Form. Payment will include all materials and labor required for complete installation, including excavation and backfill, pipe adapters, fittings, grout, slurry backfill, temporary hard surfacing, and all else related to this item not paid under other sections.

D. Payment for Connections to Existing Manholes shall be as defined in Section 33 31 00 – Sanitary Sewer Piping.

33 39 50 Manhole Rehabilitation

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes all work necessary to rehabilitate existing manholes, including stopping inflow and infiltration, repairing voids, restoring structural integrity, and providing protection against corrosion. Rehabilitation shall consist of application of a monolithic, fiber-reinforced, structurally enhanced, cement-based liner material to the walls and bench surfaces of designated manholes.

1.02 REFERENCES

A. ASTM C 78 - Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading).
B. ASTM C 94 - Ready-Mixed Concrete.
C. ASTM C 109 - Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens).
D. ASTM C 234 - Comparing Concretes on the Basis of the Bond Developed with Reinforcing Steel.
E. ASTM C 267 - Chemical Resistance of Mortars, Grouts, and Monolithic Surfacings.
F. ASTM C 321 - Bond Strength of Chemical-Resistant Mortars.
G. ASTM C 496 - Splitting Tensile Strength of Cylindrical Concrete Specimens.

H. ASTM C 596 - Drying Shrinkage of Mortar Containing Portland Cement.
I. ASTM C 666 - Resistance of Concrete to Rapid Freezing and Thawing.
J. ASTM C 827 - Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures.
K. ASTM C 952 - Bond Strength of Mortar to Masonry Units.
L. ASTM C 1244 - Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's product data, including physical properties, surface preparation, repair, application, curing, and field quality control.
B. Manufacturer Qualifications: Submit list of a minimum of 10 manhole rehabilitation projects completed during past 3 years.
C. Applicator Qualifications: Submit qualifications of applicator.

1. Certification stating applicator is factory trained and approved by manufacturer in application of the specified products.
2. List of recently completed manhole rehabilitation projects, including project name and location, names of owner and engineer, and description of products used, substrates, and application procedures.

1.04 QUALITY ASSURANCE

A. Material Qualifications: Minimum of five year history of being used for rehabilitation of sanitary system manholes.

B. Applicator Qualifications:

1. Factory trained and approved by manufacturer in application of the specified products.
2. Employs persons trained for the application of the specified products.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name, manufacturer, manufacturer’s stock number, color, and federal specification number.

B. Storage:

1. Store materials in accordance with manufacturer's instructions.
2. Keep containers sealed until ready for use.
3. Store materials in a cool dry environment.

C. Handling: Protect materials during handling and application to prevent damage.

1.06 ENVIRONMENTAL CONDITIONS

A. Do not apply materials if ambient temperature is below 40 degrees F.

B. Do not apply materials to frozen surfaces or if freezing is expected within substrate within 24 hours after application.

C. Keep mix temperature at time of application below 90 degrees F.

D. Do not exceed water temperature of 80 degrees F.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General:

1. Materials shall be from a single manufacturer.
2. Materials shall be compatible with substrate and with each other.
3. Materials shall be approved by manufacturer.

B. Chemical Grout: Durable, rapid-setting, chemical resistant, expanding foam or gel designed for injection under active water infiltration conditions, forming strong bond to concrete, and curing to form resilient, flexible rubbery gasket.

1. Grout: Hydrophilic foam or gel
2. Minimum Tensile Strength: 80 psi
3. Minimum Bonding Strength: 250 psi
4. Elongation: 300% minimum
5. Corrosiveness: Noncorrosive
6. Toxicity: Nontoxic
7. Avanti AV-330 Safeguard; Avanti AV-202 Multigrout; 3M Scotch-Seal 5600; or approved equal.

C. Patching Material: Rapid-setting, fiber-reinforced, high-early-strength, corrosion-resistant, hand-mixed and hand-applied, calcium aluminate based cementitious material.

1. Cement: Calcium aluminate cement.
2. Minimum Compressive Strength, ASTM C 109: 1,400 psi at 6 hours.
3. Minimum Bond, ASTM C 321: 145 psi at 28 days.
4. Applied Density: 105 plus or minus 5 pounds per cubic foot.
5. Shrinkage, ASTM C 596: 0 percent at 90 percent relative humidity.
6. Strong-Seal QSR; Thoroc Patch; or approved equal.

D. Infiltration Control Material: Rapid-setting, high-early-strength, hand-applied, cementitious material.

1. Compressive Strength, ASTM C 109: 400 to 600 psi at 1 hour; 1,800 to 2,400 psi at 24 hours.
2. Expansion, ASTM C 827: 0.10 percent.
3. Sulfate Resistance, ASTM C 267: No weight loss after 15 cycles; 2,000 ppm; test continuing.
4. Freeze/Thaw Resistance, ASTM C 666, Method A: 100 cycles.
5. Pull-Out Strength, ASTM C 234: 14,000 pounds.
6. Placement Time: Less than 1 minute.
7. Strong-Seal Strong-Plug;; Thoroc Plug; or approved equal.

E. Cementitious Grout: Cementitious grout, volume stable.

1. Minimum Compressive Strength, ASTM C 109: 250 psi at 28 days.
2. Strong Seal Grout 250; or approved equal.

F. Manhole Liner Material: Fiber-reinforced, spray-applied, cementitious mortar.

1. Cement: 100 percent pure fused calcium aluminate clinker and calcium aluminate cement.
2. Minimum Compressive Strength, ASTM C 109: 8,000 psi at 28 days.
3. Minimum Tensile Strength, ASTM C 496: 700 psi at 28 days.
4. Minimum Flexural Strength, ASTM C 78: 1,000 psi at 28 days.
5. Shrinkage, ASTM C 596: 0 percent at 28 days, 90 percent relative humidity.
6. Minimum Bond, ASTM C 952: 2000 psi at 28 days.
7. Applied Density: 150 plus or minus 5 pounds per cubic foot.
8. Freeze/Thaw Resistance, ASTM C 666, Method A: 100 cycles, no visible damage.
9. Factory Blended: Requires only addition of water at site.
10. Dry Bulk Density: 88 to 92 pounds per cubic foot.
11. Fiber Reinforcement: 1/2 to 5/8 inch alkaline-resistant fiberglass rods.
12. Strong-Seal High Performance Mix; Thoroc SP15 Spray Mortar; or approved equal.

G. Water: Clean and potable. Test nonpotable water in accordance with ASTM C 94.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine surfaces to receive manhole rehabilitation. Notify the Engineer in writing if surfaces are not acceptable. Do not begin surface preparation, repair, or application until unacceptable conditions have been corrected.

3.02 SURFACE PREPARATION

A. Prepare surfaces in accordance with manufacturer's instructions.

B. Protection: Place covers over invert to prevent extraneous material from entering sewer lines.

C. Cleaning: Clean manhole walls and bench by using a minimum of 1,500 psi water spray to remove contaminants, dirt, debris, and other foreign materials.

D. Remove loose, unsound, and protruding brick, mortar, and concrete.

E. Inspection by Engineer: Before application of each material, surfaces to be sprayed or coated will be inspected by the Engineer. Correct defects or deficiencies identified by the Engineer before application of subsequent material.

F. Voids: Repair and fill voids greater than 2 inches in depth with patching material. Apply patching material in accordance with manufacturer's instructions.

G. Active Leaks:

1. Stop active leaks with patching material or infiltration control material. Apply material in accordance with manufacturer's instructions.
2. Install weep holes as required to localize infiltration during application of patching material or infiltration control material.
3. Plug weep holes after application with infiltration control material before application of liner material.
4. Severe Infiltration: Drill as required to pressure grout using a chemical grout. Apply grout in accordance with manufacturer's instructions.

H. Advance Notice: Give the Engineer a minimum of 2 days advance notice of start of application.

3.03 INVERT REPAIR

A. Remove loose and unsound materials and wash walls, after surface preparation is complete.

B. Repair bench, invert, or service line using patching material. Apply in accordance with manufacturer's instructions.

C. Repair inverts with visible damage, where infiltration is present, or when vacuum testing is specified.

D. Apply patching material to invert, after blocking flow through manhole and thoroughly cleaning invert.

E. Uniformly trowel patching material onto damaged invert at a minimum thickness of 1/2 inch at invert. Extend out onto bench of manhole sufficiently to tie into liner material.

F. Ensure finished invert surfaces are smooth and free of ridges.

G. Reestablish flow in manhole after a minimum of 30 minutes after application of patching material.

3.04 APPLICATION OF LINER MATERIAL

A. Apply liner material in accordance with manufacturer's instructions.

B. Equipment: Spray apply liner material using approved equipment designed and manufactured by material manufacturer for the specific application.

C. Mixing:

1. Mix liner material with water in accordance with manufacturer's instructions.
2. Discharge prepared mix into hopper.
3. Continue mixing as liner material is continuously sprayed.

D. Cleaning: Ensure surface is clean and free of foreign material.

E. Saturated Surface: Ensure surface is damp and totally saturated with water without noticeable free water droplets or running water, just before application of liner material.

F. Spraying: Spray apply liner material in 1 or more passes from bottom of wall to bottom of frame to form a structurally enhanced monolithic liner.

1. Minimum Total Thickness: 1/2 inch.

G. Finishing:
1. Trowel surface of sprayed liner material to relatively smooth finish. Do not over trowel.
2. Apply brush finish to trowel finished surface.

H. Follow manufacturer's instructions whenever more than 24 hours have elapsed between applications.

I. Application to Bench:

1. Remove wood covers.
2. Spray bench with liner material mixed in accordance with manufacturer's instructions.
3. Spray apply liner material to produce a gradual slope from walls to invert to form a structurally enhanced monolithic liner. Minimum thickness at invert of 1/2 inch.
4. Round full circumference of intersection of wall and bench to a uniform radius.

J. Application to New Cast-In-Place or Precast Concrete Manholes:

1. Prepare surface with bonding agent in accordance with manufacturer's instructions.
2. Spray apply a single application of Strong-Seal High Performance Mix liner material to prevent corrosion.
3. Minimum Total Thickness: 1/2 inch.

3.05 CURING

A. Cure materials in accordance with manufacturer's instructions.

B. Exposure:

1. Minimize exposure of applied materials to sunlight and air movement.
2. Cover structure if time between application of additional coats is to be longer than 15 minutes.
3. Do not expose finished materials to sunlight or air movement for longer than 15 minutes before covering or closing access.
4. Shade manhole while rehabilitation is in process in hot and arid climates.

C. Concrete Curing Compound:
1. Apply concrete curing compound if relative humidity is less than 70 percent within manhole.
2. Apply curing compound in accordance with manufacturer's instructions.

D. Cure Time: Allow a minimum of four (4) hours cure time before subjecting manholes to flows.

3.06 FIELD QUALITY CONTROL

A. Inspection by the Engineer or the waiver of inspection of any portion of the work shall not relieve the Contractor of responsibility to perform the work as specified.

B. Field Quality Control Testing: Performed by an approved testing agency at Contractor's expense.

C. Compressive Strength Test:

1. Cast four 2 inch cubes each day or from each pallet of material.
2. Label, package, and mail cubes to manufacturer.
3. Manufacturer shall test cubes for compressive strength in accordance with ASTM C 109 and submit test results to the Contractor and Engineer.

D. Leaks: Visually verify absence of leaks.

E. Vacuum Test: Perform vacuum test in accordance with Section 33 39 00 – 3.03 of these Specifications. Vacuum test shall not be performed earlier than 7 days after application.

3.07 PROTECTION

A. Do not allow traffic for a minimum of 24 hours after final application of liner material.

PART 4 - SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Payment for Manhole Rehabilitation will be made on a unit price basis per each, at the price stated on the Bid Form. Payment will include all materials, labor, and equipment required for complete installation of the specified lining material, including all cleaning, chemical grouting to stop active infiltration, cementitious grout application, and all else related to this item.

33 41 00 STORM DRAIN PIPE & CULVERTS

PART 1 - GENERAL

1.01 SUMMARY

A. This item includes furnishing and installing storm drain pipe and appurtenances and culverts to the sizes and locations identified on the Plans.

B. Provide manufacturer's certifications, including test results for all piping, fittings and appurtenances supplied.

C. All work shall conform to the latest version of the Oregon Standard Specifications (OSS) Part 00400, except as otherwise specified herein and shown on the Plans.

PART 2 - PRODUCTS

2.01 MATERIALS

A. All pipe, fittings and appurtenances shall be new and unused.

B. HDPE Storm Drain Pipe (12” through 48” diameter)

1. Storm drain pipe shall have smooth interior and annular exterior corrugations. Pipe and fittings shall meet AASHTO M294, Type S. Pipe and fittings shall be from the same manufacturer.

2. Pipe end connections and fittings shall be rubber or neoprene gasketed.

3. HDPE pipe and fittings shall be Sure Lock WT Pipe as manufactured by Hancor, Inc. or N-12 IBST pipe as manufactured by Advanced Drainage Systems, Inc. or approved equal.

C. PVC Storm Drain Pipe (12” diameter and less)

1. Pipe shall be typical sanitary sewer piping meeting the requirements of ASTM D3034.

D. Concrete shall conform to Oregon Standard Specifications Section 00440, Commercial Grade Concrete. Compressive field strength shall not be less than 3,000 psi at 28 days. Maximum aggregate size shall be 1½-inches. Slump shall be between 2 and 4 inches.

E. Non-Shrink Grout. Grout shall be Sika 212, Euco N-S, Five Star, or approved equal nonmetallic cementitious commercial grout exhibiting zero shrinkage per ASTM C827. Grout shall not be amended with cement or sand and shall not be reconditioned with water after initial mixing. Nonshrink grout shall be placed and packed only with the use of an approved commercial bonding agent. Unused grout shall be discarded after 20 minutes.

PART 3 - EXECUTION

3.01 PIPE INSTALLATION

A. All pipe and fittings shall be installed in accordance with the manufacturer's recommendations and applicable ODOT/APWA standards.

B. Remove from job site material, which in the judgment of the Engineer is damaged, not as specified, or otherwise rejected. Payment will not be made for damaged or rejected materials, their removal, or for repairs to such materials.

C. Preparation of Trench – Excavate and prepare trench for pipe laying to the lines and grades as specified and shown on the Plans. Place any required foundation stabilization and compact pipe bedding prior to laying pipe. Stabilize trench as required and comply with OSHA safety provisions.

D. Place and compact pipe bedding material before placing pipe in the trench. When applicable, dig depression for pipe bells to provide uniform bearing along the entire pipe length. Thoroughly compact bedding material to prevent future bellies.

E. Install to lines and grades shown on the Plans. Maximum deviation shall not exceed 0.05 feet vertically or 0.10 feet horizontally.

F. Prior to lowering pipe into the trench, the Engineer or City representative will check for damage to the pipe. The Contractor shall repair or replace, as directed, all damaged or flawed pipe prior to installation.

G. Thoroughly clean inside the pipe before laying. Prevent foreign material from entering the pipe while it is being placed in the trench. Remove all foreign material from the inside of the pipe and joint before the next pipe is placed. Keep debris, tools, rags or other materials out of the pipes at all times.

H. Lay pipe with bell ends facing the direction of laying. For lines on an appreciable slope, face bells up-grade unless otherwise allowed by the Engineer. Thoroughly clean the ends of the pipe to remove all foreign matter from the pipe joint. Lubricate the bell and spigot ends with approved pipe lubricant, as recommended by the manufacturer.

I. Care must be taken to ensure the pipe is not moved and the side support fill is not disturbed when moving sheeting or trench boxes.

J. Place materials in the pipe zone in layers not greater than 6 inches thick and in a manner that equalizes the pressure on the pipe and minimizes stress. As required under the haunches of pipe and areas not accessible to mechanical tampers or to testing, compact with hand methods to ensure

thorough contact between the material and the pipe. Before placing the pipe zone material, condition, aerate, or wet the material so that the moisture content of each layer is within minus 4% to plus 2% of optimum moisture content

K. Provide proper Backfill Class material as required. Backfill the trench above the pipe zone in successive lifts. Do not allow the backfill to free-fall into the trench until at least 3 feet of cover is provided over the top of the pipe. Modify the compaction as necessary to protect the pipe. Compact each lift to not less than 95% of the maximum dry density.

PART 4 - SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Payment for Storm Drain Pipe will be made on a lineal foot basis for each size, type and backfill class, regardless of depth, at the unit prices stated on the Bid Form. Payment shall include compensation for trench excavation, pipe zone, pipe, backfill, anchors, fitting, transition couplings, and all related work. Measurement will be made along the pipe centerline.

B. Payment for Culverts will be made on a lineal foot basis for each size, type and backfill class, regardless of depth, at the unit prices stated on the Bid Form. Payment shall include compensation for trench excavation, pipe zone, pipe, backfill, anchors, fitting, transition couplings, and all related work. Measurement will be made along the pipe centerline.

33 44 00 STORM DRAIN INLET STRUCTURES

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes furnishing and installing catch basins, ditch inlets, and area drains at the locations shown on the Plans. All catch basins, ditch inlets, and area drains shall conform to the type specified and indicated on the Plans and shall include frames and grates.

B. Storm drain inlet structures for new piping systems shall be precast unless otherwise indicated on the Plans or approved by the Engineer.

C. New storm drain inlets connecting to existing piping generally may be either precast or cast-in-place, Contractor's preference, unless specifically called out on the Plans.

D. Minor revisions in the dimensions of new catch basins and ditch inlets may be required to allow for adjustment of new storm drain pipe grades. The Contractor shall field verify dimensions (height) required and shall not be entitled to any additional compensation for revising precast catch basins and ditch inlets to allow for minor field revisions.

1.02 SUBMITTALS

A. Contractor shall provide submittals for precast catch basins and/or ditch inlets including manufacturer's drawings and installation methods.

1.03 DEFINITIONS

A. Oregon Standard Specifications – The joint Oregon Department of Transportation/APWA Oregon Chapter Standard Specifications for Construction, latest edition.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Catch Basins

1. Catch basins shall be precast to the sizes shown on the Plans. Catch basin, grate and frame shall meet H20 loading. Steel frame shall be cast into catch basins. Unless otherwise specified, catch basins shall be ODOT Type G-2 with Type 2 grates.

2. Concrete used in precast catch basins shall have a minimum compressive strength of 4,000 psi at 28 days. Reinforcing steel shall be Grade 60.

3. Precast catch basins shall have minimum 12-inch sump.

B. Ditch Inlets

1. Ditch inlets shall be precast to the sizes shown on the Plans. Ditch inlet, grate and frame shall meet H20 loading. Steel frame shall be cast into ditch inlets. Unless otherwise specified, ditch inlets shall be ODOT Type D with Type 1 grate.

2. Concrete used in precast ditch inlets shall have a minimum compressive strength of 4000 psi at 28 days. Reinforcing steel shall be Grade 60.

C. Area Drains & Field Inlets

1. Area drains shall be precast to the sizes shown on the Plans. For locations subject to vehicular traffic, area drains, grate and frame shall meet H20 loading, unless otherwise allowed by the Engineer. Steel frame shall be cast into catch basins. Unless otherwise specified, area drains shall be ODOT Type G-2MA with Type 1 grate.

2. For non-traffic locations, field inlets may consist of a 24-inch diameter concrete pipe on end with a round grate sized fit into the bell end (see Detail Drawing D-7). Type G-2MA area drains also are allowed in non-traffic locations.

D. Connections

1. Connections to precast catch basins shall be made at knockouts. If knockouts do not exist at appropriate locations penetrations shall be core drilled.

2. Non-shrink grout shall be utilized to provide watertight connections of all pipes entering or exiting catch basins.

E. Grout – Grout shall be non-shrink, Sika 212, Euco N-S, Five Star, or approved equal nonmetallic cementitious commercial grout exhibiting zero shrinkage per ASTM C827. Grout shall not be amended with cement or sand and shall not be reconditioned with water after initial mixing. Nonshrink grout shall be placed and packed only with the use of an approved commercial bonding agent. Unused grout shall be discarded after 20 minutes.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Prepare native soil and place and compact the crushed rock base to 95% maximum dry density as shown in the Standard Detail Drawings. Backfill material around catch basins shall be as specified for trenches in Section 31 23 00 – Excavation, Bedding and Backfill.

B. Catch basins and inlets shall be carefully placed on the prepared bedding so as to be fully and uniformly supported at true grade and alignment.

C. Catch basins and inlets shall be installed such that the grate and frame match the rim elevation referenced on the Plans. If no rim elevation is referenced, catch basin rims shall be situated 0.1 to 0.2 foot below adjacent finish surfaces. Catch basin and area drain rims should approximately match finished surface slopes.

D. Pipe penetrations shall be made at locations of precast knockouts. Apply non-shrink grout to around pipe to provide positive seal. Locate pipe joint within 12-inches of the outside wall of catch basins on each pipe to allow flexibility.

PART 4 - SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Payment for Type G-2 Catch Basins will be made on a unit price basis per each at the price stated on the Bid Form. Payment will include all materials and labor required for complete installation, including excavation and backfill, all precast components, grate and frame, pipe adapters, grout, and all else related to this item not paid under other sections.

B. Payment for Type D Ditch Inlets will be made on a unit price basis per each at the price stated on the Bid Form. Payment will include all materials and labor required for complete installation, including excavation and backfill, all precast components, grate and frame, pipe adapters, grout, and all else related to this item not paid under other sections.

C. Payment for Type G-2MA Area Drains will be made on a unit price basis per each at the price stated on the Bid Form. Payment will include all materials and labor required for complete installation, including excavation and backfill, all precast components, grate and frame, pipe adapters, grout, and all else related to this item not paid under other sections.

D. Payment for Field Inlets will be made on a unit price basis per each at the price stated on the Bid Form. Payment will include all materials and labor required for complete installation, including excavation and backfill, all precast components, grate and frame, pipe adapters, grout, and all else related to this item not paid under other sections.

33 49 00 STORM DRAIN MANHOLES, FRAMES, AND COVERS

PART 1 - GENERAL

1.01 SUMMARY

A. This section covers storm drain manholes, frames, covers, adapters, and other manhole appurtenances not specifically paid for in other sections, used for the storm drain improvements.

B. Manholes shall be precast concrete conforming to the sizes, dimensions and locations shown on the Plans and specified herein.

C. All frames and covers shall be from a single manufacturer.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Manholes

1. Manhole riser sections shall be pre-cast reinforced concrete with a minimum wall thickness of 5 inches (48-inch manhole), conforming to ASTM C 478. Concrete used in forming the sections shall have a minimum compressive strength of 4000 psi at 28 days. Reinforcing steel shall be Grade 60.

2. Manholes shall have precast reinforced concrete bases with shelves, channels and slopes as specified. Precast bases shall have same wall thickness and reinforcement as riser sections.

3. Joints between manhole sections as well as base section shall be tongue and groove with an o-ring gasket or approved equal conforming to ASTM C-443. Preformed gaskets shall be Ram-Nek, Kent-Seal No. 2, or approved equal

4. Manholes shall have yard permeability tests passing ASTM C497-03 prior to delivery.

B. Frames and Covers

1. All frames and covers shall be heavy duty, gray cast iron designed for H20 traffic loading. Metal used in the castings shall conform to ASTM A48 Class 30. All castings shall be manufactured true to pattern, uniform in quality, free from blowholes, shrinkage, distortion or other defects. Component parts shall fit together in a satisfactory manner and shall have continuously machined bearing surfaces to prevent rocking and rattling. Castings shall be smooth and well cleaned by shotblasting at the factory.

2. Frames and covers shall have skid resistant surface of raised knobs or indentations. Cover shall have the letter “S” cast into it. Lids shall have 16 vent holes.

3. Frames and covers shall be manufactured in accordance with the dimensions shown in the Standard Detail Drawings; Olympic Foundry, or approved equal.

C. Manhole Connections

1. Connections to precast manhole sections shall be accurately core-drilled and shall utilize a properly sized watertight seal. ALOK; or approved equal.

2. Connections to cast-in-place concrete shall be made with a rubber waterstop grouting ring. Ring shall clamp to pipe with stainless steel clamp and have waterstop ribs. Waterstop Grouting Ring by Press-Seal Gasket Corp., or approved equal.

D. Grout – Grout shall be non-shrink, Sika 212, Euco N-S, Five Star, or approved equal nonmetallic cementitious commercial grout exhibiting zero shrinkage per ASTM C827. Grout shall not be amended with cement or sand and shall not be reconditioned with water after initial mixing. Nonshrink grout shall be placed and packed only with the use of an approved commercial bonding agent. Unused grout shall be discarded after 20 minutes

PART 3 - EXECUTION

3.01 MANHOLE INSTALLATION

A. Prepare native soil and place and compact the crushed rock base to 95% maximum dry density as shown in the Standard Detail Drawings. Backfill material around manholes shall be as specified for trenches in Section 02320.

B. Concrete base shall be carefully placed on the prepared bedding so as to be fully and uniformly supported at true grade and alignment.

C. Pipe penetrations shall be core drilled to the appropriate size for each pipe entering or exiting the manhole. Jackhammering will not be allowed. Install appropriately sized watertight seal on each pipe and apply non-shrink grout to remainder of wall penetration to provide positive seal. Non-shrink grout shall be as specified.

D. Install transition couplings, per Section 02630, within 2 feet of the outside wall of manholes on all pipes; or, a pipe bell shall be located a minimum of 1 foot to a maximum of 2 feet from the outside wall of manholes.

E. All flow channels within precast bases shall be constructed of non-shrink grout with a minimum depth of three-fourths (¾) the contributing pipe diameter. Inverts shall be true to line and grade with flow lines having a minimum drop of 0.2 feet from inlet to outlet. Sides of channels shall be troweled smooth to prevent solids deposition. Ledges or benches shall be sloped towards channel to drain. Provide fine broom finish on ledges.

F. Clean tongue and grooves of base and wall sections, prime and apply joint sealer prior to setting in place. Ensure that joint has fully seated. Use approved flexible joint sealant and same manufacturer's primer. The height of the lowest wall section shall be at least three (3) times the inside diameter of the largest sewer pipe entering the manhole and in no case less than 2-feet. Wall sections shall be plumb vertical.

G. Use eccentric cone top section for manholes greater than 6-feet deep. Use extension rings in accordance with the standard detail.

H. Frame and covers shall be installed so that the cover is exposed and flush with the existing surface. In no case will pavement be raised or lowered to meet the grade of installed manhole frames and covers. Where manholes are installed in sloping areas, the grade of the slope shall intersect the top rim of the cover on the uphill side. Manhole frame shall be sealed to the concrete manhole section with a bed of non-shrink grout on either side of bead of flexible joint sealant. In addition, the frame and cover shall be grouted to the outside of the concrete manhole section.

I. Manhole installations with tilted or otherwise defective bases, wall sections which are not plumb, covers which do not match existing grade properly, or are otherwise not in specification compliance shall be removed by the Contractor and replaced until acceptable.

3.02 CONNECTIONS TO EXISTING MANHOLES

A. Connections to existing manholes shall be made at the line and grade shown on the Plans. Existing invert elevations within the manhole shall be verified by the Contractor to ensure proper flow through manhole from new pipe. The Contractor shall report any deviation from the Plans to the Engineer before proceeding.

B. Connections to existing manholes should be core drilled to the appropriate size for the pipe whenever possible. Jackhammering will only be allowed when an obstruction on the exterior of the manhole prevents proper alignment or mounting of the core drill or when pipe size exceeds practical limitations of core drilling.

C. For core drilled penetrations, install appropriately sized watertight seal on each pipe and apply non-shrink grout to remainder of wall penetration to provide positive seal. Non-shrink grout shall be as specified.

D. For all other penetrations, thoroughly clean all portions of the penetration. Install appropriately sized sand collar and grout the wall penetration to provide a positive seal. Locate a pipe bell or transition coupling 1 to 2 feet from the outside wall of the manhole.

3.03 OUTSIDE DROP MANHOLE CONNECTIONS

A. Outside drop manhole connections shall be constructed where indicated on the Plans. Outside drop connections shall be constructed using the size and type of pipe indicated in the Detail Drawings. In order to prevent differential settlement of the piping, excavations for drop pipe installation shall be backfilled with Class E (cement slurry) Backfill as defined in Section 31 23 00 – Excavation, Bedding and Backfill.

3.04 INSIDE DROP MANHOLE DEFLECTION PLATE

A. Where indicated on the Plans, inside drop manholes shall be equipped with removable deflection plates on the incoming drop pipe. Deflections plates shall be mounted 12-inches from the end of the incoming pipe and shall be supported within a fixed partition anchored to the manhole wall. Deflection plates shall be equipped with a pull chain secured near the top of the manhole where it is accessible from the surface to facilitate removal without entry into the manhole. Deflection plates, fixed partitions, and mounting hardware shall be fabricated of approved non-corrosive materials. (Refer to City of Coos Bay Standard Detail D-2.)

PART 4 - SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Payment for Storm Drain Manholes up to an overall depth of 8-feet will be made on a unit price basis per each, at the price stated on the Bid Form. Payment will include all materials, labor, and equipment required for complete installation, including excavation and backfill around manholes, all precast components, grouting and shaping of base channels, pipe adapters, testing, temporary hard surfacing, and all else related to this item not paid under other sections.

1. Payment for Extra Manhole Depth will be made on a unit price basis per foot for each foot over the standard 8-foot depth. Payment shall be in addition to the price of one Storm Drain Manhole for each manhole over 8 feet deep and shall cover all costs related to extra materials, labor, and equipment necessary to construct manholes to depths indicated on the Plans or directed by the Engineer. Depth measurement shall be from the lowest pipe invert (flowline) to the manhole rim. The quantity for payment shall be the actual measured depth minus 8 feet and shall be rounded up to the nearest whole foot for any fractional amount over a given footage depth (i.e. 8.1 feet measured depth rounds up to 9 feet; payment item is 1 foot Extra Manhole Depth).

B. Payment for Outside Drop Manhole Connections shall be made on a unit price basis per each at the price stated on the Bid Form. Payment will include all materials and labor required for complete installation, including excavation and backfill, pipe adapters, fittings, grout, slurry backfill, temporary hard surfacing, and all else related to this item not paid under other sections.

C. Payment for Inside Drop Manhole Deflection Plate will be made on a unit price basis per each at the price stated on the Bid Form. Payment will include all materials and labor for a complete installation.