

**MANDATORY
PREBID MEETING**

July 7, 2015
1:00 PM

To be held at
Columbia Blvd. WTP
Mt. Mazama Room 5001
N Columbia Blvd.
Portland, Oregon

OPTIONAL SITE VISITS:
July 9, 2015 10-12 PM &
July 16, 2015 10-12 PM



Bureau of
Environmental Services

**PREQUALIFICATION
REQUIRED IN**

**Class #7
Excavation
and Grading
for
\$11,000,000**

BID NUMBER 0000060

for

**COLUMBIA BOULEVARD WASTEWATER TREATMENT
PLANT LAGOON RECONSTRUCTION – PHASE 3/4**

Project Number E07146
June 2015

Bid Set - Volume I

Bidding Requirements, General Conditions and Requirements, Technical Specifications
Division 0 through 41

Refer Questions to:

Kathleen Brenes-Morua
Procurement Supervisor, Const.
Phone: 503-823-5371
Fax: 503-823-6865
Kathleen.Brenes-
Morua@portlandoregon.gov

Submit Bid to:

Procurement Services
1120 SW 5th Avenue, Rm. 750
Portland, OR. 97204
Attention: Kathleen Brenes-Morua
Procurement Supervisor, Const.

BIDS DUE:

**August 4, 2015
BY 2:00PM**

PROCUREMENT SERVICES

CITY OF PORTLAND, OREGON
BUREAU OF ENVIRONMENTAL SERVICES

Nick Fish, Commissioner
Jim Hagerman, Interim Bureau Director
William F. Ryan, P.E., Chief Engineer

**COLUMBIA BOULEVARD WASTEWATER TREATMENT
PLANT LAGOON RECONSTRUCTION PHASE 3/4**

PROJECT # E07146

VOLUME I

**COLUMBIA BOULEVARD WASTEWATER TREATMENT
PLANT LAGOON RECONSTRUCTION PHASE 3/4
PROJECT NO. E07146**

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GENERAL BIDDING REQUIREMENTS

NOTICE TO BIDDERS
BIDS ARE DUE BY 2:00 P.M.

This checklist is provided for the use and convenience of bidders. Please refer to the bid documents for requirements, as we cannot guarantee this list is complete. The responsibility for compliance with all requirements remains with the bidder. All submissions are made to Procurement Services.

PRIOR TO BID OPENING: The contractor shall have a current active license from the Oregon Construction Contractors Board. If required by the bid documents, contractors may also be required to attend a pre-bid conference. Contractors also are expected to be aware of, and base their bids upon, all addenda that might be issued prior to bid opening.

1. Prequalification by City of Portland (*Prequalification Application must be filed with Procurement Services at least 10 days prior to bid opening, unless that time period has been changed by a prequalification application or the Instructions to Bidders.*) **Download** at: <http://www.portlandoregon.gov/brfs/44700?>
2. **Current, active CCB license** is required to submit a bid as stated in Chapter 5.34.520 (A) of the Code of the City of Portland. Specialty licensing as required in the Bid Specifications (shown below)
Specialty license: None
Specialty license: None
3. Addenda (**check for receipt of all addenda and acknowledge all addenda before submitting bid**)
- 4a. Prebid Conference scheduled
- 4b. Attendance: Mandatory
 Optional

Checked items must be submitted WITH the Bid.

1. Bid (*see Instructions to Bidders*)
2. Bid Guarantee (*see Instructions to Bidders*)
3. Non-Collusion Affidavit
4. Subcontractor and Self-Perform Work List (Form 1)
5. Federally Funded Project forms (*see Federal Specification*)
 - a. Certification of Non-segregated Facilities
 - b. Certification regarding Debarment, Suspension & Other Responsibility Matters
6. Other

Checked items must be submitted BY 4:00 p.m. on the day of the bid opening.

1. State of Oregon – First Tier Subcontractor Disclosure Form required if bid is greater than \$100,000. (*see State of Oregon Subcontractor Disclosure form for requirements*)
2. Good Faith Effort Program - Subcontractor and Self-Perform Work List - Form 1
3. Other

Low Bidders:

1. Good Faith Effort Program: The apparent low bidder must submit M/W/ESB Contact / Bids Received Log – Form 2 by 4:00 p.m. the next working day after bid submission. (*see Good Faith Effort Specification for detailed requirements*)
2. Workforce Training and Hiring Program (*see Workforce Training Specification for requirements*)
3. Certification as an EEO Affirmative Action Employer <http://procure.portlandoregon.gov/>
4. Equal Benefits Compliance

**PROJECT CONTACTS
NAMES, ADDRESSES, AND PHONE NUMBERS**

During the bidding process, bidders should direct all questions to Kathleen Brenes-Morua for this project.

The following names, addresses, and phone numbers are included for the convenience of the Bidders and Contractor:

Certification as an EEO Affirmative Action Employer:

Procurement Services
1120 SW 5th Avenue, Room 750
Portland, OR 97204-1972
(503) 823-6855
(503) 823-6865 FAX
<http://cityofportland.ebidsystems.com>

Prequalification of Bidders:

Louise Tamiesie
Procurement Services
1120 SW 5th Avenue, Room 750
Portland, OR 97204-1972
(503) 823-6865 FAX
louise.tamiesie@portlandoregon.gov
<http://www.portlandonline.com/omf/index.cfm?c=27353&>

Submittals of Bids:

(Place return address on outside of envelope)
Kathleen Brenes-Morua
Procurement Services
1120 SW 5th Avenue, Room 750
Portland, OR 97204-1972
(503) 823-5371
kathleen.brenes-morua@portlandoregon.gov

Purchase of "Standard Construction Specifications":

Permit Application Center
BDS Building, First Floor
1900 SW 4th Avenue
Portland, OR 97204-1971
(503) 823-7660

Good Faith Effort / Workforce Training & Hiring

Angela Pack
Procurement Services
1120 SW 5th Avenue, Room 750
Portland, OR 97204-1972
(503) 823-6883
(503) 823-6865 FAX
angela.pack@portlandoregon.gov

INSTRUCTIONS TO BIDDERS

1.0 SECURING DOCUMENTS

Bid documents are available electronically at: <http://procure.portlandoregon.gov/>.

All Bidders who submit bids on this project are required to have copies of a complete set of Bid Documents (plans and specifications), and all addenda issued prior to the bid due date. If there is any question as to the Bid Documents or addenda, contact Procurement Services.

If you intend to submit a bid on this project, you must register as a plan holder through Procurement Services, <http://procure.portlandoregon.gov/>

1.01 INCORPORATION OF GENERAL CONDITIONS

Bidder shall incorporate all applicable provisions of the General Conditions contained within this document.

All work done and materials used on this project and the legal relations between the parties and the Contractor's requirements shall be as set forth in said General Conditions, except as specially and specifically modified or deleted by the Special Specifications. If there is any difference, discrepancy or conflict between these Special Specifications and the General Conditions of the City of Portland, the Special Specifications as set forth here shall apply.

2.0 SUBMITTING BIDS

2.1 BID FORM

2.1.1 The bid and all other required documents must be enclosed in a sealed envelope and mailed or delivered to Procurement Services to arrive on or before the bid due date and time. The outside of the envelope shall plainly identify; (1) the Project Name as listed on the Bid Form, and (2) the Bid number.

2.1.2 All bids must be on the form included in the Invitation for Bid and all applicable blanks giving general information must be filled in and signed by the Bidder or a duly authorized agent. All bids must be clearly and distinctly typed or written with ink or indelible pencil. Any statement accompanying and tending to qualify a bid may cause rejection of such bid unless a statement is required in a bid embracing alternatives.

2.1.3 Bidders shall bid on all items included in the bid. Bids that are incomplete or fail to include all items contained in the plans and specifications may be rejected.

2.1.4 Bidders should reference the Notice to Bidders for a list of forms to be submitted with the Bid.

2.2 WITHDRAWAL, MODIFICATION OF BID

A bid may be withdrawn by written request if such request is received prior to the date and time set for bid opening. Changes to a bid already submitted may be made by submitting the change, in form and manner required for a bid, prior to the bid due date and time. A change, which makes a successful bid more advantageous to the City, will be considered at any time.

2.3 LATE BIDS

Bids received after the scheduled bid due date and time will be returned to the Bidder unopened.

2.4 COST OF BIDS

This Invitation for Bid does not commit the City to pay any costs incurred by any Bidder in the submission of their bid, or in making any necessary studies or designs for the preparation thereof.

2.5 BID GUARANTY

No bid will be considered unless accompanied by a certified check, cashier's check, or a bid bond for an amount not less than ten percent (10%) of the aggregate amount of the bid. It shall be payable to the City of Portland as a guaranty that the bid shall be irrevocable for a period of sixty (60) calendar days, unless otherwise specified, after the bid opening date and time and as liquidated damages should the Bidder fail or neglect to furnish the required performance bond and insurance and execute a contract within ten (10) calendar days after receiving said contract from the Chief Procurement Officer for execution. The bid guaranty shall be retained for a period of time in accordance with City of Portland Code 5.33.410.

2.6 CONFLICT OF INTEREST

A Bidder submitting a bid hereby certifies that no officer, agent or employee of the City who has a pecuniary interest in this bid has participated in the contract negotiations on the part of the City, that the bid is made in good faith without fraud, collusion, or connection of any kind with any other Bidder of the same Invitation for Bids, and that the Bidder is competing solely in its own behalf without connection with, or obligation to, any undisclosed person or firm. No bid will be considered unless accompanied by the notarized Non-Collusion Affidavit form included in the Invitation for Bid.

3.0 LEGAL REQUIREMENTS

3.1 LAWS, ORDINANCES, AND REGULATIONS

The Bidder is presumed to be familiar with all Federal, State and local laws, ordinances, and regulations, which in any manner affect the personnel, material or equipment used in the proposed Work. Bidders agree that if awarded a contract, the successful Bidder will comply with all applicable federal, state and local laws, ordinances, and regulations. Contractor shall comply with Title VI of the Civil Rights Act of 1964 and its corresponding regulations as further described at: <http://www.portlandoregon.gov/brfs/?c=27353&a=446806>.

3.2 SPECIFIC STATUTES AND ORDINANCES

The Bidder's attention is called to the requirements of Oregon Revised Statutes Chapter 279A, 279B, 279C, and to Title 17 and Chapter 5.34 of the City of Portland Code with reference to public improvement contracts, purchasing in general, and to contractor's procedures and pre-qualification requirements.

3.3 EQUAL EMPLOYMENT OPPORTUNITY (EEO) CERTIFICATION

All Bidders must be certified as Equal Employment Opportunity Employers as prescribed by Chapter 3.100 of the Code of the City of Portland. Failure to receive EEO certification prior to the date and time of bid opening may result in delaying the award of the contract. Details of certification requirements are available from Procurement Services, 1120 SW Fifth Avenue, Room 750, Portland, Oregon 97204, (503) 823-5047, website:

<http://www.portlandoregon.gov/brfs/265222?>. In order to be EEO certified, Bidders must complete an online certification form at: <http://procure.portlandoregon.gov/>.

3.4 NON-DISCRIMINATION IN EMPLOYEE BENEFITS (EQUAL BENEFITS)

The successful Bidder must be in compliance with the City's Equal Benefits Program as prescribed by Chapter 3.100 of the Code of the City of Portland prior to contract award. Details of compliance requirements are available from Procurement Services, 1120 SW Fifth Avenue, Room 750, Portland, Oregon 97204, (503) 823-6855, website <http://www.portlandoregon.gov/brfs/43774?>. In order to comply, Bidders must complete an online compliance form at: <http://procure.portlandoregon.gov/>.

3.5 PRE-QUALIFICATION OF BIDDERS

All public improvement projects with an engineer's estimate of \$250,000 or greater require pre-qualification.

**Bidders shall be prequalified in Class 7 – Excavating & Grading
in the amount of \$11,000,000**

Prequalification application forms may be obtained from Procurement Services, 1120 SW Fifth Ave, Room 750, Portland, Oregon 97204, or by download at the following internet site: <http://www.portlandoregon.gov/bfrs/44700?>. Prequalification applications must be received by Procurement Services at least ten (10) days prior to the date of bid opening, unless specifically stated otherwise in the advertisement. Pre-qualification applications received less than ten (10) days prior to the bid opening may be processed or rejected at the City's sole discretion. If the application is not approved notice shall be given by the City at least three (3) business days prior to the bid opening date per City Code 5.34.510 (F).

Pre-qualification applications submitted without designation for a specific project shall be considered as general pre-qualification applications and processed pursuant to ORS 279C.430 (2).

3.6 DRUG TESTING PROGRAM

Pursuant to ORS 279.505 (2) (1), the Contractor awarded the contract shall demonstrate that an employee drug-testing program is in place.

3.7 AMERICANS WITH DISABILITIES ACT

Bidders agree that if awarded a contract, the successful Bidder will comply with all applicable provisions of the Americans with Disabilities Act of 1990, 42 USC Section 12101 et seq. If any Bidder requires special assistance or auxiliary aids during the bidding process, please notify Procurement Services, (503) 823-6855, or TDD (503) 823-6868, at least two (2) business days prior to the required assistance.

3.8 BUSINESS TAX COMPLIANCE

A current business tax registration is required before doing business with the City (reference City Code Chapter 7.02). Persons whose gross receipts from all business, both within and without the City, amounts to less than \$50,000 may be exempt, information related to complying with the business tax registration is available at: <http://www.portlandoregon.gov/revenue/29320?>

3.9 CONSTRUCTION AND LANDSCAPE CONTRACTORS BOARDS

Construction contractors must be licensed with the State of Oregon Construction Contractors Board in accordance with ORS 701.005 and any other specialty licensing as required in the bid specification prior to submitting a bid to the City. For information contact:

CONSTRUCTION CONTRACTORS BOARD
700 Summer St. NE, Suite #300
Salem, OR 97310
(503) 378-4621
(website) <http://www.ccb.state.or.us>

A Landscape Contractors Board license is required in accordance with ORS 671.510 if the bid specification includes landscape work as defined by ORS 671.510. For information contact:

LANDSCAPE CONTRACTORS BOARD
2111 Front St. NE, Suite #2-101
Salem, OR 97301
(503) 378-5909
<http://www.oregon.gov/LCB/>

4.0 PRE-BID REQUIREMENTS

4.1 EXAMINATION OF BID DOCUMENTS & WORKSITE

Before submitting a bid, each Bidder shall carefully examine the Drawings, read the Specifications and all Addenda and visit the site of the Work. Each Bidder shall fully inform themselves prior to submitting a bid as to all existing conditions and limitations under which the Work is to be performed, and shall include in the bid a sum to cover all costs of all items necessary to perform the Work as set forth in the Bid Documents. No allowance will be made to any Bidder because of lack of such examination or knowledge. Submission of a bid will be construed as conclusive evidence that the Bidder has made such examination.

4.2 CLARIFICATION OF BID DOCUMENTS PRIOR TO BID - ADDENDA

4.2.1 Requests for additional information or interpretation of the bid document shall be submitted to the Chief Procurement Officer no later than five (5) calendar days before the deadline for submission of bids. Bid due date is indicated on the cover of the Bid Document.

4.2.2 If, in the opinion of the City, additional information or clarification is required, an addendum will be issued to all plan holders on record in Procurement Services. Any addenda issued by the Chief Procurement Officer seventy-two (72) hours or more before the scheduled closing time for filing bids shall be binding upon the Bidder. Failure of the Bidder to receive or obtain such addenda shall not excuse them from compliance therewith if they are awarded the contract.

4.2.3 Oral instructions or information given by City Officers, employees or agents to Bidders concerning this Bid Document or the work in general shall not bind the City.

4.3 PRE-BID CONFERENCE

A pre-bid conference may be scheduled to answer Bidders' questions. See front cover of Bid Document for date, time and place. If a mandatory pre-bid conference

is scheduled, only General Contractors are required to attend, it is optional for sub-contractors.

If an insufficient number of General Contractors or their representatives attend the Mandatory Pre-Bid conference scheduled for this project, the City may decide to hold a 2nd Mandatory Pre-Bid conference to solicit additional interest and provide a more competitive bidding process.

5.0 CONTRACT AWARD

5.1 BASIS OF AWARD

5.1.1 The contract, if awarded, will be made to the lowest, responsive and responsible Bidder offering the lowest unit price base bid.

5.1.2 Determination of the lowest responsive, responsible bid is subject to review by the City Attorney.

5.1.3 The City reserves the right to accept or reject any or all bids in whole or in part, and waives irregularities not affecting substantial rights; and may reject for good cause all bids upon the City's finding that it is in the public interest to do so.

5.1.4 Award of contract, if awarded, will be made within sixty (60) calendar days after the date of bid opening unless otherwise stated in the Bid Documents.

5.2 EXECUTION OF CONTRACT DOCUMENTS

5.2.1 The Contract Form to be executed by the City and the successful Bidder for the Work is a standard form of the City of Portland, Oregon. Such form, incorporated into these Bid Documents by reference only and not physically contained herein, may be reviewed by prospective Bidders at Procurement Services, City of Portland, 1120 SW 5th Avenue, Room 750, Portland, Oregon 97204, phone (503) 823-5047 or by contacting the Buyer for this project, Kathleen Brenes-Morua at 503-823-5371.

5.2.2 If the contract total is \$50,000 or less, a purchase order may be used to confirm the City's acceptance of a bid.

5.2.3 The Bidder to whom the Contract is awarded shall, within ten (10) calendar days after receipt of Contract forms from the Chief Procurement Officer, sign and deliver to the Chief Procurement Officer all required copies.

5.2.4 At or prior to delivery of the signed Contract, the Contractor shall deliver to the Chief Procurement Officer a Performance Bond, a separate Payment Bond, any other bonds and policies of insurance or insurance certificates with additional insured endorsement form(s) attached as required by the Contract Documents.

5.2.5 Failure or refusal to furnish the signed Contract, bonds and/or insurance policies or certificates in a form satisfactory to the City within the time stated above shall be just cause for cancellation of the award, withdrawal of the Contract, and forfeiture of the Bid Guaranty.

5.3 ELECTRONIC PAYMENTS

It is the City's policy to pay its vendor invoices via electronic funds transfers through the automated clearing house (ACH) network. To initiate payment of invoices, vendors shall execute the City's standard ACH Vendor Payment Authorization Agreement which is available on the City's website at: <http://www.portlandoregon.gov/bfrs/article/409834?>. Upon verification of the data provided, the Payment Authorization Agreement will authorize the City to deposit payment for services rendered directly into vendor accounts with financial institutions. All payments shall be in United States currency.

6.0 PERFORMANCE AND PAYMENT BONDS

6.1 The forms for the Performance Bond and the Payment Bond, to be executed by the successful Bidder for the Work and delivered to the City not later than the date of execution of the Contract, are the standard forms of the City of Portland, Oregon. Such forms, incorporated into these Bid Documents by reference only and not physically contained herein, may be reviewed by prospective Bidders at Procurement Services, City of Portland, 1120 SW 5th Avenue, Room 750, Portland, Oregon, 97204, phone (503) 823-6855.

6.2 The Bonds, in an amount equal to one hundred percent (100%) of the Contract Sum, shall be satisfactory to the City and shall be executed by a corporate surety licensed to do business in the State of Oregon. The attorney in fact who executed the Bonds on behalf of the surety shall affix thereto a certified and current copy of his power of attorney and shall indicate the monetary limit of such power.

7.0 PREFERENCES FOR GOOD & SERVICES AND NON-RESIDENT CONTRACTOR

7.1 ORS 279A.120 requires that, in all public contracts, the public contracting agency shall prefer goods or services that have been manufactured or produced in this State if price, fitness, availability and quality are otherwise equal. In determining the lowest responsive bidder, the City shall add a percent increase on the bid of a nonresident bidder equal to the percent, if any, of the preference given to that bidder in the state in which the bidder resides.

7.2 Where a public contract is awarded to a nonresident contractor and the contract price exceeds \$10,000, the Contractor shall promptly report to the Oregon Department of Revenue on forms provided by the Department of Revenue, the total contract price, terms of payment, length of contract and such other information as the Department of Revenue may require before final payment on the contract can be made. For purposes of this subsection, a nonresident contractor is one

who is not domiciled in or registered to do business in the State of Oregon. The Oregon Department of Revenue Nonresident Bidder Form is available at http://www.oregon.gov/dor/docs/nonresident-bidder_800-020.pdf

8.0 LOCAL BUSINESS PREFERENCE

Residents of the State of Oregon and SW Washington benefit from optimizing local businesses and services, and the local employment opportunities they generate. As such the City desires to employ local businesses in the purchase, lease, or sale of any personal property, public improvements or services. Therefore, the City shall prefer goods or services that have been manufactured or produced by a local business if price, fitness, availability and quality are otherwise equal.

9.0 WAGE RATES

- 9.1 State of Oregon, Bureau of Labor and Industries (BOLI) prevailing wage rates are required to be paid to all workers for all work on contracts that total \$50,000 and above, unless exempt.
- 9.2 State of Oregon, Bureau of Labor and Industries (BOLI) prevailing wage rates are required to be paid to workers in each trade or occupation that the Contractor or Subcontractor uses in performing all or part of the work on this project. The applicable prevailing wage rates for this project will be the rates in the BOLI publication titled "Prevailing Wage Rates for Public Works Contracts in Oregon" effective on January 1, 2015, including the applicable Amendments dated April 1, 2015, which are hereby incorporated into this contract by this reference. Workers must be paid not less than the specified minimum hourly rate of wage in accordance with ORS 279C.838 and 279C.840. You can download your copy from www.oregon.gov/boli. If you need additional copies, contact Bureau of Labor & Industries, 800 NE Oregon St. #32, Portland, OR 97232; phone 971-673-0839.
- 9.3 The City of Portland is required to pay the Prevailing Wage Rate (PWR) fee directly to the Oregon Bureau of Labor and Industries. Therefore, Contractor acknowledges that this fee has not been included in the bid amount for this project.
- 9.4 The Contractor awarded the contract is required to post a Public Works Bond with the Oregon Contractors Construction Board (OCCB) unless exempt prior to start of work on the project.
- 9.5 Subcontractors awarded the contract are required to post a Public Works Bond with the Oregon Contractors Construction Board (OCCB) unless exempt prior to start of work on the project.

10.0 REPORTING REQUIREMENTS

Contractor shall cooperate with the City with respect to its reporting requirements for financial and programmatic data resulting from the expenditure of City funds, as follows:

- 10.1 Contractor shall provide an estimate of the number and types of jobs created or retained by the project at the beginning of the project. If Contractor uses vendors in the project, include direct jobs created or retained by the vendors.
- 10.2 Contractor shall report actual performance results consisting of the number and types of jobs created and/or retained at final completion of the project.
- 10.3 Contractor must include these requirements in any subcontracts awarded for the project.
- 10.4 Reports shall be submitted upon request. The Contractor's timely, complete, accurate, and truthful compliance with the reporting obligations constitutes a material element of the Contractor's performance of this contract. Failure to submit these reports shall be deemed noncompliance, and the City may withhold any amounts otherwise due to the Contractor under this contract until the Contractor has submitted the reports.

11.0 PROTEST OF CONTRACTOR SELECTION

Bidders are permitted to challenge the City's decision to award a contract. Portland City Code 5.34.700 thru 5.34.740 describes in detail the protest and appeal procedures when a bid process is officially protested.

For each formal bid project not exempted from the competitive bidding procedures of ORS 279C.410 Procurement Services shall post a Notice of Intent to Award upon determination of the lowest responsive and responsible bidder. The Notice of Intent to Award shall be posted both on the Bureau's Internet Web Page, and in Procurement Services office location at 1120 SW Fifth Avenue, Room 750, Portland, OR, 97204. If the proposed contract exceeds \$500,000, the Notice of Intent to Award shall also be mailed to each Bidder.

A Bidder who is adversely affected or aggrieved by the award of contract shall have seven (7) calendar days from the issuance of the Notice of Intent to Award to file a bid protest. The protest must be filed in writing to the Chief Procurement Officer and must specify the grounds upon which the protest is based. To be valid, a protest must come from an actual Bidder for the contract who claims to be the rightful awardee. A protest is not valid if filed by a Bidder who cannot show that it would be awarded the contract if its protest were accepted.

The Chief Procurement Officer will review the protest and issue a written decision. If the Bidder disagrees with the decision of the Chief Procurement Officer, the Chief Procurement Officer may refer to the Contract Board of Appeals or City Council as he/she determines. The request for appeal must be filed with the Chief Procurement Officer within seven (7) calendar days from the date of the written decision. The request must describe the specific reason for the appeal request, and is limited to those matters that were raised in the original protest letter.

**CITY OF PORTLAND, OREGON
BID FORM
BUREAU OF ENVIRONMENTAL SERVICES**

TO THE CHIEF PROCUREMENT OFFICER:

The undersigned, having full knowledge of the quality of the material and labor to be performed, hereby proposes to perform all labor and furnish all materials necessary for the **Columbia Boulevard Wastewater Treatment Plant (CBWTP) Lagoon Reconstruction - Phase 3/4** for the unit prices set opposite the different items of the material to be furnished and the work to be done as herein below stated:

Bid No. 00000060

NO.	ITEMS OF WORK AND MATERIALS	ESTIMATED QUANTITY	UNIT	UNIT PRICE	TOTAL AMOUNT
1	Mobilization and demobilization as required for entire project	1	LS		
2	Dewatering, groundwater and surface water control	1	LS		
3	Lagoon solids: dry, load, and place in monofill	22,300	Dry Ton		
4	Lagoon solids: dry, load, and haul to offsite disposal	29,700	Dry Ton		
5	Excavate, condition and incorporate existing dike material into Dike 1	6,000	CY		
6	Haul unsuitable existing dike material to offsite disposal	500	CY		
7	Import material and construct Dike 1	9,800	CY		
8	Regrade and compact bottom of Cell 1 and Cell 2	58,010	SY		
9	Import material and place in bottom of Cell 1 and Cell 2 to establish final grade.	14,400	Ton		
10	Import material and place on monofill cover to establish final grade	33,450	Ton		
11	Place and compact Type A subgrade in Cell 1 and Cell 2 (side slopes)	12,700	SY		
12	Place and compact Type A subgrade in Cell 1 and Cell 2 (cell bottoms)	58,010	SY		
13	Install geomembrane liner system in Cell 1 and Cell 2	70,710	SY		
14	Install geomembrane liner system over monofill solids	26,800	SY		

NO.	ITEMS OF WORK AND MATERIALS	ESTIMATED QUANTITY	UNIT	UNIT PRICE	TOTAL AMOUNT
15	Over excavate and fill per 31 00 00-3.01. B if directed by Owner's Representative	500	CY		
16	Construct bioswale	1	LS		
17	All other work: This bid item includes all other work whether incidental to or directly related to performance and completion of project work not included in bid items 1 through 16.	1	LS		
				TOTAL BID	\$

ADDENDA

The undersigned acknowledges receipt of all addenda issued to this solicitation.

PREVAILING WAGES

Bidder acknowledges the requirements of this solicitation in regards to the State of Oregon Prevailing Wage requirements or the federal prevailing wage requirements or both as required by ORS 279C.838 or 279C.840 or 40 USC § 276A will be complied with. (HB 2041, § 25)

Effective January 1, 2008, the City of Portland is required to pay the Prevailing Wage Rate (PWR) fee of 1/10 of 1% of the total contract price directly to the Oregon Bureau of Labor and Industries (Ref. HB 2021). **Therefore, by signing this form Contractor acknowledges that this fee has not been included in the bid amount for this project.**

RESIDENT BIDDER

All bidders must state whether they are an Oregon resident bidder or a non-resident bidder. As defined in ORS 279A.120, a resident bidder is one who has paid unemployment taxes or income taxes in the state during the 12 calendar months immediately preceding bid submission, has a business address in Oregon, and has stated in their bid to be a resident bidder.

Check one: Bidder is () a resident bidder or is () a non-resident bidder. If a nonresident bidder, the bidder certifies residency of (insert name of state where the bidder is a resident): _____

ASSIGNMENT OF ANTI-TRUST RIGHTS

The undersigned acknowledges if they enter into a contract they will be assigning to the Owner any Claim for relief that the Contractor has or may have in the future by reason of violation of 15 USC SS 1-15 or ORS 646.725 or ORS 646.730.

Date: _____

Name of Firm: _____

Street Address: _____

City of: _____ State _____ Zip _____

Name: _____
(Original Signature) (Title)

Name: (Print) _____

Phone _____ Fax _____

Email _____

Employer Identification Number _____

SIC or Type of Business _____

Construction Contractors Board Registration Number _____

City of Portland Business Tax Registration Number _____

Firm is a Corporation _____ Partnership _____ Proprietorship _____

If Incorporated, Registered in the State of: _____

If a Partnership, list partners: _____

If a Proprietorship, name of principal: _____

B I D B O N D

KNOW ALL MEN BY THESE PRESENTS that we, _____, as principal, and _____, a corporation organized and existing under the laws of the State of _____ and duly authorized to transact a surety business in the State of Oregon, as surety, are held and firmly bound unto the CITY OF PORTLAND, a municipal corporation of the State of Oregon, in the penal sum of _____ Dollars (\$ _____) lawful money of the United States of America, for the payment whereof well and duly to be made, we and each of us, jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns, firmly by these presents.

THE CONDITIONS OF THIS OBLIGATION ARE SUCH that whereas the Principal has submitted, or is about to submit, a proposal irrevocable for the period specified in the proposal to the Obligee on a contract for _____ **NOW, THEREFORE**, in the event the principal seeks to revoke his offer for any reason not authorized by law and not consented to by Obligee within the irrevocable period and if awarded the contract and the said Principal fails, neglects or refuses to enter into a contract to perform said work and furnish said labor, equipment and/or material, and to furnish performance and labor material bonds as required within the time specified, then the amount herein stated shall be declared to be forfeited and become due and payable to the City of Portland.

SIGNED, SEALED, AND DATED THIS _____ day of _____, 20 _____

Principal

Address

BY _____
Signature

Print Name and Title

Surety

Oregon Agent for Service

BY _____
Attorney in Fact

Address

CORPORATE SEAL (PRINCIPAL)

CORPORATE SEAL (SURETY)

NOTE

If Principal is operating under an assumed business name, there must also be set forth in the first paragraph of the bond, the names of all partners or the individual owning the business, and the bond must be executed by one of them.

If the Principal is a corporation, the bond must be executed by one of the officers authorized to execute bonds, showing his/her official title and the seal of the corporation.

The bond must be executed by an attorney-in-fact for the surety company, shown on the face thereof, the Oregon agent for service, and bear the seal of the surety company. A current copy of the Power of Attorney must be attached which lists the attorney-in-fact signing the Bid Bond. Where the bond is executed by a person outside of the State of Oregon, his/her authority to execute bonds should be shown.

NON-COLLUSION AFFIDAVIT

STATE OF _____ Contract Bid No. _____

COUNTY OF _____

I, (Type/Print Name) _____, state that I am (Position Title) _____ of (Name of Firm) _____ and that I am authorized to make this affidavit on behalf of my firm, and its owners, directors, and officers. I am the person responsible in my firm for the price(s) and the amount of this bid.

I state that:

- 1. The price(s) and the amount of this bid have been arrived at independently and without consultation, communication or agreement with any other contractor, bidder, or potential bidder, except as disclosed on the attached appendix.
2. Neither the price(s) nor the amount of this bid, and neither the approximate price(s) nor approximate amount of this bid, have been disclosed to any other firm or person who is a bidder or potential bidder, and the price(s), not approximate amount, will not be disclosed before bid opening.
3. No attempt has been made or will be made to induce any firm or person to refrain from bidding on this contract, or to submit a bid higher than this bid, or to submit any intentionally high or noncompetitive bid or other form of complementary bid.
4. The bid of my firm is made in good faith and not pursuant to any agreement or discussion with, or inducement from, any firm or person to submit a complementary or other noncompetitive bid.
5. (Name of Firm) _____, its affiliates, subsidiaries, officers, directors and employees are not currently under investigation by any governmental agency and have not in the last four (4) years been convicted or found liable for any act prohibited by State or Federal law in any jurisdiction, involving conspiracy or collusion with respect to bidding on any public contract, except as described in the attached appendix.

I state that (Name of Firm) _____ understands and acknowledges that the above representations are material and important, and will be relied on by THE CITY OF PORTLAND, OREGON in awarding the contract(s) for which this bid is submitted. My firm understands that any misstatement in this affidavit is and shall be treated as fraudulent concealment from THE CITY OF PORTLAND, OREGON of the true facts relating to the submission of bids for this contract.

(Signature)

Subscribed and sworn to before me this _____ day of _____, 20

NOTARY PUBLIC

My commission expires _____

ASSIGNMENT OF ANTI TRUST RIGHTS

By entering into a contract, the Contractor, for consideration paid to the Contractor under the contract, does irrevocably assign to the City of Portland any claim for relief or cause of action which the Contractor now has or which may accrue to the Contractor in the future, including, at the City's option, the right to control any such litigation on such claim for relief or cause of action, by reason of violation of 15 USC SS 1-15 or ORS 646.725 or ORS 646.730, in connection with any goods or services provided to the contractor by any person, which goods or services are used, in whole or in part, for the purpose of carrying out the Contractor's obligation under this contract.

In the event the Contractor hires subcontractors to perform any of the Contractor's duties under the contract, the Contractor shall require the subcontractor to irrevocably assign to the City of Portland, as a third party beneficiary any right, title or interest that has accrued or may accrue to the subcontractor by reasons of any violation of 15 USC SS 1-15, ORS 646.725 or ORS 646.730, including, at the City's option, the rights to control of any litigation arising there under, in connection with any goods or services provided to the subcontractor by any person, in whole or in part, for the purpose of carrying out the subcontractor's obligations as agreed to by the Contractor in pursuance of the completion of the contract.

In connection with this assignment, it is an express obligation of the Contractor that it will take no action which will in any way diminish the value of the rights conveyed or assigned hereunder to the City of Portland. It is an express obligation of the Contractor to advise the City Auditor or the Office of the City Attorney of Portland, Oregon:

1. In advance, of its intention to commence any action on its own behalf regarding such claims for relief or causes of action;
2. Immediately, upon becoming aware of the fact that an action has been commenced on its own behalf by some other person or persons, of the dependency of such action; and
3. The date on which it notified the obligor(s) of any such claims for relief or causes of action of the fact of its assignment to the City of Portland.

Furthermore, it is understood or agreed that in the event that any payment under such claim is made to the Contractor, it shall promptly pay over to the City of Portland its proportionate share thereof, if any, assigned to the state hereunder.

STATE OF OREGON FIRST-TIER SUBCONTRACTOR DISCLOSURE REQUIREMENTS

(Applies to public improvement projects with an estimated value of more than \$100,000)

STATE OF OREGON FIRST-TIER SUBCONTRACTOR DISCLOSURE FORM TO BE SUBMITTED BY ALL BIDDERS NOT LATER THAN 4:00 P.M. THE DAY THE BID IS DUE

In 2003, the Oregon Legislature revised ORS 279C.370, which provides, in part:

“(1)(a) Within two working hours after the date and time of the deadline when bids are due to a contracting agency for a public improvement contract, a bidder shall submit to the contracting agency a disclosure of the first-tier subcontractors that:

- (A) Will be furnishing labor or will be furnishing labor and materials in connection with the public improvement contract; and
- (B) Will have a contract value that is equal to or greater than five percent of the total project bid or \$15,000, whichever is greater, or \$350,000 regardless of the percentage of the total project bid.”

The Bidder must disclose the following information about their first-tier subcontracts either in its Bid submission or within two (2) working hours after the date and time of the deadline when bids are due:

- 1) the subcontractor’s name,
- 2) the dollar value of the subcontract, and
- 3) the category of work that the subcontractor will be performing.

If the bidder will not be using any subcontractors that are subject to the above disclosure requirements, the bidder is required to indicate **“NONE”** on the accompanying form.

Failure to submit this form by the disclosure deadline will result in a non-responsive bid. A non-responsive bid will not be considered for award.

It is the Bidder’s responsibility to determine all the documents that must be submitted to the City. For purposes of this document, "submitted" means "in the physical possession of Procurement Services."

Note to Contractors who are not the low bidder:

If the apparent low bidder is disqualified or otherwise not awarded the contract and the next low bidder failed to submit the first-tier disclosure form within two (2) hours after the date and time of the deadline when bids were due, that bidder will be ineligible to receive award of the contract.

FIRST-TIER SUBCONTRACTOR DISCLOSURE



PROJECT NAME: Columbia Boulevard Wastewater Treatment Plant (CBWTP)
Lagoon Reconstruction – Phase 3/4

BID #: 00000060

BID CLOSING: Date: _____ Time: _____

This form must be submitted at the location specified in the Invitation to Bid on the advertised bid closing date and within two working hours after the advertised bid closing time.

List below the name of each subcontractor that will be furnishing labor or will be furnishing labor and materials and that is required to be disclosed, the category of work that the subcontractor will be performing and the dollar value of the subcontract. Enter "NONE" if there are no subcontractors that need to be disclosed. (ATTACH ADDITIONAL SHEETS IF NEEDED.)

NAME	DOLLAR VALUE	CATEGORY OF WORK
(1)	\$	
(2)	\$	
(3)	\$	
(4)	\$	
(5)	\$	
(6)	\$	
(7)	\$	
(8)	\$	
(9)	\$	

Failure to submit this form by the disclosure deadline will result in a non-responsive bid. A non-responsive bid will not be considered for award.

Form submitted by (bidder name): _____

Contact name: _____ Phone no.: () _____

- ORS 279C.370 First-tier subcontractor disclosure.** (1)(a) Within two working hours after the date and time of the deadline when bids are due to a contracting agency for a public improvement contract, a bidder shall submit to the contracting agency a disclosure of the first-tier subcontractors that:
- (A) Will be furnishing labor or will be furnishing labor and materials in connection with the public improvement contract; and
 - (B) Will have a contract value that is equal to or greater than five percent of the total project bid or \$15,000, whichever is greater, or \$350,000 regardless of the percentage of the total project bid.
- (b) For each contract to which this subsection applies, the contracting agency shall designate a deadline for submission of bids that has a date on a Tuesday, Wednesday or Thursday and a time between 2 p.m. and 5 p.m., except that this paragraph does not apply to public contracts for maintenance or construction of highways, bridges or other transportation facilities.
- (c) This subsection applies only to public improvement contracts ("projects") with a value, estimated by the contracting agency, of more than **\$100,000**.
- (d) This subsection does not apply to public improvement contracts that have been exempted from competitive bidding requirements under ORS 279C.335 (2).
- (2) The disclosure of first-tier subcontractors under subsection (1) of this section must include the name of each subcontractor, the category of work that each subcontractor will perform and the dollar value of each subcontract. The information shall be disclosed in substantially the following [above] form:
- (3) A contracting agency shall accept the subcontractor disclosure. The contracting agency shall consider the bid of any contractor that does not submit a subcontractor disclosure to the contracting agency to be a non-responsive bid and may not award the contract to the contractor. A contracting agency is not required to determine the accuracy or the completeness of the subcontractor disclosure.
- (4) After the bids are opened, the subcontractor disclosures must be made available for public inspection.
- (5) A contractor may substitute a first-tier subcontractor under the provisions of ORS 279C.585.
- (6) A subcontractor may file a complaint under ORS 279C.590 based on the disclosure requirements of subsection (1) of this section.

GOOD FAITH EFFORT DIVISIONS OF WORK (DOW)

BID NUMBER: 00000060

PROJECT NAME: Columbia Boulevard Wastewater Treatment Plant (CBWTP) Lagoon Reconstruction – Phase 3/4

ATTENTION CONTRACTORS

At least seven (7) calendar days prior to the scheduled bid due date, Prime Contractors are required to contact a minimum of FIVE (5) MWESB firms plus all MWESB pre-bid attendees for each Good Faith Effort DOW checked below in which they intend to subcontract work.

Please go to the state's website below to locate potential M/W/ESB subcontractors for each DOW listed below. Click on Search by NIGP code, enter the NIGP code listed below for the DOW you need (e.g. 91038 for Asbestos Removal, etc.). If you have difficulty identifying potential M/W/ESB subcontractors please contact Procurement Services – Paula Wendorf at 503-823-6889 or Angela Pack at 503-823-6883.

Please note: This project is located within the City of Portland and when searching for potential subcontractors we encourage you to contact subcontractors within the general area.

Office of Minority, Women, and Emerging Small Business web site:

<http://www4.cbs.state.or.us/ex/dir/omwesb/>

NIGP CODE AND WORK DESCRIPTION	NIGP CODE AND WORK DESCRIPTION
<input type="checkbox"/> 91038 ASBESTOS REMOVAL	<input type="checkbox"/> 91227 IRRIGATION
<input type="checkbox"/> 91395 ASPHALT PAVING	<input type="checkbox"/> 98852 LANDSCAPING
<input type="checkbox"/> 91313 BRIDGES	<input type="checkbox"/> 91047 LEAD PAINT ABATEMENT
<input type="checkbox"/> 91427 CARPENTRY	<input type="checkbox"/> 91455 MASONRY
<input type="checkbox"/> 91219 CLEARING/GRUBBING/MOWING/BRUSHING	<input type="checkbox"/> 91458 METAL FABRICATION
<input type="checkbox"/> 91382 CONCRETE CUTTING	<input type="checkbox"/> 91461 PAINTING/WALLPAPERING
<input type="checkbox"/> 92519 CONCRETE PUMPING	<input type="checkbox"/> 91468 PLUMBING
<input type="checkbox"/> 91430 CONCRETE WORK	<input type="checkbox"/> 91473 ROOFING
<input type="checkbox"/> 96247 CRANE SERVICE	<input type="checkbox"/> 96826 ROCK CRUSHING
<input type="checkbox"/> 91240 DEMOLITION	<input type="checkbox"/> 91345 SEWER, WATER & STORM DRAIN WORK
<input type="checkbox"/> 91216 DRILLING/BORING	<input type="checkbox"/> 90976 SITE CLEAN UP
<input type="checkbox"/> 91075 DRYWALL/SHEETROCK	<input type="checkbox"/> 91276 STRIPING
<input checked="" type="checkbox"/> 91438 ELECTRICAL	<input type="checkbox"/> 91479 STRUCTURAL STEEL (INSTALL/ERECT)
<input checked="" type="checkbox"/> 91244 EXCAVATING	<input checked="" type="checkbox"/> 92586 SURVEYING
<input type="checkbox"/> 98815 FENCING	<input type="checkbox"/> 96878 TANK DECOMMISSION/REMOVAL
<input type="checkbox"/> 91444 FLOOR COVERINGS	<input type="checkbox"/> 91483 TILE/TERRAZZO/MARBLE WORK
<input type="checkbox"/> 91447 GLASS SERVICES	<input checked="" type="checkbox"/> 96884 TRAFFIC CONTROL SERVICES (INCLUDES TPDT)
<input type="checkbox"/> 91223 GRADING	<input type="checkbox"/> 96880 TRAFFIC SIGN INSTALLATION/REMOVAL
<input checked="" type="checkbox"/> 96239 HAULING SERVICES (TRUCKING)	<input type="checkbox"/> 91356 UTILITIES
<input type="checkbox"/> 92645 HAZARDOUS WASTE REMOVAL	<input type="checkbox"/> 96894 WATERPROOFING
<input type="checkbox"/> 91036 HVAC	<input type="checkbox"/> 91485 WELDING
<input type="checkbox"/> 91453 INSULATION	<input type="checkbox"/> 87090 WINDOWCOVERINGS

**CITY OF PORTLAND
GOOD FAITH EFFORT PROGRAM
BIDDER CHECKLIST**

This Checklist helps identify documents that shall be submitted by the Bidder to establish that Good Faith Efforts (GFE) have been made. However, it remains the responsibility of the Bidder to determine all the documents that shall be submitted. For purposes of this document, "submitted" means in the physical possession of the City of Portland, Procurement Services. All forms can be provided electronically upon request; OR available to download on the Procurement Services website:

<http://www.portlandonline.com/omf/purchasing>

DUE DAY OF BID OPENING BY 4:00PM – FROM ALL BIDDERS

- FORM 1 - City of Portland - Good Faith Effort Program - Subcontractor and Self-Perform Work List** - Provide all required information:
(*The completed Form 1 shall be submitted even if you intend to self-perform ALL the work on this project.*)
- ✓ Bidder Name, Bid Number, Bid Amount, and Project Name
 - ✓ Bidder shall list **ALL** GFE Divisions of Work and identify as Self-Performing or Subcontracting

Failure to submit Form 1 with the bid or by 4:00 p.m. on the day of the bid opening will result in the bid being non-responsive and the bid will be rejected.

DUE DAY AFTER BID OPENING BY 4:00PM - FROM THE APPARENT LOW BIDDER

- FORM 2 – City of Portland - Good Faith Effort Program - MWESB Contact / Bids Received Log** - Provide all required information in each column as applicable.
- Copy of solicitation letter or FAX sent to M/W/ESB Subcontractors**

Failure to submit Form 2 by 4:00 p.m. on the day after the bid opening will result in the bid being non-responsive and the bid will be rejected.

DUE AFTER AWARD OF CONTRACT FROM CONTRACTOR

- FORM 3 - City of Portland – Monthly Subcontractor Payment and Utilization Report**

Completed GFE Forms may be submitted in person or by fax as directed below.
The City of Portland is not responsible for delays or problems with fax transmission.

Submit all required information to:

City of Portland, Procurement Services; 1120 SW 5th Avenue, #750; Portland, OR 97204
FAX: 503-823-6865

Questions:

Please call a Procurement Services Contract Compliance Specialist at:
(503) 823-6883 (Angela Pack) / Email: Angela.Pack@portlandoregon.gov
(503) 823-6889 (Paula Wendorf) / Email: Paula.Wendorf@portlandoregon.gov

CITY OF PORTLAND

GOOD FAITH EFFORT REQUIREMENTS

Article I. PROGRAM DESCRIPTION

- A. The City of Portland has a compelling government interest to ensure that its contracts provide employment opportunities for Oregon State certified minority, women, and emerging small businesses (M/W/ESBs) in order to address historical underutilization. Therefore, Bidders are required to submit documentation showing that Good Faith Efforts (GFE) have been made to contract with M/W/ESB Subcontractors.
- B. On projects estimated at \$200,000 and above, this program:
 - 1) Is used to evaluate the Good Faith Efforts (GFE) required of all Bidders;
 - 2) Is intended to assist the City in recording Subcontractor utilization on its projects;
 - 3) Requires Bidders to perform GFE on ALL of their subcontracting opportunities (regardless of value); and
 - 4) Is adopted for reasons other than the prevention of bid shopping

Article II. ASPIRATIONAL GOALS

- A. The City has adopted an M/WBE aspirational goal of 35% of all subcontracts on each construction project estimated at \$200,000 and above. Each year the aspirational goal will be based on the prior year's actual utilization of M/WBE's and a review of available M/WBE Subcontractors.

Article III. PRE-BID REQUIREMENTS

- A. Bidders are required to make good faith efforts to contract with M/W/ESB Subcontractors for ALL GFE Divisions of Work (DOW) identified in these documents unless the work will be self-performed by the Bidder.
- B. The GFE DOW are areas where the City believes subcontracting opportunities may exist. Bidders shall use the GFE DOW, which are different than the divisions of work that might be outlined in the technical specifications. Bidders shall notify the project Buyer at least seven (7) business days prior to the bid opening date if the Bidder believes that any identified GFE DOW is not applicable to the project. If the Bidder does not account for all GFE DOW on Form 1, its bid will be deemed non-responsive for failure to follow the GFE procedures.
- C. These requirements are contractual obligations and are included in the construction contract. Failure to comply may result in a finding of breach of contract, possible disqualification of the Bidder to bid on future contracts, or a claim for damages.

ATTENTION CONTRACTORS

Please go to the State's website below to locate potential certified M/W/ESB subcontractors for each DOW. Click on Search by NIGP code, enter the NIGP code for the DOW you need (e.g. 91038 for Asbestos Removal etc.). If you have difficulty identifying potential M/W/ESB subcontractors please contact Procurement Services – Angela Pack at 503-823-6883 or Paula Wendorf at 503-823-6889.

Please note: This project is located within the city of Portland and when searching for potential subcontractors we encourage you to contact subcontractors within the general area.

Office of Minority, Women, and Emerging Small Business web site:

<http://www4.cbs.state.or.us/ex/dir/omwesb/>

D. **Who to contact**

For ALL GFE DOW identified in these documents (see Article III.A) that you will not be self-performing, Bidders shall contact:

- 1) Each M/W/ESB Subcontractor that attended a pre-bid meeting (if one was held) that specializes in a GFE DOW if that work will be subcontracted. If the M/W/ESB identified itself as another potential prime contractor at the pre-bid meeting, that M/W/ESB need not be contacted. A list of Subcontractors attending the pre-bid meeting will be available to all Bidders. **AND**
- 2) In addition, the Bidder shall contact a minimum of five (5) M/W/ESB Subcontractors listed in each GFE DOW that will be subcontracted. If there are less than five (5) Subcontractors listed for a particular GFE DOW, Bidders shall contact **all** of the Subcontractors that are listed in that GFE DOW.

E. **When to contact**

Bidders shall make the first contact with each M/W/ESB Subcontractor at least seven (7) calendar days before bid opening. For example, if bids are opening on Thursday, the first contact shall be on the Thursday of the preceding week. If bids are opened on Tuesday, then the first contact shall be on the Tuesday of the preceding week.

F. **How to contact**

- 1) Bidders shall contact M/W/ESB Subcontractors by letter or fax to advise them of potential subcontracting opportunities.
- 2) Bidders shall follow up the letter or fax with telephone calls to each M/W/ESB Subcontractor contacted to determine if a bid will be submitted or if further information is required. Follow up telephone calls need not be made to a Subcontractor who responds to the first contact with a statement that the Subcontractor will not bid on this project or if a Subcontractor already has submitted a sub-bid.

G. **What information shall be provided**

Bidders shall ensure that M/W/ESB Subcontractors have an equal opportunity to compete for work by providing all subcontractors the same information and informing them of the date and time that sub-bids are due.

Article IV. OPTIONAL GOOD FAITH EFFORTS

A. Bidders also should consider efforts such as:

- 1) Advertisements in community based newspapers (i.e. Skanner, Asian Reporter, El Hispanic, etc.)
- 2) Letters to Minority and Women Community Organizations
- 3) Alternative methods of participation in Minority, Women or Emerging small businesses through arrangements such as joint ventures, negotiated subcontract agreements and competitive bids
- 4) Purchase of construction materials and equipment from M/W/ESB suppliers

Article V. SUBMISSION OF REQUIRED DOCUMENTATION

A. **FORM 1 (Subcontractor and Self-Perform Work List) - DUE DAY OF BID OPENING BY 4:00PM – FROM ALL BIDDERS**

Bidders shall submit Form 1 with their bid or by 4:00 p.m. on the day the bid is due. Failure to timely submit Form 1 will result in bid rejection.

Form 1 shall list **ALL** Subcontractors to be used on this contract regardless of the dollar amount. (This is more than what is required by the State of Oregon's first-tier subcontractor disclosure form). If this bid includes Bid Alternates for additional work, Bidders shall list **ALL** first-tier Subcontractors who will be used if the City elects to do the additional work.

Additionally, Bidders shall identify **ALL** GFE DOW to be self-performed. If the Bidder does not account for all GFE DOW on Form 1, its bid will be deemed non-responsive for failure to follow the GFE procedures.

The City will not consider untimely or unsolicited subcontractor amounts in its award decision that do not comply with the Good Faith Effort Program.

B. FORM 2 (Log) & SOLICITATION LETTER - DUE DAY AFTER BID OPENING BY 4:00PM FROM APPARENT LOW BIDDER

- 1) **FORM 2 (Contact / Bids Received Log):** The apparent low Bidder shall submit Form 2, (or equivalent), by 4 p.m. the next business day following bid submission. Bidder shall provide all required information in each column as applicable.
- 2) **Solicitation letter or fax:** The apparent low Bidder shall submit one copy of the letter or fax sent to M/W/ESB Subcontractors to solicit bids for this project. If more than one form of letter or fax was sent, submit a copy of each form sent.
- 3) Failure to timely submit Form 2 will result in bid rejection. Failure to timely submit the solicitation letter or fax may result in bid rejection, at the City's discretion. Contractors shall submit additional information upon request if the City believes it needs to clarify the Bidder's GFE.
- 4) If for any reason the apparent low Bidder is not awarded the contract or its bid is rejected, the next apparent low bidder shall submit Form 2 and its solicitation letter or fax by 4:00 p.m. the next business day following the City's notification.

C. FORM 3 (Monthly Subcontractor Payment and Utilization Report) DUE MONTHLY FROM CONTRACTOR

The selected Contractor shall list the contract amounts and payment amounts to **ALL** Subcontractors (including MBE/WBE/ESB Subcontractors) and second-tier Subcontractors on Form 3. All first-tier Subcontractors with second-tier Subcontractors also shall submit Form 3 monthly. Monthly Subcontractor Payment and Utilization Reports shall be submitted by the 15th of each month once work has commenced.

Article VI. ADDITION OR REPLACEMENT OF SUBCONTRACTORS AFTER BID SUBMISSION

- A. The Bidder awarded the Contract shall not replace a M/W/ESB Subcontractor without the consent of the Chief Procurement Officer at any time. The Chief Procurement Officer shall be notified in writing immediately upon the need to replace an M/W/ESB Subcontractor. Permission will not be unreasonably withheld.
- B. If **ANY** Subcontractor is **added** or **replaced** after the bid is submitted, the successful Bidder shall make good faith efforts to solicit bids from M/W/ESBs for the work to be performed. Documentation of these efforts is required, and shall be submitted to the Chief Procurement Officer or designee prior to any changes to be made. Contact the Contract Compliance Specialist for any questions on this procedure.

Article VII. ENFORCEMENT AFTER CONTRACT AWARD

The Owner's commitment to this program is reflected, in part, by the cost of administering the program. Failure to meet the requirements of this section of the contract negates such funding and impairs the Owner's efforts to promote contracting diversity and to provide fair and equal opportunities to the public as a whole as a result of the expenditure of public funds. Therefore, the parties mutually agree that failure to meet the requirements of this section of the contract, including but not limited to the submission of required documentation, constitutes a material breach of contract.

In the event of a breach of contract, the Owner may take any or all of the following actions:

A. Withholding Progress Payments

The Owner may withhold all or part of any progress payment(s) until the Contractor has remedied the breach of contract. In the event that progress payments are withheld, the Contractor shall not be entitled to interest on said payments. If a Subcontractor(s) is responsible for noncompliance with the Good Faith Effort Program requirements, the Owner may choose to withhold only their portion of the progress payment.

B. Liquidated Damages

The parties mutually agree that it would be difficult, if not impossible, to assess the actual damage incurred by the Owner for the Contractor's failure to comply with the Good Faith Effort Program. The parties further agree that it is difficult, if not impossible; to determine the cost to the owner when contracting opportunities are not provided. Therefore:

1) GFE Program Non-Compliance:

If Contractor fails to comply with the GFE provisions of this contract, the Contractor agrees to pay the sum of \$1,000 for each violation. These damages are independent of any liquidated damages that may be assessed due to any delay in the project caused by the Contractor's failure to comply with this or other provisions of the contract.

2) Non-Utilization or Under-Utilization of Identified M/W/ESB Subcontractors:

The Owner has an expectation that if a Bidder is awarded a contract, and identifies that they intend to subcontract a portion of the project work in Form 1, the Contractor will actually use the identified M/W/ESB subcontractor(s). This expectation also includes utilizing the subcontractor(s) within a reasonable range of the subcontract amount identified in Form 1. A reasonable range is within twenty percent (20%) of the subcontract amount. Exceptions to this requirement are for approved change orders, reductions in scope of work caused solely by the Owner, failure of subcontractor to complete work or breach of subcontract, and approved substitution requests. This section does not apply if the subcontractor is utilized more than the subcontract amount identified in Form 1.

The Contractor agrees that failure to comply with this section will result in Contractor paying a sum of \$1,000 for each violation of this section.

3) Delay:

The Contractor agrees that any delay to the specified contract time as a result of the Contractor's failure to comply with the requirements of this section shall subject the Contractor to the amount of liquidated damages specified elsewhere in the contract.

C. Possible Debarment

Failure to comply with the requirements of this portion of the contract may lead to the Contractor's disqualification from bidding on and receiving other Owner contracts as provided in Portland City Code (PCC) 5.34.530.

D. Other Remedies

The remedies that are noted above do not limit any other remedies available to the Owner in the event that the Contractor fails to meet the requirements of the Good Faith Effort Requirements.

Article VIII. REVIEW OF RECORDS

- A. In the event that the Owner reasonably believes that a violation of the requirements of this section has occurred, the Owner is entitled to review the books and records of the Contractor and any Subcontractors employed on the project to which the requirements of this section are applicable to determine whether such a violation has or has not occurred.
- B. In the event that the Contractor or any Subcontractor fails to provide the books and records for inspection and copying when requested, such failure shall constitute a material breach of this contract and permit the imposition of any of the remedies noted in Article VII, including the withholding of all or part of any progress payment(s).

ATTACHMENTS:

FORM 1: City of Portland - Good Faith Effort Program - **Subcontractor and Self-Perform Work List**

FORM 2: City of Portland - Good Faith Effort Program - **M/W/ESB Contact / Bids Received Log**

FORM 3: City of Portland - **Monthly Subcontractor Payment and Utilization Report**

All forms are available on the Procurement Services website:

<http://www.portlandonline.com/omf/purchasing>

**CITY OF PORTLAND
GOOD FAITH EFFORT (GFE) PROGRAM
SUBCONTRACTOR AND SELF-PERFORM WORK LIST
(FORM 1)**

NOTE: IF THE BIDDER IS NOT USING ANY SUBCONTRACTORS ON THIS PROJECT, THE BIDDER SHALL WRITE "SELF-PERFORMING ALL WORK" ON THE FORM

Bidder Name:

Total Bid Amount:

Project Name: CBWTP Lagoon Reconstruction – Phase 3/4

Bid Number: 00000060

BIDDER SELF-PERFORMING: Shall identify below ALL identified GFE Divisions of Work (DOW) to be self-performed. Good Faith Efforts are otherwise required. The City will not consider untimely or unsolicited subcontractor amounts in its award decision that do not comply with the Good Faith Effort Program.

GFE DOW BIDDER WILL SELF-PERFORM (GFE not required)

BIDDERS SHALL DISCLOSE AND LIST ALL SUBCONTRACTORS, including those M/W/ESBs that you intend to use on the project. If this bid includes Bid Alternates for additional work, follow the same instructions as above.

LIST ALL SUBCONTRACTORS BELOW (Print Legibly) Use correct legal name of Subcontractor	GFE AND OTHER DOW (Painting, electrical, landscaping, etc.) Shall list ALL DOW performed by Subcontractors	DOLLAR AMOUNT OF SUBCONTRACT	If Certified MBE/WBE/ESB Subcontractor Check box <input checked="" type="checkbox"/>		
			MBE	WBE	ESB
Name Address City/St/Zip Phone# Fax # OCCB# FED ID#			□	□	□
Name Address City/St/Zip Phone# Fax # OCCB# FED ID#			□	□	□
Name Address City/St/Zip Phone# ax # OCCB# FED ID#			□	□	□

Failure to submit this form with the bid or by 4:00 p.m. on the day of the bid opening will result in the bid being non-responsive and the bid will be rejected. Completed form may be faxed to: 503-823-6865. The City of Portland is not responsible for delays or problems with fax transmission.

GFE SUBCONTRACTOR AND SELF-PERFORM WORK LIST (FORM 1) cont'd

Bidder Name:
Bid Number:

Total Bid Amount:
Project Name:

<u>LIST ALL SUBCONTRACTORS BELOW</u> (Print Legibly) Use correct legal name of Subcontractor	GFE AND OTHER DOW (Painting, electrical, landscaping, etc.) Shall list ALL DOW performed by Subcontractors	DOLLAR AMOUNT OF SUBCONTRACT	If Certified MBE/WBE/ESB Subcontractor Check box <input checked="" type="checkbox"/>		
			MBE	WBE	ESB
Name Address City/St/Zip Phone# Fax # OCCB# FED ID#			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Name Address City/St/Zip Phone# Fax # OCCB# FED ID#			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Name Address City/St/Zip Phone# Fax # OCCB# FED ID#			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Name Address City/St/Zip Phone# Fax # OCCB# FED ID#			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Name Address City/St/Zip Phone# Fax # OCCB# FED ID#			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Name Address City/St/Zip Phone# Fax # OCCB# FED ID#			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**CITY OF PORTLAND
GOOD FAITH EFFORT PROGRAM
M/W/ESB CONTACT / BIDS RECEIVED LOG
(FORM 2)**

Bidder Name:

Bid Number:

Bidders shall record their contacts with MBE/WBE/ESB Subcontractors through use of this log (or equivalent) entering all required information. All columns shall be completed where applicable. Additional forms may be copied if needed.

NAME OF M/W/ESB SUBCONTRACTOR	GFE Divisions of Work Use list provided for areas of subcontracting. (Painting, electrical, landscaping, etc.)	Date Solicitation Letter / Fax Sent	PHONE CONTACT		BID ACTIVITY Check Yes or No			REJECTED BIDS (if bid received & not used)		Notes
			Date of Call	Person Receiving Call	Will Bid	Bid Received	Bid Used	Bid Amount	Reason Not Used (Price, Scope or Other. If Other, explain in Notes>>)	
<input type="checkbox"/> MBE <input type="checkbox"/> WBE <input type="checkbox"/> ESB					<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No			
<input type="checkbox"/> MBE <input type="checkbox"/> WBE <input type="checkbox"/> ESB					<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No			
<input type="checkbox"/> MBE <input type="checkbox"/> WBE <input type="checkbox"/> ESB					<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No			
<input type="checkbox"/> MBE <input type="checkbox"/> WBE <input type="checkbox"/> ESB					<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No			
<input type="checkbox"/> MBE <input type="checkbox"/> WBE <input type="checkbox"/> ESB					<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No			
<input type="checkbox"/> MBE <input type="checkbox"/> WBE <input type="checkbox"/> ESB					<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No			
<input type="checkbox"/> MBE <input type="checkbox"/> WBE <input type="checkbox"/> ESB					<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No			

Failure of the apparent low Bidder to submit this form (or equivalent) by 4:00 p.m. on the day after bid opening will result in the bid being non-responsive and the bid will be rejected. If an equivalent form is used, it shall include all information requested on this form as required. Completed form may be faxed to: 503-823-6865. The City of Portland is not responsible for delays or problems with fax transmission.

CITY OF PORTLAND
MONTHLY SUBCONTRACTOR PAYMENT AND UTILIZATION REPORT (FORM 3 - MUR)

1. Bid Number

2. Contract Number

3. Contractor Name

I am the Prime
 I am a Sub submitting amounts I've paid to my subs

4. Prime Contract Amount

5. Month End Date

6. Project Name

7. Progress Report Number

8. Are you being paid twice per month? YES NO

9. Is this your Final MUR (all subs paid in full)? YES NO

SECOND TIER PAYMENTS TO SUBCONTRACTORS SHALL BE INCLUDED ON THIS REPORT

10 ALL SUBCONTRACTORS LISTED ON SUBPLAN (from Form 1 at bid time)	11 Check if 2nd- Tier Sub	12 ORIGINAL AWARD AMOUNT (On Form 1 at bid time)	13 AMENDED SUBCONTRACT AMOUNT	14		15	
				MONTHLY AMOUNTS		PROJECT TOTALS TO DATE	
				PAYMENTS MADE THIS MONTH ONLY	RETAINAGE	PAYMENTS MADE TOTAL-TO-DATE	RETAINAGE
	<input type="checkbox"/>						
	<input type="checkbox"/>						
	<input type="checkbox"/>						
	<input type="checkbox"/>						
	<input type="checkbox"/>						
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	<input type="checkbox"/>						
	<input type="checkbox"/>						
	<input type="checkbox"/>						

***SUBCONTRACTORS ADDED AFTER PROJECT AWARD (Shall be EEO Certified with the City of Portland)**

16 SUBCONTRACTOR NAME	17 Check if 2nd- Tier Sub	18 STATUS MWESB?	19 TYPE / NATURE OF WORK	20 SUBCONTRACT AMOUNT	21		22	
					MONTHLY AMOUNTS		PROJECT TOTALS TO DATE	
					PAYMENTS MADE THIS MONTH ONLY	RETAINAGE	PAYMENTS MADE TOTAL-TO-DATE	RETAINAGE
	<input type="checkbox"/>							
	<input type="checkbox"/>							
	<input type="checkbox"/>							
	<input type="checkbox"/>							
	<input type="checkbox"/>							
	<input type="checkbox"/>							

***** CHANGES TO CONTRACT: Before replacing, substituting, or adding any subcontractor, please contact the Contract Compliance Specialist *****

Please note: Instructions for completing this report are available on the next page.

BY SIGNING BELOW, I HEREBY CERTIFY THAT THE ABOVE LISTED FIRMS HAVE BEEN UTILIZED BY OUR COMPANY IN THE AMOUNTS REPRESENTED ABOVE AND THAT THE INFORMATION CONTAINED HEREIN IS COMPLETE AND ACCURATE.

Authorized Signature of Contractor Representative

Date

Submit with request for Progress Payment or by the 15th of the month to Project Manager & City of Portland, Procurement Services, 1120 SW 5th Av, Room 750, Portland, OR 97204 (fax: 503-823-6865)

INSTRUCTIONS FOR COMPLETING THE MONTHLY SUBCONTRACTOR PAYMENT & UTILIZATION REPORT

1. **BID NUMBER:** City of Portland Bid Number.
2. **CONTRACT NUMBER:** City of Portland contract number.
3. **CONTRACTOR NAME:** Name of contractor submitting the MUR. Indicate by checking the box whether you are the Prime or a Subcontractor listing payments to your subs.
4. **PRIME CONTRACT AMOUNT:** Total dollar amount.
5. **MONTH END DATE:** Indicate the month end date you are reporting payments for (i.e. 6/30/08; 07/31/08; 08/31/08, etc).
6. **PROJECT NAME:** As indicated on the contract documents.
7. **PROGRESS REPORT NUMBER:** Enter report No.1 for the first report submitted and subsequent numbers for reports submitted thereafter.
8. **ARE YOU BEING PAID TWICE PER MONTH?:** Indicate whether you are being paid twice per month per the City's Standard Construction Specifications.
9. **IS THIS YOUR FINAL MUR?:** Please check whether or not this is your final MUR, indicating that all subcontractors have been paid.
10. **ALL SUBCONTRACTORS LISTED ON SUBPLAN:** Names of all subcontractors (not suppliers) listed on the Contractor's original subcontract plan (Form 1) submitted at bid time.
11. **CHECK IF SECOND TIER SUBCONTRACTOR**
12. **ORIGINAL AWARD AMOUNT (From Form 1 at bid time):** Indicate the dollar amount shown on the Form 1 for each subcontractor at bid time.
13. **AMENDED SUBCONTRACT AMOUNT:** This amount should show the current subcontract amount as it changes throughout the project, reflecting additions or deletions of work.
14. **MONTHLY AMOUNTS:** Please list dollar amount of retainage with-held and actual payment amount (excluding retainage) for the month.
15. **PROJECT TOTALS TO DATE:** The cumulative retainage with-held and total payments (excluding retainage) made to date for each subcontractor.

SUBCONTRACTORS ADDED AFTER PROJECT WAS AWARDED

16. **SUBCONTRACTOR NAME:** Please list any subcontractors not appearing on original subplan (Form 1).
17. **CHECK IF SECOND TIER SUBCONTRACTOR**
18. **STATUS:** Indicate the certification status of each subcontractor listed (i.e. MBE, WBE, and ESB). Leave blank for non-certified subcontractors.
19. **NATURE / TYPE OF WORK:** Briefly describe subcontractors work (i.e. Landscaping, Electrical, Paving, etc.).
20. **SUBCONTRACT AMOUNT:** Indicate the dollar amount of the subcontract. If any changes during project, change to reflect current amount here.
21. See #14.
22. See #15.

Completed form may be faxed to: 503-823-6865. The City of Portland is not responsible for delays or problems with fax transmission.



WORKFORCE TRAINING & HIRING PROGRAM Contractor Checklist

This program applies to projects estimated at \$200,000 or more and subcontracts of \$100,000 or more

The following Workforce Training & Hiring Program requirements are a summary of the key contractual obligations of contractors working on City projects. It is the Contractor's responsibility to read and fully understand this section of the bid specifications and to comply with all provisions of the program, regardless of whether they appear on this checklist. Contractors shall include in their bid all costs associated with complying with the Workforce Program. An 18% aspirational goal for minorities, and 9% for females has been set on City funded construction projects for apprentices and journey level workers.

CHECKLIST:

1. Prime Contractor:

- A. Submit a Work Plan (Exhibit 2) to City prior to Contract award, or as otherwise designated. The Plan should detail your approach and strategies to achieve the targeted workforce goals established by the City.
- B. Submit a Work Plan for each subcontractor with a subcontract \$100,000 and above. The Plan should detail the approach and strategies that will be used to achieve the targeted workforce goals established by the City.
- C. Ensure compliance by all subcontractors with subcontracts of \$100,000 or more, and provide them with a copy of the Workforce Training & Hiring Program specifications.

2. Subcontractors, at all tiers, with contracts of \$100,000 or more:

- A. Submit a Work Plan (Exhibit 2) prior to beginning work on the project or within 5 days of signing a subcontract, whichever occurs first.

3. Prime Contractor & all subcontractors with contracts of \$100,000 or more must:

- A. Before starting work on this project: Submit proof of registration as a Training Agent with the Bureau of Labor & Industries (BOLI), Apprenticeship & Training Division. Not a BOLI registered training agent? Contact BOLI (971-673-0760) or City of Portland (503-823-5047) for further information.
- B. Throughout the duration of the project:
 1. Ensure that a minimum of 20% of labor hours in each apprenticeable trade performed by the Prime, and subcontractors with subcontracts of \$100,000 or more, are worked by state registered apprentices. The Prime and subcontractors shall fulfill the 20% apprenticeship requirement without exceeding the apprentice ratios approved by the applicable apprenticeship program, if working in excess of 300 hours in any given trade.
 2. Strive in good faith to meet the diversity goals of employing women and minorities (both journey and apprentice level workers).
 3. Make all reasonable and necessary efforts to employ a workforce that reflects the diversity of the city of Portland, including recruitment of a diverse workforce through the unions, the apprenticeship programs and other community resources, as described herein.
 4. Maintain written documentation of all requests for workers from the unions, apprenticeship programs, and community organizations.
 5. When an apprentice is hired: Notify the City's Contract Compliance Specialist assigned to the project.

6. Submit the Monthly Employment Report (Exhibit 4) by the 5th of each month to the Owner's Project Manager and the Contract Compliance Specialist. This report will be submitted electronically upon award (via email). For further information, please send an email to: murmer@portlandoregon.gov.

For additional information or questions, please contact the Contract Compliance Specialist assigned to the project or the City's Workforce Program Coordinator at 503-823-5047.

WORKFORCE TRAINING AND HIRING PROGRAM Specifications

I. PURPOSE

A. General Program Description

The Portland City Council has directed that all Bureaus and Departments maximize apprenticeship and employment opportunities for minorities, women and economically disadvantaged workers in the construction trades (ref. City Ordinance No. 167374, Feb. 16, 1994 and County Ordinance No. 861, July 11, 1996). Their goals include a) ensuring that the City does business with contractors whose workforce reflects the diversity of the workforce found in the city of Portland and Multnomah County, and b) that their contracting dollars provide fair and equal opportunities to the jurisdictions' diverse populations.

The Workforce Training & Hiring Program ("Workforce Program") is administered for the City of Portland, by the City of Portland, Procurement Services. The Workforce Program applies to all projects estimated at \$200,000 or more and to each subcontractor having a subcontract of \$100,000 or more on the project. The Contractor and all subcontractors are encouraged to fulfill the program requirements even if their contracts are less than these amounts.

Contractors shall make reasonable efforts to ensure that their workforce reflects the diversity of the city of Portland and Multnomah County.

One way contractors can make reasonable efforts to ensure that their workforce is diverse is to recruit, train and employ minorities and women whenever possible. This portion of the Contract establishes requirements regarding that recruitment, training and employment.

For purposes of the Workforce Program specifications, the following definitions shall apply:

The "**Contract**" shall mean the contract awarded as a result of these bid specifications.

"**Contractor**" shall mean the Prime Contractor to whom a Contract is awarded, and any subcontractors with subcontracts of \$100,000 or more.

The term "**minorities**" shall include members of either sex who are African-Americans, Hispanic Americans, Asians or Pacific Islanders, Native Americans or Alaskan Native Americans.

"**Owner**" shall mean the government agency that awarded the Contract, or leveraged public involvement in the project through a loan or development agreement.

The "**project**" shall include all work performed pursuant to the Contract.

B. Organization of Program Requirements

The Workforce Program specifications are divided into several parts.

Section II - refers to the action the PRIME must take in order to be eligible for award of a contract.

Section III - lists the actions that must be taken by the PRIME to meet contractual obligations.

Section IV - refers to remedies available to the Owner if a PRIME fails to meet the requirements of the Workforce Program specifications.

Section V - refers to the Owner's ability to monitor compliance with the Workforce Program specification by examination of PRIME and subcontractor records.

II. ACTIONS REQUIRED PRIOR TO BEGINNING THE PROJECT

The PRIME shall thoroughly read this Workforce Program specification and commit to perform all requirements described herein. The PRIME shall submit, before work begins, a Work Plan, which demonstrates how the workforce on this project will fulfill all program requirements, including utilization of apprentices and targeted workforce goals.

III. ACTIONS REQUIRED TO SATISFY CONTRACTUAL OBLIGATIONS

A. Make Reasonable Efforts to Have Diverse Workforce

A PRIME must make all necessary and reasonable efforts to have a workforce that reflects the diversity of the city of Portland and Multnomah County and is reasonably consistent with the availability of qualified women and minorities based on Equal Employment Opportunity data supplied by the City. This requirement is in addition to any other requirement of this portion of the Contract.

1. The PRIME and its subcontractors with subcontracts of \$100,000 or more, at any tier level, shall strive to achieve the workforce diversity goal of 18% minority and 9% female hours (including both journey level and apprentice workers) on the project.
2. Provide written documentation of its good faith recruitment efforts. Contractors must follow the process for recruiting apprentices and journey workers described in Section III, subsections F and G of this specification. This process is considered by the City to be the minimum effort to recruit a diverse workforce.
3. The failure by a union with whom the Contractor has a collective bargaining agreement to refer either minorities or women shall not excuse the Contractor's obligations under this section of the specifications.

B. Ensure Compliance by Certain Subcontractors

1. The PRIME shall ensure that each subcontractor having a subcontract of \$100,000 or more, at any tier, shall comply with all of the provisions of the Workforce Program specifications. Contractors shall include in their price all costs associated with this requirement. No change order will be executed in order for the PRIME to comply with the Workforce Program specifications.
2. The PRIME shall provide a copy of this Workforce Program specification to all subcontractors with contracts of \$100,000 or more executed for the project.

C. Register as a Training Agent

The PRIME shall register with the Oregon Bureau of Labor and Industries (BOLI) as a Training Agent and ensure that all subcontractors who have contracts in the amount of \$100,000 or more are registered as Training Agents. Registration as a Training Agent in a specific trade is not required if there are no training opportunities in that trade on the project, based on the maximum ratio allowed by BOLI.

1. Training programs approved by and registered with BOLI may be used to fulfill training requirements under the Workforce Program specifications. Other training alternatives must be approved by the City's Workforce Program Coordinator.
2. Training is intended to be primarily on-the-job training in apprenticeable crafts, and does not include classifications such as flag person, timekeeper, office engineer, estimator, bookkeeper, clerk/typist, fire fighter, or secretary. Hours performed in crafts, which are not apprenticeable occupations are exempt from the training requirements.
3. Exemptions to the training requirements must be approved by the Owner in writing prior to starting work on the project. Written requests for exemptions related to the training requirements will be considered by the Owner only for extreme circumstances during the course of the project, and must be approved in writing. All requests to exempt all or any portion of the work on a project shall be submitted to the Owner 14 calendar days before any work on the project begins. All exemptions must be approved by the Workforce Program Coordinator. *Please note: Procedures for granting exemptions are subject to change. For the most recent updates, please visit <http://www.portlandonline.com/omf/index.cfm?c=42255&>.*

D. Submit Documentation

The PRIME shall submit documentation regarding the following subjects to the Owner. The Owner's failure to object to documentation submitted by the PRIME or subcontractor shall not relieve them of the requirements of the Workforce Program specifications.

1. ***Training Agent Status***

The PRIME and all required subcontractors listed on the First Tier Subcontractor Disclosure Form must submit proof to the Contract Compliance Specialist that they are registered Training Agents with BOLI prior to beginning any work on the project.

2. ***Subcontractor Workforce Information***

Exhibit 2, Work Plan, must also be submitted for each subcontractor with a contract of \$100,000 or more, prior to beginning work on the project or within 5 calendar days after the execution of the applicable subcontract, whichever occurs first. Work by a subcontractor shall not begin prior to submission of such documentation.

3. ***Prime and Subcontractor Reports After Work Begins***

The Monthly Employment Report (Exhibit 4) must be submitted by the PRIME and any subcontractor having a subcontract of \$100,000 or more to the Contract Compliance Specialist by the 5th day of each month, with a copy to the Owner's Project Manager. The Contractor shall follow the submittal instructions on the report form. All hours subject to prevailing wage rates on public projects, in addition to supervisors, foremen and superintendents, shall be reported on Exhibit 4.

4. A copy of certified payroll reports may be requested by the Owner to verify information in the Report. The payroll reports shall be provided within 7 days of the date when the Contractor receives the request for the payroll.

E. Use of Apprentices

The PRIME shall:

1. Ensure that a minimum of 20% of labor hours in each apprenticeable trade performed on the

project by the PRIME, and subcontractors with subcontracts of \$100,000 or more, are worked by state registered apprentices throughout the duration of the project. The PRIME and subcontractors shall fulfill the 20% apprenticeship requirement without exceeding the apprentice ratios approved by the applicable apprenticeship program, if working in excess of 300 hours in any given trade.

2. Pay all apprentices the wages required by any applicable collective bargaining contract or pursuant to state or federal law and regulations.
3. Not use workers previously employed at journey-level or those who have successfully completed a training course leading to journey-level status to satisfy the requirements of these provisions.
4. Notify the Contract Compliance Specialist when an apprentice is hired for this project.
5. Count apprentice hours as follows:
 - (a) Hours worked on the project by apprentices enrolled in state-approved apprenticeship programs. If the Contractor is unable to fulfill its 20% requirement, then the Contractor may also use methods (b) and (c) below;
 - (b) Hours worked on the project by apprentices who are required to be away from the job site for related training during the course of the project, but only if the apprentice is rehired by the same employer after completion of training; and
 - (c) Hours worked on the project by graduates of state-registered apprenticeship programs, provided that such hours are worked within the 12-month period following the apprentice's completion date.

F. Use Apprenticeship Programs for Referrals

Contractors must follow all of these steps in seeking apprentice referrals:

1. Contact the appropriate apprenticeship program or dispatch center to request apprentices who are enrolled in the apprenticeship program; and
2. Request female or minority apprentices from the union or open shop apprenticeship program if such an action will help remedy historical underutilization in the Contractor's workforce; and
3. Keep a written record of the request for apprentices, including name of contact person at apprenticeship program, phone, fax, date, time, job location, start date, etc.; and
4. Make reasonable and necessary efforts to recruit apprentice applicants from the Worksource Program at the Oregon Employment Department, and seek to enroll them into an apprenticeship program, if the apprenticeship program is unable to supply an apprentice and if the program is open for applications or allows direct entry from the Oregon Employment Division.

NOTE: Contractors may contact the Contract Compliance Specialist for assistance regarding the apprentice referral process, or may utilize Exhibit 3, Request for Apprentice form, to document their efforts.

G. Utilize Unions and Community Organizations When Recruiting For any Positions

When hiring, requesting, recruiting, or replacing workers for this project, the Contractor shall:

1. Make reasonable and necessary efforts to employ a diverse workforce. Such actions should include requests for minority and female applicants. Contractors are notified that direct hiring of employees (such as "walk-ons") without providing notification of that job opportunity, in accordance with paragraph G.2. below, may not constitute a reasonable effort.
2. Document its employment efforts. Documentation should be sufficient to establish the Contractor's efforts, and should include:
 - a) Requests to union halls for signatory contractors;
 - b) Requests to union or open shop apprenticeship programs;
 - c) Requests to the Oregon Employment Division that assist contractors with recruitment and referral of workers.

IV. **CONSEQUENCES OF NONCOMPLIANCE WITH WORKFORCE PROGRAM REQUIREMENTS**

The Owner's commitment to this program is reflected, in part, by the cost of administering the program. Failure to meet the requirements of this section of the specifications negates such funding and impairs the Owner's efforts to promote workforce diversity and to provide fair and equal opportunities to the public as a whole as a result of the expenditure of public funds. Therefore, the parties mutually agree that failure to meet the requirements of this section of the specifications, including but not limited to the submission of required documentation, constitutes a material breach of the Contract.

In the event of a breach of this section of the Contract, the Owner may take any or all of the following actions:

A. Withholding Progress Payments

The Owner may withhold all or part of any progress payment or payments until the PRIME has remedied the breach of Contract. In the event that progress payments are withheld, the PRIME shall not be entitled to interest on said payments.

If a subcontractor(s) is responsible for noncompliance with the Workforce Program requirements, the Owner may choose to withhold only their portion of the progress payment.

B. Retain Sums as Damages for Failure to Comply with Workforce Program Specifications

The parties mutually agree that it would be difficult, if not impossible, to assess the actual damage incurred by the Owner for the PRIME's failure to comply with the Workforce Program specifications. The parties further agree that it is difficult, if not impossible, to determine the cost to the Owner when workforce opportunities are not provided. Therefore, if the PRIME fails to comply with the Workforce Program provisions of this Contract, the PRIME agrees to pay the sum of \$250 per day for each day of missed apprenticeship hours or until the breach of Contract is remedied. Damages may be assessed for failure to meet the 20% apprenticeship training requirements by the PRIME and each required subcontractor in each trade employed. Damages will be calculated based on the training hours not provided at a rate of \$250 per day. For example, if the Contractor was required to provide 200 hours of carpenter training (20% of 1,000 total carpenter hours), and the Contractor only provided 150 training hours, then the difference (50 hours) is divided by 8 (one day of work) to determine the

number of days of undelivered training. ($50/8 = 6.25 \times \$250 = \$1,562.5$).

Damages may also be assessed for failure to fulfill the inclusive hiring process described in Section III, subsections F and G.

These damages are independent of any liquidated damages that may be assessed due to any delay in the project caused by the Contractor's failure to comply with the Workforce Program provisions of the Contract.

C. Retain Sums as Liquidated Damages for Delay

The PRIME agrees that any delay to the specified contract time as a result of the PRIME's failure to comply with the requirements of these specifications shall subject the PRIME to the amount of liquidated damages specified elsewhere in the Contract.

D. Notification of Possible Debarment

By executing this Contract, the PRIME agrees that it has been notified that failure to comply with the requirements of this portion of the Contract may lead to the PRIME's disqualification from bidding on and receiving other Owner contracts.

E. Other Remedies

The remedies that are noted above do not limit any other remedies available to the Owner in the event that the PRIME fails to meet the requirements of the Workforce Program specifications.

V. **REVIEW OF RECORDS**

In the event that the Owner reasonably believes that a violation of the requirements of the Workforce Program specifications has occurred, the Owner is entitled to review the books and records of the PRIME and any subcontractors employed on the project to which the requirements of these specifications are applicable to determine whether such a violation has or has not occurred.

In the event that the PRIME or any subcontractor fails to provide the books and records for inspection and copying when requested, such failure shall constitute a material breach of this Contract and permit the imposition of any of the remedies noted in Section IV above, including the withholding of all or part of any progress payment.

ATTACHMENTS:

Exhibit 1: Recommended Recruitment & Retention Practices

Exhibit 2: Workforce Plan

Exhibit 3: Request For Apprentice form

Exhibit 4: Monthly Employment/Training Report

Exhibit 5: Apprenticeship Ratio Data

WorkSource Contact:

Desirae Rickman

WorkSource Portland Metro Central

30 N. Webster Street, Suite E

(503) 280-6060

Desirae.V.Rickman@state.or.us

Questions Regarding Apprenticeship:

Bureau of Labor & Industries
Apprenticeship & Training Division
800 N.E. Oregon St. # 32
Portland, OR 97232
(971) 673-0760

Questions Regarding the Workforce Training & Hiring Program:

City of Portland / Procurement Services
1120 SW 5th Ave, Room 750
Portland, OR 97204
503-823-5047 (main number)

RECOMMENDED GOOD FAITH RECRUITMENT & RETENTION PRACTICES

A. Recruitment Efforts

Good faith recruitment efforts are those intense, aggressive, sincere, and result-oriented actions taken by the Contractor designed to accomplish the objectives of the City Workforce Training & Hiring. Good faith recruitment efforts include, but are not limited to:

1. Work aggressively with Contractor's Joint Apprenticeship Training Committee (JATC) to recruit minorities, women and disadvantaged individuals. Provide evidence of these efforts.
2. Assist the JATC by conducting a workshop with minority and women employees to enlist their assistance as recruiters and request their ideas on how to increase employment of underutilized groups.
3. Support the efforts of the Contractor's JATC by giving all apprentices referred to the Contractor a fair chance to perform successfully, allowing for possible lack of previous experience. Recognize that the Contractor is responsible for providing on-the-job training, and that all apprentices should not be expected to have previous experience.
4. Participate in job fairs, school-to-work, and community events to recruit minorities, women, and disadvantaged individuals into the construction trades.
5. Allow scheduled job site visits by participants in community programs, as safety allows, increasing awareness of job and training opportunities in the construction trades.
6. Keep applications of those not selected for an opening. Contact when opening occurs.

B. Retention Efforts

The Contractor shall endeavor to retain minorities, women, and disadvantaged individuals by implementing steps such as the following:

1. Maintain a harassment-free work place.
2. Ensure that employees are knowledgeable about the company's policies if they need to report a harassment problem.
3. Make reasonable attempts to keep apprentices working and train them in all work processes described in the apprenticeship standards.
4. Review and disseminate, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination or other employment decisions.
5. Conduct a review, at least annually, of all supervisors' adherence to and performance under the Contractor's EEO policies and affirmative action obligations.
6. Take steps to reduce feelings of isolation among minorities and women to curb hostile attitudes and behavior (e.g., have several minorities and women at the job site, provide access to support group system).
7. Provide adequate toilet facilities for women on the job site.
8. Match minority, female, or disadvantaged apprentices who may need support to complete their apprenticeship programs with a journey-level mentor.

Workforce Plan

Instructions

1. This form must be completed by the prime and each subcontractor with a subcontract of \$100,000 or more.
2. Please state how you plan to perform the work on this project, indicating the number of journey workers and apprentices, by trade.
3. This plan must demonstrate how your company will fulfill all Workforce Training & Hiring Program requirements, including utilization of apprentices, and diversity goals.

Bid #: _____ **Project Name:** _____
Company Name: _____ **Contract Amount:** \$ _____
Federal Tax ID: _____ **Prime Contractor:** **Subcontractor:**

List all Trades to be used on this Project (one trade, per line)	Total # of Journey Workers	Total # of Apprentices	Total # of Female Workers	Total # of Minority Workers	# and level of New Hires (i.e. 1A or 1J)	Anticipated Start Date	Estimated Total Hours (all workers in each trade)

Please list the apprentices who will work on this project. If you need more space, attach an additional sheet of paper. Compliance Staff must approve all apprentices on the project.

Name of Apprentice	Trade	Race	Gender	Date of Hire	STAFF USE ONLY

If no current apprentices, indicate when and how they will be hired:

Name of Workforce Plan Administrator (for Apprentice/Diversity Goals): _____ **Phone:** _____ **Fax:** _____
E-mail address ? _____ **Phone number:** _____
 Are you a registered Training Agent? Yes No Are you a Union or Open Shop Contractor? Union Open Shop

Which JATC dispatches apprentices to your company?

Name: _____ **Phone:** _____ **Fax:** _____
Name: _____ **Phone:** _____ **Fax:** _____

Please answer the following questions concerning your efforts to achieve the diversity goals on this project:

1. How do you plan to achieve the diversity goals on this project?
2. Other than your JATC, what resources will you use to recruit minority and female workers for this project (please check all that apply)?

<input type="checkbox"/> Oregon Tradeswomen	<input type="checkbox"/> ETAP	<input type="checkbox"/> Portland YouthBuilders
<input type="checkbox"/> Constructing Hope	<input type="checkbox"/> Job Corps	<input type="checkbox"/> Other
3. Do you need any assistance with meeting the apprenticeship requirements or diversity goals on this project?
 Yes No

Prepared By (print): _____ **Signature:** _____ **Date:** _____

Send to:
City of Portland, Bureau of Internal Business Services, Procurement Services
1120 S.W. Fifth Avenue #750, Portland, OR 97204
Phone (503) 823-5047 or FAX (503) 823-5539

Request For Apprenticeship

CONTRACTOR: Please complete & fax/send this *Request For Apprenticeship* to your apprenticeship committee. Ask them to complete the boxed portion below explaining their response to your request and fax/send to us at address below.

FAX To: _____ / _____
(Apprenticeship Committee) (Contact/ Dispatcher)

Fax Number: _____ Number of Pages: _____

Request From:

Company Name: _____ / _____
(Registered Training Agent) (Contact Person)

Phone: _____ Fax: _____ Date: _____ Time: _____

Apprentice Request:

As a registered Training Agent, I am using this form to request referral of an apprentice for employment with my company in cooperation with the City Workforce Training & Hiring Program. I would like to continue to diversify my workforce. Therefore, please refer ethnic minorities and women for my consideration.

Apprentice referral is needed by this date: _____ Work Starts: _____

Job Site Location: _____ Expected Length of Employment: _____

Bid # and Project Name: _____ Owner: City of Portland

Number of Apprentices: _____ Trade/Occupation: _____

Number of Apprentices: _____ Trade/Occupation: _____

Minimum qualifications (if different from apprenticeship standards): _____

Safety needs: Hard hat Gloves Hard-toed boots Other _____

Apprenticeship Committee Instructions:

Please complete and fax to City Workforce Program at: 503-823-6865

We were able to dispatch an apprentice to the project listed above.
Name of Apprentice _____ Race A (Asian-American) Gender M Term

We were unable to dispatch an apprentice to the project listed above because:

Contractor: Please FAX/Send to: City of Portland Workforce Training & Hiring Program
1120 SW 5th Ave. Rm 750, Portland, OR 97204
Phone: (503) 823-5047 / FAX: (503) 823-6865

MONTHLY EMPLOYMENT REPORT

MONTHLY EMPLOYMENT REPORT

COMPANY NAME	FEDERAL TAX ID	MONTH ENDING	BIDNO	PRIME?	FINAL REPORT?
<p>The Monthly Employment/Training Report must be completed by the prime contractor and all subcontractors with contracts of \$100,000 or more. The prime contractor shall submit a report for its workforce on the project. Each subcontractor shall separately submit a report for its workforce on the project. It is the responsibility of the prime contractor to assure that all subcontractors submit Monthly Employment/Training Reports in a timely manner.</p> <p>Complete the form on the worksheet titled MER (third tab), filling in all categories for each employee working on the project during the reporting period.</p> <p>Email the completed worksheet as an Excel attachment to mur-mer@portlandoregon.gov no later than the 5th of each month for work performed during the previous month. The emailed worksheet must be titled mer.xls. Please do not change the worksheet's layout or contents.</p> <p>Please direct questions about electronic data submission to the same email address.</p>					

REVISED 3.11.11

FEDID	MONTHENDING	BIDNO	LASTNAME	FIRSTNAME	ZIP	SSN	JOBCLASS	LEVEL	RACE	GENDER	HOURS	PRIME?
123456789	8/31/2002	100758	DOE	JANE	97214	9874	1010	A	C	F	32	NO
123456789	8/31/2002	100758	DOE	JOHN	97204	7489	1018	J	C	M	154	NO

*Ratios may change pursuant to actions taken by the Oregon State Apprenticeship & Training Council/BOLI. For the purposes of this contract, the ratios approved by BOLI on the date the bid is advertised shall prevail.

<u>TRADE</u>	<u>APPRENTICE TO JOURNEY RATIO*</u>		
	<u>1st Apprentice</u>	<u>2nd Apprentice</u>	<u>Max</u>
Asbestos/Insulation Workers	1/1	1/4	
Brick/Marble/Terrazzo/Tile Finisher	1/1	1/3	
Bricklayer/Masonry	1/1	1/3	
Carpenter (Portland)	1/1	1/1	1/1 for first three apprentices; 1/5 after
Carpet Installers/Floorlayers	1/1	1/3	
Cement Masons	1/2 (1/1 Open Shop)	1/3	
Drywall Applicator (Ext/Int Specialists)	1/1	1/1	1/1 for the first three apprentices; 1/5 thereafter
Drywall Finisher (Taper)	1/1	1/3	1/3 thereafter
Electricians			
Inside	1/1	1/3	Allowed 2 apprentices for every 3 journey
Limited Energy/Limited Residential	1/1	1/1	
Construction Lineman	1/1		Max. 2 apprentices a crew/subject to conditions
Limited Maintenance	1/1	1/2	
Stationary Engineer	1/1	1/3	
Elevator Contractor	1/1	1/3	
Environmental Control System (HVAC)	1/1	1/1	Additional apprentices at 1/3
Glass Installer (Glazier)	1/1	1/3	
Hod Carrier/Mason Tender	1/1	1/5	
Iron Worker	1/1	1/3	
Laborer (Construction)	1/1	1/5 (1/3 open shop)	1/10 Union – 10 max
Maintenance Mechanic	1/1	1/3	
Millwright	1/1		1/1 for first three apprentices, 1/5 after
Operating Engineer (Heavy)	1/1-4	2/5-9	3/10-19 4/20-24 5/25-29 30 or more 1/for each 5 additional operators
Painting & Sandblasting	1/1	1/3	
Painting (Traffic Control)	1/1	1/4	
Pile Drivers	1/1	1/1	1/1 for first three apprentices, 1/5 thereafter
Pipe Fitters	1/1	1/1	1/3 thereafter
Plasterers	1/1	1/3	
Plumber	1/1	1/1	1/1 for first two apprentices, 1/3 after
Roofer	1/1	1/1	
Scaffold Erector	1/1		1/1 for the first five apprentices; 1/5 thereafter
Sheet Metal Worker	1/1	1/1	1/1 for first two apprentices, 1/3
Sheet metal Worker (Residential)	1/1	1/3	
Sign Maker/Erector	1/1	1/1	
Sprinkler Fitter	1/1	1/1	
Steamfitters	1/1	1/1	1/1 for the first two apprentices on the job; 1/3 thereafter
Terrazzo Worker	1/1	1/3	
Tile/Marble Setter	1/1	1/3	
Truck Driver (Heavy)	1/1	1/1	

PROJECT SPECIFICATIONS

CITY OF PORTLAND

BUREAU OF ENVIRONMENTAL SERVICES

PROJECT SPECIFICATIONS

FOR

**COLUMBIA BOULEVARD WASTEWATER TREATMENT PLANT
LAGOON RECONSTRUCTION PHASE 3/4**

E07146

CONSOLIDATED PROJECT SPECIFICATIONS

The preparer of the consolidated project specifications for this Project:

By:  Date: 5/3/2015

CITY OF PORTLAND

BUREAU OF ENVIRONMENTAL SERVICES

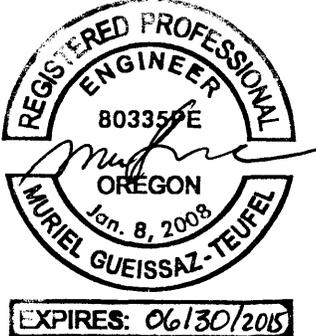
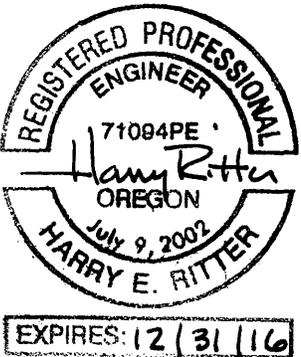
PROJECT SPECIFICATIONS

FOR

**COLUMBIA BOULEVARD WASTEWATER TREATMENT PLANT
LAGOON RECONSTRUCTION PHASE 3/4**

E07146

PROFESSIONAL OF RECORD CERTIFICATION(s):

<p>Seal w/signature</p>  <p>REGISTERED PROFESSIONAL ENGINEER 80335PE OREGON Jan. 8, 2008 MURIEL GUEISSAZ-TEUFEL EXPIRES: 06/30/2015</p>	<p>Signing as the Professional of Record for the sections listed below:</p> <p>Sections:</p> <p>All Division 00 All Division 01</p>
<p>Seal w/signature</p>  <p>REGISTERED PROFESSIONAL ENGINEER 71094PE OREGON July 9, 2002 HARRY E. RITTER EXPIRES: 12/31/16</p>	<p>Signing as the Professional of Record for the sections listed below:</p> <p>Sections :</p> <p>All Division 03 All Division 05 All Division 07 All Division 09 All Division 31 All Division 32 All Division 33 All Division 40 All Division 41</p>

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COMMERCE
WASHINGTON, D.C.

PROFESSIONAL OF RECORD CERTIFICATION(s):

 <p>REGISTERED PROFESSIONAL ENGINEER 16278 MAJID HABIBI OREGON DEC. 1, 1992 EXPIRES: 12/3/16</p>	<p>Signing as the Professional of Record for the sections listed below:</p> <p>Division: 26 Sections: 26 05 00, 26 05 33</p>
---	--

Handwritten signature
1912/13

**CBWTP PLANT LAGOON RECONSTRUCTION
PHASE 3/4
PROJECT NO. E07146**

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GENERAL CONDITIONS

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SECTION 00 72 00

GENERAL CONDITIONS

PART 1 ORGANIZATION AND CONVENTIONS

1.01 ORGANIZATION OF PROJECT SPECIFICATIONS

This publication is comprised of Division 00 (General and Supplementary Conditions) which describes the solicitation process and contractual relationships, Division 01 (General Requirements) and Divisions 02 and beyond, which contain the detailed technical specifications involved in prosecution of the Work, organized by subject matter. In addition, throughout these Specifications:

A. The project specifications are divided into categories: (1) Division; (2) Section; and (3) Paragraph, and are designated as in the following example:

- | | | |
|---------------|-------------|--------------------|
| 1. Division: | DIVISION 02 | SITEWORK |
| 2. Section: | 02 22 20 | EXCAVATING |
| 3. Paragraph: | 3.04 | PIPE ZONE BACKFILL |

Each Division is divided into Sections. Reference to a Division or Section includes all applicable requirements of the Division or Section.

When referring to a Paragraph within a given Section, only the number of the Paragraph is used; the word "Paragraph" is implied.

Where Section and/or Paragraph numbers are not consecutive, the interval has been reserved for use or future expansion.

Paragraphs are identified by number and capitalized headings.

Where a Paragraph with capitalized heading but no other text is provided, content has been reserved for future use or expansion.

B. The words directed, required, permitted, ordered, requested, instructed, designated, considered necessary, prescribed, approved, acceptable, satisfactory, or words of like import, refer to actions, expressions, and prerogatives of the Owner's Representative.

C. Command type sentences are used throughout the Contract Documents but are not exclusive of other directives. In all cases the command expressed or implied is directed to the Contractor.

D. The use of command type sentences by the Owner's Representative will not assign to the Owner's Representative any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility contrary to the provision of the Contract Documents.

E. Emphasis, such as italics, quotes, boldface, or capitalization, used in the Contract Documents does not change the meaning of the term emphasized.

1.02 CONVENTIONS USED THROUGHOUT THE SPECIFICATIONS

A. Grammar - This Section is written in the indicative mood, in which the subject is expressed. Other divisions of the Project Specifications are generally written in the imperative mood, in which the subject is implied. Therefore, throughout these other divisions, and on the Plans:

1. The subject, "the Contractor", is implied.
2. "Shall" refers to action required of the Contractor, and is implied.
3. "Will" refers to decisions or actions of the Owner and/or the Engineer.

4. The following words, or words of equivalent meaning, refer to the actions of the Owner and/or the Engineer, unless otherwise stated: "directed", "established", "permitted", "ordered", "designated", "prescribed", "required", "determined".

5. The words "approved", "acceptable", "authorized", "satisfactory", "suitable", "considered", and "rejected", "denied", "disapproved", or words of equivalent meaning, mean by or to the Owner and/or the Engineer.

6. The words "as shown", "shown", "as indicated", or "indicated" mean "as indicated on the Plans".

7. Certain Subsections labeled "Payment" contain statements to the effect that "payment will be made at the Contract amounts for the following items" (followed by a list of items). In such cases the Owner shall pay for only those Pay Items listed in the Schedule of Items.

B. Capitalization of Terms - Capitalized terms, other than titles, abbreviations, and grammatical usage, indicate that they have been given a defined meaning in the Contract Documents. Defined terms will always be capitalized in this Section; in other Sections in this Division and beyond, defined terms will generally not be capitalized, with the notable exception of "the Contractor", "the Owner" and "the Engineer".

C. Punctuation - In this publication the "outside method" of punctuation is employed for placement of the comma and the period with respect to quotation marks. Only punctuation that is part of the quoted matter is placed within quotation marks.

D. References to Laws, Acts, Regulations, Rules, Ordinances, Statutes, Orders, and Permits - References are made in the text of the Specifications to "laws", "acts", "rules", "statutes", "regulations", "ordinances", etc. (collectively referred to for purposes of this Subsection as "Law"), and to "orders" and "permits" (issued by a governmental authority, whether local, State, or federal, and collectively referred to for purposes of this Subsection as "Permits"). Reference is also made to "applicable laws and regulations". The following conventions apply in interpreting these terms, as used in the Specifications.

1. Statutes and Rules - Oregon Revised Statutes (ORS) and Oregon Administrative Rules (OAR) referenced in the Specifications are accessible on line, including through the Oregon

Legislative Counsel Committee web site and through the Oregon Secretary of State Archives Division web sites.

2. Law - In each case, unless otherwise expressly stated therein, the Law is to be understood to be the current version in effect. This also applies where a specific Law is referenced or cited, regardless of whether the text of the Law has been included in the Specifications or not, and regardless of whether the text of the Law has been summarized or paraphrased. In each case, the current version of the Law is applicable under any Contract. The reader is therefore cautioned to check the actual text of the Law to confirm that the text included in the Specifications has not been modified or superseded.

3. Permits - Orders and permits issued by a government agency may be modified during the course of performing the Work under a Contract. Therefore, wherever the term "order" or "permit" is used in the Specifications, it is intended to refer to the then-current version. That version may be embodied in a modified, superseding order or permit, or it may consist of all terms and conditions of prior orders or permits that have not been superseded, as well as the additional terms added by amendment or supplement. In certain cases, the orders and/or permits are identified by name in the Specifications; in other cases the terms are used in the generic sense. The reader is cautioned to check the text(s) of each order and permit identified either by name or by generic reference.

4. Applicable Laws and Regulations - Where the phrase "applicable laws and regulations" appears, it is to be understood as including all applicable laws, acts, regulations, administrative rules, ordinances, statutes, and orders and permits issued by a governmental or regulatory authority.

E. Owner's Representative and Engineer Terms - The specifications use both the terms "Owner's Representative" and "Engineer." The Contractor is to direct all requests, including requests for an Engineer's decision, to the Owner's Representative who in turn will forward all engineering matters to the appropriate engineer for resolution. This includes questions about whether to follow the manufacturer's recommendations for a given product application.

PART 2 - BIDDING REQUIREMENTS AND PROCEDURES

2.01 EXAMINATION OF CONTRACT, SITE OF WORK AND SUBSURFACE DATA

A. The Bidder shall carefully examine the sites (including material sites) of the proposed Work, the Bid, Plans, Supplementary Conditions, Specifications, Addenda, and Contract forms. The submittal of a Bid shall be conclusive evidence that the Bidder has made such examinations and understands all the requirements for the performance of the completed Work.

B. The Bidder shall determine the methods, materials, labor, and equipment required to perform the completed Work and shall reflect their cost in the Bid prices. Any costs exceeding those anticipated by the Bidder will not entitle it to additional compensation.

C. If the Owner has made an investigation of the site specifically for the proposed Work, boring log data, soil sample test data, subsurface data, or any historical data accumulated by the Owner's Representative will be made available for inspection by the Bidders at the Owner's office or another location. The Owner is under no obligation to search its records for other data

that may or may not be helpful for the Bidder's inspection, and the parties agree that no Claim for additional compensation may be made if such additional test data is not provided. It is mutually recognized and agreed to by all parties that:

1. When any of this data is included in the Bid Documents, it is for the purpose of disclosing design information and is not a part of the Contract.

2. The subsurface investigations made by the Owner are for the sole purpose of obtaining data necessary for planning and designing the Project.

3. The Owner assumes no responsibility whatsoever for the sufficiency or completeness of the data furnished with respect to meeting the needs of the Bidder in planning his work as it was obtained for an entirely different purpose.

4. The Owner warrants that the data represents with reasonable accuracy the conditions and materials found in the specific borings at the time the borings were made. The Owner does not warrant that the condition, materials, or proportions of materials at any other locations, or between the borings, is identical to what was found.

5. The Owner makes no representation or warranty expressed or implied that:

a. The Owner's interpretations from the data are correct.

b. Moisture conditions and indicated water tables will not vary substantially from those found at the time the borings were made.

c. The ground at the location of the boring has not been physically disturbed or altered after the boring was made.

6. The disclosure of subsurface information from the Owner is solely for the convenience of the Bidder and shall not relieve the Bidder or the Contractor of any risks or of any duty to make his own examinations and investigations as required by this Subsection or any other responsibility under the Contract.

7. The Bidder acknowledges that it has ascertained the nature and location of the Work, and that it has investigated and assured itself as to the general and local conditions that can affect the Work or its cost. The Bidder also acknowledges that it is satisfied as to the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered so far as this information can be reasonably ascertained from an inspection of the site, including exploratory work done by the Owner, as well as from the Bid Documents and any data that may be provided or made available. Failure of the Bidder to take these actions will not relieve it of responsibility for properly estimating the difficulty and cost of successfully completing the Work, or for proceeding to successfully complete the Work without additional cost to the Owner.

8. The Owner assumes no responsibility for conclusions or interpretations made by the Bidder based on the information that the Owner makes available. Statements made by Owner representatives at the pre-bid or pre-proposal conference or elsewhere are not binding on the Owner and shall not change the Solicitation Document unless the Owner confirms the statements and changes to all prospective Bidders or proposer by written addendum to the Solicitation Document.

9. In the event of a conflict between Codes, industry standards and Reference Specifications, the most stringent requirements apply and Bidders shall submit their Bids based on the most stringent requirements. See 6.01.B.

2.02 BASIS OF BID

A Bid shall be based on the requirements of the Contract Documents. The Contractor shall not submit a Bid anticipating that any portion of the Contract Documents will be changed, modified or not enforced. However, if the Contractor believes that any portion of the Contract Documents conflicts with, or is at variance with, any law, it shall immediately notify the Owner so that the Owner can analyze the situation before Bids are submitted.

2.03 INTERPRETATION OF QUANTITIES IN BID SCHEDULE

A. The Owner reserves the right to increase or decrease the amount of any class, item, or portion of the Work and to delete any bid items in their entirety after the Contract is awarded. Those changes shall not be considered as a waiver of any condition of the Contract nor shall such changes invalidate any of the remaining provisions of the Contract Documents.

B. The estimate of quantities of work to be done under Unit Price Bids is approximate and is given only as a basis of calculation for comparison of Bids and award of the Contract. The Owner does not guarantee that the amount of work to be performed will be the same as the amount estimated in the Bid Documents.

2.04 ASSIGNMENT OF CLAIM RELIEF

The Contractor hereby assigns to the Owner any Claim for relief that the Contract has or may have in the future by reason of violation of 15 USC §§ 1-15 or ORS 646.725 or ORS 646.730.

PART 3 - AWARD AND EXECUTION OF CONTRACT

3.01 AWARD OF CONTRACT

The Owner's Purchasing Rules shall govern the Bidding and Award of any Contract by the Owner.

3.02 RESTRICTIONS ON COMMENCEMENT OF WORK

A. The Notice to Proceed is a written document that authorizes the Contractor to begin the work described in the Contract Documents and sets forth the time when Contract Time will begin.

1. Work shall not begin until the Notice has been given.

2. Before starting Work, the Contractor shall file with the Construction Contractors Board, and maintain in full force and effect, the separate public works bond required by ORS 279C.830(3) unless otherwise exempt. The Contractor shall also include in every subcontract a provision requiring the Subcontractor to have a public works bond filed with the Construction Contractors Board before starting Work, unless otherwise exempt.

B. The Notice to Proceed will not be given until the Contractor provides Owner with all documentation necessary for Contract performance, including, but not limited to, all necessary signatures on Contract Documents, a Performance and Payment Bond, proof of all required insurance. After receipt of all required documentation, Owner will review the submitted documentation for conformance with Contract requirements. If the documentation conforms to Contract requirements, Owner will issue the Notice to Proceed within 30 Calendar Days after receipt. If the documentation does not conform, Owner will notify Contractor as soon as possible so that proper documentation can be provided.

C. The Owner may delay the issuance of the Notice to Proceed beyond 30 Calendar Days if all required Easements or Permits have not been obtained, if necessary Utility relocation, construction or reconstruction has not been completed by Owner or Contractor, or for Owner's convenience. If issuance of the Notice to Proceed is delayed for these reasons, Owner shall notify Contractor of the delay.

PART 4 - SCOPE OF WORK

4.01 PURPOSE OF CONTRACT

A. The Contract Documents govern the Work to be done, set forth the relative responsibilities of the Owner and Contractor, and establish the method by which changes in the Contract are made.

B. Some details of the Work may be found in only one location in the Contract Documents. Therefore, the Contractor must review all portions of the Contract Documents in order to know the full scope of Work.

C. The Owner has adopted Standard Specifications and Standard Plans that may be applicable to this Contract. Any reference to a Standard Plan or Standard Specification in this Contract refers to the ones in effect at the time that the Contract was advertised. In case of any confusion, contact the Owner's Representative for an explanation.

4.02 OWNER-REQUIRED CHANGES IN THE WORK

A. Changes to the Plans, quantities or details of construction are inherent in the nature of construction and may be necessary or desirable during the course of Project construction. Without impairing the Contract, the Owner reserves the right to require changes it deems necessary or desirable within the scope of the Project.

B. Changes to the Work may be accomplished by mutual agreement of the Owner and Contractor. When agreement is reached, the parties will execute a written Change Order that sets forth their agreement pursuant to 11.02.

C. When Extra Work or changed work is necessary, but the Owner and Contractor cannot reach agreement on the terms of a Change Order, the Owner will direct such changes by issuing a Construction Change Directive (CCD), a written statement prepared by the Owner's Representative. The CCD may result in additions, deletions or other revisions to the Work to be performed.

Upon receipt of a CCD, the Contractor shall promptly follow the direction given in the CCD and proceed with the change in the Work involved. Payment for work performed pursuant to a CCD shall be made according to Part 12.

D. In contrast to a CCD, a Field Order is oral or written advice, direction or instruction provided to the Contractor by the Owner's Representative, Inspector, or other authorized persons that is intended to assist in the completion of the Work without additional cost or Contract Time to either the Owner or to the Contractor. Field Orders include, but are not limited to, identifying relevant Contract provisions in response to a Contractor's question, clarifying a contractual requirement or directing minor changes to Contract work that can be performed by the Contractor without additional cost and without the need for additional Contract Time.

E. If the Contractor believes that following the advice, direction or instruction provided by a Field Order will result in additional costs, require additional compensation or require additional Contract Time, is contrary to the requirements of the Contract Documents or that the Field Order requires the performance of Extra Work the Contractor shall follow the requirements of 13.01 regarding Claims for additional compensation and requests for additional Contract Time.

4.03 DIFFERING SITE CONDITIONS

A. The Contractor shall promptly, and before the conditions are disturbed, give written Notice to the Owner's Representative of:

1. Pre-existing subsurface or latent physical conditions at the site which differ materially from those indicated in this Contract, or;

2. Pre-existing unknown physical conditions at the site, of an unusual nature, which differ materially from those ordinarily encountered and generally recognized as inherent in the work of the character provided for in the Contract.

B. After receipt of the Notice, the Owner's Representative will investigate the conditions encountered by the Contractor promptly. If the Representative finds that the conditions are materially different and cause a material increase or decrease in the Contractor's cost of, or the time required for, performing any part of the Work under this Contract, whether or not changed as a result of the conditions, an Equitable Adjustment to the Contract will be made under this clause and the Contract modified in writing accordingly. If possible, Owner and Contractor shall agree on the adjustment to be made. If they are unable to agree, the Representative will determine the amount of the Equitable Adjustment and adjust the time to perform if appropriate. If the Representative finds that differing site conditions do not exist, that decision is final and binding upon the Contractor.

C. Contractor has waived its right to bring a Claim for additional compensation or Contract Time for encountering a differing site condition unless the Contractor has given the Notice required by 4.03.A above. No request by the Contractor for an Equitable Adjustment to the Contract as a result of a differing site condition will be allowed if the request is made after Final Payment under this Contract.

4.04 ENVIRONMENTAL POLLUTION CHANGES

ORS 279C.525 will apply to any increases in the scope of the Work required as a result of environmental or natural resources laws enacted or amended after the submission of Bids for the Contract.

4.05 EXTRA WORK

A. Owner may at any time, by written order, require Contractor to perform extra or changed work. It is the Contractor's responsibility to notify the Surety of such order if the cost of the changed or Extra Work exceeds 25% of the total original Contract Amount.

B. When so ordered in writing, by the Owner's Representative, Contractor shall proceed with the performance of any changed or Extra Work regardless of whether an agreement has been reached on how that performance affects Contract Amount or Contract Time. If the Contractor refuses to perform the changed or Extra Work, this is a material breach of Contract and Owner shall have all remedies available to it at law and equity for that breach. Contractor shall have no right to additional Contract Time for delay incurred by Contractor's refusal to perform because the price, time, or both, has not yet been agreed upon. Contractor's remedy is, instead, to proceed as required by 13.01.

C. When the Owner's Representative is contemplating changed or Extra Work, a Notice of the proposed changed or Extra Work together with a solicitation for a quotation for the performance of the changed or Extra Work will be issued to the Contractor, in writing, by the Owner's Representative.

1. The Contractor shall submit a price quotation and Proposal for performing the changed or Extra Work within 10 days unless the Owner agrees upon a longer period of time in writing. The Contractor shall submit data to substantiate both the cost of performing the work and any additional Contract Time that may be requested.

2. The Contractor's delay in submitting a price quotation and Proposal shall not, in and of itself, extend the Contract Time. If the Contractor is unable to prove that the extra or changed work will cost additional money or is unable to substantiate that it requires additional Contract Time, Contractor has waived any Claim it might have to either Contract Time or additional money after the decision to proceed with the work has been made by Owner and communicated to Contractor.

4.06 COST REDUCTION PROPOSALS

The Contractor may submit written proposals to the Engineer that modify Plans, Specifications, or other Contract Documents for the sole purpose of reducing the total cost of construction.

A. Proposal Requirements - The Owner will not accept a cost reduction proposal that impairs essential functions or characteristics of the Project including but not limited to service life, economy of operation, ease of maintenance, designed appearance, or design and safety standards.

To conserve time and funds, the Contractor may first submit a written request for a feasibility review by the Engineer. The request should contain a description of the proposal together with a rough estimate of anticipated dollar and time savings.

The Engineer will, within a reasonable time, advise the Contractor in writing whether or not the proposal would be considered by the Owner, should the Contractor elect to submit a detailed cost reduction proposal.

A detailed cost reduction proposal shall include without limitation the following information:

1. A description of existing Contract requirements for performing the Work and the proposed change;
2. The Contract items of Work affected by the proposed change, including any quantity variation caused by the proposed change;
3. Pay Items affected by the proposed change including any quantity variations;
4. A detailed cost estimate for performing the Work under the existing Contract and under the proposed change. Cost estimates shall be based on a force account payment basis. Costs of re-design, which are incurred after the Owner has accepted the proposal, will be included in the cost of proposed work; and
5. A date by which the Engineer must accept the proposal in order to accept the proposed change without impacting the Contract Time or cost reduction amount.

B. Continuing to Perform Work - The Contractor shall continue to perform the Work according to Contract requirements until the issuing of a Change Order incorporating the cost reduction proposal. If the Owner fails to issue a Change Order by the date specified in the proposal, the proposal shall be deemed rejected.

C. Consideration of Proposal - The Owner is not obligated to consider any cost reduction proposal. The Owner will not be liable to the Contractor for failure to accept or act upon any cost reduction proposal submitted.

The Owner will determine in its sole discretion whether to accept a cost reduction proposal as well as the estimated net savings in construction costs from the adoption of all or any part of the proposal. In determining the estimated net savings, the Engineer may disregard the Schedule of Items. The Engineer will establish prices that represent a fair measure of the value of Work to be performed or to be deleted as a result of the cost reduction proposal.

D. Sharing Investigation Costs - As a condition for considering a Contractor's cost reduction proposal, the Owner reserves the right to require the Contractor to share in the Owner's costs of investigating the proposal. If the Owner exercises this right, the Contractor shall provide written acceptance of the condition to the Engineer. Such acceptance will authorize the Owner to deduct its share of investigation costs from payments due or that may become due to the Contractor under the Contract.

E. Acceptance of Proposal Requirements - If the Contractor's cost reduction proposal is accepted in whole or in part, acceptance will be made by a Change Order that will include without limitation the following:

1. Statement that the Change Order is made in accordance with 4.06;

2. Revised Plans and Specifications that reflect all modifications necessary to implement the approved cost reduction measures;

3. Any conditions upon which the Owner's approval is subject;

4. Estimated net savings in construction costs attributable to the approved cost reduction measures; and

5. A payment provision pursuant to which the Contractor will be paid 50% of the estimated net savings amount as full and adequate consideration for performance of the Work of the Change Order.

The Contractor's cost of preparing the cost reduction proposal and the Owner's costs of investigating the proposal, including any portion paid by the Contractor, will be excluded from determination of the estimated net savings in construction costs. Costs of re-design, which are incurred after the Owner has accepted the proposal, will be included in the cost of the Work attributable to cost reduction measures.

If the Owner accepts the cost reduction proposal, the Change Order that authorizes the cost reduction measures will also address any Contract Time adjustment.

F. Right to General Use - Once submitted, the cost reduction proposal becomes the property of the Owner. The Owner reserves the right to adopt the cost reduction proposal for general use without additional compensation to the Contractor when it determines that a proposal is suitable for application to other contracts.

4.07 FINAL TRIMMING AND CLEANUP

A. Before final payment is issued, the Contractor shall neatly trim and finish the Project and remove all remaining unincorporated Materials and debris. Final trimming and cleanup shall include without limitation the following:

1. The Contractor shall retrim and reshape earthwork, and shall repair deteriorated portions of the Project Site.

2. Where the Work has impacted existing facilities or devices, the Contractor shall restore or replace those facilities to their pre-existing condition.

3. The Contractor shall clean all drainage facilities and sanitary sewers of excess Materials or debris resulting from the Work.

4. The Contractor shall clean up and leave in a neat, orderly condition, Rights-of-Way, Materials sites, and other property occupied in connection with performance of the Work.

5. The Contractor shall remove temporary buildings, construction plants, forms, falsework and scaffolding, surplus and discarded Materials and rubbish.

6. The Contractor shall dispose of Materials and debris including without limitation forms, falsework, scaffolding, and rubbish resulting from clearing, grubbing, trimming, clean-up, removal, and other Work. These Materials and debris become the property of the Contractor. The Contractor shall dispose of these Materials and debris immediately.

PART 5 - CONTROL OF WORK

5.01 AUTHORITY OF THE OWNER'S REPRESENTATIVE

A. The Work shall be performed in accordance with the requirements of the Contract Documents. The Owner's Representative will determine whether that has occurred.

B. The Owner's Representative's decisions will be final, binding and conclusive on the Contractor on all questions that arise regarding the quantity of materials and work, the quality of materials and work, the acceptability of materials furnished and work performed, the acceptable rate of progress of the work, the interpretation of the Plans and Specifications, the measurement of all quantities, the acceptable fulfillment of the Contract on the part of the Contractor, and payments under the Contract.

C. Work will not be considered completed until it has passed final inspection by the Owner's Representative and is accepted by the Owner. The authority of the Owner's Representative is such that the Contractor shall at all times carry out and fulfill the instructions and directions of the Owner's Representative in so far as they concern the work to be done under the Contract.

D. If the Contractor fails to comply with any reasonable order made under the provisions of this Subsection, the Owner's Representative will have the authority to cause unacceptable work to be remedied or removed and replaced, and unauthorized work to be removed, and to deduct the costs thereof from any money due or to become due the Contractor.

E. The Owner's Representative has the authority to suspend work for cause as set forth in 8.12.A.

F. Nothing in this Subsection or elsewhere in the Contract shall be construed as requiring the Owner's Representative to direct or advise the Contractor on the method or manner of performing any work under the Contract. No approval or advice as to the method or manner of performing or producing any materials to be furnished shall constitute a representation or warranty by the Owner that the result of such method or manner will conform to the Contract, relieve the Contractor of any of the risks or obligations under the Contract, or create any liability to the Owner because of such approval or advice.

G. An Architect, Engineer, Designer or other person hired by Owner under a separate Contract is not the Owner's Representative, unless the Contract Documents expressly state otherwise. Contractor will be notified if the Owner's Representative has been changed.

5.02 INSPECTORS' AUTHORITY AND DUTIES

A. The Owner's Representative may assign Inspectors, assistants and other persons to advise the Owner whether the work and materials meet Contract requirements. Such determination may extend to any or all parts of the Work and to the preparation or manufacture of materials to be used.

B. In the event that assigned personnel discover defective materials or work not being performed safely or in accordance with Contract requirements, the Owner's Representative will have the authority to reject the materials or to suspend the Work.

C. Assigned personnel, including but not limited to, Inspectors and assistants, are not authorized to approve or accept any portion of the Work, to accept materials, to issue instructions or to give advice that is contrary to the Contract. Work done or material furnished that does not meet Contract requirements shall be at the Contractor's risk, and does not provide a basis for a Claim even if it is asserted that assigned personnel changed Contract requirements.

D. In the event that assigned personnel or the Owner's Representative fail to observe, call out or note faulty work, defective materials, errors, or the Contractor's failure to comply with Contract requirements, that failure does not constitute acceptance or approval of that particular portion of the Work. If this occurs, the Contractor remains obligated to perform the Work in accordance with the Contract Documents, without additional compensation or Contract Time.

E. The provisions of 5.02 do not apply to Regulatory Inspectors.

F. If the Owner's Representative notes faulty work, defective materials, errors or the Contractor's failure to comply with Contractor requirements, it will notify the Contractor's Representative.

5.03 COORDINATION OF SPECIFICATIONS AND PLANS; AS-BUILT DRAWINGS

A. The Owner intends the Contract Documents to coordinate with each other to provide for a complete Project. Patent conflicts in the Contract Documents, or obvious omissions, are ones that should have been discovered before submission of a Bid to the Owner by a reasonable person in the Contractor's position if all the Documents had been reviewed. In such a situation, the Contractor has a duty to inquire of the Owner before submitting its Bid about the correct interpretation of the Contract. This permits the Owner to clarify by Addendum what is intended by the Contract. That is particularly true for errors in figures, drawings or Specifications.

B. If the Contractor fails to bring a patent conflict or error to the Owner's attention before it submits a Bid, it has waived its right to additional compensation when the Owner resolves it.

C. Anything shown on the Plans and not mentioned in the Specifications, or mentioned in the Specifications and not shown on the Plans, shall be of like effect as if shown or mentioned in both. This does not constitute a conflict, discrepancy or error between the two.

D. In cases of apparent discrepancies or conflicts between the Plans and the Specifications, the Contractor shall first determine if the matter can be resolved pursuant to the rule stated in 5.03.C above. If not, the apparent conflict shall be resolved by designating the portion of the Contract Documents that takes precedence over the others. Therefore, when preparing its Bid, or when beginning any portion of the Work, the Contractor shall use the following order of precedence to resolve any apparent conflict:

1. Permits from Outside Agencies required by law
2. Change Orders
3. Addenda
4. Supplementary Conditions (007300)
5. General Requirements (Division 01)
6. Technical Requirements (Divisions 02 -49)
7. Documents specifically incorporated into the General and Technical Requirements
8. Plans*

9. Information furnished by text in notes and/or schedules on drawings
10. Information provided by lines on drawings
11. Large Scale Drawings over small scale drawings
12. Standard Plans
13. General Conditions (00 72 00)

*Figure dimensions on Plans shall take precedence over dimensions determined from the Plans in any other way.

E. Contractor shall bring any real or perceived discrepancy concerning dimensions, quantities or location between the drawings, details or Specifications to the attention of the Owner's Representative before beginning that portion of the Work.

F. In the event of any inconsistency in the Drawings and Specifications unless otherwise ordered in writing by the Owner's Representative, the Contractor shall provide the better quality of, or the greater quantity of Work or materials. This provision shall apply only to inconsistencies in express requirements of the Drawings and Specifications and not the interpretations by the Owner or Architect.

G. The Contractor shall check and compare all Plans and Specifications prior to construction and notify the Owner if conflicts, discrepancies, errors or omissions are apparent in order to permit correction at the lowest possible cost to all concerned. A current copy of the Plans and Specifications reflecting all changes that have been made during the Work shall be kept on or near the site of the Work at all times.

H. The Contractor shall provide all work and materials reasonably required or intended to complete the Work, regardless of whether they are expressly mentioned in the Plans and Specifications.

I. The Contractor shall verify measurements provided by the Plans and Specifications at the Project site to determine if they are still correct since changes to the Plans, Specifications, and Project site are common and the inherent changing nature of construction work may require adjustments to such measurements. Similarly, the Contractor is not entitled to rely on measurements deduced or scaled from, but not explicitly provided by, the Plans.

J. The Owner reserves the right to issue additional drawings or written instructions if that appears helpful or necessary to complete the Work. If so, the Contractor shall perform the Work in accordance with the additional details or instructions.

K. The Contractor shall maintain at the site for the Owner one record copy of the drawings, Plans, Specifications, Addenda, Change Orders and other modifications, in good order and marked currently to record changes and selections made during construction, as well as Working Drawings that have been reviewed and are being used. These shall be available to the Owner's Representative and shall be delivered to the Owner's Representative upon request and upon completion of the Work. The As-Built Drawings shall have recorded upon them all changes and corrections, all actual dimensions, locations and other details of the Work as actually built in progress.

L. Within 5 working days of submitting a notice of substantial completion, the Contractor shall submit a complete, signed set of plans and specifications showing all As-Built Drawings conditions on the Project.

5.04 CONSTRUCTION STAKES, LINES AND GRADES - (RESERVED)

5.05 INSPECTION

A. Inspection by the Owner - The Owner's Representative may test Materials furnished and inspect Work performed by the Contractor to ensure Contract compliance.

If the Contractor performs Work without the Owner's Representative's inspection or uses Materials that the Engineer has not approved, the Owner's Representative may order affected portions of the Work removed at the Contractor's expense. The foregoing sentence shall not apply if the Owner's Representative fails to inspect the Work within a specific period of time required in the Contract, or in the absence of a specific period of time, within a reasonable period of time after receiving the Contractor's timely written request for inspection or testing.

At the Owner's Representative's direction, any time before the Work is accepted, the Contractor shall uncover portions of the completed Work for inspection. After inspection, the Contractor shall restore these portions of Work to the standard required by the Contract. If the Owner's Representative rejects Work due to Materials or workmanship, or if the Contractor performed such Work without providing sufficient advance request for inspection to the Owner's Representative, the Contractor shall bear all costs of uncovering and restoring the Work. If the Owner's Representative accepts the uncovered Work, and the Contractor performed the Work only after providing the Owner's Representative with sufficient advance notice, the costs of uncovering and restoring the Work will be paid for by the Owner as Extra Work.

B. Inspection Facilities - The Contractor shall furnish walkways, railings, ladders, tunnels, platforms and other facilities necessary to permit the Owner's Representative to have safe access to the Work to be inspected. The Contractor shall require producers and fabricators to provide safe inspection access as requested by the Owner's Representative.

C. Sampling - The Contractor shall furnish the Owner's Representative with samples of Materials that the Owner's Representative will test. All of the Contractor's costs related to this required sampling are Incidental.

D. Inspection by Third Parties - Where third parties have the right to inspect the Work, the Contractor shall coordinate with the Owner's Representative and shall provide safe inspection access.

5.06 DELIVERY OF NOTICES

Whenever written notices are required or permitted to be given by the Contract Documents, they shall be delivered via first class mail, or in person to the current office address as shown in the records of the Owner. Notices delivered via first class mail shall be deemed delivered 5 business working days following the postmarked date.

5.08 COOPERATION AND SUPERINTENDENCE BY THE CONTRACTOR

A. The Contractor shall:

1. Keep one complete set of Contract Documents available on the Project Site at all times.

2. Cooperate in good faith with the Owner's Representative, Inspectors, the public and other contractors in performance of the Work.

3. Designate, from the Contractor's organization, a competent single representative responsible for the Project, experienced in the type of Work being performed, and capable of reading and thoroughly understanding the Plans and Specifications.

4. Provide access, facilities and assistance to the Owner's Representative in establishing such lines, grades and points as the Owner's Representative requires.

5. Carefully protect and preserve the Owner's marks and stakes.

6. Provide all assistance reasonably required by the Owner's Representative to obtain information regarding the nature, quantity, and quality of any part of the Work.

7. Allow the Owner's Representative reasonable access to the Contractor's books and records at all times. To the extent permitted by public records laws, the Owner's Representative will make reasonable efforts to honor the Contractor's request for protection of confidential information.

8. Furnish the Owner's Representative all data necessary to determine the actual cost of all, or any part, of the Work.

9. Diligently pursue progress of the Work according to the schedule requirements of Part 08.

10. Coordinate and control all Work performed under the Contract, including without limitation the Work performed by Subcontractors.

B. The Contractor shall appoint a single designated representative for the Project in writing. The single designated representative responsible for the Project shall:

1. Have full authority and responsibility to promptly execute orders or directions of the Engineer.

2. Have full authority and responsibility to promptly supply the Materials, Equipment, labor, and incidentals required for performance of the Work.

3. Be available during the hours of work on the Project site for communication with the Engineer and

4. Be present for all On-Site Work except as provided in the Contract Documents, or approved by the City.

C. For short periods of time during the performance of minor or Incidental portions of the Work, the Contractor may designate a person to act on behalf of the single designated representative responsible for the Project. The Contractor shall submit the designation in writing to the Engineer. The form of designation shall state the designee's name, duration of appointment, and scope of authority. The single designated representative responsible for the Project shall be available to the Engineer at all times for contact by telephone or radio.

D. If, for some reason, neither the Contractor nor a fully authorized representative is available, and communication is necessary, the Owner may communicate with, or give directions to, any person working for the Contractor. The Contractor shall follow any direction given by the Owner. Such directions will be confirmed in writing at the Contractor's request.

E. The Contractor's failure to provide the superintendence required by these provisions constitutes a material breach of the Contract, and the Engineer may impose any remedies available under the Contract, including but not limited to Contract termination or suspension of Contract performance.

F. Nothing in this Subsection changes the Contractor's duties as outlined elsewhere in the Contract Documents. For example, the Architect's or Engineer's presence does not relieve the Contractor from performing the Work in accordance with the law, statutes, ordinances, or building Codes nor does it relieve the Contractor from obtaining all required Permits.

5.09 UTILITIES

A. General Rules regarding Utilities

1. The parties agree that:

a. A normal and usual occurrence in the construction of underground improvements is the discovery of utilities, service laterals, underground pipes, drains and structures that interfere with the Contractor's work;

b. A reasonable number of such occurrences are usual and ordinary on Projects that include underground work;

c. Work must sometimes be done in close proximity to these conditions and that such work may be made more difficult than originally thought;

d. Such conditions may require a change in the Contractor's operations, such as changing the amount of traffic control, pavement and backfill that is required; and

e. The Contractor's Bid to the Owner reflected all costs in dealing with such conditions.

2. Owner will require a reasonable amount of time to perform design changes necessitated by conflicting utilities. In addition, Utility owners will require a reasonable amount of time to make necessary Utility relocations if such relocations are required.

B. Owner Responsibilities

1. Owner will provide information it has to Contractor regarding the location of existing watercourses, drains, sewer lines and Utility lines for purposes of preparing its Bid. Owner does not always have or receive accurate information about the location of utilities. Therefore, such information must be considered to be approximate, and not guaranteed to be accurate. Contractor is responsible for determining the exact location of utilities and existing improvements when performing its work.

C. Contractor's Responsibilities

1. Contractor shall protect the property of utilities, railways and fire control authorities that may be affected by Contractor's work as well as Utility lines, pipelines, and underground tanks.

2. Contractor shall obtain written permission from the PWB before operating any potable water valve or hydrant. Unauthorized operation is prohibited. Contractor shall pay any fee associated with their operation.

3. Contractor is required to maintain the flow of sewers, drains and water courses that might be interrupted by its work and restore that flow as directed by Owner.

4. The Contractor is responsible for any damage caused to any Utility, whether known or unknown, and whether or not that was disclosed by the Contract Documents.

5. Contractor shall maintain in place all utilities whether or not shown on the Contract Documents. If any Utility needs to be temporarily relocated for the Contractor's convenience or because of the method of construction or as a result of site conditions, Contractor shall bear all costs for that temporary relocation. Contractor shall maintain utilities that are relocated by others in their relocated positions in order to avoid interference with structures that cross the Project Work.

6. Contractor shall not hinder the work of Owner or the owner of a Utility in the event that they relocate any Utility.

D. Notification

1. The Contractor shall follow rules adopted by the Oregon Utility Notification Center. Those rules are set forth in Oregon Administrative Rules. Copies of these rules may be obtained by contacting the Center. If there are questions about the rules, contact the Center. The parties agree that any Project Plans or Permit issued by Owner will be deemed to have this language incorporated by reference.

2. In addition to the notification required by 5.09.D.1 above, Contractor shall also give Notice to the Owner of any intended excavation it may have at least 2 Working Days in advance of the proposed excavation.

3. Contractor shall maintain any markings showing the presence of underground facilities. If Contractor does not maintain such markings, and Owner is required to re-establish them, Contractor shall pay Owner any and all costs associated with that activity.

E. Utility Information

1. Arranging for a utility company to remove, relocate, or adjust a facility is the responsibility of the Owner. The Contractor shall schedule work so as to afford the utility companies sufficient time and space to perform their work. Contact the Owner for information regarding these arrangements.

2. A list of the organizations that may be adjusting utilities within the work area during the life of this Contract and an estimate of when the adjustment work is to be completed will be provided in the Contract Documents.

3. The estimates of when adjustment work is to be completed, provided by organizations, are based upon available Working Days, not Calendar Days, and are not necessarily concurrent or continuous.

4. The Contractor shall be responsible for all other utility adjustments to finish grade.

5. A list of the Utilities and their field coordinators will be included in the Contract Documents.

6. There may be unavoidable delays due to utility companies or utility contractors working in the same construction zone. It is imperative for the Contractor to provide accurate work schedules to the Owner's Representative. Notify the Owner's Representative immediately when utility work causes delays or construction issues.

7. The utility companies or utility contractors may be in the right-of-way working concurrently with this Contract. The Contractor's schedule and the schedules of the utility companies shall be coordinated and agreed upon prior to beginning construction. The Contractor shall work with the utility companies or the utility contractors so that all work on the project is completed within the Contract Time.

8. The Owner does not guarantee the site conditions will remain the same after the utility companies or the utility contractors have performed their work. The Contractor shall perform an assessment of site conditions prior to beginning work and after the utility companies or utility contractors have completed their work to determine actual conditions.

5.10 COOPERATION WITH OTHER CONTRACTORS

A. Owner reserves the right to Award other Contracts, or issue Permits, for work that may require coordination with the Contractor's operations under this Contract.

B. Contractor shall cooperate with the Owner and other Contractors and provide all reasonable opportunities to them to allow them to perform their separate work, including, but not limited to, the introduction and storage of materials and equipment.

C. The Contractor promptly shall notify the Owner's Representative if:

1. The performance of other Contractors hinders, delays, or prevents the Contractor from successfully completing its Work or makes its performance more costly;

2. The Contractor's operations are interrelated or dependent upon the work of others, or if other Contractor work has defects that hinders, prevents or otherwise makes unsuitable the successful completion of Contractor's Work.

D. Failure to provide the Notice stated in 5.10.C above constitutes Contractor's acceptance of the other Contractor's work and constitutes a conclusive waiver of any later Claim for additional compensation or Contract Time as a result of the other Contractor's work or activities.

E. Contractor shall defend, hold harmless and indemnify Owner from all Claims and all costs asserted by a separate Contractor who asserts that the Contractor damaged its Work or property, as provided in 7.09 below.

F. Contractor is responsible for any cutting, fitting and patching that may be required to complete the Work, except as otherwise specifically provided in the Contract Documents. The Contractor shall not endanger any work of any other Contractors by cutting, excavating or otherwise altering any work and shall not cut or alter the work of any other Contractor, except as directed by the Owner's Representative.

G. Contractor agrees that if a dispute arises regarding clean-up costs, the Owner's Representative may apportion such costs to Contractor and other contractors as the Representative determines is fair and equitable.

H. Contractor shall not damage any work that the Owner has performed, either with its own forces or through the forces of another Contractor. If the Contractor desires or needs to alter, change, cut or otherwise modify the work of Owner or another Contractor in any way it shall seek the Owner's Representative's written approval. If the Owner seeks the Contractor's approval to alter, change, cut or otherwise modify its work, Owner will notify Contractor of that fact.

5.11 CONSTRUCTION EQUIPMENT RESTRICTIONS

A. Load and Speed Restrictions for Construction Vehicles and Equipment - The Contractor shall comply with legal weight and speed restrictions when moving Materials or Equipment beyond the limits of the Project Site. The Contractor shall provide a copy to the Engineer of the jurisdiction permit authorizing the any overweight load(s).

The Contractor shall control vehicle and Equipment loads and speeds within the Project Site according to the following restrictions, unless the Contract Documents provide otherwise:

1. The Contractor shall restrict loads and speeds as necessary to avoid displacement or loss of Materials on Subgrades and Aggregate Bases.

2. The Contractor shall restrict weights to legal loads, and shall travel at speeds of no more than 45 mph or the posted construction speed, whichever is less, on treated Bases, Pavement, or wearing Courses.

3. The Contractor shall not cross Bridges or other Structures with Equipment or vehicles exceeding the legal load limit without prior written permission of the Owner's Representative. The Contractor shall make any such request in writing, describing the loading details and the arrangement, movement, and position of the Equipment on the Structure. The Contractor shall comply with any restrictions or conditions included in the Engineer's written permission.

B. Protection of Buried Items - The Contractor shall use temporary fill, steel plates or other methods to avoid overload of pipes, box culverts, and other items that are covered, or to be covered, by fill or backfill.

C. Responsibility for Damages - The Contractor shall assume responsibility for damages caused by excessive Equipment speed or loads while performing the Work, both inside and outside the Project Site. The Engineer's or other jurisdiction's permission to cross Bridges and other Structures, according to 5.12.A will not relieve the Contractor from responsibility for load-caused damages.

5.12 REMOVAL OF UNACCEPTABLE AND UNAUTHORIZED WORK

A. Any portion of the Work that does not conform to the requirements of the Contract is unacceptable and defective and shall be removed and corrected by the Contractor, even if it is contended that the Owner's Representative or other assigned personnel knew or should have known of the existence of the unacceptable work.

B. All portions of the Work that do not conform to the requirements of the Contract Documents shall be corrected within a reasonable time at the Contractor's sole expense and without an extension of Contract Time.

C. The Owner may replace or correct work within a reasonable time if the Contractor fails to do so and may charge the Contractor with all reasonable costs incurred with performing that work and with the costs of storing any salvageable materials or equipment. If that occurs, the Owner also is entitled to deduct such costs from any sums otherwise due the Contractor.

1. If salvageable materials, equipment, or both are stored, the Owner will notify the Contractor of the storage and give the Contractor 10 days to remove the materials. If the Contractor fails to remove them by the end of that time, the Owner may sell them in any commercially reasonable manner, whether privately or publicly.

2. If sale is made, the Owner will keep all proceeds to the extent that the proceeds do not exceed the costs incurred in correcting and replacing the work and in storing the materials and equipment. Contractor still owes Owner for any difference in costs that may remain after the sale. However, if the proceeds exceed the Owner's cost it will forward those sums to the Contractor.

D. The Contract Documents or regulatory agencies may require that portions of the Work be observed, reviewed or inspected before they are obscured or covered. Similarly, the Owner's Representative is entitled to observe portions of the Work before they are covered or obscured upon request. If the Contractor covers or obscures a portion of the Work that is required or requested to be observed, it shall uncover the Work for observation and bear any cost associated with that activity without a change in Contract Time.

E. The Owner's Representative may request to see a portion of the Work that has been covered regardless of the requirements of the Contract Documents, regulatory agencies or a prior request. Thereafter the Contractor shall comply with the Owner's request. If, upon inspection by the Owner's Representative, the portion of the Work that is uncovered is found to be in accordance with the Contract Documents, the Owner will bear all costs associated with that activity and provide additional Contract Time, if that activity would cause the Contractor to incur liquidated damages. However, if, upon inspection by the Owner's Representation, the portion of the Work that is uncovered is found not to be in accordance with the Contract Documents, the Contractor shall correct the Work and bear any cost associated with that activity without a change in Contract Time.

F. Replacement and correction of Defective Work prior to the time that the Work is completed and accepted is not limited by any warranty period otherwise established by the Contract.

G. Owner retains the right to accept portions of the Work that do not conform to the requirements of the Contract Documents. However, such acceptance will be in writing and given only by the Owner's Representative.

Inspectors, employees and other agents of Owner have no authority to bind the Owner to accept nonconforming portions of the Work. If the Owner's Representative chooses to accept nonconforming portions of the Work, and those portions cost less than what the Contractor would have spent to comply with the Contract Documents, Owner is entitled to a credit for the difference in price, which may be deducted from the Contract Amount.

5.13 USE OF WORK DURING CONSTRUCTION

A. The Owner may decide to use part of the Work that has been completed before completion of all of the work required by the Contract. If that occurs, the Owner will notify the Contractor in writing of its intention.

B. When use of part of the Work by the Owner begins, the Contractor is:

1. Relieved of the duty of maintaining and protecting that portion of the Work, provided that it has been completed in accordance with the Contract.

2. Relieved of responsibility for injury or damage to the portion of Work used by the Owner from use by public traffic or from the action of the elements of nature or from any other cause, except injury or damage resulting from the Contractor's own operations or from its negligence.

3. Relieved of the responsibility of cleaning up that portion of the Work before final acceptance, unless the Contractor's own operations require such cleanup.

C. Use by the Owner of a part of the Work as described in this Subsection does not constitute final acceptance of the Work as a whole or any part thereof.

5.14 FURNISHING TEMPORARY SERVICES AND FACILITIES

Contractor shall provide temporary light, power, water and other temporary services or facilities complete with connecting, piping, wiring, lamps and similar equipment as required during construction of the Work, including testing and start up, and remove temporary facilities upon completion. Obtaining permits and bearing the costs of temporary services and facilities is included within the Contract Amount.

5.15 MAINTENANCE WARRANTIES AND GUARANTEES

A. The Contractor expressly warrants its work shall be performed to the highest standards of good workmanship. That warranty shall extend to the fullest extent permitted by law and shall continue beyond the 2 year correction period discussed below.

B. In addition to, and not in lieu of, any other express or implied warranties, the Contractor shall make all necessary repairs and replacements to remedy any and all defects, breaks, or failures of the Work occurring within 2 years following the date of Substantial Completion due to faulty or inadequate materials or workmanship. Such repairs and replacements shall conform to the Contract Specifications under which the Contractor originally performed the work. The Owner shall notify the Contractor if such problems occur within the 2 year period.

C. In the event of a dispute regarding any portion of the Work, the Contractor shall nonetheless provide any warranty service, repairs or replacements as described in 5.15.A and 5.15.B above, for that portion of the Work that is not in dispute.

In the event that a dispute delays Acceptance of the Work, the warranty for portions of the Work not in dispute shall run from the date of Substantial Completion of the remaining portions of the Work.

D. The Contractor shall also repair any damage or remedy any disturbance to other publicly owned property or improvements thereon if caused by the Contractor's work and if the damage or remedy disturbances occurs during the warranty period.

E. If the Contractor performs warranty work, the warranty work also shall have a two (2) year warranty period from the date of its completion and acceptance by Owner.

F. The Owner will provide the Contractor with written Notice of the need to perform warranty work unless it is determined that an emergency exists, that delay would cause serious additional loss or damage, or if any delay in performing the work might cause injury to any member of the public. If the Contractor, after written Notice, fails within ten days to comply with the Owner's request, the Owner has the right to perform the warranty work either by hiring another Contractor or by using its own forces. In that event, the Contractor and its Surety shall be liable to the Owner for the cost of the work performed and any additional damage suffered by the Owner.

G. The Contractor shall provide a bond during the two-year warranty period to guarantee the Contractor's performance of warranty work. The Contractor shall provide to the Owner a bond in the amount of 20% of the final Contract Amount in one of the following ways:

1. Continuance of the Contract performance Bond and the Payment Bond;
2. Any new performance Bond and the Payment Bond, acceptable to Owner, which covers the Contractor's warranty obligations imposed by the Contract Documents.
3. Cash deposit to the City Treasury - Proof of the deposit shall be a receipt from the Treasurer.
4. Other arrangements proposed by the Contractor that the Owner finds acceptable.

H. Nothing in Paragraph 5.15 precludes the Owner from seeking recovery for any and all claims it may have against Contractor arising out of the performance of this contract, including, but not limited to, claims for breach of contract and/or for negligence, within the time permitted by Oregon law.

5.16 RESPONSIBILITY FOR MATERIALS AND WORKMANSHIP

A. The successful performance of this Contract will provide a benefit to the citizens, ratepayers, or taxpayers of the City of Portland. Therefore, satisfactory completion of the Project by the Contractor is of paramount importance. The Contractor agrees that by accepting this Contract it is required to perform the Contract in accordance with the Contract Documents and cannot contend that its performance was excused by any action of the Owner, except to the extent that the Contract terms have been modified by a written Change Order executed by both parties.

B. The Owner is entitled to insist upon completion of the Contract in the manner and to the extent required by the Contract Documents.

Therefore, any measurement, estimate or certificate made by the Owner that is incorrect may be corrected by the Owner at any time, regardless of whether that occurs before or after acceptance of the Project. Similarly, if work, equipment, parts, products or materials do not conform to what is required by the Contract Documents, the Owner may require that the work be redone and that materials, parts, products, and equipment be replaced, regardless of prior approval by any agent or employee of the Owner.

C. Acceptance of the Work by the Owner will not preclude the Owner from:

1. Later insisting that the Work be performed in accordance with the Contract Documents.
2. Recovering damages for breach of contract or pursuing any other remedies that the law may provide.
3. Any other remedy for breach of contract permitted by law.

D. No action whatsoever, nor any verbal or written statement whatsoever, made by any employee or agent of the Owner, will operate as a waiver or as an estoppel, or otherwise preclude the Owner from insisting upon its rights to performance of the Contract in accordance with the Contract Documents.

PART 6 - QUALITY OF MATERIALS

6.01 GENERAL

The Contractor shall incorporate into the Work only Materials conforming to the Specifications and approved by the Owner's Representative. The Contractor shall incorporate into the Work only manufactured products made of new materials unless otherwise specified in the Contract. The Owner may require additional testing or retesting to determine whether the Materials or manufactured products meet Specifications.

Materials not meeting the Specifications at the time they are to be used are unacceptable and must be removed immediately from the Project Site, unless otherwise directed by the Owner's Representative.

A. Materials, parts, products, and equipment shall meet the requirements of the latest printed edition, as of bid opening, of any applicable building Codes, Reference Specifications or industry standards stated in the Contract Documents for determining their acceptability in the Contract Documents.

B. Contractor is obligated to comply with Codes, industry standards and Reference Specifications that are made applicable by the Contract Documents. Such Codes, standards and Reference Specifications may include, but are not limited to, the OSHA, IBC, UFC, UMC, NEC, AASHTO, NSF, ASTM, AWWA and WEF. Without limiting the generality of other requirements of the Specifications, all work specified herein shall conform to or exceed the requirements of applicable Codes and standards. In case of conflict between Codes, standards, Reference Specifications or other portions of the Contract Documents, the most stringent requirements shall govern. Any conflict between such standards and the Contract Documents

shall be brought to the attention of the Owner's Representative for clarification and direction prior to ordering or providing any materials or furnishing labor.

6.02 REJECTED MATERIALS

The Owner's Representative may reject any Materials that appear to be defective (5.12) or that contain asbestos or other hazardous substances. The Contractor shall not incorporate any rejected Materials into the Work. Rejected Materials whose defects have been corrected may not be incorporated into the Work until the Owner's Representative has approved their use. The Owner's Representative may order the removal and replacement by the Contractor, at Contractor's expense, of any defective Materials. (Refer also to 5.05.)

6.03 MATERIALS CONFORMANCE AND QUALITY COMPLIANCE DOCUMENTS

For purposes of this Section, "Materials Conformance Documents" means the Contractor's quality-control, the Owner's verification, and the independent assurance test results and the identity of the testing facility. "Quality Compliance Documents" means those documents specified in ODOT's Nonfield-Tested Materials Acceptance Guide, unless otherwise specified in the Contract.

A. As used in this Section, the following definitions are applicable:

Products - refers to purchased items for incorporation into the Work, regardless of whether specifically purchased for the Project or taken from the Contractor's stock of previously purchased products.

Materials - refers to products that must be substantially cut, shaped, worked, mixed, finished, refined or otherwise fabricated, processed, installed or applied to form units of work.

Equipment - refers to products with operational parts, regardless of whether motorized or manually operated, including products with service connections such as wiring or piping.

Parts - refers to portions of products, materials, and equipment.

Certifications - refers to documents that show that materials, products, parts and equipment required by the Contract meet the requirements of a Reference Specification. Certifications shall require no interpretation of test results by Owner's employees to determine whether the requirements of the Reference Specification have been met.

Conformance Documents - refers to documents that show that the material, part, product or equipment meets the requirements of the Contract. Examples of Conformance Documents that may be acceptable include shop drawings, material lists, equipment lists, catalog description sheets and manufacturer's brochures.

B. The Contractor must establish that the materials, products, parts, and equipment that it proposes to use meet the requirements of the Contract Documents, including the requirements of any Reference Specifications or industry standards, by submitting the Certifications and Conformance Documents required by the Contract.

C. The Contractor shall bear the cost of providing Certifications and Conformance Documents, including the costs of any sampling and testing that must be performed in order to achieve certification. Materials, products, parts and pieces of equipment shall not be incorporated into the Work without acceptable certifications or Conformance Documents.

D. Certification shall be provided by the manufacturer or testing agency verifying that Contract requirements have been met. The certification shall identify the testing agency, the representative responsible for the test results, and include a copy of the specified test results (for example, ASTM, AASHTO, UL, etc.).

E. Conformance Documents shall be sufficient to permit the Owner to determine that the Contractor has provided what is required by the Contract Documents.

F. Certifications and Conformance Documents shall be clear and understandable to determine whether the material, product, part, or equipment is the one specified by the Contract Documents. Certifications or Conformance documents that are unclear or require analysis in order to determine whether the materials, parts, products or equipment meet the requirements of the Contract are insufficient and will be rejected. The Contractor shall bear all costs of and is responsible for any delay that occurs as a result of unclear certifications or conformance documents.

G. Certifications and Conformance Documents shall be delivered to the Owner with the shipment of the material, part, product or material to which the certification corresponds, unless other portions of the Contract Documents specify a different procedure.

6.04 TESTING BY OWNER

When testing Materials, the Owner will conduct the tests in the field, in the Owner's central laboratory, field laboratories, or other laboratories designated by the Owner's Representative, even though certain AASHTO, ASTM, and other Materials specifications may require testing at the place of manufacture. Results of the Owner's tests will be made available to the Contractor.

PART 7 - LEGAL RELATIONS AND RESPONSIBILITIES

7.01 GENERAL

A. The Contractor shall comply with all federal, state, and municipal laws in regard to all matters concerning this Contract. This includes, but is not limited to, compliance with the ADA (Americans with Disabilities Act), Title 10 of the City Code regarding Erosion Control, City business license requirements, EEO certification requirements, Equal Benefits compliance, and CCB licensing and bonding requirements. The Contractor also shall comply with the orders, rulings, decrees and decisions of any administrative or judicial officials that in any manner whatsoever affects the Project, the Work, the safety of persons around the construction site, or the manner in which the Work is performed.

B. If the Contractor observes that any portion of the Work is to be performed in a way that violates any law, Code, or regulation, it shall notify the Owner in writing immediately.

7.02 OTHER AGENCIES AFFECTING OWNER CONTRACTS

A. Representatives of regulatory bodies or units of government whose Laws may apply to the Work shall have access to the Work according to 5.05.D. These may include but are not limited to those stated below or as stated in the Contract Documents.

1. Federal Agencies:
 - a. Agriculture, Department of:
 - 1) Forest Service
 - 2) Natural Resources Conservation Service
 - b. Army, Department of the:
 - 1) Engineers, Corps of
 - c. Commerce, Department of:
 - 1) National Oceanic and Atmospheric Administration
 - 2) National Marine Fisheries Service
 - d. Homeland Security, Department of:
 - 1) US Coast Guard
 - e. Interior, Department of:
 - 1) Heritage, Conservation and Recreation Service
 - 2) Indian Affairs, Bureau of
 - 3) Land Management, Bureau of
 - 4) Mines, Bureau of
 - 5) Reclamation, Bureau of
 - 6) Geological Survey
 - 7) Minerals Management Service
 - 8) Surface Mining, Reclamation and Enforcement, Office of
 - f. Solar Energy and Energy Conservation Bank
 - g. US Fish and Wildlife Service
 - h. Labor, Department of:
 - 1) Occupational Safety and Health Administration (OSHA)
 - 2) Mine Safety and Health Administration
 - i. Transportation, Department of:
 - 1) Federal Highway Administration
2. Oregon Tribal Governments:
 - a. Warm Springs, Confederated Tribes of
3. State of Oregon Agencies:
 - a. Administrative Services, Department of
 - b. Agriculture, Department of:
 - 1) Natural Resources Division
 - 2) Soil and Water Conservation Division
 - c. Consumer and Business Services, Department of:
 - 1) Insurance Division
 - 2) Oregon Occupational Safety and Health Division
 - d. Energy, Department of
 - e. Environmental Quality, Department of (DEQ)
 - f. Fish and Wildlife, Department of
 - g. Forestry, Department of
 - h. Geology and Mineral Industries, Department of
 - i. Human Resources, Department of
 - j. Labor and Industries, Bureau of
 - k. Land Conservation and Development Department

- l. Parks and Recreation, Department of
- m. State Lands, Division of
- n. Water Resources Department
- 4. Local Agencies:
 - a. City Council
 - b. County Courts
 - c. County Commissioners, Board of
 - d. Design Commissions
 - e. Historical Preservation Commissions
 - f. Metro
 - g. Planning Commissions
 - h. Port of Portland
 - i. Public and Private Utilities:
 - 1) County Service Districts
 - 2) Fire Protection Districts
 - 3) Irrigation Districts
 - 4) Lighting Districts
 - 5) Metropolitan Service Districts
 - 6) Sanitary Districts
 - 7) Water Districts
 - j. TriMet

7.03 PERMITS, LICENSES, AND TAXES

A. The Contractor shall, without additional expense to the Owner, be responsible for paying any necessary fees, obtaining any necessary fees, licenses and Permits, and for complying with any Federal, State, and municipal laws, Codes, and regulations applicable to the performance of the Work, unless expressly provided otherwise in other portions of the Contract Documents. However, the Owner will pay the fee charged by the Bureau of Development Services commonly known as the "plan check" fee.

B. The Contractor understands that preliminary approval of the Owner's Plans and Specifications by regulatory agencies does not prohibit such agencies from requesting changes in order that the Work complies with the provisions of applicable Codes, laws and regulations. Contractor agrees that a reasonable number of changes directed by Regulatory Inspectors are inherent in the nature of construction work and that the Bid includes the costs of making them. Contractor shall bear the expense of complying with the requirements of Regulatory Inspectors for a reasonable number of changes even if such requirements require different or extra work than that originally described by the Contract Documents.

C. Contractor shall defend, hold harmless and indemnify Owner for all claims brought against the Owner as provided in 7.09 if such claim arose in whole or in part out of Permits and licenses that were the responsibility of the Contractor to obtain.

7.04 RIGHTS-OF-WAY, EASEMENTS AND PREMISES

A. The Contractor shall confine its construction activities within property lines, rights-of-way, limits of Easements and limits of construction Permits as shown or specified in the Contract Documents unless the Contractor has obtained permission to use other land from the owner(s) of adjacent private property.

The Contractor's Bid shall include all costs related to its needs for additional space and property if such is needed by the Contractor's method of operation to perform the Work. In order to protect the City from any claim by an owner of private property, the Contractor shall provide the Owner's Representative with written permission from the property owner prior to the use of the property.

B. The Contractor shall obtain and bear the cost of Permits for special occupancy and use of specified work areas from all appropriate and necessary governmental agencies.

C Unless required to be obtained in the name of the Contractor, the Owner will obtain and pay for the following when they are required by the applicable Laws or by Plans or Specifications:

1. All necessary Rights-of-Way;
2. Permits required for crossing or encroaching upon navigable streams;
3. Permits required for removing materials from or depositing materials in waterways;
4. Permits required for operating in City-controlled source of Materials or disposal area;
5. System development fees charged by local units of government;
6. Building construction permits, not including specialty work such as heating, ventilation, air conditioning, or electrical;
7. Cost of referencing and replacing endangered survey monuments; and
8. Environmental permits, including erosion control permits

7.05 PATENTS, COPYRIGHTS, AND TRADEMARKS

The Contractor shall acquire and pay for all patents, royalties and license fees required to perform the Work. Contractor shall defend, hold harmless and indemnify Owner for all claims brought against it regarding royalties, license fees and patents as provided in 7.09.

7.06 SAFETY, HEALTH, AND SANITATION PROVISIONS - (RESERVED)

7.07 INSURANCE - (RESERVED)

7.08 INDEPENDENT CONTRACTOR

The service or services to be rendered under this Contract are those of an independent Contractor. Contractor is not an officer, employee, or agent of the City as those terms are used in ORS 30.265.

7.09 INDEMNITY/HOLD HARMLESS

A. The Contractor shall indemnify, hold harmless, and defend Owner, its officers, employees and agents from any and all claims, losses, damages, attorney fees, costs and liabilities arising out of accidents, unforeseen difficulties, or the intentional, reckless or negligent acts or omissions of the Contractor, its Subcontractors, suppliers, employees, or agents in the

performance of the Work. For purposes of this Subsection, "claims" includes any assertion of a right to money damages or equitable relief or any combination thereof.

B. Owner shall notify Contractor of any claim of which it is aware that requires Contractor to defend, indemnify and hold Owner harmless. Thereafter, Contractor shall notify Owner in writing within 30 days that it will defend, indemnify and hold Owner harmless. Contractor's failure to provide such notification is a breach of contract. In the event that Contractor fails to give Notice within 30 days, Owner may defend the claim and charge Contractor with any costs associated with that effort.

C. Owner reserves the right to participate in any claim irrespective of Contractor's obligations to indemnify, hold harmless, defend or notify. However, if Owner elects to participate in any claim after receiving notification from Contractor, Contractor is not obligated to indemnify Owner for the costs associated with that participation, although its other obligations to indemnify, hold harmless and defend remain intact.

D. Nothing in this section requires the Contractor or its insurer, to indemnify the Owner for any claims or losses arising out of death, or bodily injury to persons or property damage caused, in whole or in part, by the negligence of the Owner.

7.10 EMPLOYEE DRUG TEST PROGRAM

As required by ORS 279C.505(2), the Contractor shall have in place, and maintain during the period of the Contract, an employee drug-testing program. The Owner retains the right to audit or monitor the program. On request by the Owner's Representative, the Contractor shall furnish a copy of the employee drug-testing program.

7.11 THIRD PARTY BENEFICIARY

The parties agree that the execution of this Contract is not intended to, nor does it create, any third party beneficiary rights in any person.

7.12 RESPONSIBILITY FOR DAMAGE TO WORK

A. The Contractor shall perform the Work as required by the Contract Documents, including, but not limited to, providing all labor, materials, equipment, tools, machines and Incidental Work necessary for its performance. In addition, the Contractor is responsible for the means and methods of construction.

B. Until the Work is completed and accepted by Owner, the Contractor is responsible for any damage caused to either permanent or temporary work, utilities, materials, plants and equipment, all of which shall be repaired to the satisfaction of the Owner's Representative at the Contractor's expense. Damage to any portion of the Work that has been completed and accepted by the Owner and which is open for public use is not the responsibility of the Contractor unless caused by the Contractor.

C. The Contractor shall repair any damage for which it is financially responsible promptly. If the damage is something for which the Contractor is not financially responsible, the Owner's Representative may direct the Contractor to repair the damage with compensation established as follows:

1. If the Contract establishes Unit Prices for performing the work, the Contractor will be compensated at those Unit Prices;

2. If the Contract, or a portion of the Contract, uses Lump Sum pricing, then the Owner and Contractor shall use the Schedule of Values

D. The Owner reserves the right to have any work performed for which the Contractor is not financially responsible by its own forces or by hiring another Contractor to perform the work.

E. Contractor shall make sure its Work is in good condition to receive subsequent work that may be performed by another Contractor. See 5.10.

F. Partial Relief of Responsibility for Damage to Work Caused by Public Traffic

(1) Interim Acceptance - The Contractor may request in writing interim acceptance of certain completed portions of the Work, such as drainage facilities and traffic control devices. If approved, the Owner's Representative will issue written interim acceptance stipulating the scope and duration of the Contractor's relief from responsibility for damage to Work caused by public traffic. The Owner's Representative will also include in the interim acceptance the scope and duration of Contractor's relief, if any, from responsibility for protection and maintenance.

(2) Scope of Relief - For the duration of interim acceptance issued by the Owner's Representative, the Contractor will be relieved of responsibility to repair those portions of the Work upon which relief was granted under this Subsection. The scope of potential relief applies only to damages caused by public traffic, and is limited to the following:

- a. A segment of Roadway, drainage facilities, Slopes, lighting, traffic control devices and access facilities;
- b. A Bridge or other Structure within a segment of Roadway;
- c. Traffic signals and appurtenances at an intersection;
- d. Permanent, passive traffic control devices;
- e. Complete circuits of a highway lighting system; and
- f. Portions of a building open to public use.

G. Vandalism - The Contractor shall provide reasonable protection of the Work from vandalism and is liable for any damage caused by vandalism until Substantial Completion of the Work. In addition, the Contractor shall carry insurance to cover any and all damage caused by vandalism.

7.13 RESPONSIBILITY FOR DAMAGE TO PROPERTY AND FACILITIES

A. Property Protection - Contractor shall protect, and take every reasonable precaution to avoid damage to, all public and private property that might be damaged by its operations. See 7.04 regarding Rights of Way, Easements and construction limits.

B. Property Repair - If public or private property, or both, is damaged by the Contractor's operations, the Contractor shall either repair the damage, or have the damaged repaired by others at its own expense, without additional compensation from Owner. The repair shall bring the property damaged back to the same condition as it was before the damage occurred.

If repair and restoration is not feasible, the Contractor shall pay the Owner of the damaged property for the damage. If the damage has been caused to property of the Owner, the Owner has the right to determine whether the property shall be repaired and restored by the Contractor or not. If Owner elects to have the property repaired with its own forces or by another entity, the Contractor shall pay the Owner all costs associated with that repair and restoration.

C. Vehicle and Other Removal Notice - Contractor shall give reasonable Notice to owners and occupants of property adjacent to the Work to permit them to remove vehicles, trailers and other possessions as well as salvage or relocate plants, trees, fences sprinkler systems or other improvements in the Easement or Right-of-Way that are designated for removal or which might be destroyed or damaged by the Contractor's operations.

D. Landscape Protection/Restoration - Contractor shall protect all trees not designated for removal, lawns and planted areas within the Right-of-Way or Easements and restore all disturbed areas, by seeding, mulching and providing erosion control as set forth in the Contract Documents, Technical Specifications and Plans. If conditions are such that seeding cannot be done, provide temporary erosion control measures as set forth in the Contract Documents or as directed by the Owner's Representative.

E. Clearing Work Review - Contractor shall review the location, limits and methods to be used with the Owner's Representative prior to performing any clearing work.

F. Sign Protection - Contractor shall protect all signs, including business signs and tourist-oriented direction signs, from damage whether the signs are to remain in place or are placed on temporary supports until they are reinstalled on permanent supports in the same or similar location. Signs that are damaged shall be repaired at Contractor's expense. Contractor is responsible for any and all damages that result from the displacement of such signs.

G. Permanent Survey Markers

1. Contractor shall notify the Owner's Representative not less than five (5) working days prior to starting work in order that the Representative may take necessary measures to ensure the preservation of survey monuments, stakes, lot stakes and bench marks. Contractor shall not disturb permanent survey monuments, stakes, lot stakes or bench marks without the consent of the Owner's Representative, and shall bear the expense of replacing any that are disturbed.

2. When a change is made in the finished elevation of the pavement of any roadway in which a permanent survey monument is located, Contractor shall adjust the monument cover to the new grade at no additional expense to Owner.

H. Construction and Survey Markers - Contractor shall preserve construction survey stakes and markers for the duration of their usefulness during construction. If survey stakes are lost or disturbed through the Contractor's negligence and therefore need to be replaced, the Contractor shall pay for the cost of the replacement. The amount of that cost may be deducted from any payment due to Contractor.

I. Protection and Restoration of Non-City Property and Facilities

1. The Contractor shall determine the location of properties and facilities that could be damaged by the Contractor's operations, and shall protect them from damage. The Contractor

shall protect monuments and property marks until the Owner's Representative has referenced their location and authorized their removal. The Contractor shall restore property or facilities damaged by its operations to the condition that existed before the damage, at no additional compensation.

2. The Contractor shall provide temporary facilities when needed, e.g., to maintain normal service or as directed by the Owner's Representative, until the required repair, rebuilding, or replacement is accomplished.

3. The Contractor shall protect specific service signs, e.g., business logos, and tourist-oriented directional signs (TODS) from damage, whether the signs are to remain in place or be placed on temporary supports. The Contractor shall repair or replace damaged signs at no cost to the City.

7.14 RESPONSIBILITY FOR DEFECTIVE WORK

A. The Contractor shall make good any defective Work, Materials or Equipment incorporated into the Work.

B. Latent Defects - The Contractor shall remain liable for all latent defects in the Work regardless of whether discovery of the defect occurs outside any applicable Performance Bond, warranty security, or warranty period.

C. Warranties - For those Pay Items with Specifications referencing this 7.14.B warranty, the Contractor warrants that all Work, including Changed Work, Additional Work, Incidental Work, On-Site Work, and Extra Work, and Materials and Equipment incorporated into the Work, shall meet the technical and performance Specifications required under the Contract, from the date and for the period of time identified in each applicable Specification or elsewhere in the Contract. The Contractor shall be responsible for making good the Work and for all repairs of damage to other improvements, natural and artificial structures, systems, equipment, and vegetation caused by, or resulting in whole or in part from, defects in warranted Materials, Equipment, and workmanship. The Contractor shall be responsible for all costs associated with site cleanup and remediation caused by, or resulting in whole or in part from, defects in warranted Materials, Equipment, or workmanship. This warranty provision shall survive expiration or termination of the Contract.

D. Manufacturer Warranties and Guarantees:

1. Manufacturer Warranties - For those specification Sections referencing this Paragraph, the Contractor shall furnish Warranties from the Manufacturer and signed by a Manufacturer's Representative.

The Warranty period will be specified in the applicable Specification Section for which it applies.

When the Owner makes written notification to the Manufacturer of failure of an item covered by this Warranty, the Warranty period will stop for the affected item or the portion of the affected item that failed, as applicable until the required repairs or replacements are made and accepted. All repaired or replaced items shall meet current specifications, unless otherwise specified in the Contract, and will be warranted for the remaining Warranty period.

Warranty work shall be performed when weather permits. If, in the opinion of the Owner's Representative, temporary repairs are necessary, the temporary repairs will be made by the Owner or an independent contractor at the Manufacturer's expense. The Manufacturer shall replace all temporary repairs at no additional cost to the Owner.

The Manufacturer shall provide all required traffic control during repair or replacement of failed items at no additional cost to the Owner.

2. Trade Practice Guarantees - For those items installed on the Project that have customary trade practice guarantees, the Contractor shall furnish the guarantees to the Owner's Representative at the completion of the Contract.

7.15 TRESPASS

Contractor is responsible for trespass or encroachment upon or damage to adjacent property and from claims resulting from the Contractor's operations.

7.16 USE OF EXPLOSIVES

The Contractor shall comply with all Laws regarding the use of explosives. The Contractor shall notify anyone having facilities near the site of the intended use or storage of explosives. The Contractor shall be responsible for all damage resulting from the Contractor's own, its agents' and employees' and its Subcontractors' use of explosives. Comply with the Contract Documents and contact the City of Portland Fire Bureau for details on required permit.

7.17 OVERTIME WORK

A. The Contractor shall obtain approval from the Owner's Representative in order that the work can be appropriately monitored.

B. The Owner's Representative may refuse the Contractor the right to perform overtime work if the Owner does not have sufficient staff to inspect the work or when the Representative determines that the overtime is not in the public interest.

C. Work performed during overtime in the absence of the Owner's inspection or other staff must be performed at Contractor's expense unless expressly authorized.

D. This Subsection does not apply to labor performed in the manufacture or fabrication of any material ordered by the Contractor or manufactured or fabricated in any plant or place other than the place where the main Contract is to be performed.

7.18 RECORDS

A. The Contractor and its Subcontractors shall maintain all fiscal records relating to public Contracts in accordance with generally accepted accounting principles. In addition, Contractors and Subcontractors shall maintain any other records necessary to clearly document their performance of the work and any Claims for additional compensation or requests for additional Contract Time arising from or relating to their performance under a public Contract. Contractors and Subcontractors shall make all records pertaining to their performance, and any Claims or requests under a public Contract accessible to the Owner at reasonable times and places, regardless of whether litigation has been filed as to such Claims.

B. The Owner may, at reasonable times and places, have access to, and an opportunity to inspect, examine, copy and audit the books and records of any person who has submitted cost or pricing data according to the terms of a Contract to the extent that such books and records relate to such cost or pricing data. Any person who receives a Contract, for which cost or pricing data are required, shall maintain such books and records that relate to such cost or pricing data for three years from the date of Final Payment under the Contract, unless a shorter period is otherwise authorized in writing.

C. The Owner and its authorized representatives shall be entitled to inspect, examine, copy and audit the books and records of the Contractor and its Subcontractors and suppliers as provided in 7.18.A above. Such books and records shall be maintained by the Contractor and all Subcontractors, and kept accessible and available at reasonable times and places for a minimum period of three years from the date of Final Payment under the public Contract, or until the conclusion of any audit, controversy, litigation, dispute or claim arising out of, or related to, the public Contract.

D. Contractor shall produce all such records in Portland, Oregon, regardless of whether the records are produced pursuant to this provision of the Contract or as a result of a claim, litigation, arbitration or other proceeding. Contractor may produce the records elsewhere if it fully compensates the Owner for the reasonable costs of travel to and from the place where the records are produced and the reasonable cost of any employee's time in having to travel.

7.19 PARTIAL OCCUPANCY OR USE

A. The Owner may occupy or use any completed or partially completed portion of the Work, at any state of construction, provided such occupancy or use is not prohibited by regulatory agencies having jurisdiction over the Work.

B. The partial occupancy or use may commence before that portion is substantially complete. Before partial occupancy, the Owner's Representative and Contractor shall discuss payments, retainage, if any, security, maintenance, utilities, damage to the Work and insurance, the period of time for correction and completion of the portion of the Work occupied and the commencement date of any applicable warranties and reduce matters of agreement to writing. Disputes about these matters shall be handled as provided by 13.01.

C. Before partial occupancy or use, the Owner's Representative and Contractor shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work. Thereafter a list shall be prepared recording the items that need correction and completion. This list is not a "punch list" and does not represent that Substantial Completion has occurred. Either the Owner's Representative or Contractor may inspect the portion separately if the other refuses to join in an inspection in a timely fashion.

D. Partial occupancy or use of a portion or portions of the Work shall not constitute Owner's Acceptance of Work not complying with the requirements of the Contract Documents, nor does it waive rights the Owner has to completion of the Contract in accordance with the requirements of the Contract Documents.

E. Owner also is entitled to occupy or use all or a portion of the work upon Substantial Completion.

Occupancy or use upon Substantial Completion does not constitute Owner's Acceptance of Work not complying with the requirements of the Contract Documents nor does it waive rights the Owner has to completion of the Contract in accordance with the requirements of the Contract Documents.

PART 8 - PROSECUTION AND PROGRESS

8.01 OWNER'S RIGHT TO DO WORK AT CONTRACTOR'S EXPENSE

A. If the Contractor refuses or fails to comply with the Contract, the Owner may correct any deficiency or defect or perform work that the Contractor has failed to perform, or take other appropriate action without prejudice to any other remedy the Owner may have under the Contract. Before taking that action, the Owner will provide the Contractor and its sureties with seven days Notice of its intentions, unless an emergency or dangerous condition exists, in which case the action may be taken without Notice. In the event that the Owner performs part of the Contractor's work, corrects deficiencies or is required to take action as a result of an emergency or dangerous condition, the Owner will deduct the cost of that action from any payment then or thereafter due the Contractor. In the event that the cost of the Owner's action exceeds any sums held by Owner and otherwise payable to Contractor, Contractor agrees to reimburse Owner for any excess costs.

B. The Owner has the right to delete work from this Contract and the parties agree that such action does not constitute a breach of contract. Therefore, Owner may delete work from the Contract and perform it with its own forces or have such work performed by another Contractor. If work is deleted from the Contract, the cost of performing such work will be deducted from the Contract Amount to be paid to the Contractor. Any objections to the change in Contract Amount shall be processed as a Claim as required by 13.01.

8.02 SUBCONTRACTING

A. Contractors are responsible for performing the Work required by the Contract Documents. Use of Subcontractors is permitted. However, the use of Subcontractors, material suppliers, equipment suppliers or others to perform portions of the Work does not release the Contractor from any contractual obligation. The Contract Awarded to the Contractor cannot be assigned or transferred to another person without the Owner's written approval.

B. The Contractor shall provide in all of its subcontracts that the Subcontractor, material supplier and equipment supplier shall be bound by the terms and conditions of this Contract.

C. All agreements, subcontracts and purchase orders executed between the Contractor and others for the Project must provide that they are assignable or otherwise transferable to the Owner at the Owner's option, in the event that this agreement is terminated for any reason. If the agreements, subcontracts and purchase orders are not assignable, the Contractor shall be liable for any additional costs incurred by Owner in procuring the same or substitute services, materials, equipment, supplies, or parts.

D. The Contractor shall provide the Owner with copies of all its subcontracts, purchase orders and supply agreements relating to the Work upon request of the Owner within 3 business days of the request.

E. Substitution of Subcontractors shall be in accordance with Oregon law. In addition, substitution of M/W/ESB Subcontractors requires notification to the Owner's Representative, approval of the Purchasing Agent and good faith efforts to acquire a new Subcontractor, as more specifically provided in the Good Faith Effort Specifications, which are hereby incorporated by reference.

8.03 MATERIALS, EQUIPMENT, AND WORK FORCE

The Contractor shall remove from the job any laborer, worker, mechanic, foreman, superintendent or other person who is found to be incompetent or who fails or refuses to perform the work properly. In addition, the Contractor shall remove any person who disrupts the Work by being intemperate, troublesome, or disorderly. If the Contractor refuses to take such actions the Owner's Representative may order the person to be removed and those instructions shall be followed. Replacement of that person is at the Contractor's cost.

8.04 SUBSTITUTION OF MATERIALS AND EQUIPMENT TO BE INCORPORATED INTO THE WORK

A. Whenever a process is designated, or a manufacturer's name, brand or item designation is given, or whenever a process or material covered by patent is designated or described, it shall be understood that the words "or approved Equal" follows that name, designation or description. The Owner does not know, and cannot guarantee, however, that an "Equal" actually exists. If the Contractor submits a Bid assuming that the Owner will approve an Equal, it does so at its own risk, and remains responsible for providing the item specified in the event the proposed substitution is rejected.

B. The Contractor may offer to substitute materials, products, parts or equipment of Equal or better quality and performance from those specified after execution of the Contract. To do so, the Contractor shall submit any and all information to the Owner to show that the proposed substitution is Equal to or better than that specified by the Contract, including any and all information regarding changes to, or coordination with, any other portion of the Work, that may be affected by the substitution.

C. The Owner's Representative has the sole discretion to accept or reject an offer of substitution. If the Owner's Representative accepts the proposed substitution, the Contractor may proceed to use the substituted material, product, part or equipment and incorporate it into the Work. However, acceptance by the Owner's Representative shall not relieve the Contractor from full responsibility for the efficiency, sufficiency, quality and performance of the substitution.

D. No substitutions can be made without written approval of the Owner's Representative. Any cost differential between what was originally specified and what was substituted and any change in Contract Time resulting from the substitution will be reflected in a Change Order executed before the substitution is effective. If no Change Order is executed before the substitution occurs, the parties agree that the substitution had no effect on either the Contract Amount or Contract Time.

E. If the Owner's Representative rejects the proposed substitution the Contractor shall proceed to follow the Contract Documents as originally drafted, without a change in the Contract Amount or Contract Time. Therefore, the Contractor shall not order materials, products, parts or equipment in anticipation of the substitution prior to the time that the offer of substitution is accepted.

8.05 LIMITATION OF OPERATIONS

A. In General - The Contractor shall comply with all Contract provisions and shall:

- 1. Conduct the Work at all times so as to cause the least interference with traffic;**
- 2. Not begin Work that may allow damage to Work already started;**
- 3. Coordinate with Owner and maintain access in all construction operations to minimize conflicts and to facilitate Owner's occupation and normal operation of Owner's facilities.**

B. On-Site Work - The Contractor shall not mobilize equipment onto the Project site or begin On-Site Work until the Contractor has:

- 1. Received Notice to Proceed;**
- 2. An approved Project Work schedule;**
- 3. An approved Traffic Control Plan;**
- 4. An approved Pollution Control Plan;**
- 5. An approved Erosion and Sediment Control Plan;**
- 6. Met the Owner's Representative at the required preconstruction conference, and provided those information required by the Contract Documents.**
- 7. Assembled all materials, equipment and labor so that Work can proceed according; to the Project Work schedule;**
- 8. Completed any other task required by the specifications before On-Site Work begins.**
- 9. An approved Site Specific Safety and Health Plan; and**
- 10. An approved shoring plan (if applicable).**

8.06 PROJECT WORK SCHEDULES

A. An accurate and regularly updated schedule is essential for Owner to monitor progress of the Work. The Contractor shall provide an updated schedule as described herein and in the Contract Documents.

B. A preliminary Construction Schedule shall be submitted by the Contractor at the preconstruction conference, unless requested at a different time by the Owner's Representative. The preconstruction conference is a meeting scheduled by Owner between the Owner and Contractor before work begins to discuss the Project.

C. Within three (3) weeks of receipt of the Notice to Proceed or before starting work, whichever is earlier, the Contractor shall submit for Owner's written review a comprehensive Construction Schedule in the form required by the Contract Documents. If during the course of that review the Owner's Representative notices that the schedule conflicts in some way with the Contract

Documents, that fact will be brought to Contractor's attention. However, failure to catch errors or inconsistencies in the schedule by Owner's Representative shall not relieve the Contractor from having to comply with the Contract Documents, or from finishing the Work within the Contract Time.

D. If it is desirable to carry on portions of the Work in more than one location simultaneously, Contractor shall submit a schedule for each location at least two (2) weeks in advance of that activity, or at such other time as requested by the Owner's Representative.

E. In the event that the Contractor's proposed Construction Schedule does not meet the requirements of the Contract, Contractor shall immediately resubmit a schedule that conforms to the Contract.

F. Schedules must show the proposed sequence of work, state the time required for completion of major tasks, take into account the passage and handling of traffic with the least practicable interference, and the orderly, timely, and efficient prosecution of work. Owner will use the Contractor's schedule to check on the progress of work, to coordinate related activities such as Utility relocation, to ensure adequate inspection resources, and to plan and coordinate surveying and testing.

G. Contractor shall prepare and submit a revised schedule whenever requested by the Owner's Representative or when substantial changes in the sequence, timing, or progress of work require it. The Owner's Representative may request a revised schedule at any time and, if so, Contractor shall provide one within seven (7) Calendar Days of the request.

H. In the event a schedule or revised schedule does not accurately reflect work on the Project or conflicts with requirements of the Contract, the Owner's Representative may direct that the Contractor's work be suspended until satisfactory schedules are provided. The suspension will not entitle the Contractor to additional Contract Time or additional compensation. In addition, the Owner's Representative may withhold part or all of a progress payment until proper schedules and revised schedules are submitted.

I. The Contractor shall meet with the Owner's Representative once a week to discuss the progress of the work. A written schedule for the next two (2) weeks' work will be submitted at that time with particular attention given to the next week's schedule. If the two-week schedule deviates more than one (1) week behind the overall schedule, the Contractor shall resubmit an updated overall schedule that indicates what measures will be taken to get the project completed within the allotted time.

8.07 PRECONSTRUCTION CONFERENCE

The Owner, at its discretion, may hold a preconstruction conference. If so, the successful Contractor will be notified and is required to attend. The Owner's notification will include specific details regarding the date, time, and location of the conference, any need for attendance by subcontractors, and information regarding the items to be discussed.

8.08 CONTRACT TIME TO COMPLETE WORK

A. Contract Time will be expressed in one or more of the following ways:

1. By a calendar date on which the Work shall be completed; or

2. By a given number of Calendar Days.

B. When Contract Time is expressed as a given number of Calendar Days, the date on which it will begin is the first Calendar Day following the date of the Notice to Proceed, unless the Notice establishes a different date.

C. Contractor shall provide the necessary labor, equipment and materials to ensure that work is completed within the Contract Time. If the Contractor does not complete the Work within the Contract Time, Owner is entitled to impose liquidated damages in addition to any other remedies Owner may have under the Contract Documents.

8.09 ADJUSTMENT OF CONTRACT TIME

A. The amount of Contract Time that a Contractor has to complete a Project may be adjusted, but only as specified in this paragraph.

B. The Owner has discretion to decrease the amount of Contract Time if a portion of the Work is eliminated and the amount of remaining work to complete the Project will take less time. The Owner and Contractor shall try to reach an agreement regarding any reduction in Contract Time before the Owner's exercise of discretion.

C. Contract Time will be increased only if three events all occur: 1) the Contractor must encounter one or more excusable delays, and 2) the excusable delay must be shown to have actually affected the overall completion date of the Project, and 3) the Contractor must give the Owner a request for an increase in Contract Time in the manner specified by 13.01.

D. An excusable delay is one that arises from unforeseeable causes that are beyond the control and without the fault or negligence of the Contractor, its Subcontractors and suppliers. Excusable delays alone do not justify an extension of Contract Time unless the two other factors noted in 8.09.C have occurred.

1. Examples of excusable delays include:

a. Act of God, which means a singular, unexpected and irregular visitation of a force of nature such as fire or flood;

b. Act of Public Enemy;

c. Act of Vandalism;

d. Strikes, labor disputes, or freight embargoes which, despite the Contractor's reasonable efforts to avoid, cause a shutdown of the entire Project or one or more controlling operations. A strike or labor dispute may involve a union bargaining with the Contractor, a Subcontractor, supplier or the Owner;

e. Suspension of the work if by written order of the Owner's Representative and the suspension is not because of Contractor's failure or neglect; or

f. Unusually severe weather. Unusually severe weather is weather that is abnormal compared to past weather at the same location for the same time of year, which actually has an adverse impact on critical work and which could not reasonably have been anticipated by the

Contractor. Rain, windstorms, and other natural phenomena for the specific locality of work, which might reasonably have been anticipated from the previous ten years of historical records of the general locality of the work shall not be construed as abnormal or unanticipated. However, it is agreed that rainfall greater than the following cannot be reasonably anticipated:

1) Daily rainfall equal to, or greater than 0.50 inch during a month when the monthly rainfall exceeds the normal monthly average by twenty-five percent or more; or

2) Daily rainfall equal to, or greater than, 0.75 inch at any time.

g. The office of the Environmental Data Service of the National Oceanic and Atmospheric Administration (NOAA) shall be considered the official agency of record for weather information and the closest reporting station nearest the locality of the Work shall be used to measure rainfall and other typical weather conditions.

h. Unreasonable delays caused by actions of the Owner that delay an item of work on the Project. Such delays might stem from errors, changes or omissions in the Plans, quantities or Specifications, Extra Work, and Right-of-Way and access delays if they meet the conditions stated in 8.09.E.

i. The Owner's direction to perform extra work.

2. Examples of delays that are not excusable include:

a. Delays by Subcontractors or suppliers at any tier unless it can be shown that the delay was unforeseeable and not caused by any failure or neglect on the part of the Subcontractor or supplier.

b. Delays that affect the Contractor's planned early completion, but do not affect the specified or adjusted Contract Time;

c. Shortages of materials or equipment if the supplies, services, or equipment were obtainable from other sources in sufficient time to permit the Contractor to meet the required schedule.

d. Inadequacy or late delivery of materials and equipment;

e. Financial difficulties;

f. Lack of knowledge or other inability to perform;

g. Labor problems other than the examples specified in 8.09.D.1.d.;

h. Any requirement that the Contractor use equipment designated by the Owner for the Project ("sole source" equipment);

i. Time used by the Owner that is permitted by the Contract. Examples include the Owner's use of time to review Contractor requests for substitutions, Contractor requests for Proposals and Contractor submittals.

E. As noted above, Right-of-Way and access delays may be considered to be excusable delays. Such delays are excusable delays only if the Contractor's work is actually delayed because of the Owner's failure to make available to the Contractor necessary Right-of-Way for performance of the work, or Owner controlled access to or rights of occupancy of buildings and other properties which the Contractor is required to enter or to disturb under Contract requirements.

8.10 REMEDIES FOR DELAY

A. The parties agree that the occurrence of an excusable delay that delays overall Project completion may not result in additional compensation paid to the Contractor. No additional compensation will be paid to Contractor for excusable delays that are not the fault of either the Contractor or Owner, such as those listed in 8.09.D.1.a through 8.09.D.1.f. In that situation, the Contractor is only entitled to an adjustment of Contract Time.

B. No additional compensation will be paid to Contractor for any time period when the overall Project completion date is delayed as a result of concurrent delay. Delays are considered to be concurrent when the Contractor encounters an excusable delay as defined in 8.09.D.1.h or 8.09.D.1.i, but also has caused its own delay to the Project for the same period of time. In that situation, the Contractor is only entitled to an adjustment of Contract Time for the length of the concurrent delay.

C. Additional compensation will be paid to the Contractor if unreasonable delays caused by the Owner as described in 8.09.D.1.h and 8.09.D.1.i are the sole reason that the overall Project completion date is delayed. No additional compensation is warranted for delay if that delay does not affect the overall Project completion date.

D. When the Contractor is entitled to additional compensation for delay, the compensation shall be calculated as provided in Part 13, as if it were force account work, and only to the extent that the Contractor incurred additional costs for labor, equipment and materials as a result of the delay.

E. All adjustments of Contract Time will be solely for the period of time during which the overall Project completion date was actually delayed.

8.11 TIME IS OF THE ESSENCE

A. Time is of the essence of this Contract - The time allowed to complete the Work will be stated in the Proposal and/or Contract Documents and will be known as the "Contract Time." The Contractor agrees to complete the Work within the Contract Time.

B. Liquidated Damages

1. If the Contractor fails to complete the Work within the original or adjusted Contract Time, the parties agree that Owner will be damaged and that the amount of damage to Owner and to the public will be difficult to determine. Therefore, Contractor agrees to pay the amount of liquidated damages stated in the Contract Documents.

If no liquidated damages are specified, Contractor shall be liable to Owner for whatever damages Owner may actually establish. Liquidated damages will be measured not only by direct losses to the Owner as a result of delay, but intangible losses to the general public such as loss of use.

2. Liquidated damages are assessed for each Calendar Day of delay, including holidays and weekends and shall run until the Project is substantially complete, regardless of whether the Contractor or a replacement Contractor achieves Substantial Completion.

3. Liquidated damages are intended to compensate Owner and the public for Contractor's delay in completion of the Work. The Owner has the right to recover additional damages that are not based solely on delay in addition to liquidated damages, such as the excess costs of procurement or completion, the costs of restoring uncompleted work, and costs paid to other Contractors, or Owner's own employees, to complete the Work.

4. Permitting Contractor to finish the Work, or any part thereof, after the original or adjusted Contract Time has expired, is not a waiver of Owner's rights under the Contract Documents, including Owner's right to recover liquidated or additional damages.

5. Owner may retain liquidated damages from any payment or Retainage due to Contractor. Payment or assessment of liquidated damages does not release the Contractor's obligation to fulfill the entire Contract.

8.12 SUSPENSION OF WORK

A. The Owner has the authority to suspend all, or part of, the work of the Contractor as provided below.

1. The Owner may suspend all or part of the Contractor's work for its convenience for a period of time that the Owner's Representative determines necessary.

2. If suspension occurs for Owner convenience or at the direction of the federal government, as a result of the operation of law, such as an injunction issued by the court or a directive from the federal or state government, Contractor shall be provided an adjustment of Contract Time corresponding to the period of the suspension and shall be reimbursed for its direct costs incurred as a result of the delay and an additional sum based on 10% of the direct costs to compensate for overhead and profit. However, if performance of work would have stopped as a practical matter for other reasons irrespective of Owner convenience, such as unusually adverse weather conditions or other excusable delays noted in 8.09.D, then no additional compensation will be provided.

3. The Contractor is responsible for protecting the work already performed during the period of suspension. It also shall provide temporary protection devices to warn, safeguard, protect and inform traffic and the public during this same time. Costs are recoverable for such measures only if provided in 8.12.A.2.

4. The Owner is also entitled, but not required, to suspend work on the Project if the Contractor has failed or neglected to perform work in the manner required by the Contract or if the Contractor has created any unreasonable risk to safety. Contractor is not entitled to any additional compensation or Contract Time if suspension occurs because the Contractor has failed or neglected to carry out any provision of the Contract.

5. Work shall resume as soon as possible after the Contractor receives written Notice that the Owner has canceled the suspension of work. The Contractor is deemed to have received the Notice if it is mailed, emailed, or sent by facsimile transmission to it.

8.13 TERMINATION OF RIGHT TO PROCEED

A. Termination for Default:

1. The Owner has the right to terminate the Contractor's right to proceed with all or any portion of the Work if the Contractor is found to be in default of its obligations under this Contract. Default will occur if:

a. The Contractor refuses or fails to prosecute the Work or any separate part of the Work, with the diligence that will ensure its completion within the time specified in this Contract including any extension of Contract Time that has been granted;

b. The Contractor fails to construct the Project in accordance with the Plans and Specifications or fails to follow the directions of the Owner's Representative;

c. The Contractor is adjudged as bankrupt or has made a general assignment for the benefit of creditors; or

d. The Contractor fails to comply with other provisions of the Contract Documents or disregards laws and ordinances applicable thereto.

2. If the Contractor is in default, the Owner will notify the Contractor and all of its sureties of its intention of terminating the Contractor's right to proceed with the Work in writing no less than seven days in advance of the date of the actual termination. The Contractor and the sureties are notified if the Notice is sent to the last known address provided to Owner by the Contractor and its sureties. For purposes of computing time in this subsection, the first day counted will be the day that the Notice is mailed or sent by the Owner.

3. When termination occurs, the Owner may take over the Work and complete it, and may take possession of any materials, tools, plant and appliances thereon, as well as all other materials whether on the premises or not, for which the Contractor has received whole or partial payment that are necessary to complete the Work. The Contractor and its sureties shall be liable for any damage to the Owner resulting from the Contractor's default, whether or not the Contractor's right to proceed with the Work is terminated. This liability includes any costs incurred by the Owner in completing the work that exceeds any remaining Contract balance.

4. When termination occurs, the Owner may elect to have the Contractor assign any and all subcontracts and material contracts to Owner or to the Owner's designee, which may be another Contractor. Contractor shall execute such assignments within four Calendar Days of their receipt.

5. Upon termination, Owner will make no further payments to Contractor. Contractor shall receive additional payment for work performed prior to termination only if the cost of completion of the work is less than the Contract balance held by Owner.

6. If, after termination of the Contractor's right to proceed, it is determined that the Contractor was not in default, or that the delay was excusable, the rights and obligations of the parties, including the right to any damages, will be the same as if the termination had been issued for the convenience of the Owner as provided in 8.13.B below.

7. The rights and remedies of the Owner in this Subsection of the Contract are in addition to any other rights and remedies provided by law or under this Contract.

B. Termination for Public Convenience:

1. The Owner may terminate performance of work under this Contract in whole, or in part, if the Owner determines that a termination is in the Owner's interest.

2. The Owner will notify the Contractor and its sureties in writing when it decides to terminate a Contract for convenience no less than seven days in advance of the date of the actual termination. The date of termination, which is the date after which no work shall be performed, shall be stated in the Notice. Notice shall be deemed to have been given if sent to the Contractor's or any Surety's last known address provided to Owner by the Contractor and its sureties. For purposes of computing time in this subsection, the first day counted shall be the day that the Notice is mailed or sent by the Owner.

3. After Receipt of a Notice of Termination, and except as directed by Owner, the Contractor shall immediately proceed with the following obligations:

- a. Stop work by the date as specified in the Notice;
- b. Award no further subcontracts nor place further orders for materials, services, or facilities, except as necessary to complete the continued portion of the Contract, if any;
- c. Terminate all Subcontractors and orders to the extent that they relate to the work terminated;
- d. Assign to the Owner, if directed by the Owner's Representative, all right, title and interest of the Contractor under the subcontracts terminated, in which case the Owner will have the right to settle or to pay any termination settlement proposals arising out of those terminations;
- e. With approval or ratification to the extent required by the Owner, settle all outstanding liabilities and termination settlement proposals arising from the termination of subcontracts; the approval or ratification will be final for purposes of this clause;
- f. As directed by the Owner, transfer title and deliver to the Owner, (a) the fabricated or unfabricated parts, work in process, completed work, supplies and other materials produced or acquired for the work terminated, and (b) the completed or partially completed Plans, drawings, information and other property that, if the Contract had been completed, would be required to be furnished to the Owner;
- g. Take any actions that may be necessary, or that the Owner's Representative may direct, for the protection and preservation of the property related to this Contract that is in the possession of the Contractor and in which the Owner has or may acquire an interest; and
- h. Use its best efforts to sell, as directed or authorized by the Owner's Representative, any property of the type referred to in 8.13.B.3.f above; provided, however, that the Contractor (a) is not required to extend credit to any purchaser and (b) may acquire the property under the conditions prescribed by, and at prices approved by, the Owner's Representative. The process of any transfer or disposition will be applied to reduce any payments to be made by the Owner

under this Contract, credited to the price or cost of the work, or paid in any other manner directed by the Owner's Representative.

4. Upon termination, the Owner will pay the Contractor the following costs as a result of the termination and no other:

a. In regard to the Contract work performed before the effective date of termination, the total (without duplication of any items) of the following costs:

1) The cost of this work, as determined by the method of payment established by the Contract Documents;

2) The cost of settling and paying termination settlement proposals under terminated subcontracts that are properly chargeable to the terminated portion of the Contract if such costs are not included in 8.13.B.4.a.1) above and if the Owner does not have the contracts assigned for the purpose of settlement;

3) A sum as profit on 8.13.B.4.a.1) above, not to exceed 10% of that amount, unless it appears that the Contractor would have sustained a loss on the entire Contract had it been completed. However, no profit is permitted on costs compensated under 8.13.B.4.a.2).

b. The reasonable costs of settlement of the work terminated, including:

1) Accounting, clerical and other expenses reasonably necessary for the preparation of termination settlement proposals and supporting data, except that no Allowance will be made for costs incurred as attorney fees;

2) The termination and settlement of Subcontractors (excluding the amounts of such settlements); and

3) Storage, transportation, and other costs incurred, reasonably necessary for the preservation, protection or disposition of the termination inventory.

5. No other costs other than those allowed in 8.13.B.4 shall be paid. By way of example only, and not by way of limitation, costs that would not be allowed include anticipated profits on unperformed work, consequential damages, post-termination overhead, Bid or Proposal preparation costs, costs for retraining employees, depreciation on idle equipment, cost of common items reasonably usable on the Contractor's other work and costs unrelated to the work performed prior to the date of termination.

6. The Owner may deduct from any sums otherwise due the Contractor under 8.13.B.4 above, the cost of advance payments made to the Contractor under the terminated portion of this Contract, any Claim which the Owner has against the Contractor whether or not arising from this Contract, and the agreed price of, or proceeds of sale of, materials, supplies or other things acquired by the Contractor or sold under the provision of 8.13.B.3.h above, and not recovered by or credited to the Owner.

7. Payment from the Owner is not due until the Contractor has submitted an itemization of its recoverable costs to the Owner in writing, together with supporting documentation. The Contractor shall supply additional supporting documentation upon request by the Owner in order to recover its costs.

8. The Contractor shall maintain all records and documents relating to the termination until the Owner and the Contractor resolve the amount of costs to be paid by the Owner to the Contractor as a result of this termination. Such records shall be made available to the Owner within 30 days of the request.

8.14 SUBCONTRACTOR TERMINATION CLAIMS

A. This Subsection establishes the procedure and provides additional details regarding costs allowed by 8.13.B when a Contractor must terminate subcontracts when its own Contract has been terminated for convenience. It is not applicable if the Contractor assigns its subcontracts to Owner for the purpose of settling or paying termination settlements to those Subcontractors as provided in 8.13.B.3.

B. The Contractor shall reach a binding agreement with the Subcontractor before the Contractor can recover from the amount of the Subcontractor's Claim from the Owner. That agreement shall be reached before the Contractor presents its Claim to the Owner. Contingent agreements with Subcontractors are prohibited.

C. The Owner is only liable for reasonable settlement costs between the Contractor and its Subcontractors. Therefore, if the Contractor has agreed to pay an unreasonable amount to a Subcontractor by way of settlement, the Owner is liable only for reasonable costs incurred in that settlement. Reasonable settlement costs do not include the Subcontractor's anticipated profits on unperformed work or consequential damages, or costs similar to those excluded by 8.13.B.5.

PART 9 - MEASUREMENT OF PAY QUANTITIES

9.01 SCOPE

A. The Owner's Representative will measure pay quantities for accepted Work according to the United States standard measure unless otherwise provided in the Contract. Unless otherwise specified in the Contract, the Owner's Representative will round off all quantity computations using the following convention:

1. The final significant digit will not be changed when the succeeding digit is less than 5.
2. The final significant digit will be increased by one when the succeeding digit is 5 or greater.

B. The measurement provisions contained in the Specifications for each Pay Item will supplement or modify the above convention by:

1. Imposing measurement limitations
2. Describing measurement or computation procedures
3. Giving conversion factors or adjustment conditions
4. Providing for determination of reasonably accurate and representative Pay Item quantities

C. Measurements required or allowed to be made by the Contractor will be subject to the Owner's Representative's verification. The Owner's Representative's decision about measurement is final.

9.02 MEASUREMENT GUIDELINES

A. Unit Basis - Unit will be each, unless otherwise specified in the Contract and will be determined by actual count of units in place.

B. Length Basis - Length will be feet or mile, unless otherwise specified in the Contract and will be determined by measuring the length at least to the nearest 0.1 foot or at least to the nearest 0.1 mile, as applicable, unless otherwise specified in the Contract. Measurements will be limited to the dimensions shown or specified, or as directed by the Owner's Representative.

C. Area Basis - Areas will be square foot, square yard, or acre, unless otherwise specified in the Contract and will be determined by measuring the width and the length (or height) at least to the nearest 0.1 foot and computed at least to the nearest 0.1 square foot, nearest 0.1 square yard, or nearest 0.1 acre, as applicable, unless otherwise specified in the Contract.

D. Weight Basis - Weight will be pound or ton, unless otherwise specified in the Contract and will be determined as follows:

1. Pound - Pound weight will be determined by the net weight identified on the manufacturer's packaged labels, subject to periodic check weighing. Weight by pound will be measured at least to the nearest 1.0 pound unless otherwise specified in the Contract.

Provide a certificate with each shipment together with a certified copy of the weight of each delivery. If the check weight is less than the manufacturer weight by more than 0.4%, the discrepancy will be resolved by the Owner's Representative.

2. Ton - Ton weight will be determined on Contractor-provided scales as specified. Weight by ton will be measured at least to the nearest 0.01 ton unless otherwise specified in the Contract.

If bituminous materials, Portland cement, lime, and similar bulk Materials are shipped by truck or rail, the supplier's shipping invoice with net scale weights, or volumes converted to weights, may be used for Pay Item quantity determination in place of weights determined on the Contractor-provided vehicle scales.

Shipping invoice weights of the supplier's truck or transport shall be subject to periodic check weighing on the Contractor's vehicle scales, or other scales designated, according to 9.03. If the check weight is less than the supplier weight by more than 0.4%, the discrepancy will be resolved by the Owner's Representative.

3. No payment will be made:

- a. For quantities in excess of the supplier weight
- b. When materials have been lost, wasted or otherwise not incorporated into the Work
- c. For additional hauling costs resulting from the checking weight.

E. Volume Basis - Volume will be cubic yard truck measure or in-place measure, gallons, foot board measure (FBM), or thousand foot board measure (MFBM), unless otherwise specified in the Contract and will be measured at least to the nearest 0.1 cubic yard, nearest 1.0 gallon, nearest 0.1 FBM, or nearest 0.1 MFBM, as applicable, unless otherwise specified in the Contract.

Truck measure will be the measured and calculated maximum "water level" capacity of the vehicle. Quantities will be determined at the point of delivery, with no allowance for settlement of Material during transit. When required to facilitate measurement, the vehicle load shall be leveled at the point of delivery. Payment will not be made for Material in excess of the maximum "water level" capacity. Deductions will be made for loads below the maximum "water level" capacity.

When bituminous materials are measured by volume, the volume will be measured at 60 °F or will be corrected to the volume at 60 °F using the correction factors found in the MFTP (ODOT TM 321).

F. Standard Manufactured Items - If standard manufactured items, such as fence, wire, plates, rolled shapes, pipe, conduit and other similar items are specified in the Contract by properties such as gage, unit weight, or section dimensions, the manufacturing tolerances established by the industry involved will be accepted unless more stringent tolerances are cited in the Contract.

G. Time Basis - Time will be hour, Day, or year, unless otherwise specified in the Contract, and will be measured to at least the nearest 0.5 hour, nearest 1.0 Day, or nearest 1.0 year, as applicable, unless otherwise specified in the Contract.

H. Lump Sum Basis - Lump sum, when used, means the Work described shall be completed and accepted without measurement unless changes are ordered in writing by the Owner's Representative. If estimated quantities of the Work to be performed are listed in the Contract Documents, they provide only a basis for adjusting payment amounts. Estimated quantities are approximate only, and are made from a reasonable interpretation of the Plans and Specifications. Computations based on the details and dimensions shown on the Plans or Specifications are not guaranteed to equal estimated quantities.

If the Owner issues no Change Order, the Owner will make no pay adjustment for quantities based on the Contractor's computations that overrun or underrun the estimated quantities.

If the Owner issues Change Orders for changes in the Work, the Owner's Representative will measure such changes according to the standards set by 11.02 to determine adjustment of payment.

PART 10 - PAYMENT

10.01 SCOPE AND LIMIT

A. General:

1. The Contractor shall be paid the Contract Amount for performing the Work.
2. The Contract Amount for Lump Sum Contracts is the amount bid by the Contractor for performing the Work, as changed by any authorized Change Orders.
3. The Contract Amount for Unit Price Contracts is determined by multiplying the final bid item quantities by the Unit Prices bid by the Contractor, as changed by any authorized Change Orders.
4. The Contract Amount for Contracts using a combination of Unit Prices and Lump Sum prices is determined by adding together the amount bid by the Contractor for the Lump Sum items with the amount determined for the Unit Price items, as noted in 10.01.A.3 above, as changed by any authorized Change Orders.
5. The Contract Amount is full compensation for furnishing all materials, Incidental Work, equipment, tools, labor and incidentals necessary to perform the Work in a complete manner in compliance with the Contract Documents, and for risk, loss, damage or expense arising from the nature or prosecution of the Work or from the action of the elements. In addition, the cost of Bonds, insurance and compliance with all legal requirements for the Project are included within the Contract Amount.
6. Any work required to be performed by the Contract Documents for which no Pay Item is established shall be considered Incidental and no separate measurement or payment will be made for that work.

10.02 CHANGES TO PLANS OR CHARACTER OF WORK

A. Unless changes and alterations in the plans, or quantities or details of construction materially change the character of the work to be performed or the unit costs thereof, the Contractor shall accept as payment in full, so far as Contract Pay Items are concerned, payment at the same Unit Prices as are provided under the Contract for the accepted quantities of work done.

B. In contracts based on Unit Price, changes in quantities do not entitle the Contractor to a change in compensation, unless the final quantities are 125% or more, or 75% or less than the quantities estimated in the bid documents for a major item of work. A "major item of work" is one that, under the original Contract, has a value greater than 5% of the Contract Amount. In that event, the Contractor shall be paid as follows:

1. In the event that the quantities encountered are 125% or more, the Contractor shall be paid at the unit cost bid for all quantities up to 125%. For all additional quantities the Contractor shall be paid a fair and equitable price as determined by the Owner's Representative.

2. In the event that the quantities encountered are 75% or less, the Contractor shall be paid a fair and equitable price as determined by the Owner's Representative.

C. In the event that the Contractor disagrees with any decision of the Owner's Representative regarding changes to compensation it shall file a claim in the manner required by 13.01.

10.03 PROGRESS PAYMENTS AND RETAINED AMOUNTS

A. The Owner will pay the Contractor the Contract Amount for the Work. See Part 5 regarding the Owner's Representative's authority.

1. The Contractor shall submit to the Owner's Representative a Schedule of Values allocating costs to various portions of the Work, prepared in such form and supported by such data to substantiate its accuracy as the Representative may require. This Schedule, unless objected to by the Owner's Representative, shall be used as a basis for reviewing the Contractor's applications for payment.

2. The Owner's Representative may reject any portion of any Schedule of Values that is reasonably believed to not reflect an accurate estimation of costs and substitute a fair estimate. Rejection of any part of the Schedule of Values does not change any subcontract amount entered into by the Contractor. Failure to object to any portion of the Schedule of Values is not an indication that the Owner's Representative agrees that the costs listed are accurate. Instead, the Schedule is used only for the purpose of making payments.

3. When the Contractor is required to provide equipment as well as training or testing of the equipment, the Contractor shall list the equipment and the training or testing of that equipment separately on the Schedule of Values.

B. The Contract Amount shall be full compensation for all work on the Project of whatever nature, including all Incidental Work, such as, but not limited to, formwork, falsework, shoring, and cribbing that is necessary to perform the work. In Unit Price Contracts, no payment will be made for Incidental Work until the work for which the Incidental Work is required is in place or has been completed. If the Contract Amount is based on a Lump Sum and only a portion of the Work for which payment is made has been completed, then only a portion of the cost of the Incidental Work will be paid.

C. The cost of Bonds and insurance are recoverable as part of the Contractor's Mobilization costs if the Contract Documents or an approved Schedule of Values provide for a separate payment for Mobilization. Otherwise, no separate payment is made for such costs.

D. The Contractor shall comply with ORS 279C.845 and submit certified payroll forms as required by the Oregon Bureau of Labor and Industries and shall ensure all Subcontractors do the same.

1. Pursuant to ORS 279C.845(7), the Owner will retain 25% of any amount earned by the Contractor on this public works project until the Contractor has filed the certified statements required by law. The Owner will pay to the Contractor the amount retained under this section within 14 Days after the Contractor files the required certified statements, regardless of whether a Subcontractor has failed to file certified statements. The Owner is not required to verify the truth of the contents of certified statements filed by the Contractor under this section.

2. Pursuant to ORS 279C.845(8), the Contractor shall retain 25% of any amount earned by a first-tier Subcontractor on this public works project until the first-tier Subcontractor has filed with the Owner the certified statements required by law. Before paying any amount retained under this subsection, the Contractor shall verify that the first-tier Subcontractor has filed the certified statement. Within 14 Days after the first-tier Subcontractor files the required certified statement the Contractor shall pay the first-tier Subcontractor any amount retained under this subsection. Neither the Owner nor the Contractor is required to verify the truth of the contents of certified statements filed by a first-tier Subcontractor under this section.

10.04 MID-MONTH PAYMENT

A. The Owner will pay the Contractor two times per month on this Project as set forth below. Because Owner wants to ensure that Subcontractors are paid amounts owed in a timely fashion, Contractor is required to make payments to its Subcontractors twice per month as well. Contractor has no discretion to only accept one payment per month to avoid this obligation.

1. On the 15th of each month, or on the next work day, the Contractor shall submit a good faith Estimate of the value of the work performed that was not included within the Contractor's previous progress payment, if any. The Contractor's Estimate shall be calculated in the manner otherwise established by the contract documents, whether that is based on Unit Prices, lump sum amounts, a Schedule of Values, a combination of these methods or otherwise.

2. The Owner may either approve the Contractor's Estimate or prepare its own Estimate of the work performed if the Contractor fails to prepare one on time or the Contractor's submission appears to be incorrect. Thereafter, Owner will pay Contractor an advance payment based on the Contractor's Estimate or the Owner's estimate. Owner may withhold money from the advance for any of the reasons specified in 10.07 below. The Owner is not required to pay for any portion of the Work that is disputed.

3. The "mid-month" or advance payment will be taken into account and deducted from any amount otherwise due the Contractor on the end of the month progress payment, or any subsequent advance payment or progress payment.

4. Because the payment is an advance not otherwise required by law, the Contractor agrees that the only dispute about the amount of the advance payment is whether the Owner prepared its own Estimate in good faith. The Contractor acknowledges the advance payment is simply a rough estimate made for the purpose of providing the Contractor and its subcontractors with funds in advance of the progress payment and is not intended to represent the exact amount owed.

5. The Owner's Representative may request additional documentation from the Contractor to verify any Estimate submitted or may instead calculate the Owner's own Estimate. If requested, Contractor shall provide documentation to establish its Estimate within 3 working days. Failure to provide additional documentation when requested precludes any dispute whether the amount of the Owner's Estimate was calculated in good faith.

6. Owner has discretion not to make an advance payment if the amount of work performed by the 15th of any month is \$5000 or less, or if there is a chance that the advance payment might exceed the remaining amounts due the Contractor under the Contract.

7. Because the mid-month payment is an advance on the monthly progress payment, no interest is due on the advance payment until the time when interest would otherwise be due under the progress payment.

8. Within 10 Calendar Days from the date that any payment is sent by Owner to Contractor, Contractor shall pay its Subcontractors for work performed during the period covered by the Application for Payment regardless if the Subcontractor agrees to some different schedule. The Contractor is required to take all necessary good faith actions to ensure that it makes payment

to its Subcontractors. In the event of a dispute, the Contractor shall pay the portion not in dispute and timely resolve the amount that is in dispute.

9. Upon request from Owner, Contractor shall inform Owner of the portion of any advance payment owed to any of its Subcontractors.

10. Nothing in 10.04 requires the Contractor to pay its Subcontractors for any portion of the Work that is disputed or which otherwise would not be eligible for payment.

10.05 MONTHLY PROGRESS PAYMENT

A. In addition to the mid-month payment described in 10.04, Contractor will be paid a monthly progress payment as described in more detail in 10.03.B and 10.03.C. To receive a monthly progress payment, the Contractor first shall estimate the work performed in any calendar month and submit an invoice to the Owner's Representative for approval before the fifth day of the following month based on the estimate. The invoice shall include the value of labor performed and materials incorporated into the project since the work began or the last invoice, whichever is applicable. The estimate may be an approximation of the work, labor and materials provided, but should bear a reasonable relationship to the entire contract amount due once the project is completed.

B. Where the invoice is filled out incorrectly, or where there is any defect or impropriety in any submitted invoice or when there is a good faith dispute, the Owner's Representative will so notify the Contractor within 15 days stating the reason or reasons the invoice is defective or improper or the reasons for the dispute. A defective or improper invoice, if corrected by the Contractor within seven days of being notified by the Owner, shall not cause a payment to be made later than 30 days after receipt of the original invoice from the Contractor or 15 days after the payment is approved by the Owner's Representative, whichever is the earlier date.

C. The Owner's Representative will approve of payment to the Contractor depending on how costs are calculated in the contract documents.

1. If the Contract Documents establish Unit Prices to accomplish various portions of the Work, the Unit Prices shall be used to determine payment.

2. If the contract documents establish a lump sum for the performance of the Work, payment will be made in accordance with any Schedule of Values submitted by the Contractor and approved by the Owner. If no Schedule of Values was submitted, or if a Schedule of Values is submitted by the Contractor that does not fairly reflect the cost of the work to be performed, the Owner's Representative will determine a fair and equitable payment based on the percentage of work performed compared to the entire contract.

3. If the contract documents establish a lump sum for a portion of the Work and Unit Prices for other portions of the Work the Owner's Representative will approve of payment utilizing both methods (1) and (2) established above.

4. The monthly progress payment invoice shall deduct any payments made by the Owner as an advance payment as explained in 10.04.A and 10.05.A above.

D. Notwithstanding the provisions above, progress payments on Local Improvement District (LID) Contracts shall be made in accordance with the state law, the Contract Documents and City Code.

10.06 ADVANCE PAYMENT FOR MATERIALS

A. The Owner's Representative has discretion, but is not required, to approve payments to the Contractor of up to 85% of the total bid item price for materials and equipment that will be incorporated into the Work that are not yet incorporated if the following conditions are met:

1. The value of the materials or equipment shall be greater than \$5,000;

2. The Contractor submits bills of sale or other documentation satisfactory to Owner establishing the Contractor's proof of payment and title to the materials or equipment and the materials are free and clear of liens, claims, security interests or other encumbrances. When payments are made, the Contractor guarantees that title to all materials and equipment covered by a progress payment, whether incorporated in the Project or not, will pass to the Owner upon receipt of such payment by the Contractor, free and clear of all liens, claims, security interests or encumbrances;

3. The Contractor shall protect the Owner's interest in the materials or equipment, including applicable insurance and transportation to the site. In no event shall payment for such materials require the Owner to pay for replacement materials if the original materials or equipment for which payment was made are damaged or destroyed prior to their incorporation into the Work. By submitting a request for payment, the Contractor accepts full responsibility to continue to protect the stored materials and equipment from the elements and against loss or damage;

4. The materials or equipment meet Contract requirements, proof that the materials or equipment conform to Contract requirements has been provided to Owner, are in a form ready for incorporation into the Project and are clearly marked and identified as being specifically fabricated, produced and reserved for use on the Project; and

5. The Materials shall have been delivered and/or acceptably stored or stockpiled in accordance with the Specifications and as follows:

a. At the Project Site;

b. On Owner property;

c. On property in the State of Oregon on which the property owner has authorized storage in writing. The written authorization must allow the Owner to enter upon the property and remove Materials for at least six months after completion of the Project. The Contractor shall furnish a copy of the written permission to the Owner; or

d. On property outside the State of Oregon on which the property owner has authorized storage in writing, provided that such storage location is allowed by the Contract Documents or authorized in writing by the Owner's Representative.

The permit must allow the Owner to enter upon the property and remove Materials for at least six months after completion of the Project. The Contractor shall furnish a copy of the written permission to the Owner.

10.07 RETAINAGE AND WITHHELD AMOUNTS

A. The Owner has discretion to withhold amounts from any progress payment otherwise due the Contractor if it receives claims for damages or costs from third parties as a result of the Contractor's operations and the Owner determines such withholding is necessary to protect the Owner's interests. Such withholding may continue until the claim is resolved.

B. The Owner may retain and hold back up to 5% of amounts otherwise due the Contractor as "Retainage." Retainage will be held and paid to the Contractor as part of the Final Payment of the Contract Amount. Alternatives to cash retainage, if approved by owner, shall be permitted by ORS 279C.560.

Progress payments on Local Improvement District (LID) Contracts shall be made in accordance with the state law, the Contract Documents and City Code.

C. The Owner's Representative may disapprove a payment previously made, withhold money from a future progress payment, or disapprove of an invoice submitted by the Contractor in whole or in part, if:

1. The Work has not progressed to the point indicated by the Contractor's submittal;
2. Defective, unsatisfactory or improper work is discovered;
3. The Contractor fails to make payments to employees, Subcontractors and suppliers as required by the Contract;
4. The Contractor violated material terms and conditions of the Contract that remains to be remedied;
5. The Contractor performed unsatisfactory work for which payment was sought;
6. The Owner has a monetary claim against the Contractor that the Contractor has not yet paid;
7. Failure to submit any of the following items required by the Contract: Construction Schedule, Revised Work Schedule, Record Drawing Set, or Operations & Maintenance Manual;
8. The Contractor was exceeding the limits of Work Specified, or other work limits specified by the Contract; or
9. The Contractor owes liquidated damages to the Owner.
10. The Contractor fails to submit certified payrolls per 10.03.D.

D. The Contractor is not entitled to interest on money purposely withheld for any of the reasons specified in 10.07.C above.

E. Progress payments reflect the Owner's Representative's best judgment about payment at the time payment is made. Such payments, however, do not constitute acceptance of the Work.

F. The Contractor shall provide the Auditor's Office with a list of personnel authorized to receive Contract payments. No payment will be released to an unauthorized person. In addition, no payment will be made if the estimate submitted by the Contractor is less than \$1,000, unless approved in advance by the Owner's Representative.

G. If the Contractor fails to make timely advance payments or progress payments to its Subcontractors, the Owner is entitled to take any action permitted by law, including, but not limited to, the following:

1. Withhold all or a part of any progress payment until Contractor makes payment;
2. Impose liquidated damages in the amount of \$250 per day for each day that the payment is delayed by acts or omissions of the Contractor. Owner is paying Contractor to administer this Contract, to supervise the Work and to ensure that the Work is not hindered by poor relationships between Contractor and its Subcontractors. Owner has found that a failure to promptly pay Subcontractors causes complaints to be registered with Owner, and requires Owner to devote unnecessary time, resources and personnel to such matters. The parties mutually agree that it would be difficult, if not impossible, for Owner to determine the amount of damage caused to it by such actions, and that the amount of liquidated damages noted above is a reasonable amount and not a penalty;
3. Find the Contractor is not a "responsible bidder" as that term is used in Oregon law;
4. Pay the Subcontractor who has not received proper payment directly; and
5. Terminate the Contract for Default as provided in 8.13.A.

10.08 FINAL PAYMENT

A. The Contractor shall notify the Owner's Representative in writing when it considers that all the work required by the Contract Documents is complete or is Substantially Complete. The Notice must be more than an invoice that requests the balance of the Contract Amount. Instead, the Notice shall plainly call to the Owner's attention the Contractor's belief that all work has been completed in accordance with the Contract. Retainage does not have to be returned to the Contractor until all work required by the Contract is complete.

B. Within 15 days of receipt of the Notice, the Owner's Representative will carry out a final inspection and will take one of the following actions:

1. Determine the Work is complete and prepare and forward to the Contractor a Certificate of Completion to be signed by the Contractor.
2. Determine that the Work is Substantially Complete and provide the Contractor with a Punch List of items that remain to be corrected and completed.
 - a. The Contractor is required to proceed promptly to complete the Punch List of items remaining. If the Contractor fails to do so within 30 days or such other time as may be allowed by the Owner's Representative, the Owner may terminate any further services of the Contractor under the Contract, complete the items remaining to be completed or corrected with the Owner's own forces or by hiring another Contractor to perform the punch list work. Costs of performing the Punch List work shall be deducted from any payments otherwise due the

Contractor. If Owner has hired an Architect or Engineer to assist it on the Project, the Contractor shall pay costs for the Architect or Engineer's services if more than one inspection of the work is required because remaining portions of the Work are incomplete.

b. When the Contractor believes the Punch List items have been corrected and completed, the Contractor shall again notify the Owner's Representative that all the work required by the Contract Documents is completed and the Owner's Representative will again take the actions referenced in 10.08.B.1 or 10.08.B.2; or

c. If the work is not complete despite the Contractor's Notice that the punch list items are complete, and Owner has hired an Architect or Engineer to assist it on the Project, Contractor shall pay costs for the Architect or Engineer's services if more than two inspections of the Work are required because the punch list remains incomplete.

d. Upon Substantial Completion, the Owner will be responsible for utilities, insurance, security, maintenance and damage to work caused by Owner's agents and employees unless otherwise provided in the Certificate of Substantial Completion. Contractor remains responsible for damage to work caused by its Subcontractors, agents and employees during the performance of punch list work

e. Warranties for products and services provided by the Contractor shall commence upon issuance of the Certificate of Substantial Completion, unless otherwise provided by the Contract Documents or agreed to in writing by the Owner's Representative.

3. Determine the Work is neither complete nor Substantially Complete and provide the Contractor with a Deficiency list of items that remain to be corrected and completed. When all such items have been corrected and completed, the Contractor shall again notify the Owner's Representative that the Work is complete or Substantially Complete.

4. In the event the Contractor does not notify the Owner, but the Owner determines the Work is complete or Substantially Complete, the Owner may, but is not required to, notify the Contractor of its determination. If so, the Owner will notify the Contractor and the Contractor shall proceed with either the completion of the Punch List items noted above or shall sign the Certificate of Completion in the same manner and within the same time as that stated in 10.08.B.1 and 10.08.B.2.

C. If the Contractor disagrees with the Owner's conclusion that the Work is not Substantially complete, the Contractor nevertheless shall perform the work that the Owner believes is required by the Contract. If the Contractor then believes that the performance of such work entitles it to additional compensation, additional Contract Time, or both, it shall follow the requirements of 13.01. After performing the work that the Owner believes is required by the Contract the Contractor shall then again provide the Notice required by 10.08.A regarding the completion of work.

D. Following preparation of the Certificate of Completion, the Owner's Representative will send it to the Contractor for the Contractor's signature.

After return of the Certificate, the Owner's Representative will submit it, together with the estimate of the Final Payment due to the Contractor for ultimate acceptance of the Project. After acceptance, the Contractor shall be paid within 30 days.

E. Invoices submitted by the Contractor to the Owner during the course of the Project are made to receive progress payments and are not binding on the Owner. In the event that any previous Invoice is discovered to be inaccurate, any resulting overpayment or underpayment to the Contractor may be corrected in the next payment or the Final Payment. Corrections of overpayments or underpayments between the Contractor and any Subcontractor or supplier are the sole responsibility of the Contractor.

F. The Final Payment shall be the difference between the Contract Amount, as adjusted by any authorized Change Orders, and the sums of all payments previously made, plus any Retainage held by the Owner.

1. The Owner may deduct against any progress payment, including the Final Payment, any amount previously paid to the Contractor in error or any other amount owed to the Owner for any reason resulting from the Contractor's work under the Contract.

2. If the work under the Contract is designated as one for a Local Improvement District Project (LID), Retainage will not be released until the conclusion of the assessment hearings and the adoption of an assessment ordinance as provided in City Code.

3. If the Owner declares a default of the Contract and the Contractor's Surety fulfills its responsibility to ensure completion of the Work, then the Contractor agrees that all progress payments not yet made and all Retainage held by the Owner shall be paid to the Surety and not to the Contractor.

4. ORS 279C.845 requires the Contractor or Contractor's surety and every subcontractor or subcontractor's surety to file certified statements with the Owner in writing certifying various matters regarding the hourly rate of wage paid each worker and that no worker has been paid less than the prevailing rate of wage or less than the minimum hourly rate of wage specified in the Contract. If the Contractor fails to file these certified statements, the Owner is required by law to retain 25% of any amount earned by the Contractor until the Contractor has filed the statements. The Owner will follow the requirements of ORS 279C.845 as if fully set forth herein.

G. Acceptance of the Work will not occur until the Contractor provides the Notice referenced in 10.08.A, signs and submits the Certificate of Completion referenced in 10.08.B signs and submits the Acknowledgement Form referenced in 10.08.H, submits the Warranty Bond referenced in 5.15 and all other documents required by the Contract, the Owner's Representative presents a report recommending acceptance to the Owner and that report is approved. Thereafter, Final Payment will be made within 30 days.

H. At the conclusion of the Work, and as a condition of Final Payment, the Contractor shall sign an Acknowledgement Form:

1. Acknowledging payment of sums previously paid to the Contractor except for Final Payment; and

2. Releasing all monetary Claims against the Owner other than the receipt of Final Payment.

However, if the Contractor has submitted a Claim to the Owner pursuant to 13.01, the Contractor may state that a Claim has been submitted, and not yet resolved. If that occurs, no waiver of the Claims stated on the form will be deemed to have occurred. However, all Claims not specifically referenced on the form will be deemed to have been waived; and

3. Certifying that:

a. All amounts due for labor, materials and other obligations due to the Contractor's own workers, its Subcontractors and suppliers have been fully paid in accordance with Oregon law, Chapter 279C, except for amounts that might be due upon Final Payment or if a Claim submitted pursuant to 13.01 that is specifically referenced on the form is later paid by the Owner in whole or in part; and

b. If there are outstanding claims against the Contractor from any person, including the Owner, that are disputed by the Contractor that such claims are payable by its Performance and Payment Bond, its insurance carrier, or by the Contractor itself.

4. At the conclusion of the Work, the Owner will provide the Contractor the Acknowledgement Form. If the Contractor fails to return the Acknowledgement Form, the Owner will send the Acknowledgement Form to the Contractor via certified mail. If the Contractor still fails to return the Acknowledgement Form within 30 days from the date of the mailing, such failure shall be deemed to serve as:

a. An acknowledgement that all payments are correct; and

b. A waiver of any future right to claims in respect to the Contract, except for claims that have already been submitted by the Contractor pursuant to 13.01.

PART 11 - PAYMENT FOR EXTRA WORK

11.01 GENERAL

A. Compensation may be adjusted if the Contractor performs Extra or changed Work. All adjustments to compensation will occur through a written Change Order. The Change Order may be the result of mutual agreement between the Owner and Contractor or, in the absence of agreement it may be the result of the application of the force account payment provisions found in Part 12.

B. Compensation is not adjusted if the Contractor receives a Field Order, as described in 4.02.

11.02 CHANGE ORDERS

A. The only authorized method for increasing or changing the amount of compensation, increasing the amount of Contract Time or changing the scope or work to be performed is through the execution of a written Change Order. Change Orders must be executed before the work is performed, unless the work has been performed on a Force Account basis pursuant to Part 12.

B. The Contractor's signature on the Change Order signifies the Contractor's agreement that the additional compensation stated on the Change Order is the total amount of compensation due to the Contractor for all costs, whether labeled as direct, indirect, "impact" or otherwise, and that the total amount of additional Contract Time, if any, is the total amount of additional Contract Time resulting from the changed or Extra Work. When signed by the Contractor, the

Change Order represents an accord and satisfaction regarding the changed or Extra Work and precludes the Contractor from seeking any additional compensation or Contract Time.

C. If the Contractor performs Extra Work and additional compensation is due, but the Contractor and Owner disagree about the amount of compensation that is due or any Contract Time that might be changed, the Owner may issue a unilateral Change Order. A unilateral Change Order is not signed by the Contractor. This permits Owner to pay Contractor what the Owner believes is due, and does not prejudice the right of the Contractor to file a Claim pursuant to 13.01 for additional compensation or Contract Time. However, if after evaluation of the Contractor's Claim and documentation the Owner believes that it paid an incorrect amount or granted an inappropriate amount of Contract Time, the Owner may readjust the unilateral Change Order, either for or against the Contractor as necessary.

PART 12 - PAYMENT FOR FORCE ACCOUNT WORK

12.01 GENERAL

A. The materials, equipment, and labor rates agreed upon in this Subsection apply only to extra work ordered by the Owner's Representative to be performed on force account basis. These rates do not apply to any other work performed under the Contract. The rates and markups listed acknowledge the Owner's Representative's authority to control and alter the materials, equipment, and labor used and to determine the time of execution of the ordered extra work.

B. If extra work is ordered to be done on force account basis, the Owner's Representative will record, on a daily basis, the materials, equipment, labor, and special services used for the force account work during that day. Records will be kept on approved forms. The Contractor and the inspector shall sign the form daily to indicate agreement on the materials, equipment, labor, and special services used for the work involved on that day. The Daily record will include:

1. Materials actually used in the Work as directed by the Owner's Representative except those furnished and paid under rental rates for use of equipment. See 12.02.

2. Equipment that the Owner's Representative considers necessary to perform the work. Equipment hours will be recorded to the nearest quarter hour. See 12.03.

3. Labor, including equipment operators and supervisors in direct charge of the specific operations while engaged directly on the force account work. See 12.04.

4. Special services performed by a specialist, if the Owner's Representative and Contractor agree that the Contractor's or subcontractor's forces cannot satisfactorily perform an item or service. See 12.03.L.

C. The Contractor shall supply Owner with all documentation necessary to substantiate any claim for payment. Owner is not required to pay Contractor for any amount that is not supported by documentation sufficient to establish entitlement to payment.

12.02 MATERIALS

A. The Contractor will be paid for materials actually used in the extra work, except for those furnished and paid for under rental rates included with the use of equipment. Payments will be at actual cost, including transportation costs to the jobsite, from the supplier to the purchaser, whether the purchaser is the Contractor, subcontractor, or other forces. All costs are subject to the provisions of this entire subsection.

B. If a commercial trade discount is offered or available to the purchaser, it shall be credited to the Owner, even though the discount may not have actually been taken. The Owner will not take any discounts for prompt or early payment, whether or not offered or taken.

C. If materials cannot be obtained by direct purchase from and direct billing by the supplier, their cost shall be considered to be the price billed to the purchaser less commercial trade discounts, as determined by the Owner's Representative, but not more than the purchaser paid for the material. No markup other than actual handling costs will be permitted as an actual cost.

D. If materials are obtained from a supply or source wholly or partly owned by the purchaser, the cost shall not exceed the price paid by the purchaser for similar materials furnished from that source on contract items or the current wholesale price for the materials delivered to the jobsite, whichever is lower.

12.03 EQUIPMENT

A. Equipment Payment – Equipment approved by the Owner's Representative to perform the work will be eligible for payment at the established rates only during the hours it is operated or on standby as ordered by the Owner's Representative. Equipment hours will be recorded to the nearest quarter hour. Except as modified by these provisions, equipment use approved by the Owner's Representative will be paid at the rental rates given in the Rental Rate Blue Books for Construction Equipment referenced in the Contract Documents.

B. Equipment Billing Form - On the billing form for equipment costs, list for each piece of equipment and its attachments the information needed by the Owner's Representative to determine the proper rental rate from the Blue Book.

C. Rental Rate Formula – The Rental Rate Formula for Contractor Owned Equipment Without Operators: Rental Rates for equipment without operators will be paid on an hourly basis for the machine and for attachments according to the following formula:

$$\text{Hourly Rate} = \frac{\text{Monthly Base Rate} \times \text{Rate Adjustment Factor}}{176 \text{ hours/month}} + \text{Hourly Operating Rate}$$

The terms used above are defined below:

1. Monthly Base Rate - The monthly base rate used above for the machine and for the attachments represents the major costs of equipment ownership, such as depreciation, interest, taxes, insurance, storage, and major repairs.

2. Rate Adjustment Factor - The rate adjustment factor used above will be determined as defined in the Rental Rate Blue Books.

3. **Hourly Operating Rate** - The hourly operating rate used above for the machine and for attachments represents the major costs of equipment operations, such as fuel and oil, lubrications, field repairs, tires, or ground engaging components, and expendable parts.

D. **Attachments** - Some attachments are considered "standard equipment" and are already included in the monthly base rate for the machine. That information can be obtained from the Blue Book publisher. The terms used above are defined below:

E. **Limitations** - The "Regional Adjustment Factor," usually found on page 1 of each Blue Book section, will not apply.

F. **Multiple Attachments** - If multiple attachments are included with the rental equipment, only the attachment having the higher rental rate will be eligible for payment, provided that attachment has been approved by the Owner's Representative as necessary to the force account work.

G. **Small Tool Rental** - Rental will not be allowed for small tools that have a daily rate less than \$5 or for unlisted equipment that has a value of \$400 or less.

H. **Equipment Condition** - The above rates apply to approved equipment in good working condition. Equipment not in good working condition, or larger than required to efficiently perform the work, may be rejected by the Owner's Representative or accepted at reduced rates.

I. **Moving Equipment** - When necessary to obtain equipment from sources beyond the project limits exclusively for force account work, the actual cost to transfer the equipment to its work site and return it to its original location will be allowed as an additional item of expense.

1. Move-in and move-out allowances will not be made for equipment brought to the project for force account work if the equipment is also used on contract item or related work. If the move-out destination is not to the original location, the payment for move-out will not exceed the payment for the move-in.

2. If the move is made by common carrier, the allowance will be the amount paid for the freight. If the equipment is hauled with the Contractor's own forces, rental will be allowed for the hauling unit plus the hauling unit operator's wage. If equipment is transferred under its own power, the rental will be 75% of the appropriate hourly rate for the equipment, without attachment, plus the equipment operator's wage.

J. **Standby Time**

1. If ordered by the Owner's Representative, standby time will be paid at 40% of the hourly rate established above, excluding the hourly operating rate. Rates for standby time that are calculated at less than \$1 per hour will not be paid. Payment will be limited to not more than 8 hours in a 24-hour period or 40 hours in a 1-week period.

2. If a rate has not been established in the Blue Book, the Contractor may use the rate of the most similar model found in the Blue Book, considering such characteristics as manufacturer, capacity, horsepower, age, and fuel type if approved by the Owner's Representative; request the Blue Book publisher to furnish a written response for a rental rate on the equipment, which shall be presented to the Owner's Representative for approval; or request the Owner's Representative to establish a rental rate.

K. Outside Rental Equipment:

1. If Contractor or subcontractor-owned equipment is not available, and equipment is rented from outside sources, payment will be based on the actual paid invoice. If the invoice specifies that rental rate does not include fuel, lubricants, field repairs, and servicing, an amount equal to the Blue Book hourly operating cost may be added for those items which were excluded. The Owner is only obligated to pay the reasonable rental value of the equipment, even if the actual cost to Contractor exceeds that amount. Therefore, Owner may reduce the payment when the invoice amount plus allowance is higher than the amount that would have resulted as specified in 12.03.B through 12.03.H.

2. Equipment not approved by Owner for use in advance of performing the work will be paid by using rates for the least expensive equipment that will accomplish the work or utilizing the applicable Blue Book rates established above.

3. Equipment having a value of \$400 or less will be considered to be tools or small equipment and no rental will be allowed on those items, unless they are not normally on the work site and must be rented from others. If so, then 12.03.C above will apply.

L. Outside Rental Equipment with Operator:

1. The use of equipment rented with operators will be permitted only if the following requirements are met:

a. The Contractor has submitted a written request accurately describing the service to be provided, its estimated cost and the estimated duration. The request must be approved by the Owner's Representative before the service is provided.

b. The service is limited to:

i. Truck hauling of material; or

ii. Performing minor, incidental, short duration work under the direct supervision of the Contractor or subcontractor with equipment not normally owned, leased, or operated by the Contractor, or equipment that is temporarily unavailable to the Contractor.

2. In addition, the Contractor shall furnish the Owner's Representative with a copy of the rental agreement or purchase order covering the service provided. The Contractor shall make certain that the provider of the approved services submits payrolls as required by law and complies with applicable contractor provisions. The service provider will not be considered as a subcontractor under this Contract. If at any time the Owner's Representative determines that the service provided by rented, operated equipment is not minor, incidental, short duration work, any previous approval will be revoked, and the Contractor shall execute a subcontractor agreement with the service provider and then submit it for approval to the Owner's Representative. Failure to execute a subcontract in such situations will be cause for removal of the service provider from the project.

12.04 LABOR

A. For all labor, including equipment operators and supervisors in direct charge of the specific operations while engaged directly on force account work, the Contractor will be paid:

B. The actual wages paid to laborers and supervisors, if those wages are paid at rates not more than those for comparable labor currently employed on the project, or at the recognized, current, prevailing rates in the locality of the project. The Owner has no duty to pay rates higher than those stated above.

C. The actual cost of industrial accident insurance, unemployment compensation contributions, payroll transit district taxes, and social security for old age assistance contributions incurred or required under statutory law and these specifications. The actual cost of industrial accident insurance is the National Council on Compensation Insurance (NCCI) rate for the assigned risk pool for the appropriate work class multiplied by the experience modification factor for the Contractor.

D. The actual amount paid to, or in behalf of, workers by reasons of subsistence and travel allowances, health and welfare benefits, pension funds benefits, or other benefits when such amounts are required by collective bargaining agreement or other employment contract generally applicable to the classes of labor employed on the work.

E. The Contractor shall provide the Owner with the names, identification, and classification of all workers, their hourly rate of pay, hours worked, and any other information requested by Owner to determine the proper amount of payment.

12.05 PERCENTAGE ALLOWANCES

A. To the actual costs given and limited above, amounts equal to a percentage of these costs will be allowed and paid to the Contractor as follows for that portion of the extra work performed by the Contractor's own forces:

Paragraph	Percent
12.02 Material	15
12.03 Equipment	0
12.04 Labor	20
12.03.L Outside Rental with Operator	5
Special Services	15

B. The allowances shown in 12.05.A shall also apply to force account work performed by a Subcontractor. When work is performed by a Subcontractor on a force account basis or other basis agreed to by the Owner's Representative, the Owner shall pay an additional five percent allowance for both overhead and profit to the Contractor. Regardless of the number of tiers of Subcontractors, this supplemental markup will be applied only one time.

C. When changed work includes both additions and reductions to the Work, the allowances provided in 12.05.A and 12.05.B shall apply to the net difference between the cost of the added work and the estimated value of the deleted work. However, when the cost of the added work is less than the estimated value of the deleted work, the allowances will not be applied.

D. The allowances permitted by 12.05.A, 12.05.B, and 12.05.C, when paid to the Contractor, will be complete compensation for overhead, profit, and all other force account work costs that were incurred by the Contractor or by other forces that the Contractor furnished. No other reimbursement, compensation, or payment will be made.

12.06 BILLINGS

A. Billings for Force Account Work by the Contractor shall be submitted for the Owner's Representative's approval on Owner provided forms or on a form approved by the Owner's Representative. Billings for materials (other than incidental items out of the inventory of the Contractor or subcontractors), outside rental equipment, and services, shall be accompanied by copies of invoices for the goods and services. The invoices shall be fully itemized showing dates, quantities, Unit Prices, and complete description of goods and services. Invoices for amounts of \$10 or less per invoice are not required, unless requested by the Owner's Representative.

B. Contractor and subcontractors shall take advantage of all practicable discounts on bills for materials and supplies and such discounts shall be reflected on all bills and invoices submitted to Owner. Freight will be considered to be part of the cost of materials and supplies and will be paid for as materials and supplies. Materials and supplies will be paid for as agreed in writing prior to their production or use. If there is no prior agreement, the Owner's Representative shall establish a reasonable price for such materials and supplies.

C. Costs billed shall not be greater than those permitted in Part 12.

PART 13 - DISAGREEMENTS, PROTESTS, AND CLAIMS

13.01 CLAIMS PROCEDURE

A. This section outlines the exclusive procedure to be followed if the Contractor believes that it is entitled to additional compensation, additional Contract Time or both. This section applies to all Claims for additional compensation and all requests for additional Contract Time, regardless of whether the basis for the Claim for additional compensation, or request for additional Contract Time, or both, stems from the performance of extra work, changed work, excusable delays of any nature, suspension of Contract work, or any other reason whatsoever.

B. When the Contractor believes it is entitled to be paid more than the Contract Amount, the Contractor shall notify the Owner's Representative in writing before beginning any work for which additional compensation is sought. The written Notice shall include

1. A description of the event that requires additional compensation;
2. The estimated amount of the additional cost to the Owner; and
3. Any Contract provision(s) that support the Claim.

C. When an event occurs that the Contractor believes entitles it to more time to complete the Work than Contract Time permits, the Contractor shall notify the Owner's Representative in writing when the event occurs. The written Notice shall include

1. A description of the event that permits additional Contract Time;
2. An estimate of the delay that the event will cause; and

3. Any Contract provision(s) that support the request for additional Contract Time.

D. If the Contractor does not provide written Notice of a Claim for additional compensation or additional Contract Time in the time required, the Claim for additional compensation, additional Contract Time, or both, is waived.

E. If the Owner agrees with the Contractor's request for additional compensation or Contract Time the parties shall negotiate a Change Order setting forth their agreement. If the Owner disagrees, the Contractor shall do the following

1. Continue promptly with the work, including any extra work required by the Owner so the Project is not delayed;

2. Keep complete records of its costs in the manner set forth by the Force Account provisions of this Contract. The Owner also may elect to keep such records to eliminate later confusion. The keeping of such records by either Contractor or Owner does not mean that any Claim is valid;

3. Submit documentation supporting the request for additional compensation, additional time or both, as required in 13.01.F and 13.01.G below.

F. The Contractor's request for additional compensation shall be supported by a Claims Package that includes a) all documentation that establishes its right to additional compensation and b) all documentation substantiating the amount of additional compensation to which it is entitled. The documentation shall include the cost records required by 13.01.E above and all other relevant documentation, such as payroll records, purchase orders, quotations, invoices, estimates, profit and loss statements, daily logs, ledgers and journals.

1. The documentation shall be submitted within 45 days following completion of any work for which a Claim of additional compensation has been made.

2. If the Contractor contends that it will incur costs beyond the 45-day time period that should be included in the Claim, the Contractor shall notify the Owner's Representative of this fact in writing and provide an estimate of that cost. Thereafter the Contractor shall provide the Owner with additional documentation when the remainder of its additional costs is known.

3. The Owner will rely on the accuracy of the Claims Package to make decisions regarding future expenditures. Failure to submit the Claims Package within 45 days is a conclusive waiver of the Contractor's right to additional compensation.

4. The Owner may request additional documentation from the Contractor at any time regarding a Claim. Failure to provide additional documentation when requested and when such documentation exists constitutes a waiver of that portion of the Contractor's Claim to which the additional documentation relates.

G. Any request for additional Contract Time shall be supported by documentation that includes a) a description of the event on which the request is based, and b) all information, including a schedule analysis, that shows that the event delayed completion of the Project as a whole.

1. The Contractor shall submit the documentation within 45 days following the completion of the event that caused the delay and for which additional Contract Time is sought.

2. The Contractor shall provide additional documentation to support its request within 30 days if requested to do so by the Owner. Failure to provide that information is a conclusive waiver of that portion of the Contractor's request to which the additional documentation relates.

H. Following receipt of all required documentation, and after the Owner's Representative has had sufficient period of time to review it in light of work responsibilities, the Owner's Representative and the Contractor's Project Manager shall meet to attempt to resolve the matter if either requests it. If Owner determines that the Contractor has not provided required documentation, the Owner may still meet with Contractor to discuss any claim without waiver of the Owner's right to later assert that the Contractor's claim has been waived for failure to submit documentation.

1. If the Claim cannot be resolved, it shall be referred to persons with higher authority on the part of the Contractor and the Owner, who also shall have the authority to resolve the dispute. Those persons shall meet for negotiations at a mutually agreed upon time and place after having had a sufficient time to review the Claim.

2. If the Claim is not resolved after this meeting, the Contractor and Owner agree that the matter will be submitted to mediation. The mediator shall be chosen by mutual agreement. If a mediator cannot be agreed upon the Contractor and Owner agree to present the Claim to a mediator selected by the Presiding Judge of Multnomah County, Oregon. The mediation fee shall be borne equally by the Owner and Contractor.

3. If the matter is not resolved by mediation, the Owner and Contractor may mutually agree to resolve the dispute by arbitration. The Owner and Contractor may mutually agree to any arbitration method. In the event that no agreement is reached as to the method of arbitration, the arbitration shall be as set forth in accordance with the Large, Complex Construction Cases procedures of the American Arbitration Association's panels of arbitrators for Large, Complex Construction Cases. The Contractor shall pay the arbitration fee required to initiate the arbitration.

a. The Contractor and Owner shall agree upon the appointment of an arbitrator. In the event of disagreement, each party shall appoint one arbitrator within 30 Calendar Days of the disagreement. Those two arbitrators will appoint a third arbitrator to act as the presiding arbitrator.

b. The decision of the arbitration panel shall be final, binding and conclusive upon the parties and subject to appeal only on those grounds for which arbitrations in Oregon are subject to appeal and may be confirmed or embodied in an order or judgment of any court having jurisdiction. The arbitrators appointed pursuant to this Agreement shall not have the power to award punitive damages or attorney fees and shall not have the power to rescind this agreement.

4. If the matter is not arbitrated and the dispute remains unresolved, either party may pursue resolution through litigation in accordance with the requirements of these Specifications.

5. The procedures specified in this subsection shall be the sole and exclusive procedures for the resolution for disputes between the Owner and Contractor arising out of or relating to this

agreement, except that either may seek preliminary judicial relief or an injunction to avoid irreparable damage. Despite any injunctive relief, the procedures specified in this Contract for the resolution of Claims shall remain applicable.

I. The Owner is not obligated under the Contract to provide additional Contract Time or additional Compensation unless documentation submitted by the Contractor establishes its entitlement to additional compensation, additional Contract Time, or both. The parties agree that it is not a breach of contract to deny a request for additional compensation or request for additional Contract Time if the Contractor fails to submit adequate documentation substantiating its Claim or request for time.

J. If the Contractor is entitled to additional compensation, the Contractor shall receive compensation based on the Force Account provisions of Part 12.

13.02 LITIGATION

A. Any legal proceeding, of any nature whatsoever, brought by the Contractor against the Owner, that asserts a breach of contract, a claim of quantum meruit, a declaratory judgment proceeding, or any other legal or equitable claim related to, or arising, from work performed pursuant to the Contract Documents, shall be brought within one year of the date that Final Payment is made to the Contractor, regardless of whether the Contractor is aware of the legal claim it might have during that time. If the legal proceeding is not brought within that one-year period, the Contractor expressly waives any and all claims that are in any way related to the Contract.

B. For purposes of this Subsection payment is considered made when the City of Portland sends a check to the Contractor that contains the Final Payment. The subsequent payment of minor amounts to the Contractor that constitute less than 2% of the total Contract Amount, or the payment of Claims made pursuant to 13.01, shall not affect the date when Final Payment is considered to have been made.

C. The Contractor agrees that any legal proceeding initiated by the Contractor shall be brought only in the Circuit Court of Multnomah County, Oregon.

D. The Contractor agrees that, as a result of its willingness to do business with the City of Portland, the Contractor shall resolve any dispute with the Owner in Multnomah County, Oregon. All discovery between the parties undertaken pursuant to federal, state, or local rules shall be conducted within that county, including, but not limited to, the production of documents and the appearance of expert and lay witnesses for deposition, if such depositions are permitted by court rules.

E. In the event of a dispute, the Contractor and the Owner agree to bear the cost of producing their own employees for deposition in Multnomah County, including but not limited to travel costs, per diem expenses and the cost of employee time. The parties further agree that if court rules or the court itself permits the deposition of expert witnesses, the party seeking the testimony of the expert witness will bear that witness' reasonable costs of travel, reasonable preparation costs and costs for time while in transit.

F. If litigation has commenced or is expected, the Contractor and its representative, including but not limited to the Contractor's attorneys, agree to make any requests for documents, including Public Records Requests, through the City Attorney's Office of the City of Portland.

END OF SECTION

SECTION 00 73 00

BES GENERAL CONDITIONS SPECIAL PROVISIONS

PART 1 – GENERAL

1.01 DESCRIPTION

A. This section modifies the General Conditions specified in Section 00 72 00.

1.02 SPECIAL PROVISIONS

A. These Special Provisions modify Section 00 72 00 as follows:

1. Paragraph 4.02 OWNER-REQUIRED CHANGES IN THE WORK:

a. REPLACE Article B with the following (new text underlined):

“B. Changes to the Work may be accomplished by mutual agreement of the Owner and Contractor using unit pricing or fixed pricing. When agreement is reached, the parties will execute a written Change Order that sets forth their agreement pursuant to 11.02.

1. Unit pricing may be used at the Owner’s option when unit prices or solicitation alternates were provided that established the cost for additional work, and a binding obligation exists under the Contract on the parties covering the terms and conditions of the additional work.

2. Fixed pricing may be used and shall be established before the work is performed. The allowances shown in 12.05.A shall be used as a guide in establishing fixed pricing and will not be exceeded without adequate justification. Cost and price data relating to the work shall be supplied by Contractor to Owner upon request.”

b. REPLACE Article C with the following (new text underlined):

“C. When Extra Work or changed work is necessary, but the Owner and Contractor cannot reach agreement on the terms of a Change Order, the Owner will direct such changes by issuing a Construction Change Directive (CCD), a written statement prepared by the Owner's Representative. The CCD may result in additions, deletions or other revisions to the Work to be performed. Upon receipt of a CCD, the Contractor shall promptly follow the direction given in the CCD and proceed with the change in the Work involved.

Payment for the Direct Costs for work performed pursuant to a CCD shall be made according to Part 12. Direct Costs are limited to:

1. The cost of materials, including sales tax;
2. The cost of material delivery;
3. The cost of labor, including social security, old age and unemployment insurance, and fringe benefits required by agreement or custom;
4. The cost of worker's compensation insurance and project specific insurance (including, without limitation, Builder's Risk Insurance) except insurance waived by the project specifications;
5. The cost of bond premiums,
6. The rental cost of equipment and machinery required for execution of the work; and
7. The additional costs of field personnel directly attributable to the Work."

2. Paragraph 4.05 EXTRA WORK:

- a. REPLACE Article C, Item 1 with the following (new text underlined):

"1. The Contractor shall submit a price quotation and Proposal for performing the changed or Extra Work within 10 days unless the Owner agrees upon a longer period of time in writing. The Contractor shall submit data and any other information or documentation required by Owner, including but not limited to subcontractor proposals, material quotes, rental agreements, and critical path schedules, to substantiate both the cost of performing the work and any additional Contract Time that may be requested."

3. Paragraph 12.01 PAYMENT FOR FORCE ACCOUNT WORK:

- a. DELETE Paragraph B, Item 4, in its entirety (deleted text struck out below):

"4. Special services performed by a specialist, if the Owner's Representative and Contractor agree that the Contractor's or subcontractor's forces cannot satisfactorily perform an item or service. See 12.03.L."

4. Paragraph 12.05 PERCENTAGE ALLOWANCES:

- a. REPLACE Article A with the following (deleted text struck out):

"A: To the actual costs given and limited above, amounts equal to a percentage of these costs will be allowed and paid to the Contractor as follows for that portion of the extra work performed by the Contractor's own forces:

Paragraph	Percent
12.02 Material	15
12.03 Equipment	0
12.04 Labor	20
12.03.L Outside Rental with Operator	5
Special Services	15

b. REPLACE Article D with the following (new text underlined):

“D. The allowances permitted by 12.05.A, 12.05.B, and 12.05.C, when paid to the Contractor, will be complete compensation for overhead, including all costs that are not Direct Costs such as wages or salary of personnel not included in performing the force account work as defined in 12.04, expenses of Contractor’s offices at the job site (e.g. job trailer) including expenses of personnel staffing the job site office who are performing tasks such as preparing RFI’s, submittals, as-builts, Purchase Orders, change orders to subcontractors and other administrative documents required by the Contract, Commercial General Liability Insurance and Automobile Liability Insurance, warranty work that arises after Substantial Completion, and small tools, consumables and personnel safety items not solely required or used in the force account work, profit, and all other force account work costs that were incurred by the Contractor or by other forces that the Contractor furnished. No other reimbursement, compensation, or payment will be made.”

PART 2 – PRODUCTS [NOT USED]

PART 3 – EXECUTION [NOT USED]

END OF SECTION

INTENTIONALLY LEFT BLANK

SECTION 00 73 16

INSURANCE REQUIREMENTS (OCIP)

PART 1 - GENERAL

1.01 INSURANCE

A. General Provisions:

1. The Owner will provide certain insurance coverage for the Work at its expense through an Owner Controlled Insurance Program ("OCIP"). The objective of the OCIP is to provide the majority of the insurance coverage for the Contractor and Subcontractors of all tiers for construction work performed on the Project Site as defined herein.
2. OCIP coverage will not extend to automobile liability insurance, contractors equipment insurance, professional liability, or for Contractor activities off the Project. The Contractor and all its Subcontractors of any tier are required to provide this insurance at their expense.
3. Before preparing the bid, Bidders shall make the provisions of this Subsection known to the following persons:
 - a. Persons who manage the Bidder's insurance, and/or the Bidder's insurance agent prior to their bidding Work on the Project.
 - b. Bidders intended Subcontractors, with instructions to pass this OCIP Project information to their Subcontractors.
4. Under the OCIP, the Owner will pay all premiums for OCIP coverage.
 - a. Bidders shall deduct from their Bids all costs for insurance that would otherwise have been paid in the absence of the OCIP.
 - b. After Award of Contract, the Owner will provide the Contractor with information and forms necessary to enroll into coverage under the OCIP.
5. For purposes of the OCIP the following definitions apply:
 - a. "Construction Safety Manager" is the Owner's employee assigned this responsibility, acting directly or through an assistant or representative.
 - b. "Contractor" is any person who has entered into a Contract with the Owner for the Work, and whose employees are actively performing such Work at the Project Site. Suppliers, vendors, material dealers, haulers, transporters, or others whose function is solely to make deliveries or removals, or supply materials or equipment to the Project Sites are not Contractor forces for purposes of the OCIP. Vendors, suppliers, materials dealers, or their subcontractors who install their product at the Project Site are Contractor forces for the purposes of the OCIP, but only for such on-site installation.
 - c. "Insured" is the Owner, and the Contractor and Subcontractors who have a contractual obligation to perform some part of the Work at the Project Site, and whose employees are actively performing such Work at the Project Site.

- To qualify as an Insured, such Contractor or Subcontractor must complete all forms contained in the OCIP Enrollment Manual, and receive certificates of insurance from the Owner evidencing completion of such enrollment and acceptance into the OCIP.
- d. "Project Site" is the site of construction, including all facilities described in the Contract Documents. The Project Site includes the area inside the work limits shown on the Plans where the Contractor and its Subcontractors perform the Work. The Project Site also includes areas immediately adjacent thereto, including areas within boundaries of local roads and public easements in which Contractor and its Subcontractors perform the Work. In addition, the Project Site includes Contractor staging areas in close proximity to the Work limits, and which are used exclusively by the Contractor and its Subcontractors to perform the Work, but only if such area is so designated by the Owner in writing as part of the Project Site prior to Contractor beginning work at such staging areas. Private property adjacent to work areas shown on the Plans, or public rights-of-way adjacent thereto, are not part of the Project Site unless permission to occupy such property has been granted by the property owner in writing and such permission has been filed with the Owner's Representative.
 - e. "Subcontractor" is any individual, partnership, firm, corporation, or any combination thereof, with whom the Contractor enters into a subcontract to perform a part of the Work, and whose employees are actively performing such Work at the Project Site. Suppliers, vendors, materials dealers, haulers, transporters, or others whose function is solely to make deliveries or removals, or supply materials or equipment to the Project Site are not Subcontractor forces for purposes of the OCIP. Vendors, suppliers, materials dealers, or their subcontractors who install their product at the Project Site will be considered to be Subcontractors under the OCIP, but only for such on-site installation. The term "Subcontractor" includes every Subcontractor of any tier.

B. Insurance Coverage:

1. **Owner Provided Insurance:** The Owner will, at its sole expense, maintain the following types of insurance in force as a part of the OCIP. The Owner assumes all responsibility for the selection of insurers.
 - a. **Statutory Workers Compensation:** Coverage will be provided with limits and benefits in conformance with the Oregon Workers Compensation Act. Coverage includes occupational disease as defined by the Act.
 - b. **Employer's Liability** coverage will be provided with the following limits:
 - 1) Bodily injury by accident: \$1,000,000 for each accident.
 - 2) Bodily injury by disease: \$1,000,000 for each employee.
 - 3) Bodily injury by disease: \$1,000,000 maximum annual aggregate.
 - c. **Commercial General Liability:** Coverage will be provided on an "occurrence" basis on the standard ISO 1994 or equivalent policy form. The policy will include Premises and Operations coverage, and Completed Operations coverage extending for not less than five (5) years after the completion of Work and Acceptance by the Owner. Coverage will also include Personal Injury Liability, and contractual coverage for liability assumed under an "insured" contract as defined by the insurance policy. The policy will not contain exclusions for Broad Form Property Damage, Independent Contractors, or for the hazards commonly known as Explosion, Collapse, and Underground (XCU).

Employees are insureds under the policy, and policy terms include "Separation of Insureds" as defined by the standard ISO Policy Form. Policy limits are: Bodily injury and property damage: \$2,000,000 for each occurrence subject to a deductible to be assigned to the Contractor and/or Subcontractor of any tiers [hereafter referred to as Contractor/Subcontractor] liable for the loss as follows:

- 1) For each existing individual underground and aboveground utility line and/or service, \$5,000 of loss resulting in property damages liability arising from or aggravated by Work activities for the first occurrence, \$10,000 for the second occurrence, and \$15,000 for each occurrence thereafter.
- 2) For all other losses, the deductible shall be determined by the amount, in dollars, of the Contractor's/Subcontractor's contract/subcontract as specified below

Contract Amount	Deductible Amount
\$0 - \$250,000	\$1,000
\$250,001 - \$1,000,000	\$2,500
\$1,000,001 - \$5,000,000	\$5,000
\$5,000,001 - and greater	\$10,000

- a) Personal injury and advertising liability: \$2,000,000 for each occurrence subject to a \$10,000 deductible to be assigned to the Contractor.
 - b) General aggregate: \$4,000,000 maximum for each annual period.
 - c) Products and completed operations: \$4,000,000 maximum for each annual period.
 - d) If more than one Contractor/Subcontractor has a loss resulting from the same occurrence, the Contractors/Subcontractors shall share the deductible in the same proportion that each Contractor's/Subcontractor's negligence is to the entire loss.
 - e) In the event of dispute by the parties over responsibility for or proportionate share of the loss, the Owner's Representative will be the adjudicator and the Owner's Representative's decision will be final.
 - f) The Commercial General Liability policy will be primary insurance for claims arising from the Contractor's/Subcontractor's Work under this Contract, and will be non-contributing with respect to any other insurance carried by the Contractor/Subcontractor for Work performed at the Project Site.
- d. Excess Liability: Excess Liability insurance will be provided in a combination of layers which equal \$50,000,000 per claim and annual aggregate. This insurance will be excess over the primary liability insurance policies provided and listed above. The excess liability limits will be shared among all eligible contractors and subcontractors enrolled in the OCIP.
- e. Builders Risk: "All Risk" Builders Risk and Property insurance will be provided to cover physical loss of or damage to the Work, and to suitably stored materials, equipment, and supplies to be incorporated into the Work. Coverage extends to damage caused by the perils of earthquake and flood. A blanket waiver of subrogation will be provided among all enrollees in the OCIP.
- 1) The policy will not cover the Contractor's/Subcontractor's owned, rented, hired or leased construction type tools, or equipment used for construction.

- 2) The policy limit shall not exceed the project's construction value and will be subject to a deductible to be assigned to the Contractor/Subcontractor incurring the loss. The deductible shall be determined by the amount, in dollars, of the Contractor's/Subcontractor's contract/subcontract as specified below:

Contract Amount	Deductible Amount
\$0 - \$250,000	\$1,000
\$250,001 - \$1,000,000	\$2,500
\$1,000,001 - \$5,000,000	\$5,000
\$5,000,001 - and greater	\$10,000

- 3) If more than one Contractor/Subcontractor has a loss resulting from the same occurrence, the Contractors/Subcontractors shall share the deductible in the same proportion that each Contractor's/Subcontractor's loss is to the entire loss.
- 4) In the event of a dispute over fault or damage between the Contractor/Subcontractor and the Owner, the Owner's Representative shall serve as the adjudicator, and the Owner's Representative's decision will be final.
- f. **Contractor Pollution Liability:** Contractor Pollution Liability coverage will be provided with limits of \$10,000,000 each incident and in the aggregate, covering third party bodily injury and property damage arising from a pollution condition at the Project Site as defined by the policy.
- g. **Contractor Furnished Insurance:** The OCIP will not provide all the insurance protection needed or desired by the Contractor and its Subcontractors. Such other insurance as the Contractor and its Subcontractors may carry for normal business operations or to protect its interests shall be the responsibility of the Contractor or Subcontractors, and purchased at their own expense and risk. If the Contractor/Subcontractor elects to insure its construction equipment or other property, the Contractor/Subcontractor shall waive its rights of subrogation against the Owner, its officers, agents, employees, and other OCIP Participants. Throughout the life of the Contract, the Contractor and all of its Subcontractors of all tiers shall maintain at its sole expense the following minimum insurance coverages and limits with policy forms and insurers acceptable to the Owner:
- h. **Automobile Liability Insurance for Contractor's/Subcontractor's activities on the Project Site and off the Project Site:** \$1,000,000 combined single limit for bodily injury and property damage per occurrence for Contractor's/Subcontractor's owned, non-owned, and hired vehicles.
- i. **Workers Compensation and Employers Liability Insurance for activities off the Project Site:** Oregon statutory coverage and limits for Workers Compensation Employers Liability insurance with limits not less than:
- 1) \$500,000 for each accident-bodily injury by accident.
 - 2) \$500,000 each employee-bodily injury by disease.
 - 3) \$500,000 annual aggregate-bodily injury by disease.
- j. **Commercial General Liability insurance for activities off the Project Site:** The policy shall not contain exclusions for Blanket Contractual, Broad Form Property Damage, Personal Injury, Premises-Operations, Products-Completed Operations, Independent Contractors, Fire Legal Liability, and Explosion, Collapse, and Underground (XCU) property damage liability. Policy limits shall not be less than:

- 1) \$1,000,000 combined single limit for bodily injury and property damage per occurrence.
- k. The insurance coverage obtained by the Contractor shall name the Owner, its officers, employees and agents as additional insureds, and shall not be terminated or canceled or materially reduced prior to the completion of the Contract without thirty (30) days written Notice to the Owner, with a copy of such Notice being sent to the City Auditor. For purposes of computing time, the first day of the thirty days written Notice shall begin on the day that the Notice is actually received by the City Auditor.
- l. Prior to entry of any Subcontractor onto the Project Site, the Contractor shall provide the Owner with certificates of insurance in force evidencing insurance coverage of such Subcontractor with limits and conditions as described herein.
- m. It is recommended that in lieu of excluding coverage for the Project from its ongoing liability insurance program, each Contractor and Subcontractor should have its General Liability and Umbrella Liability policies endorsed to the effect that insurance provided under those policies will be excess over valid and collectible insurance provided by the OCIP.

C. Review of Contractor Coverage Before Contract Execution:

1. Within ten (10) Calendar Days of the announcement of the intent to Award the Contract, the Contractor shall provide the City Auditor with certificates of insurance and additional insured endorsements in force for insurance specified herein showing the type, amount, class of operations covered, effective dates, and date of expiration of policies, and containing a provision that states substantially the following: "The insurance described in this certificate shall not be cancelled or materially altered without giving the Owner 30 days written Notice in advance of that action." Failure to comply with the reporting provisions of this Contract shall not affect the coverages provided to the City of Portland, the Owner and their officers, employees and agents.
2. The City Attorney's office will review the certificates for approval. The City Attorney's office may reject any proposed certificate if the insurance proposed to be provided is not the same as the coverage required by the Contract Documents, and may reject the certificate if it is unclear. If the City Attorney's office determines that the certificates are unclear, the Contractor shall provide revised certificates that clearly show the insurance required by the Contract Documents has been obtained. Review or approval of the City Attorney's office of any insurance certificate does not excuse the Contractor from providing the insurance required by the Contract Documents.
3. If the Contractor fails or refuses to provide the required insurance coverage or certificates in a form satisfactory to Owner within the time required, the Owner is entitled to take any and all of the following actions:
 - a. Reject the Contractor's Bid;
 - b. Award the Contract to someone other than the Contractor; and
 - c. Recover any costs suffered by the City as a result of taking the actions above from the Contractor or its Bid Bond.

D. Certificates and Policies - The Owner will provide the Contractor and each of its Subcontractors with an original Workers Compensation and Employers Liability policy, and with appropriate certificates evidencing the Commercial General Liability, Excess Liability, and Builders Risk insurance coverage described in Paragraph B(1) above. The Commercial

General Liability, Excess Liability, Builders Risk, and Pollution Liability insurance policies will be available for examination at the Owner's Representative's office.

- E. **Contractor Responsibilities** - The Contractor and its Subcontractors of all tiers shall cooperate with the Owner and the Owner's Representative with regard to OCIP administration and operation. The Contractor's and Subcontractors' responsibilities shall include, but shall not be limited to, the following activities:
1. Complete and provide to the Owner's Representative all forms and exposure information necessary to enroll in the OCIP. The Contractor/Subcontractor will be an OCIP Participant upon completion of all enrollment requirements contained in this Subsection and upon completion of all required forms set forth in the OCIP Enrollment Manual. This manual will be provided to the Contractor and its Subcontractors following Award of Contract. The Owner's Representative will issue to the Contractor/Subcontractor appropriate evidence of enrollment upon compliance with enrollment requirements. No Contractor/Subcontractor eligible under the OCIP shall commence work on the Project Site until its enrollment is completed and approved.
 2. Provide certificates of insurance for coverage required of the Contractor herein, and collect and submit certificates of insurance from all Subcontractors. The Contractor/Subcontractors shall name the Owner, and its officers, agents and employees as additional insureds under its insurance policies, and indemnify, save, and hold harmless the Owner, its officers, agents, and employees. The scope of the indemnification and defense shall be as provided by Section 00 72 00, General Conditions, PART 7.09.
 3. Notify the Owner's Representative in advance of intent to award any subcontract. It is the Owner's intent to enroll into the OCIP all Contractors and Subcontractors other than those expressly excluded herein.
 4. Contractually bind each of its Subcontractors to the insurance, indemnification, hold-harmless and safety provisions of the Contract Documents, including the provisions of this Subsection.
 5. Not violate or knowingly permit violation of any conditions of the OCIP policies of insurance and at all times satisfy the requirements of the insurance companies issuing them.
 6. Provide the Owner's Representative with accurate monthly payroll data (OCIP Project Site Payroll Report which will be provided at the time of Enrollment) and other necessary insurance related information on itself and its Subcontractors for this Project, and permit its books and records for this Project to be audited by the OCIP insurance company or companies or their respective representatives. The Contractor agrees to maintain separate payroll records for itself and its Subcontractors and to retain them for five (5) years after Acceptance of its Work under this Contract.
 7. Comply with the Owner's claim reporting and Project Site medical procedures as specified in the OCIP Enrollment Manual.
 8. Provide modified duty to all injured employees for all work-related injuries as specified in the OCIP Enrollment Manual and General Construction Safety Provisions.
 9. Comply with the Owner's General Construction Safety Provisions and Specifications, and cooperate with Construction Safety Manager in all inspections, accident investigations, and all other safety activities related to the Contract. Complete necessary reports related to safety inspections and accident investigations, for all Contract related activities, including all Subcontractor activities. Take prompt corrective action when

safety and health deficiencies are noted from the Construction Safety Manager and from the Owner's Representative. The Contractor shall be fully responsible for the safety of its operations and for the safety of its Subcontractors' operations.

10. Provide the Owner's Representative with a signed Notice of (Policy) Cancellation Request, for Contractor and each Subcontractor upon completion of its respective portion of the Work.

- F. Contract Price and Assignment of Return Premium - The Owner will provide the OCIP coverage listed above for the benefit of the Contractor and its Subcontractors at the Owner's expense. In consideration of the Owner providing OCIP coverages, the Contractor agrees to:
1. Remove all applicable insurance costs from its Bid that would duplicate or provide similar insurance coverages as will be provided for the Contractor in the OCIP.
 2. Assign to the Owner all return premiums, dividends, refunds, discounts, and other credits due or to become due under the OCIP insurance policies. The Contractor and its Subcontractors agree to execute documents and agreements provided by the Owner's Representative necessary to accomplish this assignment.

- G. Termination/Modification of the OCIP - It is the Owner's intent to maintain the OCIP throughout the life of the Contract. However, circumstances may require termination or modification of the OCIP. If this occurs, the Owner will give thirty (30) days advance written notice to the Contractor, and, at the Owner's sole discretion, will provide replacement coverage or will require Contractor to obtain replacement insurance coverage as required herein or as otherwise may be directed by the Owner. If the Owner requires the Contractor to obtain replacement insurance, the actual, direct, auditable cost of such approved replacement insurance will be reimbursed as extra work. In this case, Contractor shall furnish written evidence of such insurance in force before the OCIP's actual termination date.

H. Insurance Coverage Not Provided by the OCIP:

1. Owner provided insurance does not cover suppliers, vendors, materials dealers, haulers, transporters, or others whose work location is off the Project Site, and who merely pick up or deliver materials, equipment, or supplies at the Project Site. However, if such suppliers, vendors, or materials dealers physically incorporate their product into the Work or contract with Subcontractors to physically incorporate their product into the Work on the Project Site, those employees or Subcontractors' employees working on the Project Site will be enrolled in the OCIP and will be covered by Owner provided insurance.
2. The OCIP will not cover any fabrication, manufacturing, assembly, testing, or other operations away from the Project Site.
3. Subcontractors engaged in asbestos abatement, abatement or remediation of environmental hazards, and/or commuting exposures to and from the Project Site will not be eligible for enrollment in the OCIP. Such Subcontractors shall carry Subcontractor furnished insurance as specified herein at their own expense or such other coverage as may be required in the Contract Documents.
4. Notwithstanding other provisions of this Subsection, the Owner reserves the right to exclude any Contractor or Subcontractor of any tier from the OCIP at its sole discretion. If the Owner requires any such Subcontractor to obtain insurance to replace any the Owner would otherwise provide, the actual, direct, auditable cost of such approved

replacement insurance will be reimbursed as extra work. In this case, the Contractor or Subcontractor shall furnish written evidence of such insurance in force.

- I. Waiver of Recovery and Subrogation - The Owner and the Contractor shall cause their respective underwriters of insurance policies, as described in Paragraph B (2) above, to waive their rights of subrogation for claims for losses, costs, and expenses arising from the Work performed under this Contract, which one party may have against the other. This waiver applies only to personal injury, bodily injury, death, and property damage covered by Owner provided insurance as described herein and occurring in the course of the Contractor's performance under this Contract. The Contractor shall be responsible in ensuring that all tiers of Subcontractors also meet this Waiver of Subrogation requirement.
- J. Miscellaneous Provisions and Requirements:
1. The cost of the premiums for insurance provided under the OCIP will be paid by the Owner, and the Owner will receive and pay, as the case may be, all adjustments in such costs, whether by way of dividends, audits, or otherwise.
 2. The Contractor recognizes and agrees that Marsh USA Inc. is the Broker of Record for the OCIP, and that the Contractor has the obligation to notify Marsh USA Inc. and request correction of any insurance-related deficiencies, omissions, or errors in the OCIP policies or certificates.
 3. Any portrayal of insurance policy coverage definitions, terms, and conditions contained in this contract shall not be a binding interpretation of coverage or conditions of the actual policies. Actual policy provisions shall in all cases take precedence over this Subsection of the Specifications.
- K. Liabilities and Obligations - Insurance provided by the Owner for the Contractor and its Subcontractors is not intended to and will not in any manner limit or qualify the duties, liabilities, and obligations assumed by the Contractor under the Contract. Losses by and claims against the Contractor that are outside the coverage limits of the insurance policies to be provided by the Owner shall be borne by the Contractor.

PART 2 - PRODUCTS [NOT USED]

PART 3 - EXECUTION [NOT USED]

END OF SECTION

SECTION 00 73 19

HEALTH AND SAFETY REQUIREMENTS (OCIP)

PART 1 - GENERAL

1.01 SUMMARY

- A. This section outlines the minimum safety and health requirements applicable to this project. These requirements include, but are not limited to, Oregon Revised Statutes, Oregon Administrative Rules, Oregon Occupational Safety and Health Regulations, Department of Labor and Industries, Oregon Department of Transportation, and other applicable federal, state, and local regulations.
- B. Contractor has ultimate responsibility for the safety and health of all employees and contract tiers. This ultimate responsibility cannot be delegated to subcontractors or other persons or agencies. Contractor is responsible for ensuring that employees and/or subcontractor employees follow these minimum safety and health requirements, and are trained and understand the applicable policies and procedures of the Owner that affect the Work.
- C. In addition to the regulatory requirements outlined above, the Contractor shall comply with the Specifications and the General Construction Safety Provisions (GCSP). These requirements are not to be considered as all inclusive. If any portion of these requirements conflicts with, or is less stringent than any applicable federal, state, or local statutory safety regulation, the more stringent shall take precedence.

1.02 SAFETY AND HEALTH REGULATIONS

- A. Comply with all federal, state, and local safety and health regulations and laws including, but not limited to, the following:
 - 1. Oregon Revised Statutes - ORS 654
 - 2. Oregon Safe Employment Act (OSEA)
 - 3. Oregon Occupational Safety & Health Code of the Oregon Occupational Safety & Health Division (OR-OSHA), Oregon Administrative Rules (OAR), Chapter 437
 - a. Division 1-General Administrative Rules
 - b. Division 2-General Occupational Safety & Health Rules
 - c. Division 3-Construction

- 1) The Contractor shall comply with OAR 437, Division 3, Subdivision S, for underground construction and tunneling safety, and Subdivision P, for excavation and trenching safety.
4. Comply with 29 Code of Federal Regulations (CFR) 1926.800 through 804 and 1926.650 through 652.

1.03 PUBLIC SAFETY AND CONVENIENCE

- A. Conduct the Project with proper regard for the safety and convenience of the public. When the project involves use of public ways, provide necessary flag persons and install and maintain means of reasonable access to all fire hydrants, service stations, warehouses, stores, houses, garages, and other property.
 1. Private residential driveways shall be closed only with approval of the Owner's Representative or specific permission of the property owner.
 2. Do not interfere with normal operation of public transit vehicles unless otherwise authorized.
 3. Do not obstruct or interfere with travel over any public street or sidewalk without approval.
 4. At all times provide open trenches and excavations with secured and adequate barricades or fences of an approved type which can be seen from a reasonable distance.
 5. Close up or plate all open excavations at the end of each working day in all street areas unless approved otherwise by Owner's Representative and in all other areas when it is reasonably required for public safety or as directed by the Owner's Representative.
 6. At night, mark all open work and obstructions by lights. Install and maintain all necessary signs, lights, flares, barricades, railings, runways, stairs, bridges and facilities.
 7. Observe all safety instructions received from Owner's Representative or governmental authorities, but following of such instructions shall not relieve Contractor from its responsibility or liability for accidents to workmen or damage or injury to person or property.
- B. Emergency traffic such as police, fire and disaster units shall be provided reasonable access to the work area at all times.

- C. Keep the surfaces of all roadways which are being used by the public traffic free of dirt, mud, cold plane grindings, and other deleterious matter. This maintenance shall constitute continuous and effective work prosecuted day by day, with adequate equipment and forces to the end that the roadway or structures are kept in satisfactory condition at all times.
- D. Provide suitable notice to property owners and shall arrange for removing parking on those streets where parked cars would interfere with its operations. Contractor shall obtain necessary permits at its sole expense from the Bureau of Traffic Management and shall arrange for verification of no parking posting so permitted. No towing or moving of parked vehicles will be permitted without proper authority.

1.04 SUBMITTALS

A. Notices

- 1. Supply road closures and traffic detour information, as well as associated closure/detour dates to the City of Portland Fire and Police Bureaus, American Medical Response, and the agencies listed below, two weeks prior to the activity. FAX information 2 weeks prior to activity; phone information to provide last minute changes in routing/detour plans. The Contractor will also provide weekly updates on routing information, as needed. Contacts are as follows:

Bureau of Emergency Communications (BOEC)	Phone: 503-823-0911 FAX: 503-823-4630
Fire Liaison at BOEC	Phone: 503-823-3873 FAX: 503-823-3875
Fire Bureau – Emergency Operations (EOPS)	Phone: 503-823-3830 FAX: 503-823-3710
Police Bureau - Traffic Division	Phone: 503-823-2103 FAX: 503-823-2220
American Medical Response (AMR) Communications Center	Phone: 503-231-6300 FAX: 503-235-1365
Local School District: Portland Public Schools Student Transportation	Phone: 503-916-6901
Traffic Signal Operations - Portland Bureau of Transportation	Phone: 503-823-7184 FAX: 503-823-7576
Transportation Maintenance	Phone: 503-823-1700
Trimet – Field Operations Coordinator	Phone: 503-962-8117 FAX: 503-674-6933
Portland Bureau of Transportation	Phone: 503-823-7233
ODOT District 2B- (Will redirect if District 2A or 2C)	Phone: 971-673-6200 FAX: 503-653-5655

1.05 SITE SECURITY

- A. Contractor shall be responsible for all labor, materials and equipment needed to secure the construction site at all times. This may include labor, lighting, fencing, alarm systems and other miscellaneous materials to maintain security at all sites where the Contractor may be working, staging work and storing materials or equipment.

1.06 CONFINED SPACE ENTRY

- A. Refer to Section 4, Part 4.6, General Construction Safety Provisions, (GCSP) for specific instructions on Confined Space Entry.

PART 2 - PRODUCTS

2.01 SITE SPECIFIC SAFETY AND HEALTH PLAN

- A. Develop and submit a Site Specific Safety and Health Plan, based upon the sequence of Work, anticipated hazards, and the means/methods to confine or eliminate the hazards. Refer to the General Construction Safety Provisions for specific requirements. Review of the Contractor's Site Specific Safety and Health Plan by the Owner's Representative shall not impose a duty or responsibility on the Owner's Representative for the Contractor's performance of the work in a safe manner.

2.02 CONTRACTOR-FURNISHED SAFETY EQUIPMENT AND TRAINING

- A. Contractor shall furnish all safety equipment and training as required by the approved Site Specific Safety and Health Plan and the General Construction Safety Provisions.
- B. Owner will provide training including General Safety Orientation, OCIP overview.

PART 3 EXECUTION [NOT USED]

END OF SECTION

DIVISION 01 – GENERAL REQUIREMENTS

SECTION 01 10 00

SUMMARY

PART 1 - GENERAL

1.01 SUMMARY

- A. Contract is for the construction of **Lagoon Reconstruction Phase 3/4, BES project Number E07146.**
- B. Project Location is at the Columbia Boulevard Wastewater Treatment Plant (CBWTP) at 5001 North Columbia Boulevard, Portland, Oregon 97203. The work will be performed at the site of the existing lagoon located on the northern portion of the CBWTP site.
- C. See Section 01 11 13, Work Covered by Contract Documents for specific elements of the project work.
- D. City may award a separate contract for another project in the project area and work may be in progress simultaneously with a portion of the work under this contract. The Contractor shall cooperate with the City, agencies, trades or contractors that are involved in the execution of any other contract.
- E. The City of Portland 2010 Standard Construction Specifications (as revised) are incorporated by reference into these specifications.

1.02 PRE-CONSTRUCTION CONFERENCE

- A. After the contract is awarded, but before any work is performed, meet with the Owner's Representative for a pre-construction conference at a time mutually agreed upon. See Section 01 31 19, Project Meetings.
- B. The Contractor shall invite a representative from each subcontractor to attend the pre-construction conference.

1.03 CONSTRUCTION PROGRESS MEETINGS AND REPORTING

- A. Attend regular Progress Meetings. See Section 01 31 19, Project Meetings.
- B. Submit Schedules, Progress Reports and other Construction Progress Documentation as Specified in Section 01 32 00, Construction Progress Documentation.

1.04 SUBMITTALS

- A. Submit Shop Drawings, Product Data, Samples, Information Submittals, Coordination Drawings, Documentary Submittals, Working Drawings, and Deferred Submittals as Specified and per the procedures outlined in Section 01 33 00, Submittal Procedures.

1.05 PROJECT RECORD DRAWINGS

- A. Submit Project Record Drawings as specified. See Section 01 78 39, Project Record Documents.

1.06 OPERATION AND MAINTENANCE INFORMATION

- A. Submit Operations and Maintenance Information where specified. See Section 01 78 23, Operation and Maintenance Data.
- B. Operation and Maintenance Manuals will be provided by the Owner for Owner-Furnished Equipment included in this Project, if any.

1.07 INSTALLATION OF OWNER FURNISHED PRODUCTS (OFP) [NOT USED]

1.08 COORDINATION OF ACTIVITIES

- A. Owner will occupy the premises during the entire period of construction to conduct normal operations. Contractor shall plan, schedule, and coordinate his demolition and construction operations and activities in a manner that will allow the progress of the work included in these Contract Documents within the operational constraints of a working Wastewater Treatment Plant. See Specification Section 01 11 13, Work Covered by Contract Documents, Paragraph 1.08, Coordination of Activities.

1.09 CONTRACTOR'S USE OF PREMISES

- A. Contractor shall establish and maintain a separate field office at the project site for the duration of the work. The Contractor will be assigned a lay down and parking area as indicated on the Drawings to be used by the employees working on the project. The Contractor will advise stores and the Administration office of their plant location so that any items which require delivery can be directed to this area. The Contractor's field office shall be accessible by the Owner's Representative during working hours.

- B. All of the Contractor's employees shall enter the plant through the construction access point on North Portland Road (see Drawings). If the Contractor's personnel will be working at any time other than 7 a.m. to 4 p.m., arrangements must be made with Construction Engineering and the Treatment Plant Management. All traffic signs and directions are to be obeyed. Portland Bureau of Transportation requirements for ingress and egress from North Portland Road shall be incorporated into the Contractor's traffic plan. See 01 14 13, Facility Access Procedures.
- C. The City's operating personnel will be responsible for operating the existing treatment plant throughout the execution of this contract. Equipment presently installed in the treatment plant must be available to plant personnel at all times for use, maintenance, and repair. If it becomes necessary for the Contractor to move equipment or materials to facilitate plant operations, he shall do so promptly.
- D. The City's construction staging area is shown on the Drawings and may be used for several projects simultaneously. The Owner's representative will designate a portion of the staging area for the Contractor's use based on availability of space at the time of the project. Storage of materials is not permitted outside of the designated areas without prior written permission from the Owner's Representative.
- E. Work within existing structures shall be completed without disruption to routine access by plant personnel. No material, equipment or tools are to be left in the structures after normal work hours without prior written permission of the Owner's Representative.
- F. During the course of the work, the Contractor shall keep the site clean and orderly and shall follow housekeeping guidelines as set forth in the State Safety Codes. Particular care shall be taken at the end of each day to guard, barricade, provide temporary lighting and otherwise minimize potentially hazardous situations to the City Employees who operate this facility twenty-four hours per day. At the completion of the work remove all material of any kind not incorporated into the work, and leave the site in a condition acceptable to the Owner's Representative.
- G. Public Trail – At the end of each work day, Contractor shall provide for safe public access and travel along the public trail.
- H. The Contractor will have the use of the Peninsular Crossing Trail during weekdays as required for hauling and construction purposes. This trail shares the Contractor's ingress and egress point on North Portland Road and runs along the south edge of the work area. This is a public trail that must be maintained for safe pedestrian and bicycle access. The Contractor should refer to Section 01 14 19, Trail Coordination, for trail safety and closure coordination requirements.

- I. **The Contractor shall not use the footbridge across the Columbia Slough from the lagoon site to the treatment plant without written permission from the Owner's Representative. The footbridge is not rated for truck traffic.**

1.10 EROSION, SEDIMENT, AND POLLUTION CONTROL

- A. Provide erosion, sedimentation and pollution control. See Section 01 57 13, Temporary Erosion and Controls.
- B. Provide Intermediate and Final Cleaning of Work. See Section 01 74 23, Cleaning.
- C. Comply with the Environmental Procedures specified in Section 01 35 43, Environmental Procedures.
- D. Comply with the waste management procedures specified in Section 01 74 19, Construction Waste Management and Disposal.

1.11 CONTRACTOR'S UTILITIES AND TEMPORARY CONSTRUCTION UTILITIES

- A. Provide the following temporary services and facilities:
 1. **Office** - Contractor shall establish and maintain a field office in the vicinity of the project site for the duration of the project. The Contractor's field office shall be accessible by the Owner's Representative during working hours.
 2. **Electric Power – Metered power will be available through the local utility from an on-site transformer.** The Contractor is responsible for transmission of electrical power within the work area. Standby power generator(s) provided by the Contractor shall be sound attenuated and comply with City of Portland's Noise Control Program limits.
 3. **Telephone** – If desired, Contractor shall provide telephone services at the construction site-office.
 4. **Sanitary Facilities** - Contractor shall provide toilet and wash-up facilities for the work force at the work site. These facilities shall be in conformance with applicable laws, ordinances, and regulations pertaining to the public health and sanitation of temporary dwellings and worksites.
 5. **Water – Water is not available for construction purposes at the lagoon site. The Contractor shall provide water as needed for construction. Water for lagoon cell startup purposes will be provided by Owner.**
 6. **Security** - Contractor shall at all times be responsible for the security of the facilities and equipment.

7. Work Area Restrictions - Contractor's personnel are allowed in the Contractor's staging area and in the project work area. Contractor's personnel shall not be within any other areas at the treatment facility without the Owner's permission.

1.12 DEMOLITION AND REMOVAL

- A. Structures - Demolition and removal of structures may consist of abandoned superstructures, foundation walls, footings, slabs, pipes, vaults, and any other structures. Excavations caused by existing foundations shall be cleared of waste, debris and loose soil, and refilled as specified.
- B. Pavement - When portions of asphalt pavements and concrete pads are to be removed and later construction is to be connected, edges shall be saw-cut, on a neat line at right angles to the curb face.
- C. Salvage:
 1. Owner has the right to salvage any items scheduled for removal. Contractor shall notify the Owner's Representative 5 days prior to any salvage or demolition work to determine the disposition of items to be removed.
 2. Owner's Representative will mark items to be salvaged. Items for salvage shall be properly disconnected, removed from their foundations, cleaned, and stored at a location on the plant site as directed by the Owner's Representative.

1.13 RESTORATION OF IMPROVEMENTS

- A. Structures - Take all precautions necessary to protect the integrity and usefulness of all existing facilities. If necessary, the Contractor may, with the approval of the Owner, remove such existing structures, including curbs, gutters and pipelines as may be necessary for the performance of the work. The structures removed shall be rebuilt in as good a condition as found with the requirements specified. The Contractor shall also repair existing structures which may be damaged as a result of the work under this contract.
- B. Cultivated Areas and Other Surface Improvements - Cultivated or planted areas and other surface improvements which are damaged by actions of the Contractor shall be restored as nearly as possible to their original condition in accordance with Section 00 72 00-7.12. Restoration shall take place within 1 week or sooner as directed by the Owner's Representative. Existing guard posts, barricades, and fences shall be protected and replaced if damaged.

C. Protection of Existing Installation - Protect all existing operating facilities and structures from damages. However, if damage occurs, the Contractor shall immediately correct or replace existing equipment, controls, systems, structures, or facilities which are damaged in any way as a result of his work.

D. See 01 74 23, Cleaning.

PART 2 - PRODUCTS [NOT USED]

PART 3 - EXECUTION [NOT USED]

END OF SECTION

SECTION 01 11 13

WORK COVERED BY CONTRACT DOCUMENTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Completion of the Work will provide Owner with increased operational flexibility and minimize environmental risks associated with an unlined lagoon. The work covered under this contract includes Phase 3 and Phase 4 of the Lagoon Reconstruction project; the project is referred to as Phase 3/4, where Phases 1 and 2 involved similar work in the southern portion of the lagoon, with the construction of an on-site Monofill to allow on-site long-term disposal of lagoon solids, and the creation of newly lined lagoon cells 3 and 4 for on-going plant operations.
- B. General work included in this section:
 - 1. Furnish all labor, materials, and equipment required in accordance with the provisions of the Contract Documents.
 - 2. Completely coordinate with work of all other trades.
 - 3. Although such work may not be specifically indicated, furnish and install all miscellaneous items incidental to or necessary for a complete facility.
- C. When applicable, Programming and Systems Integration will be provided by Owner.

1.02 WORK COVERED BY CONTRACT

- A. At the site of the existing 37-acre solids lagoon located on the northern portion of the Columbia Boulevard Wastewater Treatment Plant (CBWTP) site, provide mechanical work, electrical work, and civil site work necessary for the reconstruction of the currently operating northern portion of the lagoon, including biosolids drying and disposal (both on site in the newly constructed monofill and off-site), constructing a dike to form two cells, lining the newly formed lagoon cells with a geomembrane system, installation of a permanent geomembrane cover system on the full monofill, providing a soil cap composed of on-site borrow material and imported top soil, contouring the soil cap, and seeding the soil cap for erosion control. The Work includes, but is not limited to the following activities:
 - 1. Mobilization and demobilization as required for entire project.
 - 2. Dewatering, groundwater, and surface water control.

3. Dry, load and place lagoon solids in the existing monofill to capacity.
4. Dry, load and haul lagoon solids to offsite disposal.
5. Excavate, condition, and incorporate existing submerged dike material into Dike 1.
6. Haul unsuitable existing submerged dike material to off site disposal.
7. Import material and construct Dike 1.
8. Re-grade and compact bottom of Cell 1 and Cell 2.
9. Import material and place in bottom of Cell 1 and Cell 2 to establish final grade.
10. Import material and place on monofill cover to establish final grade.
11. Place and compact Type A material on side slopes in preparation of cell liner installation.
12. Place and compact Type A material on cell bottoms in preparation of cell liner installation.
13. Install geomembrane liner system in Cell 1 and Cell 2.
14. Install geomembrane cover system over monofill solids.
15. Over excavate and fill if directed by Owner.
16. Construct bioswale.
17. All other work, including, but not limited to:
 - a. Install piping and piping appurtenances.
 - b. Prepare Cells 1 and 2 side slopes.
 - c. Assume responsibility for and install the existing groundwater pump system in the leachate manhole to provide a permanent leachate pumping system in the monofill.
 - d. Install conduit for future electrical appurtenances.
 - e. Construct concrete structures for flow control, operations, and maintenance activities.
 - f. Maintenance/repair of access and haul roads.
 - g. Erosion and sedimentation control.

- h. Protection of existing facilities, including monofill existing temporary cover and dried solids.
- i. Regrading, compacting and importing material for side slopes.
- j. Removal and disposal of monofill temporary cover.
- k. Restoration of the site, fencing, paving, and cleaning.
- l. Cleaning, Startup and Training Services.
- m. All other work.

1.03 SUPPLIERS' / MANUFACTURERS' SPECIAL SERVICES

A. Manufacturer's Certificate of Proper Installation (MCOPI):

1. Where required in the Specifications, submit manufacturer's certification of proper installation of equipment prior to start up or performance testing. Such certificate shall state that the equipment or system has been installed in accordance with the manufacturer's recommendation and has been inspected by a manufacturer's authorized representative, that it has been serviced with the proper initial lubricants, that applicable safety equipment has been properly installed, and that the proper electrical and mechanical connections have been made.
2. Where required in the Specifications, the Contractor shall submit liner system manufacturer's certificate of Conformance stating in writing that the liner system was properly installed prior to leak testing. Such certificate shall state that the liner system has been installed in accordance with the manufacturer's recommendation and has been inspected by a manufacturer's authorized representative.

B. Spare Parts and Special Tools

1. Shall be furnished as specified prior to the issuance of a Certificate of Substantial Completion and/or operation of the equipment by the Owner.
2. Spare parts and special tools shall be properly packaged and tagged by the Contractor. Tag shall clearly identify the part description, the manufacturer's part number, the applicable equipment description and manufacturer, the quantity of parts delivered in each package, the applicable specification section, and the Contractor's and Project's name. Spare parts tags shall be firmly affixed and prominently displayed on the surface of each package. Tags shall be furnished by the Contractor.

3. Any part found to be damaged or otherwise inoperable at the time of delivery shall be replaced by the Contractor.

C. Installation Assistance:

1. Installation assistance shall be given by competent and experienced technical personnel, representing the manufacturers of all equipment and systems as may be necessary to resolve assembly or installation problems at the worksite which are attributable to or associated with the equipment furnished.

1.04 EQUIPMENT AND SYSTEM TESTING

A. Liner Systems Leak Testing:

1. Leak testing of lagoon cell liner systems will be conducted by Others as outlined in Section 33 47 13. The Contractor shall be responsible for preparing the liner systems for leak testing and for providing assistance to the tester as required. The Owner will pay for the initial testing of the liner system. Costs for subsequent re-testing of the liner, if required, will be paid for by the Contractor.
2. At least 2 weeks' notice shall be given to the Owner's Representative when the liner will be ready for testing.

B. See Section 01 75 16, Facility Startup.

1.05 CONTRACT TIME

A. Commence work within seven (7) calendar days of receipt of Notice to Proceed as defined in Section 01 42 16.

B. Contract shall be performed within the following Project Milestones:

1. North Cell Dewatering, as described in Specification 33 47 23, Lagoon Solids Handling, **cannot be started before January 15, 2016**, and only after reception of an approved Outage Request from the Owner's Representative.
2. Substantial Completion shall be **no later than 1,071 Calendar Days** after receipt of Notice to Proceed.
3. Final Completion shall be within **60 Calendar Days** of receipt of Certificate of Substantial Completion.

1.06 LIQUIDATED DAMAGES

- A. The liquidated damages for failure to achieve Substantial Completion within the Contact Time stipulated in Paragraph 1.05 B.2 are **\$2,000.00** per Calendar Day.

1.07 OTHER DAMAGES

- A. In addition to any Liquidated Damages owed by the Contractor, the Contractor shall be liable for any NPDES permit violation, up to \$25,000 per day (as imposed by DEQ and allowed by ORS 468.140), to the extent such fines are imposed as a result of the Contractor's actions.

1.08 COORDINATION OF ACTIVITIES

- A. The existing Wastewater Treatment Plant is currently and continuously receiving and treating sewage, and those functions shall not be interrupted except as specified herein. The Contractor shall coordinate the work to avoid any interference with normal operation of plant equipment and processes. The integrity of existing plant utilities shall be maintained by the Contractor at all times. Contractor shall plan, schedule, and coordinate his demolition and construction operations and activities in a manner that will allow the progress of the work included in these Contract Documents within the operational constraints of a working Wastewater Treatment Plant.
- B. The City's operating personnel will be responsible for operating the existing treatment plant throughout the execution of this contract. Equipment presently installed in the treatment plant must be available to plant personnel at all times for use, maintenance, and repair. If it becomes necessary for the Contractor to move equipment or materials to facilitate plant operations, he shall do so promptly.
- C. Notify the Owner's Representative with an Outage Request five (5) working days in advance of the time it is necessary to take any facility and/or utility out of service. Provide temporary power, materials, and equipment as required to maintain continuous operations except as otherwise specified. Maintain the integrity of existing utilities at all times. Proceeding without an approved Outage Request from the Owner's Representative is not allowed.
- D. Coordinate with public agencies and utility companies to ensure uninterrupted service to all customers.
- E. Contractor shall observe the following conditions and restrictions:
 - 1. Field verify survey elevations of existing structures and equipment at locations where structures or equipment crosses. Notify Owner's Representative if existing elevations differ from those shown in the contract documents or other documents.

2. Schedule the work and coordinate with the Owner to ensure continuous, uninterrupted operation of the plant.
3. North Cell dewatering by Owner is limited to 900 gallons per minutes.

1.09 EXISTING SITE CONDITIONS

- A. The following information is a general overview of physical conditions at the project site. It shall not be construed to be a comprehensive description of all conditions that may impact the Work, and it shall not substitute for a careful examination of the site prior to bidding.
- B. The CBWTP Solids Lagoon is located in the northern portion of the Columbia Boulevard Wastewater Treatment Plant (CBWTP). Vehicle access is from North Portland Road. The 37-acre lagoon was constructed in 1970 in the marshy areas known as Mud Lake and Triangle Lake. It is bordered on the south by the Columbia Slough (Slough) and on the northwest and east by railroad embankments. The lagoon is operated by the City's BES.
- C. The lagoon has historically received solids handling sidestreams originating from domestic, commercial, and industrial wastewater. Currently the lagoon receives solids for final conditioning or seasonal storage primarily in the form of digested solids and sidestreams generated as part of dewatering, and thickening operations.
- D. The lagoon contains materials that are typically found in wastewater. The following information is a general overview of physical conditions at the project site. It shall not be construed to be a comprehensive description of all conditions that may impact the Work, and it shall not substitute for a careful examination of the site prior to bid and throughout the duration of the Work.
- E. See 01 11 80, Environmental Conditions.
- F. See Appendices for other existing site conditions, including:
 1. Settlement Monitoring Memorandum
 2. Triangle Lake Groundwater Elevations
 3. Solid Waste Closure Permit: Special Purpose Landfill

1.10 WORK SEQUENCING

- A. Sequence of construction shall be in accordance with the submitted Contractor's Construction Schedule described in Section 01 32 00, Construction Progress Documentation.
- B. Perform Work to accommodate vehicular and pedestrian traffic during construction. Coordinate operations with the Owner's Representative.
- C. Scheduling requirements are provided in the Contract Documents for the Contractor's use in developing a sequence of operations to construct the improvements. These are suggested construction sequence requirements. The Contractor may modify or adapt these requirements as necessary, subject to review and acceptance by the Owner's Representative, to complete the project within the required schedule, provided all environmental and service continuity of operation requirements are met.
- D. See 01 12 16, Work Sequence.

1.11 PERMITS

- A. Comply with the requirements of 00 72 00 – Part 7. Provide a copy of each permit to the Owner's Representative.
- B. Owner will secure permits required by the Department of Environmental Quality (DEQ) and City of Portland bureau of Development Services (BDS) for this project.
- C. Contractor shall secure "trade" permits, including mechanical, plumbing, electrical, and sewer prior to beginning that phase of the project. Contractor shall pay for all "trade" permits.

1.12 OWNER'S REPRESENTATIVE/ENGINEER

- A. Owner's Representative: David Hammond, PE
5001 N Columbia Blvd.
Portland, Oregon 97203
503-823-9686
- B. Engineer: Muriel Gueissaz-Teufel, PE
5001 N Columbia Blvd.
Portland, Oregon 97203
503-823-2498

PART 2 - PRODUCTS [NOT USED]

PART 3 - EXECUTION [NOT USED]

END OF SECTION

SECTION 01 11 80

ENVIRONMENTAL CONDITIONS

- A. This section provides historical weather conditions in the vicinity of the project site obtained from Western Regional Climate Center website for the period of 1973 to 2006.
- B. The weather information presented herein is intended as a convenience to provide general information regarding weather patterns for the work site. **Contractor is solely responsible for collecting and analyzing environmental conditions that could impact the Work.**

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Mean temperature degrees F													
Maximum	46.5	50.7	56.2	61.3	67.4	73.3	79.4	79.7	74.9	63.4	52.2	46.2	62.6
Minimum	36.8	38.4	40.8	44.0	48.7	53.3	57.2	57.5	54.2	47.7	41.4	37.1	46.4
Mean	41.7	44.6	48.5	52.6	58.0	63.3	68.3	68.6	64.5	55.5	46.8	41.6	54.5
Extreme temperature degrees F													
Maximum	63	71	77	90	100	100	104	107	105	92	73	65	107
Minimum	12	9	19	30	35	41	45	44	37	26	13	8	8
Precipitation (inches)													
Monthly mean	6.11	4.87	4.38	3.25	2.50	1.56	.69	.97	1.67	3.32	6.60	6.81	42.73
Extreme 24 hr	2.33	2.16	1.54	1.25	1.45	1.46	1.06	1.47	2.03	2.44	2.69	2.08	2.69
Snowfall (inches)													
Monthly mean	1.18	.71	.11	.00	.00	.00	.00	.00	.00	.00	.31	.83	3.1
Average number of days for temperature													
Maximum 90° or more	.0	.0	.0	.0	.6	1.6	3.9	3.8	1.7	.1	.0	.0	11.7
Maximum 32° or less	1.2	.3	.0	.0	.0	.0	.0	.0	.0	.0	.0	.8	2.4
Minimum 32° or less	7.3	4.0	1.0	.1	.0	.0	.0	.0	.0	.1	2.1	6.4	20.9
Minimum 0° or less	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Precipitation													
.01 inches or more	18	16	17	16	13	8	4	4	7	12	19	19	154
.10 inches or more	13	11	11	10	8	4	2	2	4	8	14	13	99
.50 inches or more	4	3	3	2	1	1	0	1	1	2	4	5	27
1 inch or more	1	1	0	0	0	0	0	0	0	0	1	1	6
Degree days													
Heating days at 65° F	724	577	511	374	237	103	27	21	77	298	546	724	4,220
Growing days at 50° F	5	13	42	112	252	399	567	578	436	183	28	6	2,622

END OF SECTION

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SECTION 01 12 16

WORK SEQUENCE

PART 1 - GENERAL

1.01 CONTINUITY OF PLANT OPERATIONS

A. The solids lagoon receives solids processing side streams and returns supernatant and stabilized solids to the CBWTP. Sampling and dredging operations are normally being conducted within the active process cells. Cells 3 and 4 of the lagoon facility will remain in operation during this project and the Contractor shall coordinate the work to avoid interference with lagoon operations.

1. Contractor/plant staff communications shall be through the Owner's Representative.

B. SUBMITTALS:

1. In accordance with Section 01 32 00, the Contractor shall submit a detailed schedule with detailed descriptions of each activity required to complete the work.

1.02 OWNER RESPONSIBILITIES

A. The Owner will do the following work in support of the construction activities under this contract:

1. Shut down utilities with proper notice for the Contractor as required to facilitate construction activities.
2. Move and manage dredge equipment as required to conduct the work.
3. Monitor the elevation of the dike settlement plates and provide data to the Contractor during construction.
4. Sample groundwater monitoring wells.
5. Collect and analyze composite samples of the dried solids prior to placement in the monofill or off site disposal. See 33 47 23, Lagoon Solids Handling.
6. Conduct record surveys of construction elements.
7. Perform full-time observation during construction activities. See 01 45 23, Testing and Inspection Services.

8. Provide leak testing for initial testing of the Cells 1 and 2 with the Contractor's assistance. The cost of any subsequent testing activities to re-test repaired areas will be paid by the Contractor.
9. Fill Cells 1 and 2 at the completion of construction.
10. Assume responsibility for operation and maintenance of the groundwater control systems and monofill leachate collection system at completion of Phase 3/4.

1.03 SEQUENCE AND SCHEDULE OF CONSTRUCTION

A. GENERAL

1. To facilitate continuous operation of the lagoon during construction, the construction scheduling shall provide for the following specific conditions:
 - a. Existing systems or individual equipment items shall be isolated, dewatered, decommissioned, de-energized, or depressurized only by plant personnel. This work shall be done in accordance with the approved Outage Request submitted by the Contractor.
 - b. Outage Requests that must take place outside of normal work hours (nighttime or weekends) shall not be scheduled for a Friday or the day before a legal holiday.
 - c. Outage Requests shall either be grouped such that several work activities occur at the same time or be staged such that shutdowns are a minimum of two workdays apart.

1.04 POSSIBLE WORK SEQUENCE

- A. The work sequence presented in the section is one means by which the work can be completed. This possible work sequence is provided only for the convenience of the Contractor. It ultimately remains the Contractor's responsibility to choose, modify or develop a work sequence that best serves the project and contract requirements and the Contractor should consider the work sequence in light of other alternatives. Thereafter, if the Contractor decides to implement any or all of the work sequence that decision ultimately rests on the Contractor. No claim for additional compensation or additional contract time will be allowed if the Contractor adopts the work sequence described herein and later determines it to be inadequate.
- B. A schedule for this work sequence is included at the end of this section. The Contractor shall plan and execute the work using his own planned sequence provided that all time constraints and performance requirements are met.

C. May 1 to October 15 is considered the dry season. All other time is considered the wet season.

D. The possible work sequence is as follows:

1. Assume responsibility and maintenance of the monofill leachate and groundwater pumping systems. These systems were installed in the previous contract.
2. Pump the supernatant from the north lagoon removing as much liquid as possible without disturbing the consolidated layer of solids. Take precautions to the greatest degree possible that only supernatant is pumped and that the existing biosolids remain. This may require stopping pumping before all supernatant has been removed. Pumping supernatant directly to Cells 3 and 4 must be approved by the Owner's Representative. If pumping supernatant to the CBWTP, the pumping rate must not exceed the capacity of the supernatant pump station and the plant pump station. See Section 33 47 23 for information regarding supernatant and groundwater pumping restrictions.
3. Construct a temporary groundwater control system in the north lagoon as soon as the area is accessible to facilitate solids dewatering and to provide lagoon drainage during the wet season. Ground and storm water can be pumped to Cells 3 and 4. Keep the work area dewatered and facilitate storm water drainage during the wet season.
4. Once dewatered, continuously work the solids with low ground pressure equipment to facilitate additional drainage and air drying.
5. Place a portion of the dried solids in the monofill prior to the beginning of the second wet season. Begin hauling excess solids off site. The balance of solids to be placed on-site and hauled offsite will be determined by the estimated slope stability of dried solids placed in the previous project. Final placement of solids in the monofill will occur in the dry season of the third construction year to provide time for solids placed the previous season to consolidate and gain shear strength. Solids exceeding the final monofill capacity will be hauled offsite.
6. Install a temporary cover over monofill solids to prevent the intrusion of rain water during the wet seasons. Slope the temporary cover to drain to the leachate collection manhole.
7. Prepare subgrade and construct Dike 1 by the end of the second construction year to allow for the required settlement before installing the liner system.
Construction of Dike 1 will occur simultaneous with air drying of solids.
8. Keep work area free of standing water in the wet season with groundwater controls. Maintain leachate and stormwater pumping within the monofill to avoid standing water. Pump the groundwater manhole to maintain groundwater levels below the monofill liner to prevent liner uplift.

9. Complete air drying of solids and place in the monofill or haul offsite the remaining solids in the third construction year. Once the monofill is to capacity, install the geomembrane cover system, the permanent leachate pump and discharge piping and the perimeter drain.
10. Construct drainage swale for conveyance and treatment of stormwater runoff from monofill cover prior to start of wet season.
11. Import material and place over monofill to establish the final design grades. Seed for erosion control.
12. Import material and regrade the bottoms of Cells 1 and 2 to design grade.
13. Install yard piping, piping appurtenances; construct conveyance and maintenance structures and other site improvements. Install electrical conduits.
14. Prepare subgrade of Cells 1 and 2. Install permanent groundwater drainage system. Install the liner system. If required, Contractor is responsible for managing groundwater levels to prevent floating of the liner over the wet season.
15. The Owner will fill Cells 1 and 2 following the liner installation. Discontinue groundwater pumping once the liquid level in the cells is above the existing groundwater elevation.

END OF SECTION

SECTION 01 14 13

FACILITY ACCESS AND PROCEDURES

PART 1 – GENERAL

1.01 SUMMARY

- A. Contractor shall comply with the following procedures while conducting work at the Columbia Boulevard Wastewater Treatment Plant (CBWTP).
- B. Site (Project Work Area)- CBWTP Solids Lagoon area as shown on the Contract Drawings and Project Staging Area as shown on the Contract Drawings.
- C. All of the Contractor's employees shall enter the project site through the construction access point on North Portland Road (see Drawings). If the Contractor's personnel will be working at any time other than 7 a.m. to 4 p.m., arrangements must be made with Construction Engineering and the Treatment Plant Management. All traffic signs and directions are to be obeyed. Portland Bureau of Transportation requirements for ingress and egress from North Portland Road shall be incorporated into the Contractor's traffic plan.
- D. Work within existing structures shall be completed without disruption to routine access by plant personnel. No material, equipment or tools are to be left in the structures after normal work hours without prior written permission of the Owner's Representative.
- E. The Contractor shall have the use of the Peninsular Crossing Trail during weekdays as required for hauling and construction purposes. This trail shares the Contractor's ingress and egress point on North Portland Road and runs along the south edge of the work area. This is a public trail that must be maintained for safe pedestrian and bicycle access. The Contractor should refer to the Section 01 14 19 for trail safety and coordination requirements.
- F. The Contractor shall not use the footbridge across the Columbia Slough from the lagoon site to the treatment plant without permission from the Owner's Representative. The footbridge is not rated for truck traffic.

1.02 DEFINITIONS

- A. Badge: Either a color-coded, clip-on visitor or contractor badge, or an adhesive contractor badge which can be affixed to a hard hat. Visitor, and/or contractor badges must be worn in a visible location at all times.

B. Normal Hours of Operation: 7:30 a.m. to 4:00 p.m., Monday through Friday.

1.03 PROCEDURES

A. ID Badges: All visitors, Contractor employees, and subcontractor employees shall wear a city issued identification badge at all times.

1. Provide the Owner's Representative with a list of Contractor and subcontractor employees who will be on site for longer than 3 days. This list shall be updated and provided to the Owner's Representative whenever changes are made. Owner's Representative will provide identification badges to the Contractor for these employees.
2. Contractor and subcontractor employees on site less than 3 days, must sign the visitor's log at the Administration Building. These employees will be issued a daily visitor's badge.
3. Delivery personnel who will be on site only to complete their deliveries are exempt from signing the visitor's log and from wearing identification badges.
4. Maintain a daily record of all employees, subcontractor employees, and visitors on site for use in the event of an emergency.

B. Access/Egress: All persons, who desire plant access/egress outside of normal hours of operation, are required to contact the **24-hour Operations Center at 503/823-2500** on both arrival and departure.

1. No unescorted visitors, Contractor employees, or subcontractor employees will be allowed access without prior arrangements being made with a City employee.
2. Contractor employees, subcontractor employees, and vendors requesting access outside of the normal operating hours and for periods longer than 3 days shall have vehicles clearly identified with the firm's name and must provide to the Owner's Representative a listing of all names and contact phone numbers for employees requiring access.
3. Visitors, Contractor employees, and subcontractor employees arriving after 4:00 p.m. must arrange with the 24-hour Operations Center to open the gate.
4. The Contractor, subcontractors, and all delivery vehicles shall use the designated "Lagoon Construction Entrance" on North Portland Road for access/egress to the lagoon project site.
5. The Lagoon Entrance located on North Portland Road falls under the jurisdictional authority of the Portland Bureau of Transportation.

The entrance to the lagoon is at an oblique angle to North Portland Road; ingress to the lagoon site is restricted to left in and right out only. In the event that the earthwork material quarry is to the south, a detour plan will be required to assure that the driveway remains left in and right out only. A u-turn may require the use of private property; the Contractor is responsible for any associated costs, and obtaining coordination, and approvals in writing.

6. It is the responsibility of the Contractor to establish and maintain sight distance in either direction from the project site entrance to insure the operational integrity of the approach road and safety of North Portland Road users. The Contractor is responsible to insure the use of approved PBOT traffic control devices and flaggers whenever trucks are entering or leaving the site.
- C. Plant Facilities: Contractor may not use any plant facilities, including lunch rooms, vending machines, showers, lavatories, phone system, etc. except during an emergency (accident or injury) without specific authorization by the Owner's Representative.
- D. Traffic Regulation: Contractor, subcontractors and visitors shall yield right-of-way to pedestrians and comply with traffic control signs, including stop signs and speed limits. Except where otherwise posted, the maximum speed limit is 10 miles per hour.
- E. Contractor is cautioned that railroad activities in the vicinity of Columbia Boulevard WTP result in frequent and unscheduled closures of various lengths to the main plant entrance. Owner has no control over these closures.
1. The Lagoon project entrance is not subject to railroad crossing closure, but Columbia Boulevard, who may or may not be used by the contractor to access the site, is.
- F. Parking: Contractor, subcontractors, and visitors shall park only in designated areas unless directed otherwise by the Owner's Representative.
- G. Smoking: Smoking is allowed in designated outdoor areas only. Smoking is not permitted in any process areas.
- H. General: All Contractor and subcontractor employees shall be courteous and respectful to City employees who must continuously operate the facility 24 hours per day.

1.04 CONTRACTOR RESPONSIBILITIES

- A. Supply all workers with the required safety and protective equipment, including, but not limited to hard hats, safety shoes, hearing protection, respirators, goggles, chemical suits, and monitoring equipment as needed, and ensure that they are used on the job. The Owner will not supply safety equipment.

- B. Submit an MSDS to the Owner's Representative before any chemical is brought on to the site.
- C. Delivery Personnel Are the Responsibility of the Contractor:
 - 1. Delivery personnel must check in with the Contractor immediately upon entering the site.
 - 2. Deliveries should be made directly to the Contractor and not to CBWTP Stores.
 - 3. Coordinate work schedule and delivery schedule to allow for Contractor off-loading of material.
- D. Contractor to develop and submit a Traffic Control Plan (TCP) to PBOT and incorporate all requirements for ingress and egress from North Portland Road into the Contractor's TCP.

1.05 EMERGENCY

- A. In the event of an emergency at the treatment plant requiring police, fire or medical assistance, call 9-911 from any plant phone, then call the 24-hour Operations Center at x32500.

1.06 ALLOWABLE LOADING [NOT USED]

PART 2 PRODUCTS [NOT USED]

PART 3 EXECUTION [NOT USED]

END OF SECTION

SECTION 01 14 19

TRAIL COORDINATION

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This section describes the coordination of construction activities with the public's access to the Peninsula Crossing Trail during Lagoon reconstruction. The trail includes the Lagoon access driveway from North Portland Road and the paved lane running along the southern boundary of the project site.
- B. Elements of the project related to trail coordination include, but are not limited to: perimeter fencing, signage, and public notification of trail closures and constraints, trail safety and maintenance and restoration of the trail and adjacent property.

1.02 CONTRACTOR RESPONSIBILITIES

- A. At least 7 days before the activity, the Contractor shall notify the Owner's Representative of any activities that affect trail access or safety, trail maintenance activities or proposed trail closures. At the completion of construction the Contractor shall resurface the trail between North Portland Road and the east property boundary in accordance with the Drawings and Specifications and seed the shoulders. Any rutting or other damage to the trail which poses a safety concern, as determined by the Owner's Representative, shall be repaired immediately and to the satisfaction of the Owner.

1.03 FENCING

- A. Existing fencing may be replaced or relocated at the discretion of the Contractor for construction purposes given that the following criteria are met:
 - 1. Fencing matching the existing is continuous at all times around the perimeter of the lagoon.
 - 2. Fencing modifications do not interfere with public access to the Peninsula Crossing Trail.
 - 3. Fencing modifications do not alter the existing barrier toward the railroad tracks.

1.04 PUBLIC NOTIFICATION SIGNS

- A. Provide five trail signs in accordance with METRO public trail standards at the locations directed by the Owner's Representative. The trail signs are intended to notify the public about the Peninsular Crossing trail closures when scheduled during the workweek. Sign wording shall be as shown below or as approved by the Owner's Representative:



- B. The Contractor's design of the signs will be reviewed by the Owner's Representative. Potential trail sign locations include:
1. The CBWTP (Plant) entrance
 2. The corners of North Portland Road and Old Marine Drive
 3. Project site entrance on North Portland Drive
 4. Trailhead at Columbia Court
 5. Trailhead at Denver Avenue

- C. Location of signs to be coordinated with the Owner's Representative.
- D. The sign shall be professionally designed and constructed. Design and construction of this sign will be reviewed by the Owner's Representative.

1.05 CONTRACTOR'S USE OF THE TRAIL

- A. The Contractor will have the use of the trail west of the Columbia Slough footbridge to North Portland Road as required for hauling or construction activities during weekdays. The trail heading east of the Columbia Slough footbridge shall be maintained and open to the public at all times. The trail west of the footbridge along the Slough shall be maintained and open for public access on weekends and on weekdays when hauling or construction activities do not pose a risk to public safety. The trail shall be cleared and checked for safe public access at the end of each workday.
- B. The extents of the trail shall be open to public access and in safe condition on weekends throughout the project. The Contractor shall schedule and conduct his work to minimize shutdowns and interferences with trail operations and public access to the trail during weekdays.
- C. Where disturbance of the existing trail is necessary, the Contractor shall provide a safe and hard surfaced bypass.
- D. Hazardous materials and debris shall be cleared from the trail whenever it is open to the public and at the end of each workday.
- E. The Contractor may remove the wooden bollards at the trail entrance along North Portland Road for temporary access but must replace them at the end of each work day.

1.07 RESTORATION OF TRAIL

- A. The trail and adjacent areas shall be restored to original condition at the end of construction.
 - 1. The extents of the trail as defined on the Drawings shall be resurfaced at the completion of the project.
 - 2. The shoulders of the trail shall be restored to original dimensions and seeded at the end of construction.
 - 3. The trail must be left in a safe and clean condition at the end of each construction season. This may require temporary resurfacing if directed by the Owner's Representative.

PART 2 - MATERIALS [NOT USED]

PART 3 - EXECUTION [NOT USED]

END OF SECTION

SECTION 01 20 00

PRICE AND PAYMENT PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes methods of measurement and payment for items of Work under this Contract. Refer also to Part 9 of SECTION 00 72 00.
- B. Payment shall be in accordance with Parts 10, 11 and 12 of SECTION 00 72 00.

1.02 BID ITEM MEASUREMENT AND PAYMENT

- A. The Bid Form includes a combination of Unit Prices and Lump Sum items. Work will be paid for on a progress payment basis in accordance with the provisions of Part 10 of SECTION 00 72 00, and Specification SECTION 01 22 13, Unit and Lump Sum Price Measurement and Payment.
- B. Contractor must submit a Schedule of Values in accordance with the requirements of paragraph 1.02 of this Section prior to the first request for payment.

1.03 SCHEDULE OF VALUES

- A. Format: Identify each line item in the Schedule of Values with number and title of the major Specification sections. Submit typed schedule on 8½ x 11-inch paper; Contractor's standard form or media-driven printout will be considered on request.
- B. At the pre-construction meeting, submit a preliminary Schedule of Values to the Owner's Representative for review. The Contractor shall incorporate any review comments from the Owner's Representative, and submit a final Schedule of Values at least 21 days prior to submitting the first Application for Payment.
- C. The Schedule of Values shall assign a fair, reasonable and equitable dollar value for each activity on the Contractor's construction schedule. The Schedule of Values shall include anticipated progress payments for each item in the bid schedule through the final payment. In addition, a detailed breakdown of lump sum prices shall be included in the Schedule of Values.
- D. The Schedule of Values shall specifically indicate installed cost for materials and equipment for each bid and sub-bid item.

- E. Each activity's assigned value shall consist of labor, equipment and materials cost and a prorata contribution to overhead and profit. Breakdown shall be so organized as to facilitate assessment of work and payment of subcontractors.
- F. The sum of the assigned values shall equal the lump sum price **or total unit cost** of the activity.
- G. If, in the opinion of the Owner's Representative or Owner, the Schedule of Values is not balanced, the Contractor shall provide documentation substantiating the cost allocations of those activities believed to be unbalanced. Cost allocation will be considered unbalanced if an activity on the construction schedule has been assigned a disproportionate allocation of labor, direct, or overhead and profit costs which result in progress payment request(s) which would create a condition where insufficient funds are available to complete the unfinished work. Upon request by Owner, support values shall be given with data that will substantiate their accuracy. Upon Owner's request, the Contractor shall submit additional detailed cost information.
- H. Schedule of Values shall include pay items for Mobilization and Demobilization. See Specification SECTION 01 29 11, Project Mobilization and Demobilization.
 - 1. Bid item No.1 is assigned for Mobilization and Demobilization Cost for the entire project.
- I. Schedule of Values shall include pay item for Project Record Drawings. See Specification SECTION 01 78 39, Project Record Documents.
- J. Upon acceptance of the Schedule of Values, it shall be used as a basis for processing all progress payment requests.

1.04 PROGRESS PAYMENT REQUESTS

- A. Contractor may submit Progress Payment Requests periodically during the course of the project in conformance with Part 10 of SECTION 00 72 00. Progress record drawings shall be submitted in accordance with SECTION 01 78 39, Project Record Documents. Submittals will be used to verify and document progress as stated in Progress Payment Requests. Work not included in the progress record drawings will not be included for payment in Progress Payment Requests.
- B. Submittal of progress record drawings of the project will be required at 25%, 50%, 75%, and substantial completion of the project. These submittals shall accompany the progress payment request and will be a condition of processing payment requests.
- C. Contractor shall submit a monthly schedule report along with its monthly pay request (SECTION 01 32 00 – 1.03).

1.05 FUEL COST PRICE ESCALATION/DE-ESCALATION

- A. A fuel escalation/de-escalation clause will be in effect during the life of the Contract.
- B. The Owner reserves all of its rights under the Contract, including, but not limited to, its rights for suspension of the Work under Part 8 of SECTION 00 72 00 and its rights for termination of the Contract under Part 8 of SECTION 00 72 00, and this escalation/de-escalation provision shall not limit those rights.

1. Monthly Fuel Price (MFP) - A Monthly Fuel Price (MFP) will be established by the Owner each month. For the actual MFP, go to the ODOT website at:

http://www.oregon.gov/ODOT/HWY/ESTIMATING/asphalt_fuel.shtml

The MFP for a given month will be the average weekly price obtained from the OPIS weekly listing dated the first Monday of that month for No. 2 diesel fuel for Portland, Oregon. Prices are based solely on rack and resellers' prices exclusive of freight, taxes, and special discounts. If the average weekly price is not posted by OPIS or is otherwise not available to the Owner for the first Monday of any month for any reason, the Owner may use the average weekly price posted by OPIS immediately before or after the first Monday of that month. If the average weekly prices cease to be available from OPIS for any reason, the Owner in its discretion will select and begin using a substitute price source or index to establish the MFP each month. The Owner does not guarantee that fuel will be available at the MFP.

2. Base Fuel Price (Base) - The Base fuel price for this Project is the MFP published on the ODOT website for the month immediately preceding the bid opening date.
3. Monthly Fuel Adjustment Factor - A Monthly Fuel Adjustment Factor will be determined each month as follows:
- If the MFP is within $\pm 25\%$ of the Base, there will be no adjustment.
 - If the MFP is more than 125% of the Base, then:
Adjustment Factor = $(MFP) - (1.25 \times \text{Base})$
 - If the MFP is less than 75% of the Base, then:
Adjustment Factor = $(MFP) - (0.75 \times \text{Base})$
4. Fuel Price Adjustment - A fuel price adjustment for fluctuations in the cost of fuel will apply only to the major fuel usage Pay Items shown in the following list and at the respective fuel factors listed:

<u>Pay Item</u>	<u>Fuel Factor</u>
Excavate, condition and incorporate existing dike material into Dike 1	0.58 Gal/CY
Haul unsuitable existing dike material to offsite disposal	0.33 Gal/CY
Import material and construct Dike 1	0.29 Gal/CY
Import material and place in bottom of Cell 1 and Cell 2 to est. final grade	0.21 Gal/ton
Import material and place on monofill cover to est. final grade	0.21 Gal/ton
Place and compact Type A subgrade in Cell 1 and Cell 2 (cell bottoms)	0.21 Gal/SY
Place and compact Type A subgrade in Cell 1 and Cell 2 (side slopes)	0.21 Gal/SY
Over excavate and fill if directed by Owner's Representative	0.33 Gal/CY

- C. The Contractor is cautioned to consider that its operations may require more or less fuel.
- D. A price adjustment (+/-) to the Contractor for fuel cost changes will be made monthly if the Monthly Fuel Price differs 25% or more from the Base Fuel Price. This adjustment will be the product of the Monthly Fuel Adjustment Factor and the estimated Monthly Fuel Used. The Monthly Fuel Used will be determined by multiplying the quantities of Work accomplished during the month for subject Pay Items, by the appropriate Fuel Factors.
- E. Fuel requirements for constructing the Project have been estimated at 17,920 gallons, based on fuel factors shown.
- F. If the Contractor elects to use an alternate fuel (natural gas, wood pellets, propane, or other), the estimated fuel requirements will not be revised. Fuel cost adjustments will continue to be made as specified and will not be revised.

PART 2 - PRODUCTS [NOT USED]

PART 3 - EXECUTION [NOT USED]

END OF SECTION

SECTION 01 22 13

PRICE MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes methods of measurement and payment for Lump Sum and Unit Price Bid Items provided under this Contract. Refer also to Part 9 of Section 00 72 00.
- B. Payment shall be in accordance with Parts 10, 11 and 12 of Section 00 72 00.

1.02 MEASUREMENT AND PAYMENT

- A. LUMP SUM and UNIT PRICE BID ITEMS (Numbering corresponds to the bid items listed on the Bid Form)

- 1. MOBILIZATION AND DEMOBILIZATION AS REQUIRED FOR THE ENTIRE PROJECT:
 - a. All costs for mobilizing and demobilizing over the course of the project will be included under this bid item. Payment will be based on the Schedule of Values and progress of the work. Total payment for this bid item will not exceed the bid amount regardless of the number of mobilization or demobilization events that occur. Limits described in Specification Section 01 29 11, Project Mobilization and Demobilization will apply.
- 2. DEWATERING, GROUNDWATER AND SURFACE WATER CONTROL
 - a. All costs for dewatering activities including supernatant pumping and for establishing, operating and managing the site dewatering system for the duration of the project will be included in this bid item. Payment will be based on the lump sum value, Schedule of Values and progress of the work.
- 3. LAGOON SOLIDS: DRY, LOAD AND PLACE IN THE MONOFILL
 - a. All costs for solids drying, loading and placement will be included under this bid item. Dry tonnage will be calculated from representative measurements of the solids content and the gross weight of the material placed. If applicable, the weight of additives used to aid dewatering or drying will be subtracted from the net weight of solids. Payment will be based on the dry tonnage of solids placed in the monofill.

- b. Solids concentration will be calculated from representative samples collected and analyzed by the Owner using a CEM Microwave Moisture/Solids Analyzer in accordance with the test procedure included in Section 33 47 23. The gross weight of the material placed in the monofill will be determined using a Contractor-supplied truck scale or other approved method. The Contractor shall be responsible for keeping an accurate record of the quantity of solids placed in the monofill.
- c. The net weight of solids will be calculated as follows:
 - 1) Net weight = wet weight x solids concentration
 - 2) Quantities will be expressed in dry tons. If applicable, the dry weight of any additives added to aid in dewatering or drying will be subtracted from the net weight.
- d. Final quantities to be placed in the monofill shall be per the Drawings or as directed by Owner's Representative. Owner reserves the right of discretion over which solids are hauled off-site rather than placed in the monofill.

4. LAGOON SOLIDS: DRY, LOAD AND HAUL TO OFFSITE DISPOSAL

- a. All costs for solids drying, loading, hauling and disposal will be based upon the dry tonnage of solids hauled offsite. If applicable, the weight of additives used to aid dewatering or drying will be subtracted from the net weight of solids. Payment will be based on dry tonnage from representative measurements of the solids content and the gross weight of the material hauled.
- b. Solids concentration will be calculated from representative samples collected and analyzed by the Owner using a CEM Microwave Moisture/Solids Analyzer in accordance with the test procedure included in this section. The gross weight of the material hauled offsite will be determined using a Contractor-supplied truck scale or other approved method. The Contractor shall be responsible for keeping an accurate record of the quantity of solids hauled offsite.
- c. The net weight of solids will be calculated as follows:
 - 1) Net weight = wet weight x solids concentration
 - 2) Quantities will be expressed in dry tons. If applicable, the dry weight of any additives added to aid in dewatering or drying will be subtracted from the net weight.

5. EXCAVATE, CONDITION, AND INCORPORATE EXISTING DIKE MATERIAL INTO DIKE 1
 - a. All costs required for excavating and conditioning existing dike material and for loading, placing, compacting and incorporating this material into Dike 1 will be included in this bid item. Measurement will be based on cubic yards of material excavated based on a Contractor provided survey of the existing dike following removal of solids. Payment will be based on the unit cost and the cubic yards of material excavated and deemed suitable for reuse. Unsuitable material that is hauled offsite for disposal will be paid for in a separate bid item.
6. HAUL UNSUITABLE DIKE MATERIAL TO OFFSITE DISPOSAL
 - a. All costs associated with loading, hauling, and disposal of existing dike material not suitable for dike construction will be included in this bid item. Payment will be based on the unit price and the cubic yards of material hauled offsite. Contractor is responsible for all costs associated with disposal. The Owner's Representative will make the final determination on material requiring disposal.
7. IMPORT MATERIAL AND CONSTRUCT DIKE 1
 - a. All costs associated with importing materials from offsite and for incorporating imported material into Dike 1 including placing, compacting and finishing the material will be included in this bid item. Type F1 road base along the top of the dike will be paid under "All Other Work". Measurement of quantities will be based on neat line survey of the dike after settlement has occurred using Contractor provided survey information. Payment will be based on the unit price and the cubic yards of imported material placed. Existing dike material used for Dike 1 construction will be subtracted from the survey quantity and paid under a separate bid item. Settlement plates installed along the dike centerline will be used to determine the degree of settlement for calculation of quantities.
8. RE-GRADE AND COMPACT BOTTOM OF CELL 1 AND CELL 2
 - a. All costs required for cutting, filling, regrading and compacting the bottom of Cell 1 and Cell 2 will be included in the bid item. Quantities will be based on Contractor provided survey information. Payment will be based on the unit price and the square yards of cell bottom re-graded.
9. IMPORT MATERIAL AND PLACE IN BOTTOM OF CELL 1 AND CELL 2 TO ESTABLISH FINAL GRADE
 - a. All costs associated with importing material from offsite and placement of material as required establishing final grade will be included in this bid item.

Quantities will be based on Contractor provided weigh scale totals. Payment will be based on the unit price and tons of material placed.

10. IMPORT MATERIAL AND PLACE ON MONOFILL COVER TO ESTABLISH FINAL GRADE

- a. All costs associated with importing material from offsite and placement of material as required establishing final grade will be included in this bid item. Quantities will be based on Contractor provided weigh scale totals. Payment will be based on the unit price and tons of material placed.

11. PLACE AND COMPACT TYPE A SUBGRADE IN CELL 1 AND CELL 2 (SIDE SLOPES)

- a. All costs to import, place, and compact Type A material on side slopes of Cell 1 and Cell 2 prior to installation of the liner will be included in this bid item. Measurement will be based on the square yards of material placed as calculated from the Drawings or as measured in the field by the Contractor's survey. Payment will be based on the unit price and square yards of material placed.

12. PLACE AND COMPACT TYPE A SUBGRADE IN CELL 1 AND CELL 2 (CELL BOTTOMS)

- a. All costs to import, place, and compact Type A material on bottoms of Cell 1 and Cell 2 prior to liner installation will be included in this bid item. Measurement will be based on the square yards of material placed as calculated from the Drawings or as measured in the field by the Contractor's survey. Payment will be based on the unit price and square yards of material placed.

13. INSTALL GEOMEMBRANE LINER SYSTEM IN CELL 1 AND CELL 2

- a. All labor, equipment and material required for completing the liner system in Cell 1 and Cell 2 including the geocomposite and geomembrane will be included in this bid item. Measurement will be based on square yards of area covered as calculated from the Drawings or as measured in the field by the Contractor's survey. Liner material placed in the anchor trench will not be included in payment quantities. Payment will be based on the unit price and square yards of material placed.

14. INSTALL GEOMEMBRANE LINER SYSTEM OVER MONOFILL SOLIDS

- a. All labor, equipment and material required for completing the top liner system including the geogrid, the two geocomposite layers and the LLDPE geomembrane shall be included in this bid item. Measurement will be based on square yards of area covered as calculated from the Drawings or as measured in the field by the Contractor's survey.

Area calculations will be based on field measurements of the completed liner system to the limits of the point that the top liner is welded to the existing bottom liner. Payment will be based on the unit price and square yards of material placed.

15. OVER EXCAVATE AND FILL PER 31 00 00-3.01.B IF DIRECTED BY OWNER'S REPRESENTATIVE

- a. This quantity allowance will be used when the Owner's Representative directs the Contractor to over-excavate existing subgrade and replace unsuitable soils with Material Type H, Fill Class H1 or H2 in accordance with Paragraph 31 00 00-3.01.B. All costs to excavate unsuitable material, dispose of unsuitable material offsite, import, place and compact Type H material, Fill Class H1 or H2 shall be included in the unit price. Quantities will be based on truck weight tickets. Weight tickets must be from a third party, state certified scale. Weight tickets shall be provided with each load by the Contractor. Payment will be made based on the unit price and tons of material in place.

16. CONSTRUCT BIOSWALE

- a. All labor, equipment and material required for construction of the bioswale as shown on Drawing Sheet D-2 and associated site fencing as shown Drawing Sheet C-2 shall be included in this bid item. Measurement is lump sum. Payment will be based on the lump sum value, Schedule of Values and progress of the work.

17. ALL OTHER WORK

- a. All other work whether incidental to, or directly related to performance and work required to complete this contract that is not covered under Bid Items 1 through 16. These items include but are not limited to manholes, concrete work, yard piping and valves, mechanical work, electrical work, maintenance/repair of access and haul roads, erosion and sedimentation control, protection of existing facilities, including existing monofill temporary cover and dried solids, regrading, compacting and importing material for side slopes, restoration of the site, fencing, and paving. Payment for All Other Work will be made based on the Schedule of Values and progress of the work.

PART 2 - PRODUCTS [NOT USED]

PART 3 - EXECUTION [NOT USED]

END OF SECTION

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SECTION 01 29 11

PROJECT MOBILIZATION AND DEMOBILIZATION

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Mobilization work shall consist of preparatory work and operations necessary to be ready to perform the Work required under the Contract; and for other work and operations which must be performed, or costs incurred prior to the beginning of the Work.
- B. Demobilization work shall consist of all activities and costs for transportation of personnel, equipment, and supplies necessary to demobilize the contractor from the site; including the disassembly, removal and site clean up/repair of offices, buildings, and other facilities assembled on the site for the Contract.
- C. Mobilization and Demobilization shall not include mobilization or demobilization for specific items of work for which payment is provided elsewhere in the Contract.
- D. In Unit Price Contracts, the cost of Bonds and insurance are recoverable as part of the Contractor's Mobilization costs if the Contract Documents or an approved Schedule of Values provide for a separate payment for Mobilization. Otherwise, no separate payment is made for such costs.
- E. When the Contract or proposed Schedule of Values includes a separate item for mobilization or demobilization, payment will include full compensation for the furnishings of all labor, materials, tools, equipment, administrative costs, and incidentals to mobilization or demobilization.
- F. If additional mobilization and demobilization activities and costs are required during the performance of the Contract as a result of the changed, deleted, or added items of work for which the Contractor is entitled to an adjustment in Contract price, compensation for such costs shall be included in the price adjustment for the item of Work changed or added.

1.02 ITEMS INCLUDED

- A. Mobilization costs shall be limited to the following items:
 - 1. Prime and Subcontractor bonds and insurance
 - 2. Obtaining required permits and licenses

3. Developing Project Work Schedule
 4. Attending Preconstruction Conference
 5. Processing Permits
 6. Furnishing and installing signs
 7. Any work that is necessary to provide access to the site, including, but not limited to, grading and clearing
 8. Moving equipment required for the first month of operation
 9. Installing temporary construction power wiring
 10. Necessary assembly and testing required prior to start of the Work
 11. Establishment of all and other facilities necessary for the Work, including utilities and specified field offices
 12. Providing for and establishing Contractor's work and storage yard
 13. Movement of personnel, equipment, supplies, and incidentals to the site
- B. Cost incurred prior to the start of the Work which must be performed, such as a down payment on a long lead item.
- C. Demobilization costs shall be limited to the following items:
1. Costs for final site cleanup, packaging of miscellaneous items for return to the yard and other project closeout related expenses
 2. Cost for final payment documents, and provision of Acknowledgement Certification Request, Bond, and Certificate of Completion
- D. The Owner will pay all costs for the Mobilization and Demobilization of all of the Contractor's personnel, equipment, supplies, and incidentals at the contract lump sum price as follows:
1. The Owner will pay no greater than five percent (5%) of the original Contract Amount as a separate pay item for mobilization. In the event the Contractor submits a mobilization pay item greater than five percent (5%) of the original Contract Amount.
 2. The Owner will pay no greater than one-half of one percent (1/2%) of the original Contract Amount as a separate pay item for demobilization.

3. Owner will pay 50 percent (50%) of the Mobilization lump sum price when five percent (5%) of the original Contract Amount is earned.
4. Owner will pay the remaining 50 percent (50%) of the Mobilization lump sum price when ten percent (10%) of the original Contract Amount is earned.
5. Owner will pay 100 percent (100%) of the Demobilization lump sum price when all closeout activities and documents are completed.
6. Furnish cost data and documentation to justify this portion of the bid if Owner believes that the percentages in paragraphs C.1 and C.2 do not bear a reasonable relation to the cost of the work in this contract.
7. Failure to justify such price to the satisfaction of the Owner will result in payment as determined by the Owner, of:
 - a. Actual mobilization costs at completion of mobilization
 - b. Actual demobilization costs at completion of demobilization; and
 - c. The remainder of this item in the final payment under this contract
8. The Owner's determination of the actual costs in paragraph C.6 and C.7 of this clause is not subject to appeal.
9. This schedule of mobilization progress payments will not limit or preclude progress payments otherwise provided by the Contract.

PART 2 – PRODUCTS [NOT USED]

PART 3 – EXECUTION [NOT USED]

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SECTION 01 31 19

PROJECT MEETINGS

PART 1 - GENERAL

1.01 PRECONSTRUCTION MEETING

- A. Prior the start of construction, the Owner's Representative will schedule a meeting of the Contractor, BES, and their respective representatives. The purpose of the meeting will be to clarify construction contract administration procedures, to establish lines of authority and communication and identify duties and responsibilities of the parties. The construction Notice to Proceed will normally be issued at this meeting.
- B. Agenda
1. The agenda for the meeting will cover at least the following items. A more detailed agenda will be distributed at the meeting:
 - a. Organization of the Contractor's forces and personnel, including all subcontractors, and materials suppliers.
 - b. BES construction management (CM) organization and personnel.
 - c. Channels and procedures for communication.
 - d. Contractor's construction schedule, including sequence of critical work.
 - e. Contract documents, including distribution of required copies of Plans and revisions.
 - f. Processing of shop drawings and other data that will be submitted to BES for review.
 - g. Processing of Construction Change Directives (CCD) and Change Orders, Part 4 of Section 00 72 00.
 - h. Rules and regulations applicable to the performance of the work, such as quality control, testing and startup.
 - i. Procedures for safety and first aid, and security.
 - j. Procedures for quality control, housekeeping and related matters.

C. Submit the following at the pre-construction conference:

1. The names and telephone numbers of Contractor's Project Manager, Superintendent and Office Manager and a list of personnel authorized to sign change orders and receive progress payments;
2. The name, address and telephone numbers of two or more persons employed by the Contractor who can be reached at any time of the day or night to handle emergency matters;
3. A list of all subcontractors that will work on the project, a description of work they will perform, and a contact list for each subcontractor with phone numbers and address;
4. A list of materials suppliers and products;
5. A draft proposed Construction Schedule (Section 01 32 00);
6. A proposed Schedule of Values (Section 00 72 00 - 10.03 and Section 01 20 00, Price and Payment Procedures);
7. Material Safety Data Sheets for all hazardous chemical products to be used by the Contractor on this project. Submit MSDS for approval before bringing any chemical on site;
8. Site Specific Safety and Health Plan (Section 00 73 19);
9. Temporary Erosion and Sediment Controls Plan (Section 01 57 19);
10. Traffic Control Plan (Section 01 14 13).

D. Minutes of Meeting

1. The Owner's Representative will compile minutes of the meeting from the transcribed record of the meeting and electronically distribute copies to all participants.

1.02 PROGRESS MEETINGS

- A. Unless otherwise arranged, there will be a **weekly** progress meeting at a location determined by the Owner's Representative. These meetings are to enable orderly project review during the progress of work. Present at these meetings will be the Contractor, subcontractors and suppliers' representatives as may be needed, other Contractors working at the site, the Project Manager, and other interested or affected parties.
- B. The specific purpose of the weekly meetings is to coordinate the efforts of all concerned so that the project progresses without delay to completion, with the least inconvenience.

The Contractor shall bring a three week look ahead schedule to each weekly meeting. See 01 32 00 Construction Progress Documentation.

C. The Contractor will be required to address the following items at the weekly meeting:

1. Work completed last week.
2. Work anticipated for the next two weeks ("Look Ahead").
3. Subcontractors on site the prior week.
4. Subcontractors scheduled on site for the next two weeks.
5. Contract document deficiencies or questions noted during prior week.
6. Coordination needs with plant operations or other work.
7. Corrective measures and procedures planned to regain planned schedule, cost or quality assurance, if necessary.
8. Report of any accidents, and any site safety issues that need to be addressed.

D. Other Agenda items to be discussed;

1. Review and revise as necessary and approve minutes of previous meetings.
2. Status of submittals of equipment and shop drawings.
3. Identify problems that impede planned progress.
4. Other current business.

E. Revision of Minutes;

1. Unless published minutes are challenged in writing prior to the next regularly scheduled progress meeting, they will be accepted as properly stating the activities and decisions of the meeting.
2. Persons challenging published minutes shall reproduce and distribute copies of the challenge to all indicated recipients of the particular set of minutes.
3. Challenge to minutes shall be settled as priority item of "old business" at the next regularly scheduled meeting.

F. Minutes of Meeting;

1. The Owner's Representative will compile minutes of each project meeting and will furnish electronic copies to the Contractor.

PART 2 - PRODUCTS [NOT USED]

PART 3 - EXECUTION [NOT USED]

END OF SECTION

SECTION 01 32 00

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section specifies schedule and reporting requirements for this project.

1.02 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Description of Work

B. The Contractor shall develop, maintain, and provide a construction schedule to the Owner's Representative. Tasks shown on the schedule shall have associated value shown and shall be unique to trade, responsible party and type of work.

C. Required Submittals

1. The Contractor shall submit a draft proposed construction schedule for review within (10) Calendar Days after Execution of Contract. Receipt of this draft Construction Schedule is a prerequisite to the Owner scheduling the Preconstruction Conference and issuing Notice to Proceed.
2. The proposed Construction Schedule shall be presented in a form that defines planned activities to the satisfaction of the Owner's Representative. The Schedule shall be developed in a manner that will accommodate revision and still demonstrate the original schedule and related items. A schedule developed and presented using Microsoft Project, Version 4.0 is considered the minimum standard of acceptability.
3. The Schedule shall incorporate:
 - a. Tasks for all submittals, including engineering, design, and permitting time for deferred submittals (if applicable).
 - b. Material and equipment procurement.
 - c. Critical Path activities, tie-ins, anticipated Shut-Downs, and anticipated flow diversions.
 - d. All construction work, and shall clearly indicate milestones of completion to be met under the Contract.

- e. All tasks shall show predecessor and successive tasks to indicate logical sequence of intended completion.
4. The Contractor shall submit a final baseline Construction Schedule within five (5) work days after receipt of Owner's comments on the draft construction schedule.

1.03 PROGRESS REPORTS

The Contractor shall submit periodic reports on the progress of the project. Reports required for this project include the following:

A. MONTHLY REPORTS

Monthly reports shall include a narrative summary of work accomplished and an updated Construction Schedule.

1. The narrative summary shall briefly describe progress of the work during the previous month and how it is progressing towards its completion. It should identify milestones completed, major equipment deliveries and any problems which arose during the month. The report shall also outline the work anticipated during the coming month, including major deliveries, submittals, milestones, and other important events.
2. The narrative shall also identify and justify any changes in schedule logic ties.
3. The Contractor shall submit the monthly progress report along with its monthly payment request. Submitting acceptable monthly progress reports as required is a precondition to approval of the monthly progress payment.

B. WEEKLY PROGRESS REPORTS

1. Weekly progress reports shall include a narrative describing work progress during the preceding week. The completion of major milestones and activities shall be identified along with significant deliveries of materials and equipment. Any problems which arose during the week shall also be noted and described.
2. The weekly report shall be accompanied by a look-ahead schedule as described in part 3.01 of this specification.

C. DAILY REPORTS

1. Contractor shall complete a daily report indicating the total labor force for each construction trade, major equipment on site, each subcontractor's labor force, weather conditions, and any other items required by the Owner's Representative.

2. The daily report shall be submitted to the Owner's Representative by 9:00 AM the following work day.
3. The report should comment on the daily progress and status of the work within each major component of the work. Submitting acceptable daily reports as required is a precondition to approval of the monthly progress payment. However, these reports are not to be used to meet the notice requirements contained elsewhere in the Contract Documents.

PART 2 - PRODUCTS [NOT USED]

PART 3 - EXECUTION

3.01 LOOK-AHEAD SCHEDULE

- A. At each progress meeting, or at regular intervals as required by the Owner's Representative if progress meetings are not being held, provide a plan of activities (look-ahead schedule) as described below.
- B. The look-ahead Schedule shall show the activities planned for the following two weeks as well as a review of the previous week's activities.
- C. The Schedule shall, as a minimum, be prepared as a bar chart and shall show all required coordinating, predecessor and successor activities.
- D. The Schedule shall clearly identify deviations from the planned schedule and adjustments to follow-on linked activities.
- E. Provide copies of the Look Ahead Schedule to all persons regularly attending the progress meetings.
- F. The Look-Ahead schedule will not be reviewed as a submittal.

END OF SECTION

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SECTION 01 32 23

FIELD ENGINEERING

PART 1 - GENERAL

1.01 SUMMARY

- A. Work required in this Section includes construction surveying, maintaining record drawings, and other field engineering services necessary for performance of the Work.
- B. The Contractor shall provide all surveys necessary to complete the Work.
- C. Provide and pay for field-engineering services required for the project. This shall include;
 - 1. Survey work required in execution of the project.
 - 2. Civil, structural or other professional engineering services specified, or required to execute Contractor's construction methods.

1.02 SURVEY WORK BY THE OWNER

- A. The Owner will replace all control points lost or damaged by the Contractor. The Contractor shall reimburse the Owner for the cost of replacing lost or damaged control points,
- B. The Owner will make electronic drawings available to the Contractor for use by the land surveyor when calculating points for construction layout.

1.03 QUALIFICATIONS OF SURVEYOR OR ENGINEER

- A. Registered land surveyor in the State of Oregon.
- B. Registered professional engineer of the discipline required for the specific service on the project, licensed in the State of Oregon.

1.04 SURVEY REFERENCE POINTS

- A. Existing basic horizontal and vertical control points for the project will be provided by the Owner.

- B. Locate and protect control points prior to starting site work, and preserve all permanent reference points during construction.
 - 1. Make no changes or relocations without prior written notice to Owner's Representative.
 - 2. Report to Owner's Representative when any reference point which is lost or destroyed, or requires relocation because of necessary changes in grades or locations.

1.05 PROJECT SURVEY REQUIREMENTS

- A. Record locations, with horizontal and vertical data, on project record documents.
- B. Establish lines and levels, locate and lay out, by instrumentation and similar appropriate means:
 - 1. Site improvements:
 - a. Stakes for grading, fill and topsoil placement.
 - b. Utility slopes and invert elevations.
 - 2. Batter boards for structures.
 - 3. Building foundation, column locations and floor levels.
 - 4. Controlling lines and levels required for the mechanical and electrical trades.
- C. Comply with the survey requirements for all monitoring as specified in other sections.
- D. The Owner's Representative may require that work be suspended at any time when location and limit marks established by the Contractor are not reasonably adequate to permit checking of the work.
- E. In advance of the paving, provide the Owner's Representative with adequate survey information to check the line and grade which the Contractor will use for concrete paving elevations and slopes.
- F. Use equipment enabled with GPS monitoring systems or Machine Controlled Grading Equipment during all on site solids drying operations, on-site solids transporting operations (where moved from the existing lagoon cells), all on site mass excavation and grading work; or provide daily field survey reports using a registered land surveyor to monitor all excavations, depths of sludge, mass grading and similar work. Survey reports shall be made available to Owner's Representative upon request.

1.06 SURVEY RECORDS

- A. The Contractor shall maintain a complete, accurate log of all control and survey work as it progresses.

1.07 SUBMITTALS

- A. Submittals shall comply with Section 01 33 00, Submittal Procedures.
- B. Submit name and address of Surveyor and/or Professional Engineer to Owner's Representative.
- C. On request of Owner's Representative, submit documentation to verify accuracy of field engineering work.
- D. Submit certificate signed by registered engineer or surveyor certifying that elevations and locations of improvements are in conformance, or nonconformance, with Contract Documents.
- E. Upon completion of the Work, provide survey field notes and all survey calculations.

1.08 OWNER'S RIGHT TO DO WORK

- A. The Owner retains the right to perform independent surveys with its own crews or other crews retained by the Owner within the work limits and along the alignment shown on the Drawings. The Contractor shall allow access for such surveys as requested by the Owner's Representative.

1.09 RECORD DOCUMENTS

- A. The Contractor shall keep and maintain, at the job site, one record set of Contract Drawings. The Contractor shall mark all project conditions, locations, configurations, and any other changes or deviations which may vary from the details represented on the original Contract Documents, including buried or concealed construction and utility features which are revealed during the course of construction. Special attention shall be given to recording the horizontal and vertical location of all buried utilities that differ from the locations indicated, or which were not indicated on the Contract Documents. Record Documents shall be supplemented by any detailed sketches or photographs as necessary or directed to indicate, fully, the Work as actually constructed. These master Record Documents of the Contractor's representation of as-built conditions, including all revisions made necessary by requests for information, addenda, design clarifications, approved substitutions, field orders, approved submittals, properly verified tests reports, and change orders shall be maintained up-to-date during the progress of the Work.

B. Record Drawings should be accurate and legible. If the Record Drawings are deemed unacceptable, the work will be redrafted or modified until acceptable at no cost to the Owner. Record Drawings and shop drawings to record actual construction including the following:

1. Measured depths of foundations in relation to finish floor datum.
2. Changes made by Change Order.
3. Measured horizontal and vertical locations of underground utilities and appurtenances referenced to permanent surface improvements.
4. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
5. Field changes to dimension and detail.
6. Details not shown on original Contract Drawings.
7. For underground utilities, include the location of lines and appurtenances. Show the actual size and types of material used. Show locations by facility coordinates or dimensioned to permanent surface structures.

Description Horizontal Location Elevation

Pressure Piping CL +1- 0.1 /ft I.E. +1- 0.01 ft

CL = Centerline

I.E. = Invert Elevation

C. In the case of those drawings which depict the detail requirement for equipment to be assembled and wired in the factory, such as motor control centers and the like, the Record Documents shall be updated by indicating those portions which are superseded by change order drawings or final shop drawings, and by including appropriate reference information identifying the change orders by number, and the shop drawings by manufacturer, drawing title, drawing number, and revision numbers.

D. Provide each month a Monthly Record Drawing set comprised of a full-size photocopy of each Record Document sheet that has been revised to reflect work accomplished since the preceding Monthly Record Drawing set was issued. The Monthly Record Drawing Sets will be used to verify and document progress payment request in accordance with Section 00 72 00. In addition, Monthly Record Drawing Sets will be used by the Owner to update the Owner's electronic version of the Record Drawings.

1. Mark each updated Monthly Record Drawing sheet of the set with the date of the most recent edit. Identify each sheet with a label, located in the lower left-hand corner, identifying the as-built month and year the drawing pertains to. Color highlight all new work accomplished during the preceding month, including the work that was done according to the Contract Documents.
 2. Photocopies of all documents indicated and referenced pursuant to subparagraph 1.9.A and C above shall be attached to the pertinent Monthly Record Drawing sheet. It is acceptable to attach additional sheets if needed.
 3. Monthly Record Drawing Sets shall be considered to be a work product, but they shall be prepared, identified, and reviewed in accordance with Section 01 33 00, SUBMITTAL PROCEDURES.
- E. Record Documents shall be accessible to the Owner's Representative at all times during the construction period.
- F. Upon substantial completion of the Work and prior to final acceptance, the Contractor shall finalize and deliver a complete set of up-to-date Record Documents to the Owner's Representative, conforming to the construction records of the Contractor. Said up-to-date Record Documents shall be in the form of a set of prints with carefully plotted information overlaid in red for additions, green for deletions. The information submitted by the Contractor in the Record documents will be assumed to be correct, and the Contractor shall be responsible for the accuracy of such information, and for any errors or omissions which may appear on the Record Documents as a result.
- G. O&M Manuals shall be revised to incorporate final as-built wiring diagrams, control diagrams, and other O&M Manual revisions following substantial completion. The final Record Documents submittal shall include these items for insertion in the approved O&M Manual by the Owner's Representative.

PART 2 - PRODUCTS [NOT USED]

PART 3 - EXECUTION [NOT USED]

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SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 – GENERAL

1.01 SUMMARY

- A. All shop drawings and other submittals by the Contractor shall be submitted to the Owner's Representative for review in accordance with SECTION 00 72 00 and this specification.
- B. This section includes requirements and administration of the submittal process for:
 - 1. Shop Drawings
 - 2. Product Data
 - 3. Samples
 - 4. Informational Submittals
 - 5. Documentary Submittals
 - 6. Working Drawings
 - 7. Deferred Submittals
- C. Requirements in this Section are generally in addition to any specific requirements for submittals specified in other Divisions and Sections of these Contract Documents.

1.02 DEFINITIONS

- A. Submittals - Documents and materials required by the Contract to be submitted to the Owner for information and/or review. They may include shop drawings, product data, material samples, information, documentation, working drawings and deferred submittals.
- B. Shop Drawings - Drawings, diagrams, bills of material, and other data specifically prepared for the Work by the Contractor, a Subcontractor at any tier, manufacturer, supplier or distributor to illustrate some portion of the Work.

- C. **Product Data** - Illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment that the Contractor proposes to provide for some portion of the Work.
- D. **Samples** - Physical examples or test specimens that illustrate the quality or equality of materials, equipment, appliances, fittings, or workmanship, and establish standards by which the completed work will be judged and approved.
- E. **Informational Submittals** - Include safety plans, erosion control plans, pollution control plans, construction schedules, start-up plans, training plans, and other documents describing the means and methods that the Contractor proposes to use to conform to the requirements of the Contract.
- F. **Coordination Drawings** - Drawings prepared to show the installation of several elements of Work, mechanical Work, or combined mechanical and electrical Work where the Work must be sequenced and located with precision in order to fit into the available space.
- G. **Documentary Submittals:**
 - 1. Documentary Submittals include Operation and Maintenance manuals, Record drawings, Record Documents, and other product information provided for the Owner's use during testing, start-up and subsequent operation of the project facility.
 - 2. Documentary submittals also include manufacturer's certificates, acceptance reports, and other information required by the Contract to confirm that the Contractor has complied with the requirements of the Contract.
- H. **Working Drawings** - The Contractor shall supplement the Owner-prepared Plans with stamped or unstamped Working Drawings that show all information necessary to complete the Work. The applicable Section or Subsection of the Standard Specifications will indicate the supplemental information required and whether the drawings are to be stamped or unstamped. Stamped and unstamped Working Drawings are defined as follows:
 - 1. **Stamped Working Drawings** - Working Drawings, calculations and other data which are prepared by or under the direction of a Professional Engineer licensed in the State of Oregon, and which bear the engineer's signature, seal, and expiration date.
 - 2. **Unstamped Working Drawings** - Working Drawings, calculations and other data that do not bear an engineering seal.

- I. **Deferred Submittals** - Those portions of the design which are not submitted at the time of permit application and which are to be submitted to the permitting agency prior to installation of that portion of the work in accordance with the state building code.

1.03 CONDITIONS

- A. The production, delivery and revision of submittals are part of the Contractor's Work. The value of an individual submittal may be shown on the Schedule of Values as a separate item, or considered as incidental to related items. Provide all submittal materials and samples at no additional cost to Owner.
- B. **Shop Drawings, Product Data, Samples and other Submittals** are not part of the Contract. Their purpose is to demonstrate, for those portions of the Work for which Submittals are required, the way the Contractor proposes to conform to the requirements of the Contract and the design concept expressed in the Contract.
- C. The Contractor shall review, approve and submit to the Owner all Shop Drawings, Product Data, Samples and other Submittals required by the Contract regardless of whether the document originated with the Contractor or with some other Subcontractor or supplier. They shall be submitted at the time required by the Contract, or, if no time is specified, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of separate Contractors. Submittals made by the Contractor that are not required by the Contract may be returned without action or may not be returned at all.
- D. **Informational Submittals** that do not require the Owner to take responsive action may be so identified in the Contract.
- E. The Contractor shall provide copies of any Submittal required by the Contract or when requested by the Owner's Representative. In addition, the Contract may also require the Contractor to provide information about the products and materials it proposes to incorporate into the Work and to provide samples of such products and materials for inspection or testing. The Contractor shall be responsible for all Submittals presented to the Owner for review, no matter what their point of origin may have been.
- F. The Contractor shall not perform a portion of the Work that requires the Owner to review a Submittal until the respective Submittal has been reviewed by the Owner as outlined below. Such work shall be performed in accordance with Submittals that conform to the Contract Documents.

- G. When tendering a Submittal to the Owner for review, the Contractor represents that it has determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and has checked and coordinated the information contained with such Submittals with the requirements of the Work and of the Contract. The Contractor shall expressly note where any submittal differs from or varies from the requirements of the Contract, notwithstanding any belief on the part of the Contractor that the variance is obvious.
- H. The Owner's review of any Submittal does not relieve the Contractor from its responsibility to follow the requirements of the Contract. The Owner is not responsible for ensuring that Submittals are correct. Failure of the Owner to discover that a submittal varies from the requirements of the Contract Documents does not relieve the Contractor of its responsibilities to conform to the Contract nor provide a basis for a Change Order. Nevertheless, the Owner's Representative shall review any Submittals provided in order to make a general determination about whether they appear to meet Contract requirements or the intended design of the Project. The Contractor remains responsible for following the Contract, including, but not limited to:
1. Confirming and correlating all dimensions;
 2. Fabricating and construction techniques;
 3. Coordinating the work with that of all other trades and Subcontractors;
 4. Satisfactorily performing the Work in strict accordance with the Contract Documents;
 5. The means and methods of construction; and
 6. Conforming to all the requirements of the Contract
- I. Refer to 01 33 00-1.04 – SUBMITTAL SCHEDULE for time allowed to review submittals. Refer to 01 33 00-3.02 – REVIEW PROCESS for reviewer's notations.
- J. The following rules about Contract Time shall apply to Submittals. Contract Time will not be extended if:
1. The Contractor's delay resulted from the Owner's use of the full amount of allotted time under the Contract to review the Contractor's Submittal;
 2. The Contractor's delay resulted from its own failure to provide a submittal in a timely manner;
 3. The Contractor's delay resulted from a submittal that properly was marked "Revise and Resubmit," "Make Corrections Noted," or

4. The Contractor did not understand what it was required to submit and failed to inquire about it in a timely manner.
- K. If the Contractor disagrees with the Owner's review of its Submittal and the Owner's action has the potential of increasing the Contractor's costs, the Contractor shall proceed as required by SECTION 00 72 00, Part 13 – Disagreements, Protests and Claims.
- L. The Contractor shall keep a current schedule of submittals available for the Owner's Representative to review.
- M. The Contractor shall not fabricate or construct any structural components until the stamped or unstamped Working Drawings are returned by the Owner's Representative with written notation of approval or review, as applicable, of the Working Drawings.
- N. The Owner's Representative's processing of the Working Drawings does not amend any contractual obligations of the parties.
- O. Equipment Lists and Other Submittals - The Contractor shall submit Equipment lists, and other required submittals for approval by the Owner's Representative. The Owner's Representative will respond to requests for approval within time frames set forth in each Section of the Specifications that requires such approval.
- P. Owner's Representative is entitled to rely upon the accuracy or completeness of designs, calculations, or certifications made by licensed professionals accompanying a particular Submittal whether or not a stamp or seal is required by the Contract Documents or Laws and Regulations.
- Q. Approval of substitutions, schedules, lists of materials, and procedures submitted or requested by the Contractor shall not add to the Contract Amount, and any additional costs that may result therefrom shall be solely the obligation of the Contractor. The Owner shall not be responsible for providing engineering or other services to protect the Contractor from additional costs accruing from such approvals.
- R. Owner is not precluded, by virtue of review, acceptance, or approval, from obtaining a credit for construction savings resulting from allowed concessions in the work or materials.
- S. Owner reserves the right to withhold monies due the Contractor to cover additional costs of review beyond the second resubmittal.

1.04 SUBMITTAL SCHEDULE

- A. Within seven (7) days of the effective date of the Notice to Proceed, provide a detailed schedule of all submittals required by the Contract.

The submittal schedule shall be integrated into the construction schedule and represent achievable durations considering all specification requirements.

1. Show all submittals and have separate activities as appropriate for:
 - a. Submittal preparation.
 - b. Submittal review.
 2. Identify submittals for all phases of the Work.
 3. Provide durations that reflect review periods indicated in the Specifications.
 4. Deviations from the submittal schedule will be allowed only with prior approval of the Owner's Representative.
- B. For items categorized as "critical" by both the Contractor and the Owner's Representative, use proper identification to highlight the importance of the submittal. The Owner's Representative will prioritize the review and disposition to support the Contractor's need.
- C. Provide Submittals at the time required by the Contract, or if no time is specified, with reasonable promptness and in such sequence as to cause no delay in the review of other submittals, the Work, activities of the Owner, or of separate contractors.
- D. Provide three (3) Samples to Owner's Representative a minimum of 30 days prior to ordering such material for delivery to the job site. Any work or related work performed or products or materials ordered prior to the Owner's Representative's review and completion of any testing will be at the Contractor's risk.
- E. Owner's Representative will have the following time to review any Submittal from date of receipt by Owner's Representative to date of transmittal of review comments to Contractor:
1. Submittal documents: Twenty-One (21) days.
 2. Review time for Critical submittals shall be as mutually agreed by Owner and Contractor.
 3. Assume a minimum of two submittal reviews (original and one resubmittal) for large, complicated and/or deferred submittals.
- F. The Owner's Representative will process and return Working Drawings within twenty-one (21) Calendar Days (sixty-five (65) Calendar Days if Railroad approval is required) after receipt by the Owner's Representative.

If the Owner's Representative fails to return such drawings within this period of time, the Owner's Representative will consider granting a Contract Time extension according to SECTION 00 72 00-8.10.

- G. Coordination Drawings shall be prepared and submitted to the Owner's Representative at least thirty (30) days prior to commencement of Work in the area.
- H. The Owner's Representative may schedule a submittal conference to provide for a rapid review of a submittal, should the project schedule warrant such a review. The Owner's Representative, Contractor, and a qualified manufacturer's representative shall attend the submittal conference.
- I. Deferred Submittals may require 12 or more weeks of review by the permitting agency, from Contractor submission to final date of approval.

1.05 OWNER'S REPRESENTATIVE REVIEW

- A. The Contractor hereby agrees that submittals processed by the Owner's Representative:
 - 1. Do not become Contract Documents and are not Change Orders;
 - 2. That the purpose of the submittal review is to establish a reporting procedure and is intended for the Contractor's convenience in organizing their work and to permit the Owner's Representative to monitor the Contractor's progress.
- B. The Owner's Representative's review does not relieve Contractor from the obligation fully to conform to the Contract Documents, nor shall such review give rise to right of action or suit against Owner's Representative or Owner.
- C. Owner's Representative's review of Shop Drawings, samples, product data, and test procedures will be only for conformance with design concepts and for compliance with information given in Contract Documents.
 - 1. Owner's Representative's review does not extend to:
 - a. Accuracy of dimensions, quantities, or performance of equipment and systems designed by the Contractor.
 - b. Contractor's means, methods, techniques, sequences, or procedures except when specified, indicated, or required by Contract Documents.
 - c. Safety precautions or programs related to safety, which shall remain the sole responsibility of the Contractor.

d. Structural integrity.

D. Submittal review by the Owner's Representative shall not relieve the Contractor from the responsibility for errors or omissions in the submittal. The Owner's Representative's failure to comment on submittal deficiencies shall not change or negate the requirements of the Contract Documents. The review by the Owner's Representative of the Shop drawings, catalog cuts, other product descriptions, and submitted work products shall not relieve the Contractor from responsibility for deviations from the contract drawings or specifications, unless the Contractor has called attention to such deviations in writing by a letter accompanying the Submittal and the Owner's Representative approves the change or deviation in writing as part of the submittal review comments. When the Contractor does call such deviations to the attention of the Owner's Representative, the Contractor shall state in his letter whether or not such deviations cause any deduction or extra cost adjustment.

PART 2 - PRODUCTS

2.01 FORMAT

A. All submittals in which PDF documents can be made of shop drawings, data sheets, and similar required informational or documentary submittals shall be provided in either 8-1/2-inch by 11-inch or 11-inch by 17-inch PDF format, and shall be provided to the Owner's Representative electronically rather than in paper form. Word, Excel and MathCad files are also acceptable where applicable. Where it is not feasible to make a text searchable PDF version of the submittal, the Contractor shall submit paper copies, the number of which is specified in this section.

2.02 SHOP DRAWINGS

- A. With the exception of Operations and Maintenance Manuals where hard copies are still required, all submittals in which PDF documents can be made shall be provided in either 8-1/2 inch by 11-inch or 11-inch by 17-inch PDF format, and shall be provided to the Owner's Representative electronically rather than in paper form. MS Project, Word, Excel, and AutoCAD files are also acceptable where applicable.
- B. Where it is not feasible to make a text searchable PDF version of the Provide six (6) copies of each submittal, unless electronic format is used. Owner's Representative will return two (2) copies with review comments.
- C. All submittal provided in electronic format will be returned with review comments in electronic format. No hard copies will be returned.

- D. For O&M manuals, and where it is not feasible to provide an electronic document, the Contractor shall submit a minimum of six (6) hard copies. All marks on the documents shall be photocopy reproducible in black and white and duplicated on all copies of each transmittal. Highlighting is not acceptable. At least three (3) of the copies shall be in color if the visual depiction of color or hue is an essential part of the information being submitted.
- E. Content: Include, as applicable, the following for prefabricated or manufactured structural, mechanical, electrical, plumbing, process systems, and equipment:
1. Complex Submittals shall be provided with a Table of Content and clearly identify Tabs or Sections of the Submittal.
 2. Shop Drawings or equipment Drawings, including dimensions, size and location of connections to other work, and weight of equipment.
 3. Catalog information and cuts. Identify specific items, including optional equipment that will be furnished. Highlight or mark proposed options on catalog cuts. Use arrows, clouds, or boxes to clearly mark proposed options on catalog cuts. Extraneous material on the pages or drawings provided by manufacturer shall be crossed out, and the equipment or material to be supplied shall be clearly marked.
 4. Installation or placing Drawings for equipment, drives, and bases.
 5. Supporting calculations and drawings for equipment anchorage and associated supports specified to be designed by equipment manufacturers or suppliers. Calculations and drawings shall be as set forth in the state building code, and shall be signed and sealed by an engineer licensed to do so in the State of Oregon. Include seismic load capacity data for all anchor bolts and braces as required by the state building code.
 6. Wiring and control diagrams of systems and equipment.
 7. Complete manufacturer's specifications, including materials description and paint system.
 8. List of special motor features being provided (such as space heaters, altitude corrections and thermal protectors).
 9. Performance data and pump curves.
 10. Suggested spare parts list with current price information.

11. List of special tools required for checking, testing, parts replacement, and maintenance (special tools are those which have been specially designed or adapted for use on parts of the equipment, and which are not customarily and routinely carried by maintenance mechanics).
 12. List of special tools furnished with the equipment.
 13. List of materials and supplies required for the equipment prior to, and during startup.
 14. List of materials and supplies furnished with the equipment.
 15. Samples of finish colors for selection.
 16. Special handling instructions.
 17. Requirements for storage and protection prior to installation.
 18. Requirements for installation and recommended installation procedures.
 19. Requirements for routine maintenance required prior to testing and startup.
 20. List of requested variations from the Contract Documents.
 21. Information and data to be provided shall be identified by the specified equipment number, as applicable.
 22. Anchorage calculations for seismic load resistance all cabinets and equipment, prepared and sealed by a professional engineer registered in the State of Oregon.
- F. Refer to individual Specification Sections for specific submittal content requirements.
- G. Submittals shall include satisfactory identification of items, units, and assemblies in relation to the Specification Section number, and the system or equipment identification or tag number shown on the Plans, or as provided in the applicable Specification Section.
- H. Extraneous material on the pages or drawings provided by manufacturer shall be crossed out, and the equipment or material to be supplied shall be clearly marked.
- I. Submittals Required for Foreign-Manufactured Items: In addition to the submittal requirements stated above, suppliers of foreign manufactured items shall submit the names and addresses of companies within the United States that maintain technical service representatives and a complete inventory of spare parts and accessories for each foreign-made item proposed for incorporation into the work. Failure to provide

the foregoing capabilities will be just cause for rejection of the foreign-manufactured items.

2.03 SAMPLES

- A. Provide no less than three (3) samples of each item to the Owner's Representative. One sample will remain with the reviewer, and one sample will remain with the Owner's Representative at the job site until completion of the Work. Upon acceptance by the Owner's Representative, one sample will be returned to the Contractor with review comments. Review procedures for samples will be similar to Shop Drawings.
- B. Samples shall be individually and indelibly labeled or tagged. Show project number, specification section number, submittal number that the sample refers to, Manufacturer's name and identification of the sample.
- C. Unless indicated otherwise, colors and textures of specified items presented in sample submittals shall be from the manufacturer's standard colors and standard materials, products, or equipment lines. Indicate on the transmittal page of the submittal if the samples represent non-standard colors, materials, products, or equipment lines and whether their selection will require an increase in contract time or price.
- D. Tests required by the Specifications and not identified as Owner furnished testing shall be performed by an independent testing service at the expense of the Contractor.
- E. Submit additional samples and test specimens as required by the Owner's Representative to assure equality with the original approved sample and/or for determination of Specification compliance.
- F. Any laboratory test and examination the Owner's Representative elects to make will be made at no cost to the Contractor, except that, if a sample of any material or equipment proposed for use by the Contractor fails to meet the Specifications, the cost of testing subsequent samples shall be borne by the Contractor.

2.04 INFORMATIONAL SUBMITTALS

- A. Review procedures for Informational Submittals will be similar to those for Shop Drawings. However, the Contract Documents may identify Informational Submittals that do not require the Owner to take responsive action.
- B. Safety and Health Submittals:
 - 1. Submit Site Specific Safety and Health Plan, and related documents required by the Contract Documents.

2. Provide one (1) copy of safety reports, training records, accident reports, etc. required by the Contract Documents or compliance with all applicable laws and regulations.

C. Control Plans and Schedules:

1. Submit erosion control plans, pollution control plans, traffic control plans, etc. required by the Contract Documents.
2. Submit Contractor's Construction Schedule, start-up plans, training plans, etc. required by the Contract Documents.

2.05 COORDINATION DRAWINGS

- A. Review procedures for Informational Submittals will be similar to those for Shop Drawings.
- B. Coordination Drawings shall be prepared after approval of all associated Shop Drawings. The Contractor shall be responsible for including and coordinating the Work of all Subcontractors into the coordination Drawings.
- C. Prepare reproducible coordination Drawings, indicating equipment, piping, valves, ductwork, conduit, junction boxes, cable tray, lighting fixtures, sleeves, inserts, supports, hangers and other appurtenances at not less than 1/4-inch scale. Drawings shall show beams, ceiling heights, walls, floors, partitions, window and door openings and all other major architectural and structural features as shown on the Contract Drawings. Individual pipes or conduits 2-inches or less in diameter that will be field routed need not be shown on coordination Drawings if agreed to in advance by the Owner's Representative.
- D. Coordination drawings shall include large scale details as well as cross and longitudinal sections as required to delineate all conditions fully. Particular attention shall be given to the location, size and clearance dimensions of equipment items, shafts, operators and necessary maintenance access.
- E. Make all minor changes in duct, pipe or conduit routings that do not affect the intended function, but items may not be resized or exposed items relocated without the approval of the Owner's Representative. No changes shall be made in any wall locations, ceiling heights, door swings or locations, windows or other openings or other features affecting the function or aesthetic affect of the building. If conflicts or interferences cannot be resolved, the Owner's Representative shall be notified. Any problems of coordination that require architectural or structural changes of design shall be submitted to the Owner's Representative for review and approval.

- F. After the reproducible Drawings have been coordinated and all necessary changes have been made, the Drawings shall be signed by the Contractor and all Subcontractors indicating that all Work on that Drawing has been coordinated with all associated vendors and Subcontractors and all conflicts have been resolved. Coordination Drawings shall be submitted to the Owner's Representative in accordance with this Section.
- G. No extra compensation will be paid for relocating equipment, ducts, pipes, conduits, panels, or other material that has been installed without proper coordination among all trades involved.

2.06 ADMINISTRATIVE SUBMITTALS

- A. The Contractor shall provide all of the submittals required by regulatory agencies, the General Conditions, the General Requirements, and as may be specifically required in other parts of this Contract.
- B. The Contractor shall submit to the Owner's Representative a copy of all letters relative to the Contract, transmitting notifications, reports, certifications, payrolls, and the like, that the Contractor submits directly to a federal, state, or other governing agency.
- C. When requested by the Owner's Representative, the Contractor shall submit to the Owner's Representative copies of each purchase order for all materials and equipment furnished under these specifications for incorporation in the Work. Each purchase order shall show the supplier's name, manufacturer's name, materials, type, model number, size, quantity, accessory list, and requested delivery date of the material and equipment ordered.
- D. Administrative Submittals are not subject to the Transmittal and Review Process described in this Section.

2.07 MANUFACTURER'S CERTIFICATES

- A. Provide Manufacturer's certifications to Owner's Representative for review in conformance with the requirements of the specifications. Review procedures for Manufacturer's Certificates will be similar to those for Shop Drawings.
- B. Certify that materials or products conform to or exceed the specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- C. Certificates may be recent or previous test results on material or product.

- D. Refer to SECTION 01 45 00, QUALITY CONTROL for additional requirements regarding certifications.

2.08 DOCUMENTARY SUBMITTALS

A. Operation & Maintenance Manuals

1. Preliminary Operation & Maintenance Manuals are draft editions similar in function to Product Submittals. They shall be prepared in accordance with SECTION 01 78 23, and identified, transmitted, and reviewed in accordance with this Section.
 - a. Provide one electronic, and six (6) hard copies of each Manual; one copy will be returned with comments to the Contractor.
2. Final Operations & Maintenance Manuals are the complete published edition.
 - a. Provide one electronic, and four (4) hard copies; no copies will be returned to the Contractor.
3. Correct any errors or omissions discovered during preparation of the Final Operations & Maintenance Manuals notwithstanding the Owner's Representative's failure to note such deficiencies during the preliminary review.

B. Record Documents

1. Maintain and provide up-to-date Record Documents and Monthly Record Drawing sets in accordance with 01 78 39, Project Record Documents. They shall be identified, transmitted, and reviewed in accordance with this Section. Unless otherwise indicated in the Contract Documents, provide one copy; no copies will be returned to the Contractor.
2. Correct any errors or omissions discovered during the final review of Record Documents notwithstanding the Owner's Representative's failure to note such deficiencies during any preliminary review.

2.09 WORKING DRAWINGS

- A. Number and Size of Drawings - The Contractor shall submit seven copies of Working Drawings for steel Structures and six copies of Working Drawings for other Structures to the Owner's Representative. The submitted copies shall be clear and readable. Drawing dimension shall be 8 1/2 inches by 11 inches, 11 inches by 17 inches, or 22 inches by 36 inches in size. One copy of the submitted Working Drawings will be returned to the Contractor after processing. The Contractor shall

submit such additional number of copies to the Owner's Representative for processing that the Contractor would like to have returned.

2.10 DEFERRED SUBMITTALS

- A. A list of Deferred Submittals is contained on the Plans and indicated on the Building Permit, if applicable. Deferred Submittals shall contain structural calculations pertinent to building permitting requirements.
- B. Prior to installation of the indicated structural or nonstructural element, equipment, distribution system, or component or its anchorage, the Contractor shall submit the required calculations and supporting data and drawings for review and acceptance by the Engineer. All designs and calculations shall be prepared by an Engineer licensed in the State of Oregon. Acceptance indicated on the Owner's Representative's comment form, along with the completed submittal, shall then be filed by the Contractor and acknowledged by the permitting agency. Approval by the Engineer of Record, Owner's Representative and permitting agency is required prior to installation of these items.
- C. Design Requirements:
 - 1. Where required, provide system, equipment and component designs, including their supports, anchorage and bracing designs, in accordance with the project-specific design loads and criteria given on the Structural Notes on the Plans.

PART 3 - EXECUTION

3.01 TRANSMITTAL

- A. Transmit all Submittals to the Owner's Representative for review.
- B. Unless otherwise indicated in this Section or elsewhere in the Contract Documents, provide submittals per the format outlined in Paragraph 2.01 of this Specification Section.
- C. All submittals shall be accompanied by the Owner's standard submittal transmittal form. The form may be obtained in quantity from the Owner's Representative. The following apply to all submittals:
 - 1. Identify Contract, Contractor, Subcontractor and/or Supplier; pertinent Drawing sheet and detail number(s), and specification section number, as appropriate. On standard Drawings or data sheets, clearly indicate model and option being proposed and strike out all non-relevant data.

2. Sequentially number the transmittal forms. Resubmittals, and periodic submittals on the same subject such as Schedule Updates and Monthly Record Drawing Sets, shall have the original number with a numerical suffix (i.e., 1.01, 1.02, 1.03, etc.).
 3. Exceptions and/or deviations to the Contract Documents shall be clearly identified in writing on the transmittal, or by letter accompanying the submittal being transmitted to the Owner's Representative.
 4. Dated signature by an authorized representative of the Contractor indicating certification that it has reviewed the submittal and is satisfied that, but for the identified exceptions, the submittal conforms to the Contract Documents.
- D. Use a separate transmittal form for each specific item or class of material or equipment for which a submittal is required. Transmittal of a submittal of various items using a single transmittal form will be permitted only when the items taken together constitute a manufacturer's "package" or are so functionally related that expediency indicates review of the group or package as a whole. Each multiple-page submittal shall be collated into sets, and each set shall be stapled or bound, as appropriate, prior to transmittal to the Owner's Representative.
- E. Contractor shall provide to the Owner's Representative a Conformed Submittal package for each submittal requiring multiple (more than one) full or partial resubmissions. This Conformed package will be utilized during construction as a complete representation of the work.

3.02 REVIEW PROCESS

- A. Illegible Submittals or Submittals without proper transmittal form, certification, or signature will be returned to the Contractor without further review or comment. Any delays caused thereby shall be the total responsibility of the Contractor.
- B. Unless submittals are provided in hard copy, submittal responses will be provided electronically. See Paragraph 2.01 of this Specification.
- C. If a submittal is returned to the Contractor marked "NO EXCEPTIONS TAKEN", formal revision and resubmission of said submittal will not be required, and the Contractor may immediately begin the work encompassed by the submittal.
- D. Submittals that are returned to the Contractor marked "MAKE CORRECTIONS NOTED" have deficiencies that must be corrected. The Contractor shall make any revisions suggested by the Owner's Representative and, upon correction, may immediately begin the work indicated by the Submittal or may incorporate the material or equipment covered by the Submittal into the Work.

- E. Submittals that are returned to the Contractor marked “REVISE AND RESUBMIT” have errors, omissions, or deficiencies that prevent a full evaluation of the product, or describe a product that is not acceptable. The Contractor is required to revise the submittal and resubmit it to the Owner’s Representative. No work shown on the Submittal, or which is dependent upon approval of the Submittal or material or equipment covered by the Submittal, may be incorporated into the Work until the Contractor has made the necessary revisions, resubmitted the Submittal and received the Submittal back marked either “NO EXCEPTIONS TAKEN” or “MAKE CORRECTIONS NOTED”.
- F. Submittals that are returned to the Contractor marked “SUBMIT SPECIFIED ITEM” require additional information to permit a full review. Work may begin on incorporating the material or equipment covered by the Submittal into the Work, only if it is not affected by the item to be submitted. However, if any material or equipment is affected by the item to be submitted, then no work may begin until the Submittal is resubmitted and returned marked either “NO EXCEPTIONS TAKEN” or “MAKE CORRECTIONS NOTED”. Once returned No Exceptions Taken or Make Corrections Noted, the Contractor is required to resubmit a Conformed Submittal.
- G. Processing Working Drawings - The Owner's Representative will process Working Drawings as a standard Submittal as described above. As required, submit Deferred Submittals to the permitting agency after the Owner’s Representative and Engineer of Record have returned the submittal as No Exceptions Taken.

END OF SECTION

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SECTION 01 35 43

ENVIRONMENTAL PROCEDURES

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. This section specifies temporary environmental controls that the Contractor is required to maintain during construction.
- B. Comply with the requirement of City of Portland 2010, Standard Construction Specifications, Section 00290.

PART 2 - PRODUCTS [NOT USED]

PART 3 - EXECUTION

3.01 SITE MAINTENANCE

- A. The Contractor shall keep the work site and the staging area clean and free from rubbish and debris. Materials and equipment shall be removed from the site and staging area when they are no longer necessary. Upon completion of the work and before final acceptance, the work site and the Contractor's staging area shall be cleared of equipment, unused material, and rubbish to present a neat and clean appearance.
- B. The Contractor shall add 1-1/2" gravel to the existing access roads as required over the course of the project to control erosion and dust. See Section 31 00 00 for specific requirements.

3.02 CONSTRUCTION ENTRANCE

- A. The Contractor shall construct and maintain a construction entrance at the location shown on the Drawings consisting of a crushed stone at least 8-inches deep and 50-foot long such that trucks leaving the site pass over the construction entrance prior to entering the paved access road. See Drawings ECP1 and ECP2 for details.

3.03 TEMPORARY DAMS

- A. Except in time of emergency, earth dams are not acceptable at catch basin openings, local depressions, or elsewhere. Temporary dams of sand bags, asphaltic concrete, or other acceptable material will be permitted when necessary to protect the work, provided their use does not create a hazard or nuisance to the public and provided that they comply with specified erosion protection and sediment control requirements. Such dams shall be removed from the site as soon as they are no longer necessary.

3.04 AIR POLLUTION CONTROL

- A. The Contractor shall not discharge smoke, dust, and other contaminants into the atmosphere that violate the regulations of legally constituted authorities. Minimize dust nuisance by cleaning, sweeping, and sprinkling with water, or other means. The use of water, in amounts that result in mud on public streets is not acceptable as a substitute for sweeping or other methods.

3.05 NOISE CONTROL

- A. Noisy operations shall be restricted to the hours from 8:00 AM to 5:00 PM, and shall be scheduled to minimize their duration. All construction activities shall be restricted to the hours from 7:00 AM to 7:00 PM on non-holiday weekdays only, unless otherwise authorized by the Owner's Representative.
- B. Each internal combustion engine used on the job or related to the job shall be equipped with a muffler of a type recommended by the manufacturer. No internal combustion engine shall be operated on the project without a muffler.
- C. No person shall operate any equipment or appurtenances, which exceeds 85 dBA, when measured at 50 feet from the source. This standard shall not apply to trucks, pile drivers, pavement breakers, scrapers, concrete saws and rock drills. Equipment that cannot meet these levels shall be quieted by use of improved exhaust mufflers or other means.

3.06 OIL SPILL PREVENTION AND CONTROL

- A. The Contractor shall, at a minimum, take the following measures regarding oil spill prevention, containment, and cleanup:
 - 1. Fuel hoses, lubrication equipment, hydraulically operated equipment, oil drums, and other equipment and facilities shall be inspected regularly for drips, leaks or signs of damage, and shall be maintained and stored properly to prevent spills. Proper security shall be maintained to discourage vandalism.

2. All storage tanks shall be diked or located so as to prevent spills from escaping to the water. Diking and subsoils shall be lined with impervious material to prevent oil from seeping through the ground and dikes.
3. All visible floating oils shall be immediately contained with booms, dikes, or other appropriate means and removed from the water prior to discharge into state waters. All visible oils on land shall be immediately contained using dikes, straw bales, or other appropriate means and removed using sand, ground clay, sawdust, or other absorbent material, which shall then be properly disposed by the Contractor. Waste materials shall be temporarily stored in drums or other leakproof containers after cleanup and during transport to disposal.
4. In the event of any oil or product discharges into public waters, or onto land with a potential for entry into public waters, the Contractor shall immediately notify the following agencies at their listed 24-hour response numbers:

DEQ, Northwest Region Office	(503) 229-5263
24-Hour Number	1-800-452-4011
Oregon Emergency Response System	1-800-452-0311 (Nationwide) (503)378-6377 (Salem, Oregon)
City of Portland, BES	(503) 823-7180

5. Maintain on the job site the following materials:
 - a. Oil-absorbent booms: 4 each, 5 feet long
 - b. Oil-absorbent pads or bulk material, adequate for coverage of 200 square feet of surface area
 - c. Oil-skimming system, if appropriate
 - d. Hay bales
 - e. Oil dryall, gloves and plastic bags
 - f. Oil absorbent material, such as kitty litter or sawdust, for material spills on land

3.07 ODOR CONTROL

- A. The solids lagoon by its nature may generate odors during lagoon drawdown, solids drying, and/or handling. As extra work, Owner's Representative may require the Contractor to implement odor control measures as directed.

END OF SECTION

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SECTION 01 40 50

CONSTRUCTION STAKES, LINES AND GRADES

PART 1 - GENERAL

1.01 SUMMARY

- A. Construction staking will be addressed differently for Work within the public Right-of-Way (ROW), and for Work on the project site outside of the ROW.
 - 1. Construction staking for Work within the ROW will be provided by the Owner in accordance with Article 00150.15 of the City of Portland Standard Construction Specifications.
 - 2. For Work on the project site, and outside of the ROW the Owner will establish vertical and horizontal survey control points for the Contractor's use to lay out the Work.

1.02 LAYOUT AND MEASUREMENT TO BE PERFORMED BY CONTRACTOR

- A. The Contractor shall be responsible for laying out the Work on the project site from the horizontal and vertical control points established by the Owner, and from the dimensions and elevations provided on the Drawings.
- B. The Contractor shall be responsible for all measurements required for the execution of the Work.
- C. The Contractor shall furnish all stakes, equipment, tools, materials, and labor as required for layout work.

PART 2 - PRODUCTS [NOT USED]

PART 3 - EXECUTION [NOT USED]

END OF SECTION

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SECTION 01 42 13

ABBREVIATIONS AND ACRONYMS

PART 1 – GENERAL

1.01 REFERENCES TO STANDARDS AND SPECIFICATIONS OF TECHNICAL SOCIETIES

- A. Reference to standards and specifications of technical societies and reporting and resolving conflicts shall be as provided in the General Conditions, and as may otherwise be required by this Section and in the individual Specification sections.
- B. Work specified by reference to published standard or specification of a government agency, technical association, trade association, professional society or institute, testing agency, or other organization shall meet or exceed minimum requirements of quality for materials and workmanship established by designated standard or specification.
- C. Where specified, products or workmanship shall also meet or exceed additional prescriptive or performance requirements included within Contract Documents to establish a higher or more stringent standard of quality than required by referenced standard.
- D. Where two or more standards are specified to establish quality, product and workmanship shall meet or exceed requirements of the most stringent.
- E. Where both a standard and a brand name are specified for a product in Contract Documents, proprietary product named shall meet or exceed requirements of specified reference standard.
- F. Copies of applicable referenced standards have not been bound in these Contract Documents. Where copies of standards are needed by Contractor, obtain a copy or copies directly from publication source and maintain in an orderly manner at the Site as Work Site records, available to Contractor's personnel, Subcontractors, Owner, and Engineer.

1.02 ABBREVIATIONS

- A. Abbreviations for Trade Organizations and Government Agencies - Following is a list of construction industry organizations and government agencies to which references may be made in the Contract Documents, with abbreviations used.

AA	-	Aluminum Association
AABC	-	Associated Air Balance Council
AAMA	-	American Architectural Manufacturers Association
AAN	-	American Association of Nurserymen
AAR	-	Association of American Railroads
AASHTO	-	American Association of State Highway and Transportation Officials
ABC	-	Associated Builders and Contractors, Inc.
ABMA	-	American Bearing Manufacturers' Association
AC	-	Asphalt Concrete
ACI	-	American Concrete Institute
ACWS	-	Asphalt Concrete Wearing Surface
ADA	-	Americans with Disabilities Act
AEIC	-	Association of Edison Illuminating Companies
AGA	-	American Gas Association
AGC	-	Associated General Contractors of America
AGMA	-	American Gear Manufacturers' Association
AHRI	-	Air-Conditioning, Heating, and Refrigeration Institute
AI	-	Asphalt Institute
AIA	-	American Institute of Architects
AIA	-	American Institute of Architects
AISC	-	American Institute of Steel Construction
AISI	-	American Iron and Steel Institute
AITC	-	American Institute of Timber Construction
ALS	-	American Lumber Standards
AMCA	-	Air Movement and Control Association
ANSI	-	American National Standards Institute
APA	-	American Plywood Association
API	-	American Petroleum Institute
APWA	-	American Public Works Association
ARA	-	American Railway Association
AREA	-	American Railway Engineering Association
ASA	-	Acoustical Society of America
ASABE	-	American Society of Agricultural and Biological Engineers
ASCE	-	American Society of Civil Engineers
ASHRAE	-	American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
ASME	-	American Society of Mechanical Engineers
ASNT	-	American Society for Nondestructive Testing
ASSE	-	American Society of Sanitary Engineering

ASTM -	American Society for Testing and Materials
ATPB -	Asphalt-Treated Permeable Base
ATPB -	Asphalt-Treated Permeable Base
AWG -	American Wire Gauge
AWI -	Architectural Woodwork Institute
AWPA-	American Wood Preservers' Association
AWPI -	American Wood Preservers' Institute
AWS -	American Welding Society
AWWA -	American Water Works Association
BES -	Bureau of Environmental Services
BHMA -	Builders Hardware Manufacturers' Association
CABO -	Council of American Building Officials
CAGT -	Certified Aggregate Technician
CAT-I -	Certified Asphalt Technician I
CAT-II-	Certified Asphalt Technician II
CBM -	Certified Ballast Manufacturers
CCD -	Construction Change Directive
CCO -	Contract Change Order
CCT -	Concrete Control Technician
CDA -	Copper Development Association
CDT -	Certified Density Technician
CEBT -	Certified Embankment and Base Technician
CFR -	Code of Federal Regulations
CGA -	Compressed Gas Association
CISPI -	Cast Iron Soil Pipe Institute
CMAA -	Crane Manufacturers' Association of America
CMDT-	Certified Mixture Design Technician
CPF -	Composite Pay Factor
CPL -	Construction Products List
CRSI -	Concrete Reinforcing Steel Institute
CS -	Commercial Standard, Commodity Standards Division, U.S. Department of Commerce
CSA -	Canadian Standards Association
CSI -	Construction Specifications Institute
CSTT -	Concrete Strength Testing Technician
D1.1 -	Structural Welding Code - Steel, American Welding Society
D1.5 -	Bridge Welding Code, American Welding Society
DBE -	Disadvantaged Business Enterprise
DEQ -	Oregon Department of Environmental Quality

DHS	-	Oregon Department of Human Services
DIN	-	Deutsches Institut für Normung e.V
DIPRA	-	Ductile Iron Pipe Research Association
DOGAMI	-	Department of Geology and Mineral Industries, State of Oregon
DSL	-	Division of State Lands, State of Oregon
EAC	-	Emulsified Asphalt Concrete
EIA	-	Electronic Industries Alliance
EJCDC	-	Engineers Joint Contract Documents' Committee
EPA	-	U.S. Environmental Protection Agency
ESCP	-	Erosion and Sediment Control Plan
ETL	-	Electrical Test Laboratories
FAA	-	Federal Aviation Administration
FCC	-	Federal Communications Commission
FDA	-	Food and Drug Administration
FED. SPEC.	-	Federal Specifications (FAA Specifications)
FEMA	-	Federal Emergency Management Agency
FHWA	-	Federal Highway Administration, U.S. Department of Transportation
FIPS	-	Federal Information Processing Standards
FM	-	FM Global
FS (FSS)	-	Federal Specifications and Standards (Technical Specifications)
FSS	-	Federal Specifications and Standards, General Services Administration
GA	-	Gypsum Association
GANA	-	Glass Association of North America
GCSP	-	General Construction Safety Provisions
GSA	-	General Services Administration
HI	-	Hydraulic Institute
HMAC	-	Hot Mixed Asphalt Concrete
HMI	-	Hoist Manufacturers' Institute
IBC	-	International Building Code (formerly UBC) as adopted by State of Oregon
ICBO	-	International Conference of Building Officials
ICC	-	International Code Council
ICEA	-	Insulated Cable Engineers Association (formerly IPCEA)
IEEE	-	Institute of Electrical and Electronics Engineers, Inc.
IES	-	Illuminating Engineering Society
IESNA	-	Illuminating Engineering Society of North America
IFC	-	International Fire Code
IFI	-	Industrial Fasteners Institute
IGMA	-	Insulating Glass Manufacturer's Alliance

IMC	-	International Mechanical Code
IMSA	-	International Municipal Signal Association
INDA	-	Association of the Nonwoven Fabrics Industry
IPC	-	International Plumbing Code
ISA	-	International Society of Automation (also known as Instrumentation Systems and Automation Society, or Instrumentation Society of America)
ISO	-	International Organization for Standardization
ITE	-	Institute of Traffic Engineers
ITL	-	Independent Testing Laboratory
JIC	-	Joint Industry Conferences of Hydraulic Manufacturers
JMF	-	Job Mix Formula
MDFT	-	Mil Dry Film Thickness
MFTP	-	Manual of Field Test Procedures (ODOT)
MGD	-	Million Gallons per Day (also mgd)
MIA	-	Marble Institute of America
MIL	-	Military Specifications
MMA	-	Monorail Manufacturers' Association
MSC	-	Minor Structure Concrete
MSS	-	Manufacturers Standard Specifications
MUTCD	-	Manual of Uniform Traffic Control Devices for Streets and Highways, FHWA, US Department of Transportation
NAAMM	-	National Association of Architectural Metal Manufacturers
NACE	-	National Association of Corrosion Engineers
NBGQA	-	National Building Granite Quarries Association
NEBB	-	National Environmental Balancing Bureau
NEC	-	National Electrical Code
NECA	-	National Electrical Contractor's Association
NEMA	-	National Electrical Manufacturers' Association
NESC	-	National Electrical Safety Code
NETA	-	InterNational Electrical Testing Association
NFPA	-	National Fire Protection Association
NHLA	-	National Hardwood Lumber Association
NICET	-	National Institute for Certification in Engineering Technologies
NIST	-	National Institute of Standards and Technology
NLMA	-	National Lumber Manufacturer's Association
NMFS	-	National Marine Fisheries Services, a part of the National Oceanic and Atmospheric Administration
NPDES	-	National Pollutant Discharge Elimination System

NPS	-	Nominal Pipe Size (dimensionless)
NRCA	-	National Roofing Contractors Association
NRTL	-	Nationally Recognized Testing Laboratories
NSF	-	National Sanitation Foundation
NSF	-	NSF International
NSPE	-	National Society of Professional Engineers
NTMA	-	National Terrazzo and Mosaic Association
NUCA	-	National Underground Contractors Association
NWWDA	-	National Wood Window and Door Association
OAR	-	Oregon Administrative Rules
OCIP	-	Owner Controlled Insurance Program
OD	-	Outside Diameter
ODA	-	Oregon Department of Agriculture
ODF	-	Oregon Department of Forestry
ODFW	-	Oregon Department of Fish and Wildlife
ODOT	-	Oregon Department of Transportation
OR-OSHA	-	Oregon Occupational Safety and Health Administration
ORS	-	Oregon Revised Statutes
ORT	-	Operational Readiness Testing (also sometimes referred to as Functional Acceptance Testing, Commissioning, or Startup)
OSHA	-	Occupational Safety and Health Administration (Federal)
PCA	-	Portland Cement Association
PCI	-	Precast/Prestressed Concrete Institute
PCP	-	Pollution Control Plan
PBOT	-	Portland Office of Transportation
PEI	-	Porcelain Enamel Institute
PF	-	Pay Factor of a constituent
PLS	-	Professional Land Surveyor
PMBB	-	Plant Mixed Bituminous Base
PPI	-	Plastic Pipe Institute
PS	-	Product Standards Section-U.S. Department of Commerce
PTI	-	Post Tensioning Institute
PUC	-	Public Utility Commission
PWB	-	Portland Water Bureau
QA	-	Quality Assurance
QC	-	Quality Control
QCT	-	Quality Control Technician
QL	-	Quality Level
RAP	-	Reclaimed Asphalt Concrete Pavement

REA	-	Rural Electrification Administration, U.S. Department of Agriculture
RMA	-	Radio Manufacturers Association or Rubber Manufacturers Association
RUS	-	Rural Utilities Service
SAE	-	Society of Automotive Engineers
SEDI	-	Secondary Diversion
SDI	-	Steel Door Institute
SI	-	International System of Units (Système International)
SJI	-	Steel Joist Institute
SMACNA	-	Sheet Metal and Air Conditioning Contractors National Association
SPC	-	The Society for Protective Coatings
SPI	-	Society of the Plastics Industry
SRCM	-	Soil and Rock Classification Manual (ODOT)
SSPC	-	Steel Structures Painting Council
SSSHP	-	Site Specific Safety and Health Plan
STI/SPFA	-	Steel Tank Institute/Steel Plate Fabricators Association
SWI	-	Steel Window Institute
T	-	Tolerances, AASHTO Test Method
TCA	-	Tile Council of North America
TEMA	-	Tubular Exchanger Manufacturers' Association
TIA	-	Telecommunications Industry Association
TM	-	Test Method (ODOT)
TV	-	Target Value
UBC	-	Uniform Building Code
UFC	-	Uniform Fire Code
UL	-	Underwriters' Laboratories, Inc.
UMC	-	Uniform Mechanical Code
UPC	-	Uniform Plumbing Code (as adopted by the State of Oregon)
USASI	-	United States of America Standards Institute
USBR	-	U.S. Bureau of Reclamation
USC	-	United States Code
WAQTC	-	Western Alliance for Quality Transportation Construction
WCLIB	-	West Coast Lumber Inspection Bureau
WEF	-	Water Environment Foundation
WI	-	Wood Institute
WWPA	-	Western Wood Products Association

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SECTION 01 42 16

DEFINITIONS

PART 1 – GENERAL

1.01 DEFINITIONS

- A. The definitions stated in this section are applicable across all documents in the Contract.

Acceptance of Work - This term signifies that the Work has been completed to the Owner's satisfaction and occurs when the Owner approves of the Certificate of Completion executed by Contractor.

Act of God – A phenomenon of nature of catastrophic proportions or intensity, such as an earthquake, flood, cloudburst, tornado, or hurricane.

Additional Work - Increased quantities of any Pay Item, within the scope of the Contract, for which a unit price has been established.

Aggregate – Fracture rock, unless otherwise indicated, of specified quality and gradation.

Application for Payment - A written request for payment based on an estimate of work performed that is submitted by the Contractor to the Engineer, accompanied by such supporting documentation as is required by the Contract Documents.

Architect - The person lawfully licensed to practice architecture or an entity lawfully practicing architecture identified as such in the Contract Documents and is referred to throughout the Contract Documents as if singular in number. The term "Architect" means the Architect or the Architect's authorized representative.

Architect's Supplemental Instructions (ASI) - Information provided to the Contractor by the Architect regarding the Project.

As-Built Drawings ("As-BUILTS") - Drawings showing how the Project has been constructed. Also referred to as "Record Drawings".

Attorney - The City Attorney of the City of Portland, Oregon, or authorized representative.

Auditor - The City Auditor of the City of Portland, Oregon, or authorized representative.

Award - The decision of the Owner to execute a Contract with a particular Bidder or proposer.

Base - A Course of specified material of specified thickness placed below the Pavement.

Bid - A competitive offer binding on the Bidder and submitted in response to an Invitation to Bid.

Bid Bond - The bond or other security required to be submitted with each Bid, which assures that the Bidder will enter into a Contract if its Bid is accepted.

Bid Documents - Those documents upon which a Bidder bases its Bid to Owner, which include, but are not limited to, the Instructions to Bidders, the Proposal, the proposed Contract Documents including: the Specifications, Plans, Addenda issued prior to Bid opening, and Permits and other documents included in the Specifications by specific reference, and any other documents that may be designated therein as part of the Bid Documents.

Bid Schedule - The list of Pay Items, their units of measurement, and estimated quantities. (When a Contract is awarded, the Bid Schedule becomes the Schedule of Items.)

Bidder - Any person who submits a Bid in response to the Owner's Invitation to Bid.

Bike Lane - A lane in the Traveled Way, designated by striping and Pavement markings for the preferential or exclusive use of bicyclists.

Bonds - Documents issued by third parties that provide financial protection to the Owner in the event that the Bidder fails to either enter into a Contract ("Bid Bond") or perform the work as required by the Contract Documents ("Payment and Performance Bonds").

Borrow - Material lying outside of planned or required Roadbed excavation used to complete Project earthwork.

Boulders - Particles of rock that will not pass a 12 inch square opening.

Bridge - A single or multiple span Structure, including supports, that carries motorized and non-motorized vehicles, pedestrians, or utilities on a Roadway, walk, or track over a watercourse, highway, railroad, or other feature.

Bureau - A subdivision of the City of Portland. The Bureaus of the City of Portland include, but are not limited to, the following: Environmental Services, Maintenance, Parks and Recreation, Purchases, Office of Planning and Development Review (OPDR), Traffic Management, Transportation Engineering and Development, Water Works, and General Services.

Buttress - A rock fill placed at the toe of a landslide or potential landslide in order to resist slide movement.

Calendar Day - Calendar days, including weekdays, weekends and holidays, beginning at midnight and ending at midnight, twenty-four hours later, unless otherwise specified by a more specific provision of the Contract Documents.

Camber - A slight arch or curvature in a surface or Structure to compensate for loading.

Bid - A competitive offer binding on the Bidder and submitted in response to an Invitation to Bid.

Bid Bond - The bond or other security required to be submitted with each Bid, which assures that the Bidder will enter into a Contract if its Bid is accepted.

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Buttress - A rock fill placed at the toe of a landslide or potential landslide in order to resist slide movement.

Calendar Day - Calendar days, including weekdays, weekends and holidays, beginning at midnight and ending at midnight, twenty-four hours later, unless otherwise specified by a more specific provision of the Contract Documents.

Camber - A slight arch or curvature in a surface or Structure to compensate for loading.

Certificate of Completion - A document that may be provided by Owner that requires the Contractor to certify that the Work has been satisfactorily completed, if the Contract Documents require one.

Certificate of Occupancy/Certificate of Final Inspection - A document provided by a regulatory agency that authorizes partial or full occupancy of a building or structure.

Change Order - A written order issued by the Engineer to the Contractor modifying work required by the Contract and establishing the basis of payment for the modified work.

City - The City of Portland, Oregon, synonymous with Owner.

Claim - A request by a Contractor for additional compensation, Contract Time, or both, that is prepared and submitted to the Engineer in strict conformance with Contract requirements regarding claims and notice of claims.

Claims Package - Documents required to be submitted to substantiate a Contractor's right to, and the amount of, additional compensation.

Clay - Soil passing a No. 200 sieve that can be made to exhibit plasticity (putty-like properties) within a range of water contents.

Clear Zone - Roadside border area, starting at the edge of the Traveled Way, which is available for safe use by errant vehicles. Establishing a minimum width Clear Zone implies that rigid objects and certain other hazards within the Clear Zone should be relocated outside the Clear Zone, or shielded, or remodeled to make them break away on impact or be safely traversable.

Close Conformance - Where working tolerances are given on the Plans or in the Specifications, Close Conformance means compliance with those tolerances. Where working tolerances are not given, Close Conformance means compliance, in the Engineer's judgment, with reasonable and customary manufacturing and construction tolerances.

Coarse Aggregate - Crushed Rock or crushed Gravel retained on a 1/4 inch sieve, with allowable undersize.

Cobbles - Particles of Rock, rounded or not, that will pass a 12 inch square opening and be retained on a 3 inch sieve.

Code - The ordinances adopted by the City Council of Portland that are in effect as of the date of the Contract and as subsequently amended. The term "Code" includes all regulations adopted by Bureaus pursuant to authority given by the Code.

Commercial Grade Concrete - Concrete furnished according to Contractor proportioning, placed in minor Structures and finished as specified.

Construction Change Directive - A written statement prepared by the Owner's Representative directing the Contractor to make additions, deletions, or other revisions to the Work to be performed.

Construction Change Directive (continued) - The directive will be issued when changes to the Work are necessary, but the Owner and Contractor are unable to reach agreement regarding the affect of the changes on the Contract Amount or Contract Time, or both.

Construction Schedule - Schedule provided by Contractor to Owner, as required by the Contract, which shall not exceed the Contract Time, shall relate to the entire Project, and shall provide for the expeditious and practical execution of the Work.

Contract Amount - The authorized amount of money to be paid to the Contractor for performing the Work.

Contract Documents - The written agreement between the Owner and the Contractor that defines the obligations of the Contractor and the Owner regarding the Work to be performed. The Contract Documents include, but are not limited to, the Advertisement for Bids, the Invitation for Bids, Plans, the Standard Requirements, General Requirements, Technical Specifications, Addenda, Change Orders, and any other documents that may be referenced therein as part of the Contract.

Contract Pay Items - A specific unit of work for which a price or basis of payment is provided in the Contract.

Contract Time - The amount of time stated in the Contract Documents for performance of all of the Work, or any specified portion thereof, as modified by any authorized Change Order.

Contractor - Any person who has entered into a Contract with the Owner for the Work.

Contractor's Representative - A person designated in writing by the Contractor to sign contract changes, accept payments, and to act upon instructions from the Owner.

Council - The City Council of the City of Portland, Oregon.

Course - A specified Surfacing Material placed in one or more Lifts to a specified thickness.

Coverage - One Pass by a piece of Equipment over an entire designated area.

Cross Section - The exact image formed by a plane cutting through an object, usually at right angles to a central axis, to determine area.

Current - When used in relationship to a code, edition, manual or version of reference material, it is the document that is available for use as of bid opening.

Day - Unless specifically indicated otherwise, Calendar Day.

DCVR/DCRFI - Design Clarification and Verification Request (“DCVR”) or Design Clarification Request For Information (“DCRFI”) is a form approved for use by the Owner and used by Contractors to request information regarding the Project. It is equivalent to a Request for Information (“RFI”).

Defective Work - Work that a) is performed in an unsatisfactory, faulty, or deficient manner, b) does not conform to the Contract Documents, c) does not meet the requirements of any reference standard, test, or approval referred to or incorporated by the Contract Documents, or d) has been damaged by anyone other than the Owner prior to Acceptance of the Work, whether or not such Work is in possession of Owner or in use by Owner.

Durable Rock - Rock that has a slake durability index of at least 90% based on a two-cycle slake durability test, according to ASTM D 4644. In the absence of test results, the Engineer may evaluate the durability visually.

Easement - The right to use a defined area of property for a specific purpose or purposes.

Emulsified Asphalt - Emulsified asphalt cement.

Emulsified Asphalt Concrete - A mixture of Emulsified Asphalt and graded Aggregate.

Engineer - A person holding an engineering license who is also authorized to act as the Owner's Representative. Engineers who may act as Owner's Representatives are the City Engineer, the Traffic Engineer, the Chief Engineer of the Portland Water Bureau, the Chief Engineer of the Bureau of Environmental Services, and any other Engineer authorized by the Contract Documents to act as the Owner's Representative. (See 1.02.E)

Entity - A natural person capable of being legally bound, sole proprietorship, limited liability company, corporation, partnership, limited liability partnership, limited partnership, profit or nonprofit unincorporated association, business trust, two or more persons having a joint or common economic interest, or any other person with legal capacity to contract, or a government or governmental subdivision.

Environmental Laws - Any applicable statute, law, ordinance, order, consent decree, judgment, Permit, license, Code provision, covenant deed, common law, treaty, convention, or other requirement pertaining to protection of the environment, health or safety, natural resources, conservation, wildlife, waste management or disposal or Hazardous Substances or pollution, including but not limited to regulation of releases to air, land, water and groundwater.

Equal - A substitute for a product, component or process whose use in or on a particular Project is specified. The "Equal" substitute shall be the same or better for that named, in features, function, performance, quality, reliability, utility, value, and suitability for the particular use.

Equipment - All machinery, tools, manufactured products, and fabricated items needed to complete the Contract or specified for incorporation into the Work.

Equitable Adjustment - A term used to describe a change in the Contract Amount, Contract Time, or both when the Contract Documents authorize such a change.

Establishment Period - The time specified to assure satisfactory establishment and growth of planted Materials.

Existing Surfacing - Pavements, slabs, curbs, gutters, walks, driveways, and similar constructions of bricks, blocks, portland cement concrete, bituminous treated materials, and granular surfacing materials on existing Highways.

Extra Work - An item of work not provided for in the Contract as Awarded, but ordered, in writing, by the Engineer as essential to the proper completion of the Contract within its intended scope.

Field Order - A written order issued by the Engineer that does not involve a change in the Contract Amount or Contract Time or the intent of the Contract.

Final Completion - The date, following Substantial Completion, when the Owner agrees that the Contractor has satisfied all requirements of the Contract and may request Final Payment. It has the same meaning as Acceptance of Work.

Final Inspection - The inspection conducted by the Owner's Representative to determine that the Project has been completed in accordance with the Contract.

Final Payment - The last progress payment made to the Contractor for earned funds, if any, plus withheld Retainage, less deductions permitted or required by the Contract.

Fine Aggregate - Crushed Rock, crushed Gravel, or Sand that passes a 1/4 inch sieve, with allowable oversize.

Force Account Work - Extra work performed by the Contractor at a cost determined by the contract documents that was ordered in writing by the Engineer, when negotiation has not resulted in a price mutually acceptable to the Contractor and the Owner.

Foreign Contractor - A Contractor who is not domiciled in Oregon or registered by the Secretary of State of the State of Oregon to do business in the State of Oregon.

General Construction Safety Provisions - A document included as part of the Specifications that establish minimum safety standards for all work performed under the Contract.

General Requirements - Requirements of a general nature particular to the Project included in the Specifications as Division 1.

Granular Material - Graded and selected free-draining material composed of particles of Rock, Sand, and Gravel.

Gravel - Particles of Rock, rounded or not, that will pass a 3 inch sieve and be retained on a No. 4 sieve.

Hazardous Substances - Substances or materials defined as hazardous in Oregon law.

Hazardous Substances (continued) - Examples include hazardous wastes, as defined in ORS 466.005, any substance defined as a hazardous substance pursuant to section 101(14) of the federal comprehensive Environmental Response, Compensation and Liability Act, oil, and any substance designated as hazardous by the State Environmental Quality Commission.

Highway - Every road, street, thoroughfare and place, including bridges, viaducts and other structures within the boundaries of the State, open, used or intended for use by vehicular traffic.

Incidental - A term identifying those acts, services, transactions, property, or other items for which the Owner will make no separate or additional payment.

Incidental Work - Work necessary for fulfillment of the Contract, but which is not listed as a Contract Pay Item and for which no separate or additional payment is made.

Inspector - An employee of Owner and representative of the Engineer or Owner's Representative authorized to inspect and report on some aspects of Contract performance. Inspectors must be distinguished from Regulatory Inspectors (defined below).

Interfacing Work - That portion of the Work that connects to, abuts, or meets with work of another Contractor, which may require cooperation between the two Contractors in order that the Work is successfully completed.

Landscape Architect - A person duly registered with the State Landscape Architect Board who performs professional services such as consultation, investigation, reconnaissance, research, design, preparation of drawings and Specifications and responsible supervision where the dominant purpose of the services is a) the preservation and enhancement of land uses and natural land features; b) the location and construction of aesthetically pleasing and functional approaches for structures, roadways and walkways or other improvements for natural drainage and erosion control; or c) the design for equestrian trails, plantings, landscape irrigation, landscape lighting and landscape grading.

Law - Any federal, state, "local" law, ordinance, Code, regulation or rule.

Leveling - Placing a variable-thickness Course of Materials to restore horizontal and vertical uniformity to existing Pavements, normally continuous throughout the Project.

Lift - The compacted thickness of material placed by Equipment in a single Pass.

Lump Sum - A way of expressing the Contract Amount for the Work, or the price bid for a portion of the Work, stated as a single price for all labor, materials, supplies, Incidental Work, overhead and profit without any breakdown into its component parts.

Materials - Any natural or manmade substance specified for use in the construction of the Project or for incorporation into the Work.

MBE/WBE/ESB (“M/W/ESB”) - Minority Business Enterprises, Women Business Enterprises, and Emerging Small Businesses are those businesses certified as such by the State of Oregon Office of Minority, Women, and Emerging Small Business.

Median - The portion of a divided Highway separating traffic traveling in opposite directions.

Mobilization - Necessary actions taken by the Contractor to begin the Work, such as the establishment of temporary facilities, equipment and personnel at the jobsite.

Multiple Course Construction - Two or more Courses, exclusive of Patching or Leveling, placed over the entire Roadway width.

Multi-Use Path - That portion of the Highway Right-of-Way or a separate Right-of-Way, physically separated from motor vehicle traffic and designated for use by pedestrians, bicyclists and other non-motorized users.

Neat Line - Theoretical lines specified or indicated on the Plans for measurement of quantities.

Nondurable Rock - Rock that has a slake durability index of less than 90% based on a two-cycle slake durability test, as tested by ASTM D 4644, or Rock that is observed to readily degrade by air, water, and mechanical influence.

Notice to Proceed - Written Notice issued by the Engineer to the Contractor authorizing the Contractor to proceed with all, or part of, the Work.

Notice - A written communication delivered by hand or by mail to an individual, employee, agent, official, or officer of the Owner or Contractor authorized to receive notice, as set forth in the Contract Documents or as prescribed by law. Communications sent by facsimile transmission (“fax”) are not considered to be adequate notice unless a copy of the original is mailed to the Owner.

On-Site Work - Any Work taking place on the Project Site, including designated staging areas adjacent to the Project Site, except for installation of covered temporary traffic control signs.

Organic Soil - A Soil with sufficient organic content to influence the Soil properties.

Owner - The City of Portland.

Owner Controlled Insurance Program (OCIP) – The Owner’s insurance program under which the Owner acquires certain Worker’s Compensation, Employees’ Liability, Commercial General Liability, Excess/Umbrella Liability, and Builders Risk Insurance for the Contractor and Subcontractors while performing operations at the Project Site or emanating from the Project Site. Another name for this is a “wrap-up” program.

Owner's Representative - An employee acting on behalf of Owner who has authority to make decisions regarding the Work and the Contract, except to the extent that City Council approval is required by the City's Charter, Code or any specific ordinance. In any particular Contract, the Owner's Representative may be designated as the Engineer, Architect, Project Manager, Construction Manager or other individual.

Owner-Controlled Lands - Lands owned by the Owner, or controlled by the Owner under lease or agreement, or under the jurisdiction and control of the Owner for the purposes of the Contract.

Owner-Furnished Products (OFP) - Any specified equipment, instrument, component, part or material supplied by the Owner or Owner's Representative, which is part of the Work and for installation under this Contract.

Panel - The width of specified Material being placed by Equipment in a single Pass.

Pass - One movement of a piece of Equipment over a particular location.

Patching - Placing a variable-thickness Course of Materials to correct sags, dips, and/or bumps to the existing grade and Cross Section, normally intermittent throughout the Project.

Pavement - Asphalt concrete or portland cement concrete placed for the use of motor vehicles, bicycles, or pedestrians on Roadways, Shoulders, Multi-Use Paths and parking areas.

Pay Item (Contract Item) - A specific unit of Work for which a price is provided in the Contract.

Pea Gravel - Naturally occurring round gravel that will pass a 3/8 inch sieve and be retained on a No. 4 sieve.

Peat - A Soil composed primarily of vegetative matter in various stages of decomposition, usually with an organic odor, dark brown to black color, and a spongy consistency.

Performance Bond and Payment Bond - Documents issued by a Surety that promise, in general, that a) the Work will be completed and performed in accordance with the Contract Documents and b) that all persons supplying labor or materials for the Project will be paid, in the event of a Contractor default.

Permit - Written authorization to do specific work issued by City Bureaus or outside agencies having statutory or proprietary jurisdiction over portions of the Work.

Person - "Person" includes an individual, firm, partnership, joint venture, corporation, limited liability companies, joint stock companies and associations.

Plans - The Project-specific official plans, profiles, cross sections, elevations, details, and other working, supplementary and detail drawings, or reproductions, stamped by a person licensed to do the same, that show the location, character, dimensions and details of the work to be performed. Plans may either be bound in the same book as the balance of the Contract Documents or bound in separate sets, and are a part of the Contract Documents.

Prequalification - A Process by which Bidders become eligible to submit Bids.

Project - General term encompassing all phases of the work to be performed under the Contract and is synonymous with the terms Improvement and/or Work.

Project Manager - The authorized representative of the Engineer assigned to administer the Contract executed by the Contractor, unless the Contract specifies otherwise.

Project Site - The geographical dimensions of the real property on which the Work is to be performed, including designated contiguous staging areas.

Provide - When related to an item or part of the Work, the word provide shall be understood to mean furnish and install the Work complete and in place.

Public Traffic - Vehicular or pedestrian movement, not associated with the Contract Work, on a public way.

Publicly-Owned Equipment - Equipment acquired by the Owner primarily for use in its own operations.

Purchasing Agent - The Director of the Bureau of Purchases or the Director's designated representative.

Purchasing Rules - Those rules adopted by the City of Portland that govern purchasing of goods, services and materials found in Chapter 5.33 and 5.34 of the Code of the City of Portland.

Punch List - The Work necessary after Substantial Completion to complete the project.

Quality Assurance - All those planned and systematic actions by the Owner necessary to provide confidence that a product or service will satisfy given requirements for quality.

Quality Control - All Contractor or vendor operational techniques and activities that are performed or conducted to fulfill the contract requirements.

Railroad - Publicly or privately owned rail carriers, including passenger, freight, and commuter rail carriers, their tenants, and licensees. Also, Utilities that jointly own or use such facilities.

Reference Specifications - Bulletins, standards, rules, methods of analysis or testing, Codes and Specifications of other agencies, engineering societies, or industrial associations referred to in the Contract Documents that when included in the Contract Documents establish the basis by which specific portions of the Work are to be performed.

Reference Specifications (continued) - All such references specified refer to the latest edition thereof including any amendments which are in effect and published at the time of advertising for bids or of issuing the Permit for the Project.

Regulatory Inspectors - Persons employed by regulatory bodies such as the Bureau of Buildings who have authority to determine whether work performed by the Contractor has been performed according to the regulations and codes applicable to that portion of the Work (e.g., electrical, plumbing, etc.).

Release - When used in regard to environmental regulations, the term “release” has the meaning ascribed to it by Oregon law.

Request for Information (“RFI”) - A form approved for use by the Engineer that the Contractor uses to request information, and upon which the Engineer’s response will be returned.

Request for Proposal or Proposal Request (“PR”) - A Request for Proposal or Proposal Request after the Contract is awarded is a written communication by the Owner to the Contractor seeking information about the effects of a possible change to the Work.

Retainage - The difference between the amount earned by the Contractor and the amount paid on the Contract by the Owner.

Right-of-Way - A general term denoting public land, property, or interest therein, acquired for or devoted to a public street, public access or public use.

Roadbed - Completed excavations and embankments for the Subgrade, including ditches, side slopes, and slope rounding, if any.

Roadway - That portion of a street or highway improved, designed or ordinarily used for vehicular travel, including its appurtenances between curbs, gutters, or ditches, but exclusive of the berm or shoulder.

Rock - Natural deposit of solid material composed of one or more minerals occurring in large masses or fragments.

Sand - Particles of Rock that will pass a No. 4 sieve and be retained on a No. 200 sieve.

Schedule of Items - The list of Pay Items, their units of measurement, estimated quantities, and prices.

Schedule of Values - A general itemization of work to be performed accompanied by an associated cost that is sometimes required when the Work, or a portion of the Work, has been priced on a Lump Sum basis. When accepted by Owner, the Schedule of Values determines how much money the Contractor is entitled to receive for work performed in a given time period based on its progress in completing the items of work listed.

Shoulder - The part of a Roadbed contiguous to the Traveled Way or Roadway, whether paved or unpaved, for accommodating stopped vehicles, for emergency use and for lateral support of Base and surface Courses.

Shown - As used herein, the words “shown,” or “as shown,” shall be understood to refer to work shown, indicated, or described on the Plans in the Contract which can be reasonably inferred as belonging to the item of Work described or indicated and which is required by good practice to provide a complete and satisfactory system or structure.

Silt - Soil passing a No. 200 sieve that is nonplastic or exhibits very low plasticity.

Single Course Construction - A wearing Course only, not including patching or leveling Courses or partial width Base Course.

Slope - Vertical distance to horizontal distance, unless otherwise specified.

Soil - Accumulations of particles produced by the disintegration of Rock, which sometimes contains organic matter. Particles may vary in size from Clay to Boulders.

Solicitation Document - Any document that requests submission of a Bid or Proposal or other offer to the Owner to enter into a Contract. All documents referenced by the solicitation document are included in the solicitation document.

Special Services - Force Account Work services that the Contractor and Engineer agree cannot be satisfactorily performed by the Contractor’s and Subcontractors’ forces, e.g., fabrication and machining work that is most effectively performed away from the Project Site, or rental of operated Equipment.

Specifications – Contract documents that describe the technical and performance requirements of the Work and include any Reference Specifications incorporated therein.

Specified - As used herein, the word “specified,” or “as specified,” means as required by the Contract.

Station - A distance of 100 feet measured horizontally along the established centerline of a street, sewer, or other work, unless specified otherwise.

Street - Any public Right-of-Way, whether improved or unimproved, including, but not limited to, an avenue, boulevard, alley, lane, bridge, bicycle path, road, public thoroughfare or public way and any land over which a Right-of-Way has been obtained or granted for any purpose of public travel.

Structures - Bridges, retaining walls, endwalls, cribbing, buildings, culverts, manholes, catch basins, drop inlets, sewers, service pipes, underdrains, foundation drains, and other similar features which may be encountered in the Work.

Subbase - A Course of specified material of specified thickness between the Subgrade and a Base.

Subcontractor - An individual, partnership, firm, corporation, or any combination thereof, with whom the Contractor enters into a subcontract to perform a part of the Work.

Subgrade - The top surface of completed earthwork on which Subbase, Base, Surfacing, Pavement, or a Course of other Material is to be placed.

Substantial Completion - A state of Contract performance that is less than full performance of all the work required by the Contract Documents, but is nonetheless sufficiently complete to permit occupancy or use of the Project for its intended purpose, and where the omissions and deviations from full performance are inadvertent and unintentional, do not impair the Work as a whole, can be easily remedied, and may be paid for by deductions from the Contract Amount.

Substructure - Those parts of a Structure which support the Superstructure, including bents, piers, abutments, and integrally built wingwalls, up to the surfaces on which bearing devices rest. Substructure also includes portions above bearing surfaces when those portions are built integrally with a Substructure unit (e.g., backwalls of abutments). When Substructure and Superstructure elements are built integrally, the division between Substructure and Superstructure is considered to be at the bottom soffit of the longitudinal or transverse beam, whichever is lower. Culverts and rigid frames are considered to be entirely Substructure.

Superstructure - Those parts of a Structure above the Substructure, including weight bearing devices.

Surety - The entity providing a Bid Bond, Performance Bond, Payment Bond, Warranty or Maintenance Bond, or any combination thereof.

Surfacing - The Course or Courses of material on the Traveled Way, auxiliary lanes, Shoulders, or parking areas for vehicle use.

Technical Specifications - Requirements of a technical nature unique to the Project and included in Specifications Divisions 02 through 49.

Ton - The short ton of 2000 pounds avoirdupois.

Topsoil - Soil ready for use in a planting bed.

Traffic Lane - That part of the Traveled Way marked for moving a single line of vehicles.

Traveled Way - That part of the Highway for moving vehicles, exclusive of auxiliary lanes, berms and Shoulders.

Typical Section - That Cross Section established by the Plans which represents in general the lines to which the Contractor shall work in the performance of the Contract.

Unit Price - The dollar amount bid to do a particular portion of Contract work when such prices are required by the Bid Documents. In some cases, unit prices are used in order to determine the lowest responsive and responsible Bidder.

Unsuitable Material - Frozen material, or material that contains organic matter, muck, humus, peat, sticks, debris, chemicals, toxic matter, or other deleterious materials not normally suitable for use in earthwork.

Utility - A line, facility or system for producing, transmitting, or distributing communications, power, electricity, heat, gas, oil, water, steam, waste, stormwater not connected with highway drainage, or any other similar commodity that directly or indirectly services the public. The term "utility" also shall mean the utility company, district, or cooperative, including any wholly owned or controlled subsidiary thereof, which provides utility services.

Wetlands - Areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, vegetation typically adapted for life in saturated Soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

Work - All material, labor, tools, equipment, and all appliances, machinery, systems, transportation, and appurtenances necessary to perform and complete the Contract, and such additional items not specifically indicated or described which can be reasonably inferred as belonging to the item described or indicated and as required by good practice to provide a complete, functioning, and satisfactory system or structure.

Working Day - Any and every day shown on the calendar, excluding Saturdays, Sundays and City of Portland legal holidays, synonymous with "workday."

Working Drawings - Shop drawings and other submittals not furnished by the Owner, that the Contractor is required to submit to the Engineer.

PART 2 - PRODUCTS [NOT USED]

PART 3 - EXECUTION [NOT USED]

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SECTION 01 45 00

QUALITY CONTROL

PART 1 - GENERAL

1.01 SUMMARY

- A. The Contractor is fully responsible for the quality control of the Work, and shall ensure that the Work meets the requirements of the Contract Documents.
- B. Inspections, monitoring, and tests performed by the Owner's Representative's will take precedence over quality control inspections, testing, or monitoring conducted by the Contractor.
- C. The Owner's Representative may establish a quality assurance inspection and testing program to check the work of the Contractor. Inspections and tests conducted by the Owner's Representative are for the sole benefit of the Owner and will not:
 - 1. Relieve the Contractor of responsibility for providing adequate quality control measures.
 - 2. Relieve the Contractor of responsibility for damage to or loss of the work before acceptance.
 - 3. Constitute or imply final acceptance.
 - 4. Affect the continuing rights of the Owner after acceptance of the completed Work.

1.02 CONTRACTOR QUALITY CONTROL PROGRAM

- A. The Contractor shall establish a quality control program to perform sufficient inspection and testing of all items of Work, including the Work of subcontractors and suppliers, to ensure conformance to applicable Contract Drawings and Specifications. The Contractor's quality control shall include three phases of inspection for each item of work, defined as follows:
 - 1. Preparatory Inspection: Prior to beginning any element of work, the Contractor shall perform a preparatory inspection on that element. This inspection shall include a review of the Contract requirements; a check to assure that all materials or equipment have been tested, submitted, and approved; a check to ensure that provisions have been made for required quality control and quality assurance testing; examination of the work area to verify that all preliminary work has been completed; and a physical examination of the materials or equipment to ensure that they conform to the approved shop drawings.

The preliminary inspection shall also verify the proper receipt, handling, and storage of equipment.

2. Initial Inspection: As soon as work begins on a representative element of the Work, the Contractor shall perform an initial inspection. This inspection shall include instruction to ensure that the workers understand the requirements of the Contract, a review to ensure that workers have the proper Contract Documents and approved submittals, an examination of the quality of workmanship, and a review of testing for compliance with Contract requirements.
3. Follow-up Inspection: The Contractor shall perform daily follow-up inspections to ensure continuing compliance with Contract requirements. The Contractor shall take necessary corrective action should any element of the Work fail to meet the Contract requirements.

1.03 CONTRACTOR'S RESPONSIBILITY

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and work in order to produce work of the specified quality.
- B. Comply fully with all manufacturer's instructions, including each step in sequence.
- C. Should manufacturer's instructions conflict with Contract Documents, request clarification from the Owner's Representative before proceeding.
- D. Perform work utilizing persons qualified to produce work of the specified quality.
- E. Furnish copies of mill test reports and quality assurance documentation to the Owner's Representative.
- F. Comply with all requirements of Part 6, Section 00 72 00.

PART 1 - PRODUCTS [NOT USED]

PART 2 - EXECUTION [NOT USED]

END OF SECTION

SECTION 01 45 23

TESTING AND INSPECTION SERVICES

PART 1 - GENERAL

1.01 INSPECTION AND TESTING

- A. The Owner's Representative will, throughout the duration of construction, inspect construction materials, test materials, and monitor settlements to assure conformance with the Contract Documents and as a basis of acceptance. At a minimum, the Owner's Representative will conduct testing to verify earthwork compaction, verify concrete compressive strength, monitor dewatering water quality, monitor noise levels at nearby receptors, and perform independent settlement monitoring during construction activities.
- B. The Contractor shall provide all labor, equipment, and apparatus necessary for quality control testing of the pipelines, equipment, site utilities, electrical and mechanical systems, and all other elements of work as required by the Contract Documents and any applicable permits and codes.
- C. The Contractor shall be responsible for the installation and maintenance of all monitoring equipment and monitoring instrumentation in accordance with the specified requirements.
- D. Testing shall not be cause for claims for delay by the Contractor, and all expenses accruing therefrom shall be deemed to be incidental to the Contract.
- E. All products, materials, and equipment are subject to inspection by the Owner's Representative at the place of manufacture. The Contractor shall provide a **minimum of 30 days notice of any testing at the place of manufacture**, unless otherwise specified. The presence or absence of the Owner's Representative at the place of manufacture shall not relieve the Contractor of the responsibility of furnishing products, materials, and equipment which comply with all requirements of the Contract Documents.

1.02 COSTS

- A. The Owner's Representative will conduct and pay for quality assurance monitoring, testing, and inspection services consisting of earthwork compaction, concrete slump, concrete compressive strength, concrete air content, dewatering water quality, and noise levels. Additional inspection and tests required because of defective work or ill-timed notices will be performed by the Owner's Representative at the Contractor's expense.

- B. The Owner will pay all costs for the Owner's Representative to perform inspections at the place of manufacture, unless otherwise noted.
- C. The Contractor shall pay for all other testing, inspection, monitoring, and certifications required by the Contract Documents.
- D. Extra work by the Owner's Representative required, as a result of the Contractor's actions, including inspection, will be charged to the Contractor at a rate of \$75.00/hour. Extra testing will be charged at the current City's material testing lab rate.

1.03 SPECIAL INSPECTIONS

- A. The Oregon Structural Specialty Code requires that special inspections be performed on certain structural elements of the project.
- B. Where a building permit is not required, Owner may elect to conduct structural inspections as indicated on the Drawings.
- C. Contractor shall provide at least **24-hour notice** to the Owner's Representative when a special inspection is required. The Owner's Representative will provide all on-site special inspections required by the OSSC. In addition, the Owner's Representative will perform all special inspections required by the OSSC for building components fabricated within a 50-mile radius of the project site.
- D. When building components are fabricated outside of a 50-mile radius from the project site, the Contractor must utilize a fabricator approved by the Owner's Representative. If the Contractor elects to utilize a fabricator that is not approved by the Owner's Representative, the Contractor shall pay all travel-related costs for a City special inspector or for a City-designated special inspector to perform continuous special inspection in the fabricator's shop. Travel-related costs associated with performing special inspection in the fabricator's shop include wages for travel time, automobile mileage or airfare, parking, rental car, lodging, and meals.

1.04 TESTING LABORATORIES AND REPORTS

- A. The Contractor shall submit to the Owner's Representative for review the names of any testing laboratories proposed for the work. The testing laboratories shall be certified by the City of Portland, and shall be recognized as being capable of providing the type of testing services proposed. The Contractor shall use no testing laboratory until it has been reviewed by the Owner's Representative.
- B. All inspection and testing conducted by the Contractor shall be performed by an independent testing and inspection agency or agencies, which will prepare logs, test reports and certifications applicable to specific tests and inspections.

Reports shall include a description of the test method, identification of samples and portions of the work tested. They shall state descriptions of the location of work, time and date of obtaining and testing samples, weather and climate conditions, and evaluation of results of tests, including recommendations for action. The Contractor shall submit test reports to the Owner's Representative in accordance with the submittal requirements of Section 01 33 00, Submittal Procedures.

- C. Reports of testing, inspection and monitoring conducted by the Owner's Representative will be distributed to the Contractor at the sole discretion of the Owner's Representative.
- D. Inspection or testing of work by persons other than the Owner's Representative will not constitute inspection or testing by Owner. Such inspection is also not a basis of acceptance.

1.05 CONTRACTOR'S RESPONSIBILITY

- A. Provide safety measures and devices to protect those who take samples.
- B. Cooperate with laboratory personnel. Provide access to the work and to suppliers operations. Furnish all labor and facilities:
 - 1. For access to the work to be tested.
 - 2. To obtain and handle test samples at the site.
 - 3. To facilitate inspections and testing.
 - 4. For laboratories exclusive use for storage and curing test samples until samples are removed to the laboratory.
 - 5. For Owner's Representative inspection in supplier's facilities.
- C. Data: Furnish samples, records, drawings, certificates and similar data in the quantities required by testing and inspection personnel to assure compliance with the Contract Documents.
- D. Notices: The Contractor shall notify the Owner's Representative not less than three work days before work requiring inspection, sampling, or testing is started. Provide notice to the Owner's Representative two workdays prior to concealment. The Contractor shall be fully responsible for any delays caused by the failure to provide adequate notice.
- E. Comply with the requirements of Section 00 72 00.

PART 2 - PRODUCTS [NOT USED]

PART 3 - EXECUTION [NOT USED]

END OF SECTION

SECTION 01 57 13

TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.01 DESCRIPTION

- A. The Contractor shall comply with the requirements of the City of Portland 2010 Standard Construction Specifications, Section 00280, as amended below:
1. Project Signing – Install one (1) erosion sign on the Project with the following information:
 - a. “EROSION CONCERNS?”, “Erosion Control Information”, or other similar message.
 - b. “CBWTP Lagoon Reconstruction Project”
 - c. “Contact Number BES 503-823-0900”
 2. Provide a “G” Type sign. Contact the Owner’s Representative to confirm the above information before fabricating the sign.
- B. Implement the Erosion, Sediment and Pollution Control Plan (ESPCP) depicted on Drawings ECP1 and ECP2. Any revisions to the plan shall be submitted to the Owner’s Representative for approval by the Owner.
- C. Site Drainage – With the exception of the new bioswale, all site disturbances during construction will be within the area defined by existing perimeter dikes. Maintain slope at top of the existing perimeter dikes to convey all stormwater runoff toward the lagoons. Offsite stormwater conveyance is prohibited.
- D. Vegetated Buffer Zone – The areas outside of the existing perimeter dikes are vegetated with high grasses and blackberry. The rooted vegetation holds the soil and filters runoff. The existing vegetated buffer zone shall not be altered during construction without the express permission of the Owner’s Representative.

PART 2 - PRODUCTS [NOT USED]

PART 3 - EXECUTION [NOT USED]

END OF SECTION

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SECTION 01 74 19

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1- GENERAL

1.01 SUMMARY

- A. Section Includes: Construction Waste Management.
- B. Comply with the requirements of City of Portland 2010 Standard Construction Specifications, Section 00290.20(c).
- C. Lagoon Solids that are subject to the requirements of Section 33 47 23, Lagoon Solids Handling, are not considered Construction Waste.

1.02 PERFORMANCE REQUIREMENTS FOR THIS PROJECT

- A. The Owner has established that this project shall minimize the disposal of construction waste material to landfill. Factors that contribute to waste such as over packaging, improper storage, ordering error, poor planning, breakage, mishandling, and contamination shall be minimized. Waste shall first be reused, then salvaged, and then recycled. As a last resort, manage waste materials by landfill disposal.
- B. A minimum of 75% of total project construction waste shall be diverted from landfill. The following waste categories, at a minimum, shall be diverted from landfill (not all categories will apply to all projects):
 - 1. Clean dimensional wood, pallet wood
 - 2. Bricks
 - 3. Concrete Masonry Units (CMU)
 - 4. Concrete
 - 5. Asbestos tile
 - 6. Cardboard
 - 7. Metals
 - 8. Gypsum board (unpainted)

9. Paint
10. Carpet and pad
11. Beverage containers
12. Insulation

1.03 REFERENCES AND RESOURCES

- A. Metro's Construction Industry Recycling Toolkit may be accessed through the City of Portland's Permit Center, by calling Metro's hotline at (503) 234-3000 or online at www.oregonmetro.gov/toolkit. The City of Portland's Bureau of Planning and Sustainability offers assistance with recycling construction waste and may be reached by calling (503) 823-7418.
- B. Except where noted below, obtain contact information on recyclers by calling Metro Recycling Information, at (503) 234-3000.
 1. Carpet and pad:
 - a. Return to manufacturer.
 - b. Donate large remnants to Habitat for Humanity or other non-profit organization.
 2. Insulation:
 - a. Check with manufacturer or installer for take-back programs.
 - b. Call Metro Recycling Information for reuse of new insulation.

1.04 WASTE MANAGEMENT PLAN

- A. The WMP shall contain the following minimum information:
 1. An estimate of the total Project waste that will be generated.
 2. The name of the landfill(s) where Project waste would normally be disposed. (Waste Management – Hillsboro, 3205 SE Minter Bridge Rd., Hillsboro, OR 97213 has accepted sewage related waste materials on past BES projects.)
 3. An estimate of the total amounts (weight, feet, square yards, cubic yards, gallons, etc.) of the following waste categories to be diverted from landfill:
 - a. Clean dimensional wood, pallet wood

- b. Bricks
- c. Concrete Masonry Units (CMU)
- d. Concrete
- e. Asbestos tile
- f. Cardboard
- g. Metals
- h. Gypsum board (unpainted)
- i. Paint
- j. Carpet and pad
- k. Beverage containers
- l. Insulation

PART 2 - PRODUCTS [NOT USED]

PART 3 - EXECUTION

3.01 WASTE MANAGEMENT PLAN IMPLEMENTATION

- A. Within ten (10) calendar days after receipt of Notice to Proceed, and prior to any waste removal, the Contractor shall submit to the Owner's Representative a Waste Management Plan (WMP).
- B. Plan Distribution:
Provide copies of the WMP to the job site Foreman, each Subcontractor, and the Owner's Representative.
- C. Instruction:
Provide on-site instruction of appropriate separation, handling, recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the Project.

D. Meeting:

Conduct Construction Waste Management meetings. The meetings shall include subcontractors affected by the WMP. At a minimum, waste management goals and issues shall be discussed at the following meetings.

1. Pre-construction meeting
2. Regularly scheduled job-site meetings

E. Separation Facilities:

Designate a specific area or areas to facilitate separation of materials for potential reuse, salvage, recycling, and return. Recycling and waste bin areas are to be kept neat, clean and clearly marked in order to avoid co-mingling of materials. Bins shall be protected during non-working hours from off-site contamination.

F. Materials Handling Procedures:

Materials to be recycled shall be protected from contamination, and shall be handled, stored, and transported in a manner that meets the requirements set by the designated facilities for acceptance.

G. Hazardous Wastes:

Hazardous wastes shall be separated, stored, and disposed according to local regulations.

H. Application for Final Payment:

Submit a summary of the completed WMP showing project waste generated with the Application for Final Payment. Failure to submit this information shall render the Application for Final Payment incomplete and shall delay Payment. The summary shall contain the following information:

1. The amount (in tons or cubic yards) of material landfilled from the project, including the identity of the landfill, the total amount of tipping fees paid at the landfill, and the total disposal cost. Attach copies of manifests, weight tickets, receipts, and invoices.
2. For each material recycled, reused, or salvaged from the Project include the amount (in tons, cubic yards, pounds, feet, square yards, gallons, etc.); the date removed from the job site; and the receiving party. Include the transportation cost; the amount of any money paid or received for the recycled or salvaged material, and the net total cost or savings of salvage or recycling each material. Attach copies of manifests, weight tickets, receipts, and invoices.

END OF SECTION

SECTION 01 74 23

CLEANING

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes intermediate and final cleaning of Work.

1.02 STORAGE AND HANDLING

A. Store cleaning products and cleaning wastes in containers specifically designed for those materials.

1.03 SCHEDULING

A. Schedule cleaning operations so that dust and other contaminants disturbed by cleaning process will not fall on newly painted surfaces.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Cleaning Agents:

1. Compatible with surface being cleaned.
2. New and uncontaminated.
3. For Manufactured Surfaces: Material recommended by manufacturer.

PART 3 - EXECUTION

3.01 CLEANING (GENERAL)

A. Prevent accumulation of wastes that create hazardous conditions.

- B. Conduct cleaning and disposal operations to comply with laws and safety orders of governing authorities.
- C. Do not dispose of any wastes in storm or sanitary drains or sewers.
- D. Dispose of all construction debris in accordance with Section 01 74 19, Construction Waste Management and Disposal.
- E. On completion of work, leave area in a clean, natural looking condition. Remove all signs of temporary construction and activities incidental to construction of required permanent Work.
- F. Do not burn on site.

3.02 INTERIOR CLEANING [NOT USED]

3.03 EXTERIOR (SITE) CLEANING

A. Cleaning During Construction:

- 1. Construction debris:
 - a. Comply with the requirements of Section 01 74 19, Construction Waste Management and Disposal.
- 2. Soils, sand, and gravel deposited on paved areas and walks:
 - a. Remove as required to prevent muddy or dusty conditions.
 - b. Do not flush into storm sewer system.

B. Final Cleaning:

- 1. Remove trash and debris containers from site:
 - a. Re-seed areas disturbed by location of trash and debris containers.
- 2. Clean paved roadways.

3.04 FIELD QUALITY CONTROL

- A. Immediately prior to Owner's Representative's Final Inspection, conduct final cleaning.

END OF SECTION

SECTION 01 75 16

FACILITY STARTUP

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Procedures and actions, required of the Contractor, which are necessary to achieve and demonstrate Substantial Completion.
2. Requirements for Substantial Completion Submittals.

1.02 DEFINITIONS

A. Installation Period: The period of time, of unspecified duration including initial construction and installation activities during which Contractor, with assistance from manufacturer's representatives, performs in the following sequence:

1. Complete installation of any Contractor-provided equipment, including any punch list items identified and submitted by the manufacturer's representative.
2. Complete installation and connection of all piping, electrical and instrumentation control systems components.

B. Commissioning Period:

1. The period of time following the Installation Period whereby the Contractor and the Owner prove the proper installation, functional integrity and operability of the mechanical and electrical equipment and components. The Commissioning period is comprised of ORT-1, ORT-2, PCS testing, and training as specified below and shall be allocated a minimum of thirty (30) calendar days in the Contractor Baseline Schedule. Completion of the commissioning activities, including Owner's acceptance of all documentation, serves as evidence of Substantial Completion.
2. Commissioning is to be performed in the following sequence:
 - a. Operational Readiness Testing (ORT 1);
 - 1) The Contractor shall inspect, test, and document that the work is ready for operation.

Contractor shall document these tests using all relevant forms including but not limited to Operational Readiness Testing Phase 1, Motor Test, Wire And Cable Resistance Test Data, Dry-Type Transformer Test Data and Motor Control Center Test forms as well as loop diagrams, electrical schematics, cable schedules and data sheets. See Section 01 99 90 for Standard ORT 1 Form. Use these forms to document the results of the testing for every instrumentation, control and power circuit. The Contractor's work will be signed by the Contractor performing the test and witnessed by the Owner's Representative. Contractor shall include sufficient work days for these activities, specified in Section 01 11 13, Work Covered by Contract Documents, in the construction schedule for the ORT 1 testing.

b. Operational Readiness Testing (ORT 2);

1) Not Applicable.

c. Project Classified System (PCS) Test:

1) Not Applicable.

C. Acceptance Testing or Operational Demonstration Test:

1. The final test of the Work, of **at least seven (7) calendar days** following the Commissioning Period, during which the Owner initiates or simulates process flow through the facility and operates the facility without exceeding defined downtime limitations, to prove the functional integrity of the mechanical and electrical equipment and components and the control interfaces of the respective equipment and components comprising the facility, as evidence of Substantial Completion and Owner's acceptance of operational responsibility of the Project.

D. Substantial Completion: See Section 01 42 16, Definitions, and Section 01 77 00, Contract Closeout Procedures.

1.03 SUBMITTALS

A. Submit in the chronological order listed below prior to the completion of the Installation Period:

1. Master Operation and Maintenance Training Schedule:

- a. Submit thirty (30) calendar days (minimum) prior to first training session for Owner's personnel.
- b. Schedule to include target date for initiation of Commissioning Period.

1) Submit for review and acceptance by Owner.

- 2) Include Holidays observed by Owner.
- 3) Schedule to be submitted until approved.
 - c. Attend a schedule planning and coordination meeting **thirty (30) calendar days prior** to first anticipated training session.
 - d. Provide a status report and schedule-to-complete for requirements prerequisite to manufacturer's training.
 - e. Identify initial target dates for individual manufacturer's training sessions.
 - f. Owner reserves the right to require a minimum seven (7) days' notice of rescheduled training sessions.
2. Substantial Completion Submittal:
 - a. Completed final "Master Operations and Maintenance Training Schedule". See SUPPLEMENT 01 at the end of this Section.
 - b. Equipment installation and startup certifications, also known as "Manufacturer's Certificate of Proper Installation" signed by the factory representative.
 - c. Completed and Accepted Testing Forms. See 01 99 90, Standard Forms, for ORT-1 FORM.
 - d. Letter verifying completion of all startup activities including receipt of all specified items from manufacturers or suppliers.

1.04 SCHEDULING

- A. Equipment subject to testing shall include, but not necessarily be limited to the following:
 1. Monofill Groundwater Pump
 2. Monofill Leachate Pump
 3. Plant Piping and Valves
 4. Associated electrical and instrumentation
 5. All incidentals necessary for a complete system

PART 2 - PRODUCTS [NOT USED]

PART 3 - EXECUTION

3.01 GENERAL

A. Work is divided into three periods:

1. Installation Period including:
 - a. Completion of construction work defined in the contract documents.
 - b. Completion and Owner's acceptance of all required submittals.
2. Commissioning Period including:
 - a. Verification of equipment availability for operation including completion of Manufacturer's Certificate of Proper Installation and all specified testing forms.
 - b. Demonstration of functional integrity of facility, including ORT 1 and ORT 2 (if applicable).
 - c. Training of Owner's personnel: Owner's personnel training occurs when the equipment can be energized and operated, at a minimum locally during hands-on training by the equipment supplier.
3. Acceptance Testing or Operational Demonstration Period that demonstrates the operational integrity of facility or system.

3.02 INSTALLATION PERIOD

A. Completion of Construction Work:

1. Complete the filing of all required submittals.
2. Complete the work to bring the Work to a state of readiness for equipment operation.
3. Prepare the equipment or other items so that it will operate properly and safely and be ready to demonstrate functional integrity during the Commissioning Period.

3.03 COMMISSIONING PERIOD

A. Startup:

1. Requirements for individual items are included in these specifications.
2. Test equipment to the extent possible without introducing product flow, using plant water provided by the Owner.
3. Procedures include but are not necessarily limited to the following:
 - a. Test or check and correct deficiencies of:
 - 1) Power, control, and monitoring circuits for continuity prior to connection to power source.
 - 2) Voltage of all circuits.
 - 3) Phase sequence.
 - 4) Cleanliness of connecting piping systems.
 - 5) Alignment of connected machinery.
 - 6) Vacuum and pressure of all closed systems.
 - 7) Lubrication.
 - 8) Valve orientation and position status for manual operating mode.
 - 9) Tankage for integrity using plant water.
 - 10) Instrumentation and control signal generation, transmission, reception, and response.
 - 11) Tagging and identification systems.
 - 12) Proper connections, alignment, calibration and adjustment for all equipment.
 - a. Calibrate all safety equipment.
 - b. Manually rotate or move moving parts to assure freedom of movement.
 - c. "Bump" start electric motors to verify proper rotation.
 - d. Perform other tests, checks, and activities required to make the equipment ready for Acceptance Testing Period.

- e. Documentation: Prepare a log showing each equipment item subject to this paragraph and listing what is to be accomplished during Equipment Startup. Record date and person accomplishing required work. Submit completed document before requesting inspection for Substantial Completion Certification.
4. Obtain certifications without restrictions or qualifications, and deliver to Owner's Representative, Equipment Manufacturer's Certificate of Proper Installation.

B. Personnel Training:

1. See individual equipment specification sections and SECTION 01 64 00, MANUFACTURERS' SERVICES, if applicable.
2. Schedule all complete Owner's personnel training after completion of equipment startup for the equipment for which training is being conducted.
 - a. Personnel training on individual equipment or systems will not be considered complete unless:
 - 1) All pre-training deliverables are received and approved before commencement of training on the individual equipment or system.
 - 2) No system malfunctions occur during training.
 - 3) All provisions of field and classroom training specifications are met.
 - b. Training not in compliance with the above will be performed again in its entirety by the manufacturer at no additional cost to Owner.
3. Field and Classroom Training Requirements:
 - a. Hold classroom training onsite.
 - b. Notify each manufacturer specified for onsite training that the Owner reserves the right to video record any or all training sessions. Organize each training session in a format compatible with video recording.
 - c. Training Instructor: Factory trained and familiar with giving both classroom and "hands-on" instructions.
 - d. Training Instructors: Be at classes on time. Session beginning and ending times to be coordinated with Owner and indicated on the master schedule. Normal time lengths for class periods can vary, but brief rest breaks should be scheduled and taken.

- e. Organize training sessions into maintenance versus operation topics and identify on schedule if so directed by owner.
- f. Plan for minimum class attendance of 20 people at each session. Trainer to provide sufficient classroom materials, samples, and handouts for those in attendance.
- g. Instructors to have a typed agenda and well prepared instructional material. The use of visual aids, e.g., films, pictures, and slides is recommended for use during the classroom training programs. Deliver agendas to the Owner's Representative a **minimum of seven (7) calendar days** prior to the classroom training. Owner to provide a Windows based PC and projector for presentation of visual aids.
- h. In the onsite training sessions, cover the information required in the Operation and Maintenance Manuals submitted according to Section 01 78 23, Operation and Maintenance Data.
- i. Maintain a log of classroom training provided, including: Instructors, topics, dates, time, and attendance.

C. Complete the filing of all Required Submittals:

- 1. Test reports.
- 2. Training material.

3.04 ACCEPTANCE TESTING OR OPERATIONAL DEMONSTRATION TESTING

A. General:

- 1. Demonstrate the functional integrity of the mechanical, electrical, and control interfaces of the respective equipment and components comprising the facility as evidence of operational reliability and facility completion.
- 2. Duration of Acceptance Testing Period:
 - a. 120 consecutive hours of operation, or as determined by Owner's Representative.
- 3. If, during the Acceptance Testing Period, the aggregate amount of time used for repair, alteration, or unscheduled adjustments to any equipment or systems that renders the affected equipment or system inoperative exceed 2 hours of the Acceptance Testing Period, the demonstration of functional integrity will be deemed to have failed. In the event of failure, a new Acceptance Testing Period will recommence after correction of the cause of failure.

The new Acceptance Testing Period shall have the same requirements and duration as the Acceptance Testing Period previously conducted. The Owner may choose to waive the full restart and substitute a shorter test period for completion.

4. Conduct the demonstration of functional integrity under operational conditions as determined by Owner.
 5. Owner will perform all operational functions, and Contractor will be available and provide any needed assistance and/or repair until successful completion of the Acceptance Testing Period.
 6. Owner reserves the right to simulate operational variables, equipment failures, routine maintenance scenarios, etc., to verify the functional integrity of automatic and manual backup systems and alternate operating modes.
 7. Time of beginning and ending any Acceptance Testing Period shall be agreed upon by Contractor, Owner, and Owner's Representative in advance of initiating Acceptance Testing Period.
 8. Throughout the Acceptance Testing Period, provide knowledgeable personnel to answer Owner's questions, and to respond to any system problems or failures which may occur.
 9. Provide all labor, supervision, utilities, chemicals, maintenance, equipment, vehicles or any other item necessary to operate and demonstrate all systems being demonstrated.
 10. Upon successful completion of Acceptance Testing Period, Owner's Representative will endorse certificate attesting to the successful demonstration, and citing the date of successful Demonstration Period.
- B. See Supplement 01 for Master Operation and Maintenance Training Schedule Example.

SECTION 01 75 16

FACILITY STARTUP

SUPPLEMENT 01

MASTER OPERATIONS AND MAINTENANCE TRAINING SCHEDULE – DRAFT								
Target Date for Start of Commissioning Period: ORT1 Complete _____								
Training Class	Conducted By	Date of Owner Witness Initial Startup	Tuesday: Date _____			Thursday: Date _____		
			Start	Duration	For ⁽¹⁾	Start	Duration	For ⁽¹⁾
	Factory Rep		7:00 AM	1 hr.	E&I, O, M	4:00 PM	1 hr.	E&I, O, M
			7:00 AM	1 hr.		4:00 PM	1 hr.	
			7:00 AM	1 hr.		4:00 PM	1 hr.	
Notes:								
1.	E&I = Electricians and Instrument Shop							
	M = Mechanical Maintenance							
	O = Operations							
2.	No two training classes to occur at the same time on the same day							
3.	Each class is held twice on different days							
4.	Owner may change days and times at no impact to contractor							
5.	Each Class will include Classroom time and training in field at the equipment							
6.	Initial Startup date is also date of visit by factory representative							

END OF SECTION

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SECTION 01 77 00

CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Description of procedures to be followed and related work required to accomplish an orderly transfer of Project deliverables from the Contractor to the Owner.
- B. See section 01 42 16, Definitions.

1.02 SUBMITTALS

A. Substantial Completion:

1. Contractor to notify Owner's Representative that the Contractor considers the Work as a whole or portions of the Work to be in Substantial Completion and request for a Substantial Completion Inspection. Attach to this notice:
 - a. A list of work items that remain to be completed and defective work that remains to be corrected.
 - b. A list of work not to be considered for Substantial Completion.
2. Two copies of complete up to date set of Record Drawings.
3. Registry of training sessions conducted and lists of attendees for Procurement Contractor's operation and maintenance training during facility startup.
4. Document final maintenance, lubrication, and change of filter for equipment.
5. Inventory of extra materials and spare parts delivered to the Owner.
 - a. Organize by Specification Sections.

B. Final Completion:

1. Contractor to notify Owner's Representative that Contractor considers the entire work to have progressed to Final Completion and request for a Final Inspection. The written Notice shall include certification that:

- a. Contract Documents have been reviewed.
- b. Work has been inspected for compliance with contract documents.
- c. Work has been completed in accordance with contract documents.
- d. Equipment and systems have been tested in the presence of Owner's representative and are operational.
- e. Work has received Final Cleaning: Section 01 74 23, Cleaning.
- f. Work is completed and ready for Final inspection.
- g. Attach to this notice:
 - 1) Substantial Completion submittals for portions of the work not previously considered substantially complete, if any.
 - 2) One complete set of Record Drawings and software files in their final form.
 - 3) Lien waivers, if required by Owner.
 - 4) Evidence of payments, if required by Owner.
 - 5) Accepted Final O&M Manuals.
 - 6) When applicable, the Building Officials "Final Occupancy Permit."

PART 2 - PRODUCTS [NOT USED]

PART 3 - EXECUTION [NOT USED]

END OF SECTION

SECTION 01 78 23

OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.01 SUMMARY

- A. Compile vendor product data and related information appropriate for Owner's Operation and Maintenance of products furnished under the contract.
- B. Prepare operation and maintenance manuals as specified in this section and as referenced in other pertinent sections of specifications. Each set of manuals shall be identical when submitted for review by the Owner's Representative.
- C. No portion of the project will be considered substantially complete until sufficient and corrected Operation and Maintenance information has been provided and approved as adequate for operation, trouble-shooting, and maintenance of that portion of the project facility.

1.02 SUBMITTALS

- A. Preliminary O&M manual: submit six (6) copies of the Preliminary O&M manual for the Owner's Representative review, as specified in Part 2 - PRODUCTS.
- B. Final O&M Manual: After the Preliminary O&M manual is approved, provide four (4) copies of each approved O&M Manual. The approved O&M in final form shall be identical to the approved preliminary O&M. If the final O&M includes new information not reviewed under the preliminary O&M, it will be considered a preliminary O&M and shall be reviewed per 1.02.A above. Include one set of associated software files prior to project completion.
- C. Submit one electronic searchable PDF of the Final O&M manual to the Owner's Representative.

1.03 FORMAT

- A. Submittals for Operation and Maintenance (O&M) Manuals shall conform to the following format:
 - 1. Binders:
 - a. Size: 8-1/2 inches by 11 inches.

- b. All binders of a set shall be similar in appearance.
 - c. 3-ring type, solid color, with view (plastic covered with opening at top for inserted paper labels), not filled beyond capacity, and no more than 2-inches thick.
 - d. Provide a separate binder for each major piece of equipment or system as applicable. Provide a flyleaf for each separate piece of equipment within a system.
 - e. Organize information in binders with tab dividers to permit easy location of desired information and in numerical order by equipment number. Numbered binder tab dividers shall subdivide each set of manuals.
 - f. Each set of manuals shall have a single index system with the index at the front of each manual volume, and the index shall indicate the material contained in each section, the volume and the tab number.
 - g. Provide a detailed Table of Contents identifying tab numbers and listing a description of equipment at that tab.
2. Binder Cover and Spine: Each binder shall be neatly and clearly labeled on the front and side. Labels shall be inserted into the binder cover and not be adhesive labels.
3. Paper: 20-pound minimum, white, for typed pages.
4. Text: Manufacturer's printed data reproduced, or neatly typed.
5. Project specific O&M manual text:
- a. Shall be prepared using MS-WORD software.
 - b. Provide one set of MS-WORD files on CD-R0M with the Final O&M. The MS-WORD requirements do not apply to manufacturer's published documents. General brochures, which describe other items not in the Contract, will not be accepted unless all references to irrelevant equipment is neatly eradicated or blocked out.
6. Photographs shall be in JPEG format.
7. Drawings:
- a. Provide reinforced punched binder tabs, and bind in with text.
 - b. Fold larger drawings to the size of the text pages.

- c. Project-specific drawings included in the O&M manual shall be prepared using AutoCAD 2010.
- d. All drawings are to be 11" x 17" unless otherwise approved. Any approved over-sized drawings shall be submitted in a packet suitable for 3-ring binders.
- e. The final O&M submittal shall include one set of the AutoCAD DWG files on CD-ROM. Include a file of all fonts and shapes that are not standard AutoCAD files. These AutoCAD requirements do not apply to manufacturer's published or proprietary drawings.

1.04 CONTENTS OF O&M MANUALS

A. General:

1. Each set of submitted manual shall be identical, and the content shall be original manufacturer's documents. For documents that contain information for more items than are part of this project, neatly mark out any information that does not apply to this project and clearly mark the applicable items.

B. Binder Cover and Spine shall be identified with:

1. "Operations and Maintenance Manual Volume X of Y volumes (if more than one volume)
2. Title of Project (CBWTP Lagoon Reconstruction Project Phase 3/4)
3. Project Number (E07146)
4. Equipment Name
5. Contractor Name

C. Table of Content:

1. Neatly typed table of contents for entire manual included in each volume, arranged in a systematic order.

D. Summary Sheet providing the following information for each product:

1. Project Location.
2. Project Name.
3. Project Number.
4. Equipment description.

5. Specification section number.
 6. Name of Contractor, Subcontractor, manufacturer, or installer; with telephone number, and fax number.
 7. Local source of supply for parts and replacement.
- E. Content, for each item of equipment and each system, as appropriate:
1. Description of Unit and Component Parts:
 - a. Function, normal operating characteristics, and limiting conditions.
 - b. Performance curves, engineering data and tests.
 - c. Complete nomenclature and commercial number of all replaceable parts.
 2. Operating Procedures:
 - a. Start-up, break-in, routine and normal operating instructions.
 - b. Regulation, control, stopping, shutdown and emergency instructions.
 - c. Summer and winter operating instructions.
 - d. Special operating instructions.
 3. Maintenance Procedures:
 - a. Routine operations.
 - b. Guide to "trouble-shooting."
 - c. Disassembly, repair and reassembly.
 - d. Alignment, adjusting and checking.
 4. Servicing and lubrication schedule: List of lubricants required.
 5. Manufacturer's printed operating and maintenance instructions.
 6. Description of sequence of operation by control manufacturer.
 7. Circuit Directories of Panelboards:
 - a. Electrical service.

- b. Controls.
 - c. Communications.
8. As-installed color-coded wiring diagrams.
 9. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance.
 - a. Predicted life of parts subject to wear.
 - b. Items recommended to be stocked as spare parts.
 10. As-installed control diagrams by controls manufacturer.
 11. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.
 12. Other data as required under pertinent sections of specifications.
 13. Manufacturer's certificate of completion.
 14. Field calibration and test reports.
 15. Copy of Warranty, bond and service contract issued.
 - a. Provide an information sheet for Owner's personnel, stating:
 - i. The proper procedures to follow in the event of failure.
 - ii. Any instances or conditions which might affect the validity of warranties or bonds.
- F. Drawings shall be provided for each equipment and each system, as appropriate:
1. Do not re-draw contract drawings.
 2. Information that is not available in "As-built" form, such as control logic, terminal connections and wiring diagrams, shall be identified and shown in its "as-planned" form. Any missing documentation shall be clearly identified with an insert stating what item is missing and when it will be provided.
 3. Final as built wiring diagrams, control diagrams, and other revisions to the O&M Manuals following Substantial Completion, shall be submitted per Section 26 05 00, Common Work Results for Electrical Work. The Owner's Representative will insert these sheets in the approved O&M Manuals.

PART 2 - EXECUTION

2.01 GENERAL

- A. Application for progress payment beyond 50% of the value of the equipment and/or installation work shall not be made until the associated preliminary O&M information is provided. Regardless of the amount of work accomplished, payment over the 70% limit will not be made unless the preliminary O&M information is approved. If additional preliminary reviews are required, provide six (6) sets per review to Owner's Representative.

END OF SECTION

SECTION 01 78 39

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. The Contractor shall maintain two copies of all project record documents. The Contractor will need to maintain a third set of documents if he wishes to retain a set for his own records.

1.02 DRAFTER'S QUALIFICATIONS

- A. The Contractor personnel responsible for documenting and working on record drawings shall be able to draft accurately and legibly. If the work is deemed to be unacceptable by the Owner's Representative, the work will be redrafted or modified until acceptable, at no cost to the Owner.

1.03 REQUIRED DRAWINGS

- A. The Contractor shall submit clear progress copies of the marked plans at 25%, 50%, 75%, and Substantial completion stages.
- B. Prior to Final Submittal, transfer recorded information to one additional black line or blue line print.
- C. Minimum requirements for accuracy:
 - 1. Show the actual location of all underground and surface features, facilities, utilities, and appurtenances by facility coordinates or dimensioned to permanent surface structures.
 - 2. Call out the actual size and types of materials installed.
 - 3. Call out all elevations to a tolerance of 0.01-feet +/-.

1.04 RECORDING

- A. The Contractor shall label each document PROJECT RECORD in neat, large-print letters.
- B. Record information concurrently with construction progress.

- C. Do not conceal any work until required information is recorded.
- D. Legibly mark drawings to record the following actual construction:
 - 1. Horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - 2. Location of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of structure.
 - 3. Field changes to dimensions and details.
 - 4. Changes made by Change Order.
 - 5. Details not shown on original Plans.
 - 6. Record the relocation of all concealed conduits, pipes and other equipment prior to concealment.
- E. Legibly mark specifications and any addenda to record the following:
 - 1. Depth of foundation elements in relation to ground elevation.
 - 2. Changes made by Change Order.

1.05 SUBMITTALS

- A. Record drawings will be used to verify and document progress as stated in Progress Payment Request. Work not included in the record drawings will not be included for payment in Progress Payment Requests.
- B. The Contractor at project closeout, or for record information submitted earlier as required by specifications, shall submit:
 - 1. Transmittal of record documents to the Owner's Representative shall include: Project title, date, Contractor's name and address, title and number of each record document, a statement indicating completion of record information for specific areas or if project closeout that the documentation is completed and in compliance with contract requirements and the signature of the Contractor or his/her authorized representative.
 - 2. Provide two copies of progress (as built) drawings showing all markings and changes to Owner's Representative at project closeout.

PART 2 - PRODUCTS [NOT USED]

PART 3 - EXECUTION [NOT USED]

END OF SECTION

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SECTION 01 99 90

STANDARD FORMS

PART 1 - GENERAL

1.01 SUMMARY

- A. The forms listed below are to be used to document the contract work. Forms not attached to this Section can be obtained from the Owner's Representative upon request on or after the preconstruction meeting.

Specification Reference	Form Title
01 75 16	ORT-1 Form
09 99 00	Coating System Checklist Form
26 05 00	Wire and Cable Resistance Test Data Form
26 05 00	Installed Motor Test Form
26 05 00	Field Switch Calibration Test Data Form
26 05 00	Equipment Test Report Form

- B. Forms are attached to this Section. Forms not attached to this Section can be obtained from the Owner's Representative upon request on or after the preconstruction meeting.

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**OPERATION READINESS TESTING
PHASE 1 (ORT 1)**

(Alternatively, Contractor may use the loop sheet to document this test in lieu of this form.)

Instrument/Loop Number _____
 Instrument Range _____ Engineering Units _____
 Instrument Manufacturer _____
 Instrument Model number (complete) _____

	Print Names: Add date below name.		Comments
	Contractor Verified	City Verified	
1. Validate instrument identification tag.			
2. Verify conductor is properly terminated.			
3. Verify proper wire labels visible and correct to contract drawings			
4. Visual check for physical damage, dirt accumulation, and corrosion.			
5. Integrity and grounding of cable shields and grounding conductor. Shield (drain) wire protected by sleeve.			
6. Fuses in place, correct ohm and knife switch closed.			
7. Confirm instrument range agrees with contract documents and range is provided to owner by writing on this form and by correcting contract documents (red-lines).			

Notes:
 1. Insulation resistance test not performed for control or signal wire (< 480 VAC or DC)
 2. Factory calibration is acceptable.

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Project Name:	CBWTP LAGOON RECONSTRUCTION PROJECT: PROJECT E07146 – PHASE 3/4		
Owner	City of Portland, Oregon	Coating System Manufacturer (CSM)	
General Contractor (GC)		Coating System Applicator (CSA)	
Area or Structure		Location within Structure	
Coating System (e.g., E-1)		Coating Type (e.g., Epoxy, etc.)	

Step	Description		Name	Signature	Date
1	Completion of cleaning and substrate decontamination prior to abrasive blast cleaning.	GC QC			
		CSM QC			
		CSA QC			
2	Installation of protective enclosure of structure or area and protection of adjacent surfaces or structures that are not to be coated.	GC QC			
		CSM QC			
		CSA QC			
3	Completion of ambient condition control in structure or building area and acceptance of ventilation methods in structure or Area.	GC QC			
		CSM QC			
		CSA QC			
4	Completion of Surface Preparation for Substrates to Be Coated.	GC QC			
		CSM QC			
		CSA QC			
5	Completion of Primer Application.	GC QC			
		CSM QC			
		CSA QC			
6	Completion of Concrete Repairs If Required and Related Surface Preparation Rework Prior to Coating System Application.	GC QC			
		CSM QC			
		CSA QC			
7	Completion of Concrete Filler/ Surface Application to Concrete.	GC QC			
		CSM QC			
		CSA QC			
8	Completion of First Finish Coat Application and of Detail Treatment at Transitions or Terminations.	GC QC			
		CSM QC			
		CSA QC			

Step	Description		Name	Signature	Date
9	Completion of Second Finish Coat Application and of Detail Treatment at Transitions and Terminations.	GC QC			
		CSM QC			
		CSA QC			
10	Completion of Full and Proper Cure of Coating System.	GC QC			
		CSM QC			
		CSA QC			
11	Completion of Testing of Cured Coating System including Adhesion, Holiday (Continuity) Testing and Dry Film Thickness.	GC QC			
		CSM QC			
		CSA QC			
12	Completion of Localized Repairs to Coating System Following Testing.	GC QC			
		CSM QC			
		CSA QC			
13	Final Acceptance of Coating System Installation Including Final Clean-Up Complying with Specification Requirements and the CSM's Quality Requirements.	GC QC			
		CSM QC			
		CSA QC			

[SPEC REF 26 05 00] WIRE AND CABLE RESISTANCE TEST DATA FORM

Wire or Cable No.: _____ Temperature, °F _____

Location of Test	Insulation resistance, megohms
1.	
2.	
3.	
4.	
5.	
6.	
7	

CERTIFIED _____ Date _____
Contractor's Representative

WITNESSED _____ Date _____
Owner's Representative

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Motor Equipment Number _____ Date of test _____

Equipment Driven _____

MCC Location _____

				Ambient temp	°F
Resistance:					
Insulation resistance phase-to-ground megohms:					
Phase A		Phase B		Phase C	
Current at Full Load:					
Phase		Current, amps			
Phase		Current, amps			
Phase		Current, amps			
Thermal Overload Device:	Manufacturer/catalog #		Amperes		
Circuit breaker (MCP) setting:					

Motor Nameplate Markings:

Mfr		Mfr Model		Frame		HP	
Volts		Phase		RPM		Service factor**	
Amps		Freq		Ambient temp rating			°C
Time rating				Design letter**			
	(NEMA 1-10.35)				(NEMA MG-1.16)		
Code letter				Insulation class			

**Required for 3-phase squirrel cage induction motors only.

CERTIFIED _____ Date _____
Contractor's Representative

WITNESSED _____ Date _____
Owner's Representative

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NOTE: This example equipment test report is provided for the benefit of the Contractor and is not specific to any piece of equipment to be installed as a part of this project. The example is furnished as a means of illustrating the level of detail required for the preparation of equipment test report forms for this project.

CITY OF PORTLAND

CONTRACTOR:

OWNER'S REPRESENTATIVE:

EQUIPMENT TEST REPORT

Equipment Name: _____
 Equipment Number: _____
 Specification Ref: _____
 Location: _____

	Contractor		Owner's Representative	
	Verified	Date	Verified	Date
COMMISSIONING PERIOD: PERFORMANCE TESTS				
<u>Mechanical</u>				
Lubrication				
Alignment				
Anchor bolts				
Seal water system operational				
Equipment rotates freely				
Safety guards				
Valves operational				
Hopper purge systems operational				
Sedimentation tank/hopper clean				
O&M manual information complete				
Manufacturer's installation certificate complete				
<u>Electrical</u> (circuit ring-out)				
Circuits:				
Power to MCC				
Control to HOA				
Indicators at MCC:				
Red (running)				
Green (power)				
Amber (auto)				
Indicators at local control panel				
Wiring labels complete				
Nameplates:				

	Contractor		Owner's Representative	
	Verified	Date	Verified	Date
MCC				
Control station				
Control panel				
Equipment bumped for rotation				
Piping Systems				
Cleaned and flushed:				
Suction				
Discharge				
Pressure tests				
Temporary piping screens in place				
Instrumentation and Controls				
Flowmeter FE2502F calibration				
Calibration Report No.				
Flow recorder FR2502G calibrated against transmitter				
VFD speed indicator calibrated against independent reference				
Discharge overpressure shutdown switch calibration				
Simulate discharge overpressure Shutdown				
COMMISSIONING PERIOD: FUNCTIONAL TESTS				
Mechanical				
Motor operation temperature satisfactory				
Pump operating temperature satisfactory				
Unusual noise, etc?				
Pump operation: 75 gpm/50 psig				
Measurement:				
Flow				
Pressure:		Test gauge number:		
Alignment hot				
Dowelled in				
Remarks:				

	Contractor		Owner's Representative	
	Verified	Date	Verified	Date
Electrical				
Local switch function:				
Runs in <i>HAND</i>				
No control power in <i>OFF</i>				
Timer control in <i>AUTO</i>				
Overpressure protection switch PS2502C functional in both <i>HAND</i> and <i>AUTO</i>				
Overpressure protection switch PS2502C set at 75 psig				
PLC 2500 set at 24-hour cycle, 25 min <i>ON</i>				
ACCEPTANCE PERIOD: DEMONSTRATION TEST				
Pump cycles as specified, indicators functional, controls functional, pump maintains capacity, overpressure protection remains functional, hour meter functional				

OWNER'S ACCEPTANCE

Owner's Representative _____ Date _____

END OF SECTION

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DIVISION 03 – CONCRETE

SECTION 03 20 00

CONCRETE REINFORCING

PART 1—GENERAL

1.01 DESCRIPTION

- A. This section specifies reinforcing steel for use in reinforced concrete.

1.02 QUALITY ASSURANCE

A. QUALITY CONTROL BY CONTRACTOR:

1. The Contractor shall adhere to all quality requirements specified by this document, and if needed, the Contractor shall provide the services of an independent testing laboratory that complies with the requirements of ASTM E329. The testing laboratory shall assist the Contractor in completing work within project specifications. The Contractors' Quality Control Program shall not be considered as part of the required inspections.

B. SPECIAL INSPECTION

1. The Owner will provide the services of an independent Special Inspector certified by the appropriate jurisdiction to perform the types of inspections specified. Special Inspection requirements shall be as specified in paragraph 03 20 00 3.05. Costs of Special Inspection will be borne by the Owner. The Contractor shall provide access to any and all work for the Special Inspector. The Contractor shall provide labor and assistance for the Special Inspector when needed such as when moving samples, creating access, etc. The Contractor shall provide ample area for work, storage of samples, etc., in order that Special Inspection can be carried out in a timely and efficient manner.

C. REFERENCES:

1. This section contains references to miscellaneous documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.
2. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization,

references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, whether or not the document has been superseded by a version with a later date, discontinued, or replaced.

Reference	Title
ACI 315-92	Details and Detailing of Concrete Reinforcement
ASTM A82-90	Steel Wire, Plain, for Concrete Reinforcement
ASTM A185-90	Steel Welded Wire, Fabric, Plain for Concrete Reinforcement
ASTM A615/A615M, REV B-92	Deformed and Plain Billet-Steel Bars Concrete Reinforcement
ASTM A616/A616M-92	Rail-Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM A617/A617M-92	Axle-Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM A706/A706M, REV B-92	Low-Alloy Steel Deformed Bars for Concrete Reinforcement
ASTM A775/A775M-92	Epoxy-Coated Reinforcing Steel Bars
ASTM E329-93	Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction
AWS D1.4-92	Structural Welding Code--Reinforcing Steel
CRSI-PRB-96	Placing Reinforcing Bars
CRSI-MSP 1-96	Manual of Standard Practice
FEDSPEC QQ-W-461H-78	Wire, Steel, Carbon (Round, Bare, and Coated)
OSSC	2010 Oregon Structural Specialty Code

1.03 PLACING DRAWINGS

- A. The Contractor shall prepare reinforcement placing drawings conforming to the requirements of ACI 315. Placing drawings shall include bar lists, schedules, bending details, placing details, and placing plans and elevations as required to fully delineate this portion of the work.
- B. The placing drawings shall be submitted to the Owner's Representative for review and comment. Review shall be for general conformance with the contract documents

regarding bar grade, size, spacing, and configuration. Bar dimensions and quantities will not be reviewed.

- C. Shop drawings do not supercede structural drawings and should not be used in conjunction with structural drawings.

1.04 SUBMITTALS

- A. Reinforcement placing drawings conforming to the requirements of Paragraph 03 20 00-1.03 shall be provided in accordance with Section 01 33 00.
- B. Certified Mill Test Report shall be provided.
- C. Welder Qualification Certification shall be provided in accordance with AWS D.1.4.

PART 2—PRODUCTS

2.01 BAR REINFORCEMENT

- A. Reinforcing bars shall be deformed billet steel in conformance with ASTM A615, including supplementary requirements. Bars shall be Grade 60. Bars to be welded shall be deformed billet steel conforming to ASTM A706. ASTM A616 or ASTM A617 steel shall not be used. Bars provided as dowels for future construction and bars where specified shall be epoxy-coated in conformance with ASTM A775.

2.02 WIRE FABRIC

- A. Wire fabric shall be welded steel mesh conforming to ASTM A185.

2.03 WIRE AND PLAIN BARS

- A. Wire used as reinforcement and bars used as spiral reinforcement in structures shall be cold drawn steel conforming to ASTM A82.

2.04 TIE WIRE

- A. The wire shall be minimum 16 gage annealed steel conforming to FEDSPEC QQ-W-461H.

2.05 BAR SUPPORTS

- A. Bar supports coming into contact with forms shall be CRSI Class 1 plastic protected or Class 2 stainless steel protected and shall be located in accordance with CRSI MSP-1 and placed in accordance with CRSI PRB. Concrete block supports shall be

provided for footing and slabs on grade. Stainless steel or plastic protected plain steel supports shall be provided for other work.

2.06 MECHANICAL SPLICE

- A. Mechanical bar splice shall develop 125 percent of the reinforcing bar and shall be BPI standard bar splice system or an approved equal.

PART 3—EXECUTION

3.01 FABRICATION

- A. Reinforcing steel shall not be bent or straightened in a manner which will injure the material. Bars with kinks or with bends not shown shall not be used. Heating or welding bars shall be performed in accordance with AWS D1.4 and shall only be permitted where specified or approved by the Owner's Representative. Bars shall not be welded at the bend.

3.02 PLACEMENT

- A. Reinforcing steel shall be placed in accordance with CRSI PRB and CRSI MSP-1.
- B. Reinforcing steel shall be positioned accurately and secured against displacement by using annealed iron wire at intersections and shall be supported by concrete or metal chairs, spacers, or metal hangers. Tack welding of cross bars is not acceptable. Bars shown on the drawings shall not be repositioned (buried) to act as support bars. Additional bars shall be provided as required for supports. Steel rods and pegs may be used to support reinforcing steel on rock foundations. Reinforcing steel shall be placed in such a manner as to not damage waterproofing membrane or plastic lining which has been previously applied or constructed. Reinforcing steel shall be shop-bent or slightly relocated where necessary to clear waterstop. Reinforcing steel shall not be placed on fresh concrete or forced into fresh concrete.
- C. Supports for embedded items shall not be welded to the reinforcement. Additional reinforcement may be provided for this purpose.

3.03 SPLICING

- A. Reinforcing steel shall be lap-spliced as shown. Additional splices may be provided where approved by the Owner's Representative.
- B. In slabs, beams, girders, and walls, reinforcing steel shall not be spliced in areas of maximum stress. Splices of adjacent bars shall be staggered at least one splice length, unless otherwise specified. Splices in welded wire fabric shall be at least 1 1/2 meshes wide.

3.04 CLEANING

- A. Reinforcing steel shall be cleaned of mill rust scale, dried concrete, or other coatings that may reduce bond. Reinforcement reduced in section is not acceptable. When concrete placement is delayed, reinforcement shall be cleaned by sandblasting if directed by the Owner's Representative.

3.05 INSPECTION

- A. The Owner will provide inspection services for the following:
 - 1. Reinforcing steel:
 - a. Placement of reinforcing steel
 - b. Splicing of reinforcing by welding or threaded couplers.

END OF SECTION

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SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1—GENERAL

1.01 DESCRIPTION

- A. This section specifies cast-in-place concrete which consists of furnishing all material, mixing and transporting equipment, and performing all labor for the proportioning, mixing, transporting, placing, consolidating, finishing, and curing of concrete in the structure.

1.02 QUALITY ASSURANCE

- A. QUALITY CONTROL:

- 1. Conform to Section 01 45 00.

- B. BASIS FOR QUALITY:

- 1. Cast-in-place concrete shall conform to the requirements of ACI 301, except as modified herein.

- C. REFERENCES:

- 1. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.
 - 2. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization, or if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued, or replaced.

Reference	Title
AASHTO T210	Aggregate Durability Index
ACI 211.1	Selecting Proportions for Normal, Heavy Weight and Mass Concrete
ACI 214	Evaluation of Strength Test Results of Concrete
ACI 301	Structural Concrete for Buildings
ACI 304	Measuring, Mixing, Transporting, and Placing Concrete
ACI 304.2	Placing Concrete by Pumping Methods
ACI 305R	Hot Weather Concreting
ACI 306R	Cold Weather Concreting
ACI 350	Code Requirements for Environmental Engineering Concrete Structures
ACI 350.1	Tightness Testing of Environmental Engineering Concrete Structures
ASTM C31	Making and Curing Concrete Test Specimens in the Field
ASTM C33	Concrete Aggregates
ASTM C39	Compressive Strength of Cylindrical Concrete Specimens
ASTM C40	Organic Impurities in Fine Aggregate for Concrete
ASTM C42	Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C88	Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C94	Ready-Mixed Concrete
ASTM C117	Materials Finer Than 75- μm (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C131	Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C136	Sieve Analysis of Fine and Coarse Aggregates
ASTM C142	Clay Lumps and Friable Particles in Aggregates
ASTM C143	Slump of Portland Cement Concrete
ASTM C150	Portland Cement
ASTM C157	Length Change of Hardened Cement Mortar and Concrete
ASTM C172	Sampling Freshly Mixed Concrete
ASTM C231	Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C260	Air-Entraining Admixtures for Concrete
ASTM C309	Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C494	Chemical Admixtures for Concrete
ASTM C595	Blended Hydraulic Cements
ASTM C618	Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
ASTM C881	Epoxy-Resin-Base Bonding Systems for Concrete

Reference	Title
ASTM C1059	Latex Agents for Bonding Fresh to Hardened Concrete
ASTM C1567	Potential Alkali Reactivity of Aggregates (Mortar Bar Method)
ASTM D75	Sampling Aggregates
ASTM D2419	Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate
ASTM E329	Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction
CRD-C572	U.S. Corps of Engineer's Specifications for Polyvinylchloride Waterstop
OSSC	2010 Oregon Structural Specialty Code

1.03 SUBMITTALS

A. The following information shall be provided in accordance with Section 01 33 00:

1. A copy of this specification section, with addendum updates included, and all referenced and applicable sections, with addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements. Check marks (✓) shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated, and therefore requested by the Contractor, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation. The Owner's Representative shall be the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications. Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.
2. Each proposed mix design showing (a) the expected strength, (b) corresponding slump before and after the introduction of mid- or high-range water-reducing admixtures, (c) weights and test results of the ingredients, and (d) other physical properties necessary to review each mix design for conformance with these specifications. Mix design proposed shall be sealed by a Professional Engineer registered in the State of Oregon.
3. Proposed layout of control/construction joints for all cast-in-place concrete. Layout shall be submitted for review/approval by the Owner's Representative prior to construction.
4. Product literature and technical data for aggregates and pozzolan.

5. Product literature, technical data, and dosage of all proposed admixtures including, but not limited to, air entraining, water reducing and/or retarding admixtures.
6. Anticipated average delivery time from batch plant to site. If this time exceeds the limit specified in paragraph 3.02, include proposed method to extend set time without deleterious effects on final product. Owner's Representative reserves the right, in their sole discretion, to accept or reject such proposed methods.
7. Curing program description in sufficient detail to demonstrate acceptable strength, finish and crack control as specified.
8. Product literature and technical data for waterstops, curing compounds, bonding compounds, surface sealers and hardeners.

1.04 INSPECTION AND TESTING

- A. Conform to Section 01 45 00.

PART 2—PRODUCTS

2.01 MATERIALS

A. CEMENT:

1. Portland cement shall be ASTM C150, Type II or Type V, low alkali, containing less than 0.60 percent alkalis. Portland-pozzolan cement shall be ASTM C595, Type IP (MS), interground, low alkali.

B. AGGREGATES:

1. GENERAL:

- a. Except as modified herein, fine and coarse aggregates shall conform to ASTM C33. Fine and coarse aggregates shall be regarded as separate ingredients. Aggregates shall be non-reactive and shall be washed before use.
- b. Tests for size and grading of fine and coarse aggregates shall be in accordance with ASTM C136. Combined aggregates shall be well and uniformly graded from coarse to fine sizes to produce a concrete that has optimum workability and consolidation characteristics. The final combined aggregate gradation shall be established during the design mix.

- c. When sources of aggregates are changed, test reports shall be provided for the new material. The tests specified shall be performed prior to commencing concrete work.

2. FINE AGGREGATE:

- a. Fine aggregate shall be hard, dense, durable particles of either sand or crushed stone regularly graded from coarse to fine. Gradation shall conform to ASTM C33. For classes of concrete which will be used in liquid retaining structures, fine aggregate shall not exceed 40 percent by weight of combined aggregate total, except for concrete with coarse aggregate of less than maximum size 1/2 inch.
- b. Variations from the specified gradations in individual tests will be acceptable if the average of three consecutive tests is within the specified limits and the variation is within the permissible variation listed below:

U.S. standard sieve size	Permissible variation in individual tests, percent
30 and coarser	2
50 and finer	0.5

- c. Other tests shall be in accordance with the following specifications:

Test	Test method	Requirements
Amount of material	ASTM C117	3 percent passing No. 200 sieve maximum by weight
Reactivity	ASTM C1567	Less than 0.10% expansion in 14 days
Sand equivalent	ASTM D2419	Minimum 75

3. COARSE AGGREGATE:

- a. Coarse aggregate shall be hard, angular (not river washed), dense and durable gravel or crushed rock free from injurious amounts of soft and friable particles, alkali, and organic matter. Other deleterious substances shall not exceed the limits listed in ASTM C33, Table 3. Gradation of each coarse aggregate size specified in paragraph 03 30 00-2.02 A shall conform to ASTM C33, Table 2.
- b. Before and during field trial mixes, the Contractor may make minor adjustments to the above gradation to produce the specified concrete.
- c. During progress of the work, variations from the specified gradations will be acceptable in individual tests if the average of three consecutive tests is within the specified limits.

d. Other tests shall be in accordance with the following specifications:

Test	Test method	Requirements
Durability index	AASHTO T210	Minimum 75
Soundness	ASTM C88	10 percent maximum loss with sodium sulfate
Amount of material	ASTM C117	1.0 percent maximum passing No. 200 sieve by weight
Abrasion	ASTM C131	35 percent maximum loss after 500 revolutions in Los Angeles machine
Clay lumps and friable particles	ASTM C142	4.5 percent maximum by weight
Reactivity	ASTM C1567	Less than 0.10% expansion in 14 days.

C. POZZOLAN:

1. Pozzolan shall be Class N, natural pozzolan, or Class F, fly ash, conforming to ASTM C618. Fly ash pozzolan shall contain less than 1 percent by weight carbon and less than 3 percent by weight sulfur trioxide. Pozzolan supplied during the life of the project shall have been formed at the same single source.
2. The pozzolan color shall not substantially alter the resulting concrete from the normal gray color and appearance.

D. ADMIXTURES:

1. **GENERAL:** Admixtures shall be compatible with the concrete and with each other. Calcium chloride or admixtures containing calcium chloride are not acceptable. Admixtures shall be used in accordance with the manufacturer's recommendations and shall be added separately to the concrete mix.
2. **WATER REDUCING ADMIXTURES AND RETARDERS:**
 - a. Water reducing retarders shall conform to ASTM C494, Type D. Candidate manufacturers include BASF, Pozzolith 300R; Sika Chemical Corp., Plastiment; Euclid Chemical Co., Eucon Retarder 75; or equal.
 - b. Water reducing admixtures shall conform to ASTM C494, Type A. Candidate manufacturers include BASF, Pozzolith 322N; SIKA Chemical Corp., Plastocrete 161; Euclid Chemical Co., Eucon WR89; or equal.

- c. The water reducing retarders and admixtures shall reduce the water required by at least 11 percent for a given concrete consistency and shall comply with the water/cement ratio standards of ACI 211.1. Retarder dosage shall result in set time consistent with Paragraph 3.02.
 - 3. HIGH RANGE WATER REDUCING ADMIXTURES AND RETARDERS:
 - a. High range water reducing (superplasticizing) retarders shall conform to ASTM C494, Type G. Candidate manufacturers include Sika Chemical Corp., Sikament 10ESL; Euclid Chemical Co., Eucon 537; or equal.
 - b. High range water reducing (superplasticizing) admixtures shall conform to ASTM C494, Type F. Candidate manufacturers include BASF, Glenium 3000NS; Sika Chemical Corp., Sikament FF or 86; Euclid Chemical Co., Eucon 37; or equal.
 - 4. AIR ENTRAINING AGENT: Air entraining agent shall conform to ASTM C260. Candidate manufacturers include BASF, MB-AE 90; Sika Chemical Corp., AEA-15; Euclid Chemical Co., AEA-92 or equal. The air entraining agent added shall produce, in accordance with ASTM C260, an entrained air content specified in paragraph 03 33 00-2.02 A for each class of concrete.
 - 5. SHRINKAGE REDUCING ADMIXTURE: Candidate manufacturer is BASF, Tetraguard AS20.
- E. WATER:
- 1. Water for washing aggregate, for mixing and for curing shall be free from oil and deleterious amounts of acids, alkalis, and organic materials; shall not contain more than 1,000 mg/L of chlorides as Cl, nor more than 1300 mg/L of sulfates as SO₄; and shall not contain an amount of impurities that may cause a change of more than 25 percent in the setting time of the cement nor a reduction of more than 5 percent in the compressive strength of the concrete at 14 days when compared with the result obtained with distilled water. Additionally, water used for curing shall not contain an amount of impurities sufficient to discolor the concrete.

2.02 CONCRETE CHARACTERISTICS

A. MIX PROPORTIONING:

- 1. Concrete shall be normal weight concrete composed of specified cement, pozzolan, admixtures, aggregates and water proportioned and mixed to produce a workable, strong, dense, and impermeable concrete. The Contractor may substitute interground Portland-pozzolan cement conforming

to ASTM C595, containing the specified amount of pozzolan in lieu of Portland cement and pozzolan. Pozzolan may be omitted in concrete exposed to normal atmospheric conditions and concrete not in contact with the ground or liquid. Water/cement ratio is based on the combined contents of cement and pozzolan in a given mix proportion.

2. Concrete shall be provided in accordance with the following:

Concrete class	ASTM coarse aggregate size	Maximum water/cement ratio	Pozzolan, percent by weight of cementitious materials ^a	Air content (percent)	Minimum ^b 28-day compressive strength, psi	Slump Range min-max/admix ^g (inches)
B	67 ^d	0.45	18-20	5.5 ^c	3000	3-4/5
C-1	467 ^d	0.40	18-20	5.5 ^c	4500	3-4/5
C-2	67	0.38	18-20	5.5 ^c	6000	3-4/5
D-2	8	0.40	18-20	4.5 ^c	4500	3-4.5/6
E ^c	467 ^d	--	18-20 ^f	0	2000	4-8/8

^a Pozzolan content may be included in cementitious fraction.

^b Compressive strength shall be determined at the end of 28 days based on test cylinders made and tested in accordance with ASTM C39.

^c Plus or minus 1.5 percent. Adjust as required for floors to receive monolithic finish.

^d ASTM coarse aggregate gradation 57 may be substituted at Contractor's option.

^e Concrete encasement for electrical conduit shall contain 3 pounds of red oxide per sack of cement.

^f Pozzolan use optional for this class of concrete.

^g Min and max represent slump due to water only. Admix refers to recommended maximum slump for the mix after the incorporation of water reducing admixtures.

B. USE:

1. Concrete shall be provided by class for the corresponding use listed as follows:

Type of use	Class of concrete
Sitework, non-structural concrete (sidewalks, curbs, pavers, etc.)	B
Typical cast-in-place structural concrete	C-1
Precast Concrete	C-2
Wall starter course	D-2
Pipe bedding and encasement, electrical conduit encasement (duct banks) and concrete fill	E

C. CONTROL TESTS:

1. **GENERAL:** Before beginning concrete work, the Contractor shall determine the proper proportions of materials for each class of concrete. The mix shall consist of specified cement, pozzolan, admixtures, aggregate and water. Methods for selecting and adjusting proportions of the ingredients shall be in accordance with ACI 211.1. Verification of mix characteristics for submittal may be achieved using either the Batch Plant Mix Design method or Historical Data method. Concrete shall not be placed in the field prior to review and acceptance of mix proposed.
2. **BATCH PLANT MIX DESIGN:** Each class of concrete and/or mix verified by this method shall be manufactured in a 1 cubic yard quantity at the batch plant which will supply concrete to the project. Testing, data and reporting shall conform to ACI 318 Section 5.3. At a minimum, twelve standard test cylinders shall be cast and cured as specified for the field concrete for each mix. Four cylinders from each batch shall be tested at age 7 days, 14 days, and 28 days, or as required to comply with ACI 318 Section 5.3 and demonstrate an acceptable mix is proposed for use. Additional cylinders may be cast and tested at 56 days at the option of the manufacturer; however, specified compressive strength evaluation will be based on 28-day results only.
3. **HISTORICAL DATA:** When sufficient historical data for a particular mix design is available which is identical or substantially similar to that proposed for use, Contractor may substitute use of this data in lieu of a laboratory mix design. Historical data, reports and analysis shall conform to ACI 318 Section 5.3, except as modified herein. Historical mix design proportions for which data are submitted may vary from the specified mix within the following limits: (a) f'c as specified or up to 500 psi above; (b) W/C ratio as specified or lower; (c) pozzolan content within 5 percent of that specified; (d) maximum coarse aggregate size may not vary smaller, but gradation of coarse aggregate may vary; (e) fine aggregate fraction within +0/ 5 percent of that specified; and (f) slump after introduction of admixtures +0/-1 inch. Use of historical mix design data does not allow modification of the project mix specifications herein without the express review and acceptance of the Owner's Representative.
4. **SHRINKAGE:**
 - a. Process structures are intended to be watertight, and are designed and detailed with an expected drying shrinkage limit of 0.03 percent in the laboratory and 0.04 percent in the field, as tested by ASTM C157. This concrete mix design specifications herein is intended to limit drying shrinkage, and therefore verification testing of that characteristic is not specified. In particular, coarse aggregate size, gradation and quality, and

total cementitious material content of the mix are important variables. Contractor is encouraged to consider mix designs which minimize total cementitious materials content while still achieving specified compressive strength. Substitution of smaller coarse aggregates shall not be allowed for process structures unless that proposed mix demonstrates (by actual test results) drying shrinkage at or below the limits noted above. If Contractor wishes to propose a mix with constituent properties and proportions that increases shrinkage potential, then shrinkage testing shall be conducted. Contractor shall timely conduct and report tests, which typically take over 35 days to complete. Contractor shall not claim or charge any additional expense to the Owner for either the testing or associated project delays.

- b. Concrete shall not be placed in the field prior to acceptance of the field trial mix.

2.03 WATERSTOPS

A. POLYVINYL CHLORIDE (PVC):

1. PVC waterstops shall be manufactured from virgin polyvinyl chloride conforming to the Corps of Engineers Specification No. CRD-C572. Unless otherwise specified or noted on the drawings, waterstops in construction joints shall be 6-inch flat center/ribbed sides/0.375 inch thick, Greenstreak 679, Vinylex R6-38, or equal. Waterstops in expansion joints shall be 9 inch center-bulb/ribbed sides/0.375 inch thick, Greenstreak 696, Vinylex RLB9-38, or equal.

B. EXPANDING (HYDROPHILIC) WATERSTOPS:

1. Expanding waterstops shall be bentonite-free and made from unvulcanized rubber. Acceptable products include SikaSwell or SikaSwell Profile by SIKA, and Ultra Seal by Adeka. Equivalents approved by the Owner's Representative are acceptable. These are allowable for use only where indicated on the drawings or accepted in writing by the Owner's Representative. Provide adhesive approved by the waterstop manufacturer where required due to geometry, irregular surface conditions, or as recommended by the manufacturer. Unless otherwise shown on the drawings, use Adeka Ultra Seal MC-2010MN where 3/8" x 3/4" waterstops are called for and Adeka Ultra Seal MC-2005T where 3/16" x 3/4" waterstops are called for. Both of these waterstops MUST be placed between two mats or curtains of steel reinforcement. Where only one mat or curtain of reinforcement is present, use Adeka Ultra Seal KBA-1510FP.

2.04 SEALANTS AND JOINT FILLERS

- A. Sealants and preformed joint fillers shall be as specified in Sections 07 92 00 and 07 91 26.

2.05 BONDING COMPOUNDS

- A. Epoxy resin bonding compounds to be used for wet areas shall conform to ASTM C881 Types IV or V, Class A, B, or C depending on temperature at use, and Grade to suit geometry and installation circumstances. Acceptable products include: Degussa Building Systems, Concrecive Paste SPL or 1490 as applicable; Sika Chemical Corporation Sikadur 35 or Sikadur 32, as applicable; or equal.
- B. Non-epoxy bonding compounds may be used in dry areas for non-structural bonding or as specifically noted on the drawings only and shall conform to ASTM C1059 Type II. Acceptable products include: Burke by Edoco, Acrylic Bondcrete; ChemMasters, Cretelox; or equal.
- C. Bonding compounds shall be applied in accordance with the manufacturer's instructions.

2.06 EPOXY FOR CRACK INJECTION

- A. Epoxy for crack injection shall be a two-component, moisture insensitive, high modulus, injection grade, 100 percent solids, blend of epoxy-resin compounds. The consistency shall be as required to achieve complete penetration in hairline cracks and larger. Material shall conform to ASTM C881 Type 1 Grade 1, such as Sika Corporation Sikadur 52, Adhesives' Technology Corporation SLV 300 series, or equal approved by the Owner's Representative.

2.07 CHEMICAL GROUT FOR CRACK INJECTION

- A. Chemical (hydrophobic polyurethane) grout shall be used at the Owner's Representative's discretion as an alternative to the injection of the epoxy grout for sealing crack and voids in structures intended to be watertight. Chemical grout shall be De Neef "Hydro Active Cut" by De Neef Construction Chemicals or SikaFix HH by Sika Corporation, or equal approved by the Owner's Representative.
- B. Chemical grout injection tube system, if shown on the drawings, shall be De Neef "Injecto System" by De Neef Construction Chemicals or equal. Equivalent systems shall be submitted to the Owner's Representative for review.

2.08 RETARDANT

- A. Retardant for exposing aggregates for unformed surfaces in construction joints shall be Sika Rugasol-S, Horn Aggretex-H, Burke Company True Etch Surface Retarder, or equal. Retardant shall be applied in accordance with manufacturer's instructions sufficient to assure a minimum penetration of 1/8 inch.

2.09 NOT USED

2.10 CURING AND SEALING COMPOUNDS

- A. Curing and sealing compound shall be Degussa Building Systems, Masterseal; Sonneborn, Kure and Seal; A. C. Horn Inc., Horn Clearseal EM180; Burke Company Spartan-Cote WB Cure Seal Hardner; or equal, conforming to ASTM C309.
- B. Curing compound shall be clear and shall be applied in accordance with the manufacturer's instructions, except as otherwise specified. Curing and sealing compound shall be certified compliant with final finish systems.
- C. Curing compound for use in potable water storage and conveyance structures shall be NSF 61 approved. Provide only resin curing compound Euclid Chemical Company "Pliocure", Unires 150, or equal approved by the Owner's Representative.

2.11 TRENCH DRAINS

- A. Trench drains may be either field formed and cast, with compatible grate as specified below, or utilize a manufactured trench drain system. Trench drain systems shall be pre-engineered, manufactured systems that conforms to the design loading requirements of AASHTO H-20 in traffic areas or 300 pounds per square foot elsewhere and with the following minimum requirements:
 - 1. A method of forming a round or V-bottom channel pre-sloped to a minimum of 0.5 percent (1/16-inch per foot) installed in sections. See drawings for channel cross section or size. If not shown, assume 12 inches wide and deep (nominal) and confirm with Owner's Representative.
 - 2. An aluminum frame with stainless steel anchors at 45 degrees into the surrounding concrete. Aluminum shall be coated to prevent direct concrete contact as specified elsewhere.
 - 3. An aluminum grate conforming to Federal Specification RR-F-621C.
 - 4. A locking device which directly connects the grate to the frame.

- B. Candidate manufacturers include: MultiDrain Systems, Atlanta, Georgia, 800-433-1119; ABT, Inc., Troutman, North Carolina, 800-438-6057; or approved equal.

2.12 NOT USED

2.13 PRODUCT DATA

- A. The following product data shall be provided in accordance with Section 01 33 00.

- 1. MANUFACTURER'S DATA: Copies of manufacturer's data shall be provided for the following:

- a. Cement
- b. As-delivered concrete strength, slump, temperature, and air content
- c. Final laboratory report.

- B. READY-MIXED CONCRETE TRUCK DELIVERY TICKETS:

- 1. Each load of ready-mixed concrete delivered to the job site shall be accompanied by a delivery ticket showing the information listed in ASTM C94, Section 16.

PART 3—EXECUTION

3.01 GENERAL

- A. The Owner is defining the quality of cast-in-place concrete by specifying in this part some of the means, methods, techniques, sequences, and procedures for construction of cast-in-place concrete. The Contractor, without relinquishing authority and responsibility for supervision and direction of the work, agrees to follow the specified means, methods, techniques, sequences, and procedures.

3.02 CONCRETE

- A. Concrete shall be truck-mixed, ready-mixed concrete conforming to the applicable portions of ASTM C94. Materials shall be proportioned by weighing. Pozzolan shall be introduced into the mixer with cement and other components of the concrete mix; pozzolan shall not be introduced into a wet mixer ahead of other materials or with mixing water. Water shall be introduced at the time of charging the mixer; additional water may be introduced within 45 minutes from charging the mixer, provided the specified slump is not exceeded; or the Contractor shall be responsible for producing concrete of the specified characteristics. Contractor shall arrange with the testing laboratory for inspection as required to comply with these specifications.

- B. Concrete shall be delivered to the site and discharge shall be completed within one (1) hour after introduction of water to the mixture. Extension of allowable time beyond this limit requires a Contractor proposed remedial action plan to be reviewed and accepted by the Owner's Representative.

3.03 CONVEYING AND PLACING CONCRETE

A. CONVEYING CONCRETE:

- 1. Concrete shall be conveyed from the mixer to the forms in accordance with ACI 301 and ACI 304. Concrete which has segregated in conveying shall be removed from the site of the work.

B. PLACING CONCRETE:

- 1. GENERAL: Concrete shall be placed in accordance with ACI 301 and ACI 304 as applicable.
- 2. PLACING CONCRETE BY PUMPING:
 - a. Concrete may be placed by pumping at Contractor's discretion according to ACI 304 and ACI 304.2. Use of pumping shall not, however, be cause to change or relax specified mix design characteristics, in particular coarse aggregate size and gradation.
 - b. Slump shall be measured at the hose discharge, except as follows. Initial slump testing in each pour shall occur at both the pumping unit inlet hopper and hose discharge. Slump loss in pumping, measured between the inlet hopper and the hose discharge, shall not exceed 1 inch. After this criterion has been satisfied, slump may be measured at the inlet hopper with allowable slump increased by the earlier measured difference, not to exceed 1 inch.
 - c. Before starting each pumping operation, the pump and line shall be primed with a cement slurry to lubricate the system. Cement slurry shall be wasted outside the forms. Hose tip shall be equipped with a safety chain for recovery in case of hose blowout during pumping, and in no case shall hose or accessories remain in the freshly placed concrete.
 - d. Proper tremie placing techniques and equipment shall be used for all pump placed concrete. Pump discharge system shall remain full of concrete from pump to discharge point at all times. Concrete pumping shall not occur until Owner's Representative has verified that the proper equipment is available, in particular, the tremie plug. Should the discharge line become open, with significant zones empty of concrete,

then the pumping shall cease and the line re-primed with tremie plug installed before continuing the pour.

3. **PLACING CONCRETE IN HOT WEATHER:** In hot weather (above 85 degrees F), concrete shall be placed in accordance with ACI 305R.
4. **PLACING CONCRETE IN COLD WEATHER:** In cold weather (below 45 degrees F), concrete shall be placed in accordance with ACI 306R.
5. **STARTER COURSE AT WATERSTOPS:** When placing concrete in wall forms for water retaining structures over eight (8) feet in height, without form windows, and which have a waterstop at the bottom of the form, a starter course of Class D-2 concrete shall be placed to a depth of approximately six (6) inches and thoroughly consolidated. Subsequent lift(s) of concrete shall be placed onto this starter course within ten (10) minutes of the starter course placement, and the two lifts shall be thoroughly consolidated together to result in a dense, continuous, watertight structure with no cold joint. Contractor shall provide adequate pumping and consolidating equipment and personnel to achieve the time limit specified herein.

C. CONSOLIDATING CONCRETE:

1. Concrete shall be consolidated in accordance with ACI 301. Concrete placing shall be suspended if proper consolidation is not being secured until proper consolidation can be achieved. For wall pours in excess of eight (8) feet tall by fifteen (15) feet long, two consolidation devices each with a two man crew shall be utilized, minimum.

3.04 CURING AND SEALING

A. GENERAL:

1. Concrete curing shall be completed by water curing or by using a clear membrane curing compound or by a combination of both methods. Repairs or treatment of concrete surfaces shall be coordinated so that interruption of the curing will not be necessary.
2. Concrete surface temperature shall be maintained between 50 degrees F and 80 degrees F for at least 5 days. Curing concrete in hot weather (above 85 degrees F) shall be in accordance with ACI 305R. Curing concrete in cold weather (below 45 degrees F) shall be in accordance with ACI 306R.

B. WATER CURING:

1. When water curing is used, concrete shall be kept wet continuously for a minimum of 10 days after placement. Absorptive mats or fabric may be used to retain moisture during the curing period.
2. Unless otherwise specified, water curing shall be used in hot weather for water containment structures. Forms shall be covered and kept moist. The forms shall be loosened, as soon as possible without damage to the concrete, and provisions made for curing water to run down inside them. During form removal, care shall be taken to provide wet cover to newly exposed surfaces. At the end of the specified curing period, the covering shall be left in place without wetting for several days.

C. CURING COMPOUND:

1. When curing compound is used, it shall be applied as soon as the concrete has set sufficiently so as not to be marred by the application or immediately following form removal for vertical and other formed surfaces. Preparation of surfaces, quantities used, application procedures, and installation precautions shall be followed in strict compliance with the manufacturer's instructions.
2. Curing compound shall not be used on concrete surfaces to be coated, waterproofed, moistureproofed, tiled, roofed, or where other coverings are to be bonded, unless the curing compound is compatible with the final finish covering or it is removed prior to covering.

3.05 PROTECTION

- A. Concrete shall be protected from injurious action by sun, rain, flowing water, frost and mechanical injury, and shall not be allowed to dry out from the time it is placed until the expiration of curing periods.
- B. Steel troweled slabs shall be protected with craft paper, 6 mil thick polyethylene membrane, or other similar waterproof material for at least 2 weeks after placement. Joints between adjacent strips of the paper shall be sealed. Float or broom finished slabs need be protected after curing only in areas subject to damage during construction.
- C. Arrangements for covering, insulating, and protecting concrete in cold weather shall be in accordance with ACI 306R.

3.06 CONSTRUCTION JOINTS

A. GENERAL:

1. Concrete in each unit of construction shall be placed continuously. Before new concrete is placed on or against concrete which has set, forms shall be retightened and the surface of the set concrete shall be cleaned of foreign matter. Watertight joints shall be provided as specified in Paragraph 03 30 00-3.09.

B. CONSTRUCTION:

1. Construction joints shall be formed as specified. A rough surface of exposed concrete aggregates shall be produced using a surface retardant at construction joints, including joints between slab and topping concrete. The limit of the treated surfaces shall be 1 inch away from the joint edges. Within 24 hours after placing, retarded surface mortar shall be removed either by high pressure water jetting or stiff brushing or combination of both so as to expose coarse aggregates. A rough surface of exposed aggregate may also be produced by sandblasting followed by high pressure water jetting. Sandblasting, if used, shall remove 1/8 inch of laitance film and shall expose coarse aggregate to ensure adequate bond and watertightness at the construction joints.

C. LOCATIONS:

1. Construction joint locations shall be as follows:
 - a. Walls exceeding 50 feet in length shall be cast in panels not to exceed 30 feet in length. Where the number of panels is three or more, the panels shall be cast in an alternating pattern, unless 5 days have elapsed between casting of adjoining panels. Joints are not allowed within the lesser of 10 feet or 25 percent of the wall length from any corner unless specifically detailed thus on the drawings.
 - b. Joints in beams or girders shall be located at or near the midpoint between supports.
 - c. Joints in the members of a floor system shall be made at or near the center of the span.
 - d. Joints in walls and columns shall be at the underside of floors, slabs, beams or girders and at the tops of footings or floor slabs. Joints in columns shall be perpendicular to the axis.

- e. Slabs panels shall be cast in checkerboard patterns not to exceed 40 feet in length and not to exceed 900 square feet in area, with maximum 1 ½ to 1 ratio of side lengths. Minimum lapsed time between placing adjacent panels shall be 72 hours. This requirement may be waived if slab joints are specifically detailed on the drawings, both plan for locations and in detail for construction.
2. Vertical construction joints shall be grooved at exposed faces. Grooves subjected to wetting or weather shall be caulked with joint sealer as specified.
3. Reinforcing steel and welded wire fabric shall be continued across construction joints. Girders and floor slabs shall not be constructed over columns or walls until at least one hour has elapsed to allow for shrinkage in the column or wall. No joint will be allowed between a slab and a beam or girder unless otherwise specified. Joints shall be perpendicular to the main reinforcement. Waterstops shall be provided in construction joints at locations as specified in paragraph 03 30 00-3.09.

3.07 INSERTS AND EMBEDMENTS

A. INSERTS:

1. Where pipes, castings, or conduits are to pass through structures, the Contractor shall place such pipes or castings in the forms before placing the concrete, or he may provide openings in the concrete for subsequent insertion of such pipes, castings or conduits. Such openings shall be provided with waterstops and V-shaped construction joint as shown and shall have a slight flare to facilitate grouting and permit the escape of entrained air during grouting.
2. Additional reinforcement shall be provided around openings as shown. Grout fill around inserts shall be non-shrink grout as specified in Section 03 60 00.
3. Horizontal conduits and pipes, where shown in structural slabs and beams, shall be placed between the top and bottom layers of reinforcement. Spacing and size limitations shall conform to ACI318 Section 6.3 unless specifically approved otherwise by the Owner's Representative. Such conduits and pipes shall not run directly beneath a column or, if used, its steel base plate.

B. EMBEDMENTS:

1. Gate frames, gate thimbles, special castings, channels or other miscellaneous metal or rubber parts that are to be embedded in the concrete shall be set and secured in the forms prior to concrete placement. Unless otherwise specified, anchor bolts and inserts shall be embedded in concrete as shown. The

Contractor shall provide inserts, anchors or other bolts necessary for the attachment of piping, valves, metal parts and equipment. Nailing blocks, plugs, strips, and the like necessary for the attachment of trim, finish, and similar work shall be provided. Voids in sleeves, inserts and anchor slots shall be filled temporarily with readily removable material to prevent the entry of concrete into the voids. Operators or sleeves for gate or valve stems shall be positioned to clear reinforcing steel, conduit and other embedments, and to align accurately with equipment.

3.08 EXPANSION JOINTS

- A. Expansion joints shall be as shown. Reinforcement or other embedded metal items bonded to the concrete shall not extend through expansion joints. Waterstops shall be provided in expansion joints as specified in Paragraph 03 30 00-3.09.

3.09 WATERSTOPS

- A. Waterstops shall conform to ACI 301. Waterstops shall be securely held in position during placing of concrete. If, after placing concrete, waterstops are materially out of position or shape, the surrounding concrete shall be removed, the waterstop reset, and concrete replaced in accordance with Paragraph 03 30 00-3.10.
- B. Waterstops shall be provided at the following joints:
 - 1. Expansion joints in structures.
 - 2. Joints in parts of structures exposed to ground or water on one side and occupied by non-submerged equipment or by personnel on the other.
 - 3. Wall and slab joints of tanks and channels subject to water pressure. Waterstops shall be provided from 6 inches above high water level to structural foundation slab or footing, or as otherwise noted on the drawings.
- C. Field splices shall be heat fused welded butt splices only and shall be acceptable only in straight sections. Lapping of splices or joining by any means other than heat fused welding shall not be allowed. Crosses, tees, and other shapes used for changes of direction, intersections, and transitions shall be factory fabricated.
- D. Hydrophilic waterstops shall be installed according to manufacturer's recommendations. Surfaces of concrete shall be prepared to required level/plumb and smoothness as required by manufacturer. Form and finish concrete placed first with contact surface requirements in mind, or grind surface if necessary. Provide bonding adhesive if required for the particular product, or if surface conditions warrant. Note restrictions on use described in Paragraph 03 30 00-2.03 B.

3.10 MODIFICATION OF EXISTING CONCRETE

A. GENERAL:

1. Structural dimensions related to or controlled by previously constructed or existing structures shall be verified in the field by the Contractor prior to concrete work.

B. CUTTING OR CORING CONCRETE:

1. Surfaces exposed to view shall be neatly saw cut to a depth of 1 inch prior to removing the existing concrete. New openings in existing concrete shall be cut 2 inches oversize, coated with epoxy bonding compound and re-finished with profiling mortar to the required opening size.
2. Existing joint edge shall be ground to create a chamfer matching those used adjacent, where occurs. Hidden or other surfaces shall receive a 1/2-inch radius tooled joint between new and existing concrete. Grind existing to imitate tooled edge.
3. Unless specifically notified otherwise, Contractor shall investigate concrete to be drilled, cored or sawcut to determine location of existing reinforcing steel. Penetrations shall be located so as to clear existing reinforcing steel if possible. Unless otherwise detailed on the drawings, or where not possible to avoid reinforcing steel, consult Owner's Representative as to acceptability of cutting reinforcing steel and provide new reinforcing systems as directed. Locating methods include chipping to expose reinforcing steel, ground penetrating radar, X-ray, or magnetic flux devices. Locates of existing reinforcing shall be paid for by the Contractor.

C. JOINING NEW CONCRETE TO EXISTING:

1. Existing concrete surfaces to be joined with new concrete shall be thoroughly cleaned, and roughened by abrasive blasting, bush hammering or other method to achieve 1/4-inch amplitude surface. Existing metalwork, embeds or other interfering items shall be removed. In typical cases, coat existing surface with epoxy bonding compound just prior to placement of new concrete. In restricted access situations or for large quantity work, review need for epoxy bonding agent with Owner's Representative if not specifically required by notes or details on the drawings.

D. DOWELS:

1. Dowels to be installed in existing concrete shall utilize drilled holes, properly brushed and air-cleaned, and epoxy based adhesive, as per Section 03 60 00. When the holes are horizontal, they shall be drilled slightly downward

(approx 15 degrees). When overhead holes are required, capsule anchors shall be used. Installation and Special Inspection shall conform to ICC Evaluation Report or comparable agency certification. Adhesive anchored dowels shall not be used where developed reinforcing requires full transfer of force to adjoining reinforcing unless approved by the Engineer of Record, or where restricted in Section 03 60 00.

E. WATERSTOPS:

1. Where a PVC waterstop between new and existing concrete is required, Contractor shall cut a suitable groove in the existing concrete and install waterstop with epoxy based adhesive unless otherwise noted on the drawings. Waterstop shall be securely braced and supported during installation and to the completion of adhesive curing.

3.11 FORMED SURFACE FINISHES

A. REPAIR OF SURFACE DEFECTS:

1. Surface defects, including tie holes, minor honeycombing or otherwise defective concrete shall be repaired in accordance with ACI 301. Areas to be patched shall be cleaned. Minor honeycombed or otherwise defective areas shall be cut out to solid concrete to a depth of at least 1 inch. The edges of the cut shall be perpendicular to the surface of the concrete. Patches on exposed surfaces shall be finished to match the adjoining surfaces after they have set. Patches shall be cured as specified for the concrete. Finished surfaces shall be protected from stains and abrasions. Finishes shall be equal in workmanship, texture, and general appearance to that of the adjacent concrete. Concrete with honeycombing which exposes the reinforcing steel or with defects which affect structural strength shall be corrected.

B. FORMED SURFACE FINISHING: Formed surfaces shall be finished as soon as practicable after form removal and repair of surface defects. Finishes shall be as follows.

1. **FINISH A:** Finish A shall be a grout clean finish in accordance with ACI 301, Section 5.3.4.4.b except that all form fins and other protrusions shall be completely removed to the final surface. Surfaces shall be lightly sandblasted prior to sacking. For interior areas not exposed to moisture or weather, water used in the mortar shall be mixed with a PVA bonding compound as recommended by the manufacturer. Finish A shall be provided for all structural surfaces that have geomembrane system attachments; surfaces of stair wells; exposed channels and tanks from 1 foot below minimum water surfaces and up; and permanently exposed vertical and sloped surfaces, such as pipe chases.

2. FINISH B: Finish B shall be the same as Finish A, except that the final burlap rubbing may be omitted, providing the steel trowel scraping removes the loose buildup from the surface. Finish B shall be provided for waterproof and moistureproof coated surfaces.
3. FINISH C: Finish C shall be a finish which has surface imperfections less than 3/8 inch in any dimension. Surface imperfections greater than 3/8 inch shall be repaired or removed and the affected areas shall be neatly patched. Finish C or smoother shall be provided for interior surfaces of tanks and channels from 1 foot below minimum water surfaces and down and otherwise unfinished interior surfaces.
4. FINISH D: Finish D shall be the finish for surfaces which may be left as they come from the forms, except that tie holes shall be plugged and defects greater than 1/2 inch in any dimension shall be repaired.

3.12 SLAB FINISHES

A. GENERAL:

1. The finishes specified herein include surface finishes, treatments and toppings for floors and slabs. Dry cement shall not be used on new concrete surfaces to absorb excess moisture. Edges shall be rounded to a radius of 1/2 inch. Joints shall be grooved to a radius and depth of 1/4 inch each.
2. Floors shall be sloped to drain uniformly within a room or space. Unless otherwise specified, slope shall be a minimum of 1/8 inch per foot toward nearest drain. Where finish is not specified, floor slabs shall receive steel troweling. Use of floor drains with only locally depressed slabs shall be coordinated with Owner's Representative if detailed on the drawings, and restricted to locations specifically noted.

B. FLOAT FINISH:

1. Float finish shall conform to ACI 301, Section 5.3.4.2.b. Floating shall be performed with a hand or power-driven float. Floating of any one area shall be the minimum necessary to produce the finish specified. Floating shall compact and smooth the surface and close any cracks and checking of surfaces. Float finish shall be applied to surfaces of channel and tank bottom slabs and to footings.

C. STEEL TROWEL FINISH:

1. Steel trowel finish shall conform to ACI 301, Section 5.3.4.2.c. Immediately after final troweling, the surface shall be cured and protected as specified in

paragraphs 03 30 00-3.04 and 03 30 00-3.05. Steel trowel finish shall be provided on floors unless specified otherwise.

D. BROOMED FINISH:

1. Broomed finish shall conform to ACI 301, Section 5.3.4.2.d. Broomed finish shall be provided for walks, tops of tanks, slabs-on-grade exposed to atmosphere, and where otherwise indicated or specified.

E. SAMPLES OF CONCRETE FLOOR FINISHES:

1. A sample concrete panel, 2 feet by 2 feet, representative of each specified finish, shall be provided to the Owner's Representative. The panels shall be representative of the workmanship and finishes required. Samples shall be approved in field prior to the start of such work.

3.13 NOT USED

3.14 RELATED SURFACES

A. NOT USED

B. STAIR TREAD:

1. Stair tread shall be constructed with nonskid nosing as specified in Section 05 53 10. Tread shall have a steel trowel finish with moderate duty surface hardener and shall have a slope of 1/8 inch per foot toward the front. Ends of treads shall have a 1/16 to 1/8 inch cut between concrete and metal tread to allow for expansion.

C. FINISHING OF UNFORMED SURFACES:

1. RELATED UNFORMED SURFACES: Tops of walls or buttresses, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces shall be struck smooth after concrete is placed and shall be floated to a texture reasonably consistent with that of the adjacent formed surfaces. Final treatment of formed surfaces shall continue uniformly across the unformed surfaces.
2. PAVEMENTS AND SIDEWALKS: The surfaces of the concrete shall be screeded to grade and sloped to drain. After screeding, the surface shall receive a broomed finish as specified in Paragraph 03 30 00-3.12 D. Edges and expansion joints shall be rounded to a radius of 1/2 inch. Joints shall be grooved to a radius and depth of 1/4 inch each.

3.15 NOT USED

3.16 REPAIR OF DAMAGED CONCRETE, CRACKING:

A. REPAIR METHODS: Damaged or excessively cracked concrete shall be repaired by one of the following methods:

1. Fill the joint or crack by drilling holes to the affected area, install injection ports and force epoxy or chemical grout (expanding urethane) into the joint under pressure. The material type, whether epoxy or chemical grout shall be made by the Owner's Representative. After injection and cure, ports, sealing mix and surface generally shall be cleaned and worked to match the specified finish.
2. Fill cracks with low viscosity epoxy, applied by pouring/flooding crack zone until cracks are filled. Prepare surface and cure according to manufacturer's recommendations. At a minimum, prepare surface to result in a clean, dry surface and with no visible detrimental material in cracks to be filled. Conform to temperature limitations for epoxy to be used. Finish to match adjacent areas.
3. Cut a bevel groove 3/8 to 1/2 inch in width and depth, and caulk with sealant in accordance with manufacturer's instructions. This repair method is only to be used where expressly allowed by the Owner's Representative. Groove and caulk shall be applied on wet or hydrostatic pressure side of surface where occurs.

B. METHODS, WHERE USED:

1. Repair Method 1 shall be used for all cracks in walls, surfaces sloped 1:1 or greater, beams, columns, slabs, overhead surfaces and generally for liquid retaining surfaces. Need for repair depends upon crack width, location, and surface conditions under service conditions. Owner's Representative shall determine repair need in their sole discretion.
2. Repair Method 2 may be utilized in lieu of Method 1 for slabs which receive a raked finish. Method 2 may also be used with Owner's Representative's approval for exposed trowelled and broomed finishes after review of conditions, degree of exposure to public, and proposed repair product and installation. Finish shall substantially match adjacent surfaces.
3. Repair Method 3 shall be limited to dry-surface slabs, walls subject to less than three feet of liquid pressure, or as specifically directed by the Owner's Representative. Method 3 is not an equivalent repair method to Methods 1 or 2 which shall be considered the standards.

3.17 NOT USED

3.18 WATERTIGHTNESS, TESTING AND REPAIR

A. WATER RETAINING CONCRETE TANKS AND CHANNELS:

1. Concrete tanks, basins, reservoirs and channels which have walls or slabs subjected to hydrostatic pressure shall be tested for watertightness. The tests shall be made after the structure is complete and the concrete has achieved its specified 28-day strength, but prior to application of waterproofing coating or backfilling. Testing shall consist of filling the tank or channel with water to the maximum operating water surface for at least 72 hours and then visually inspecting the dry side of all walls and base perimeter of slab for evidence of leakage. Damp spots, leakage, or seepage revealed by the test, including those caused by shrinkage of concrete, honeycombed areas, construction joints, or other sources shall be repaired by Method 1, Paragraph 03 30 00-3.16-A.1. Damp spots are defined as spots from which water that can be picked up on dry hand.
2. The Contractor shall re-test tanks or channels which have been repaired to check the suitability of repairs. Water required for testing and re-testing shall be provided by the Contractor and disposed of so as not to create a nuisance.
3. All liquid retaining or conveying concrete structures must also meet maximum leakage criteria set forth in ACI 350.1 as follows:

Structure Type	ACI 350.1 Designation	Tightness Criterion
Cylindrical water and wastewater storage tanks and reservoirs other than digesters	HST-025	0.025% per day
Digesters	SHT-050	0.050% per day (surcharged hydrostatic test)
Rectangular basins and tanks	HST-050	0.050% per day
Concrete paved reservoirs and channels	HST-100	0.10% per day

Note: All damp spots on or leakage through walls or wall-to-slab joints shall be repaired as described above. Leakage equal to or less than the values shown in the table above is permitted only through the base slab or mat foundation.

4. Volume loss shall be measured by measuring the vertical distance from the water surface to a fixed point on the tank above the water surface taking into account evaporation from open surfaces. If the drop in water surface in the 24-hour period exceeds the values given in the table above, exclusive of evaporation, the leakage shall be considered excessive and shall be remedied.

3.19 CLEANUP

- A. Upon completion of the work and prior to final inspection, the Contractor shall clean all concrete surfaces. The cleaning procedures shall be as follows: After sweeping with an ordinary broom to remove the loose dirt, the surface shall be flushed with clean water. Final scrubbing by hand or machine shall follow.
- B. Floors that have curing and sealing compound shall be cleaned of loose dirt and debris by sweeping with ordinary brooms. They shall then be washed and mopped with clean water. Finally, one additional coat of the same clear curing and sealing compound shall be applied in the same manner as specified.

END OF SECTION

SECTION 03 40 00

PRECAST CONCRETE

PART 1—GENERAL

1.01 DESCRIPTION

- A. This section specifies the materials and labor required for the manufacture and installation of precast concrete.

1.02 QUALITY ASSURANCE

A. INSPECTION AND TESTING:

- 1. Conform to the requirements of Section 03 20 00 and 03 30 00 for reinforcing and cast-in-place concrete.

B. REFERENCE STANDARDS:

- 1. The appropriate reference standards are specified in specification Sections 03 20 00 and 03 30 00 of this project manual, and the following documents. They are part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.
- 2. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, whether or not the document has been superseded by a version with a later date, discontinued, or replaced.

Reference	Title
ACI 318	Building Code Requirements for Reinforced Concrete
AWS D1.1	Structural Welding Code - Steel
AWS D1.4	Structural Welding Code - Reinforcing Steel
AASHTO	Standard Specification for Highway Bridges

Reference	Title
AISC	Manual of Steel Construction, 13 th Edition
MNL-116	Prestressed Concrete Institute's Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products, third edition
OSSC	2010 Oregon Structural Specialty Code

1.03 SUBMITTALS

- A. In accordance with specification Section 01 33 00 and in addition to the requirements of that section, the following submittals shall be provided:
1. A copy of this specification section, with addendum updates included, and all referenced and applicable sections, with addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements. Check marks (✓) shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated, and therefore requested by the Contractor, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation. The Owner's Representative shall be the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications. Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.
 2. Shop drawings shall be provided showing product showing location, fabrication details, number identification marks, reinforcement, connection details including field installed anchor sizes and locations, if required, openings, loose or embedded items and inserts, dimensions and relationship to adjacent materials in sufficient detail to cover manufacture, handling, and erection. Shop drawings shall be accompanied by a letter signed by an Oregon registered Professional Engineer, certifying that the shop drawings submitted represent construction which meets or exceeds the requirements of the Contract Documents and the requirements of codes and agencies having jurisdiction over the Work.
 3. Concrete mix design if different than specified in Section 03 30 00.

4. ICC Evaluation Reports for all anchors and fasteners that differ from products specified or indicated on the drawings.

1.04 LABELING

- A. Each vault, item or member shall have an identification mark indicating its location in the project of structure as shown on the placing diagrams and date of casting.

1.05 HANDLING AND STORAGE

- A. Unless specified otherwise herein, fabrication, handling and erection of precast elements shall be in accordance with the recommendations made by ACI 318 and ACI Committee 533.
- B. Precast elements shall be properly supported off the ground to avoid damage during curing, storage, handling and hauling. Lateral support shall be sufficient to prevent bowing, warping, or permanent set due to creep. Edges of the units shall be adequately protected by padding or other means to prevent staining, chipping or spalling of concrete. Lifting devices shall have a minimum safety factor of 4.

PART 2—PRODUCTS

2.01 PERFORMANCE AND DESIGN REQUIREMENTS

- A. Concrete mix design and compressive strength shall meet or exceed that as specified for Class C-2 concrete in specification Section 03 30 00 or greater as required by the design calculations.
- B. Design live loads for structural precast units are given in General Structural Notes on the Drawings. Soil loadings are provided in the geotechnical report referenced in the General Structural Notes on the drawings. The General Contractor shall furnish the precast supplier with locations and loads of mechanical equipment, if any. The precast units shall be designed for soil and gravity loads, the actual mechanical equipment to be supplied, and wind/seismic loads.
- C. Unless otherwise noted, precast concrete vaults, boxes and manholes which are installed in, under, or adjacent to paved or unpaved driving surfaces shall be designed to resist H-20 traffic loading. In areas not subject to traffic loading, cover design live load shall be 300 psf.

2.02 PRECAST CONCRETE MATERIALS

A. CONCRETE:

1. Conform to Section 03 30 00, Class C-2. Similar mix designs in general use by the manufacturer and which satisfy the design requirements may be submitted for review.

B. REINFORCING STEEL:

1. Conform to Section 03 20 00.

C. EMBEDDED ITEMS AND ANCHORAGE DEVICES:

1. All embedded items, inserts, and anchorage devices exposed to view, moisture or weather shall be hot-dipped galvanized steel. Anchorage devices shall be fabricated from ASTM A36 steel.

D. PENETRATIONS AND DETAILS:

1. All required penetrations and openings larger than 6 inches in diameter or 6-inches square shall be formed in place at the time of casting. Additional reinforcing shall be added where required to meet loading requirements. Openings and penetrations smaller than 6-inches may be core drilled.
2. Provide standard, cast-in sump depression in all vaults.

E. MOLDS:

1. Material from which molds are to be fabricated shall be steel, concrete, fiberglass, reinforced plastic or wood. The selection of materials for molds shall be at the manufacturer's option, except that wood shall not be used without the express approval of the Owner's Representative. All elements shall be cast in molds of rigid construction, accurate in detail with precise corners and arises, and designed to provide a close control of dimensions and details as indicated on the drawings.
2. Prior to casting of precast elements, molds shall have all surface joints, radii, corners, etc., filled, ground, filed, straightened or otherwise removed to provide a finished concrete surface that is smooth and dense, free of honeycombing, large air pockets, offsets, sinkages, or other irregularities.

F. PARTING COMPOUND:

1. All molds shall be coated with parting compound to facilitate removal of elements from molds. Parting compound shall be non-petroleum, nonstaining and shall be of a nature and composition not deleterious to concrete.

G. JOINTS:

1. Provide "O-ring" or similar gasket in joints, as well as exterior side joint sealants per Section 07 92 00 to prevent intrusion of groundwater.

2.03 PRODUCT DATA

A. The following information shall be provided in accordance with Section 01 33 00.

1. **LABORATORY TEST REPORTS:** Before delivery of materials, three copies of the reports of the tests specified herein shall be provided. Test reports on previously tested materials shall be accompanied by the manufacturer's statement that the previously tested material is the same type, quality, manufacture, and make as that proposed for use in this project. Test reports are required for the following:
 - a. Cement
 - b. Aggregates
 - c. Pozzolan
 - d. Admixtures
 - e. Curing compounds
 - f. Waterstops, O-ring gaskets, sealants

PART 3--EXECUTION

3.01 INSTALLATION

A. CASTING:

1. Casting shall be accomplished by methods and equipment that are in conformance with generally acceptable systems for this type of Work. All precast concrete shall be manufactured by a plant thoroughly experienced in this type of Work. The manufacturer shall meet all production schedules. Surfaces on which units are cast shall be level and free from any imperfections detrimental to the surface appearance of the finished units. Parting compound shall be applied evenly as per manufacturer's recommendations.

2. Concrete shall be so handled as to prevent segregation of materials and shall be continuously vibrated during casting, either internally or externally, to achieve proper compaction, finish, and distribution of concrete. All precautions must be taken to keep the reinforcing steel in the proper location during placing and consolidation of the concrete. Unless shown otherwise and except at concrete faces exposed to soil or liquids, all reinforcing steel shall have a minimum cover of 1 1/2 inch. At concrete faces exposed to soil or liquids, cover shall be 2 inches minimum. Embedded items shall be accurately placed and maintained in their proper location during the casting operation. Special inserts or other devices for handling of panels for the convenience of the manufacturer shall not be exposed to view after members are erected. Embedded anchors, inserts, plates, angles and other cast-in items shall have sufficient anchorage and embedment for design requirements.
3. Casting, bowing, warpage, and dimensional tolerances shall be in accordance with MNL-116, third edition.

B. CURING:

1. All precast units shall be steam cured for a period of at least 12 hours. Fog spraying may be used when reviewed by the Owner's Representative. Precast elements shall not be removed from molds for a minimum period of 12 hours after casting, or until concrete has attained a minimum compressive strength of 3500 pounds per square inch, whichever governs. After removal from the forms, curing by steam or fog spraying shall be continued until concrete has attained specified strength and confirmed by standard tests. Curing procedures shall be consistent and uniform throughout the entire project.

C. WELDING:

1. The quality of material and fabrication of all welded connections shall conform to AISC and applicable provisions of AWS D1.1 or D1.4. All welding, other than tacks, shall be done by certified welders. All units shall be protected from damage by field welding or cutting operations. Noncombustible shields shall be provided as necessary for this purpose.

D. JOINTS AND JOINT SEALANTS:

1. In all instances, the edges of precast concrete units and of adjacent material shall be sound, smooth, clean and free of all contaminants prior to joint treatment.
2. Sealant and primer shall be supplied by the same manufacturer and the primer, when required, shall be as recommended for the particular sealant used. All sealant compounds shall be delivered to the job in the manufacturer's original sealed containers with labels intact and shall be

applied in strict accordance with the manufacturer's recommendations.
Sealant shall be as specified in specification Section 07 92 00.

3.02 ERECTION

- A. Any errors or misalignment in the structure which would prevent the proper setting of the elements shall be corrected by the Contractor before the erection is commenced. Erection shall be supervised and performed by workmen skilled in this type of Work. Each element shall be set in the proper position, carefully plumbed and anchored securely to the structural frame. Adjustments or changes in connections which could involve additional stresses in the products or connections shall not be permitted without approval of the Owner's Representative. All bearing surfaces shall be true to line and grade. Erection tolerances shall be in accordance with MNL-116. All joints shall be uniform and straight.

3.03 CLEANING AND REPAIRING

- A. After installation, precast elements shall be protected from all damage until final acceptance by the Owner's Representative. Precast units with cracks, spalls, and other defects shall be subject to rejection. Units reviewed for repair shall be repaired to the satisfaction of the Owner's Representative.

3.04 ALTERNATIVE DESIGN

- A. The Contractor may offer an alternative designs for any precast element. Such design shall be comparable in terms of strength, deflection, finish, and all other design criteria indicated. Complete drawings prepared and sealed by a civil or structural engineer registered in the State of Oregon where applicable shall be submitted to the Owner's Representative for his review in accordance with specification Section 01 33 00 of this project manual. No alternative design will be permitted unless it has been specifically accepted in writing by the Owner's Representative. If an alternative design is accepted, all expenses resulting therefrom shall be borne by the Contractor.

END OF SECTION

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SECTION 03 60 00

GROUTING

PART 1—GENERAL

1.01 DESCRIPTION

A. This section specifies grout for uses other than masonry.

1.02 QUALITY ASSURANCE

A. QUALITY CONTROL BY CONTRACTOR:

1. To demonstrate conformance with the specified requirements for grout, the Owner will provide the services of an independent testing laboratory which complies with the requirements of ASTM E329. The testing laboratory shall sample and test grout materials as required in this section. Costs of testing laboratory services shall be borne by the Owner.

B. REFERENCES:

1. This section contains references to the miscellaneous documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

2. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, whether or not the document has been superseded by a version with a later date, discontinued, or replaced.

Reference	Title
ASTM C33	Concrete Aggregates
ASTM C40	Organic Impurities in Fine Aggregates for Concrete
ASTM C88	Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate

Reference	Title
ASTM C117	Material Finer Than 75 μm (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C136 REV A	Sieve Analysis of Fine and Coarse Aggregates
ASTM C150	Portland Cement
ASTM C289	Potential Reactivity of Aggregates (Chemical Method)
ASTM C494	Chemical Admixtures for Concrete
ASTM C881	Epoxy-Resin-Base Bonding Systems for Concrete
ASTM D2419	Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate
ASTM E329 REV C	Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction
CRD-C621	Corps of Engineers Specification for Nonshrink Grout

1.03 REGULATORY REQUIREMENTS—SPECIAL REQUIREMENTS

- A. Certain adhesives specified herein require special inspection. Contractor shall provide for and coordinate such services as specified in Section 03 20 00 if these products are used.

PART 2—PRODUCTS

2.01 MATERIALS

A. CEMENT:

1. Portland cement shall be ASTM C150, Type II or Type V, low alkali, containing less than 0.60 percent alkalis.

B. AGGREGATE:

1. GENERAL:

- a. Aggregate shall be nonreactive and shall be washed before use.
- b. When sources of aggregate are changed, test reports shall be provided for the new material. The tests specified shall be performed prior to commencing grout work.

2. FINE AGGREGATE:

- a. Fine aggregate shall be hard, dense, durable particles of either sand or crushed stone regularly graded from coarse to fine and shall conform to ASTM C33 as modified herein. When tested in accordance with ASTM C136, gradation shall be such that 100 percent by weight will pass a standard No. 8 mesh sieve and no less than 45 percent by weight will pass a standard No. 40 mesh sieve.
- b. Variation from the specified gradations in individual tests will be acceptable if the average of three consecutive tests is within the specified limits and the variation is within the permissible variation listed below:

U.S. standard sieve size	Permissible variation in individual tests, percent
30 or coarser	2
50 or finer	0.5

- c. Other tests shall be in accordance with the following specifications:

Test	Test method	Requirements
Organic Impurities	ASTM C40	Color lighter than standard
Amount of Material Passing No. 200 Sieve	ASTM C117	3% maximum by weight
Soundness	ASTM C88	10% maximum loss with sodium sulfate
Reactivity	ASTM C289	Innocuous aggregate
Sand Equivalent	ASTM D2419	Minimum 80

C. ADMIXTURES:

- 1. GENERAL: Admixtures shall be compatible with the grout. Calcium chloride or admixtures containing calcium chloride are not acceptable. Admixtures shall be used in accordance with the manufacturer's recommendations and shall be added separately to the grout mix.
- 2. WATER REDUCING RETARDER: Water reducing retarder shall be ASTM C494 Type D and shall be Master Builders Pozzolith 300-R, Sika Corporation Plastiment, or equal.

3. LUBRICANT FOR CEMENT PRESSURE GROUTING: Lubricant additive for cement pressure grouting shall be Intrusion Prepakt Intrusion Aid, Sika Intraplast N, or equal.

D. WATER:

1. Water for washing aggregate, for mixing and for curing shall be free from oil and deleterious amounts of acids, alkalis, and organic materials; shall not contain more than 1000 mg/L of chlorides as Cl, nor more than 1300 mg/L of sulfates as SO₄; and shall not contain an amount of impurities that may cause a change of more than 25 percent in the setting time of the cement nor a reduction of more than 5 percent in the compressive strength of the grout at 14 days when compared with the result obtained with distilled water. Additionally, water used for curing shall not contain an amount of impurities sufficient to discolor the grout.

2.02 GROUT

A. DRYPACK GROUT:

1. Drypack grout shall be a mixture of approximately one part cement, 1-1/2 to 2 parts sand, water reducing retarder, and sufficient water to make a stiff workable mix.

B. CEMENT GROUT:

1. Cement grout shall be a mixture of one part cement, two parts sand, proportioned by volume, admixtures for pressure grouting, and sufficient water to form a workable mix.

C. NONSHRINK GROUT:

1. Nonshrink grout is available with both metallic and nonmetallic aggregate. Metallic aggregate grout shall be Master Builders Embeco 636, Burke Company Metallic Spec Grout, Sonnoborn Ferrolith G Redimix, or equal. Nonmetallic aggregate grout shall be Five Star Products, Inc. Five Star Grout, Master Builders Masterflow 713, Burke Company Non-Ferrous, Non-Shrink Grout, or equal.

D. EPOXY GROUT FOR CRACK REPAIR AND DOWEL ANCHORAGE:

1. Except as noted below, epoxy grout shall be a high modulus, two-component, moisture insensitive, 100 percent solids, thermosetting modified polyamid epoxy compound. The consistency shall be a paste form capable of not sagging in horizontal or overhead anchoring configurations. Material shall conform to ASTM C881, Type 1, Grade 3, such as Master Builders

Concrete Standard Paste or SPL series, Sika Corporation Sikadur Hi-Mod Series, or equal, and shall have a heat deflection temperature in excess of 130 degrees F.

2. Epoxy for pressure grouting/crack injection shall be a two-component, moisture insensitive, high modulus, injection grade, 100 percent solids, blend of epoxy-resin compounds. The consistency shall be as required to achieve complete penetration in hairline cracks and larger. Material shall conform to ASTM C881, Type 1, Grade 1, such as Sika Corporation Sikadur 52, Master Builders SCB Concrete 1300 Series, Adhesive Technology Corporation SLV 300 series, or equal.

E. POLYMER CONCRETE (FOR RESURFACING OR PATCHING):

1. Polymer concrete (profiling mortar) for resurfacing or patching shall consist of a liquid binder and dry aggregate mixed together to make a mortar or grout of a consistency as required for the application. The liquid binder shall be a chemical and oil resistant, stress relieved, low modulus, moisture insensitive, two-component epoxy-resin compound. The consistency shall be similar to lightweight oil for proper mixing with aggregate. Material shall conform to ASTM C881, Type 3, Grade 1, such as Sika Corporation Sikadur Lo-Mod series, Master Builders Concrete 1490, Adhesive Technology Corporation 400 series, or equal.
2. Alternatively, polymer concrete may be a one-component, shrinkage compensated, polymer-modified cement based mortar, with or without fiber reinforcement. Candidate manufacturers include Master Builders R300 series, or equal.
3. The aggregate shall be oven dry in sealed packages until time of mixing, and shall be of size and consistency compatible with recommendations of manufacturer of liquid binder for intended application.

F. ADHESIVE CAPSULES FOR DOWEL ANCHORAGE:

1. Adhesive resin capsules shall consist of sealed glass capsules containing premeasured amounts of a polyester or vinylester resin, quartz sand aggregate and a hardener contained in a separate vial within the capsule. Adhesive capsules shall be Hilti HVU Capsules, Molly Parabond Capsules, or equal.

G. INJECTION ADHESIVE:

1. Injection adhesive shall consist of side by side refill packs designed to keep the two adhesive components separate. Side by side packs shall be designed for use with an in-line static mixing device to thoroughly mix components

together during injection. Injection tools and mixing devices shall be as specified and supplied by the product manufacturer. Candidate manufacturers for injection adhesive include Hilti HY150 for concrete, HY 20 for masonry; Rawl Power-Fast Injection Gel; and Simpson SET Epoxy-Tie Adhesive; or equal.

2. When injection adhesive anchors are called for on the Drawings, allowable load values, embedment depths and installation procedures conform to Hilti HY 150 adhesive. For use of other products, Contractor shall submit an equivalency table to Owner's Representative for review prior to ordering materials. Equivalency table shall present the following information, at a minimum, for each substitution: Location and use, anchor diameter and embedment depth, hole diameter and cleanout requirements for the specified Hilti product and the substitute. Any other installation requirements from the manufacturer or ICBO certification which differ between the two products shall also be noted on the table.

2.03 PRESSURE GROUTING EQUIPMENT

- A. Pressure grouting equipment shall include a mixer and holdover agitator tanks and shall be designed to place grout at pressures up to 50 psi. Gauges shall be provided to indicate pressure used. The mixer shall be provided with a meter capable of indicating to one-tenth of a cubic foot the volume of grout used.

2.04 PRODUCT DATA

- A. The following information shall be provided in accordance with Section 01 33 00.
 1. MANUFACTURER'S DATA: Manufacturer's data shall be provided for the following:
 - a. Bonding compounds
 - b. Nonshrink grout
 - c. Pressure grout
 - d. Retardants
 - e. Epoxy grout
 - f. Polymer concrete
 - g. Adhesive capsules
 - h. Injection adhesive (Note: For products other than Hilti, submit according to Paragraph 03 60 00-2.02 G for review.)

2. **LABORATORY TEST REPORTS:** Test reports on previously tested materials shall be accompanied by the manufacturer's statement that the previously tested material is the same type, quality, manufacture, and make as that proposed for use in this project. Test reports are required for the following:
 - a. Cement
 - b. Aggregates
 - c. Retardants
 - d. Bonding compounds
 - e. Epoxy resin

3. **EVIDENCE OF TESTING LABORATORY COMPETENCE:** The Contractor shall require that the laboratory provide directly to the Owner's Representative evidence of the most recent inspection of its facilities by the Cement and Concrete Reference Laboratory of the National Bureau of Standards. The evidences shall show that deficiencies mentioned in the report of that inspection have been corrected. The evidence of inspection shall be provided prior to delivery of materials to the job site.

PART 3--EXECUTION

3.01 GENERAL

- A. Bonding compound for use with grout is specified in Section 03 30 00. Primer, if required for polymer concrete, shall be provided per manufacturer's recommendation.

3.02 DRYPACK GROUT

- A. Drypack grout shall be used for built-up surfaces, setting miscellaneous metal items and minor repairs.
- B. Surfaces required to be built up with drypack grout shall be roughened by brushing, cleaned, and coated with the bonding compound specified in Paragraph 03 30 00-2.05 before the application of the grout. The drypack grout shall be applied immediately following the application of the bonding compound in bands or strips to form a covering of the required thickness. The covering shall be smooth. Construction joints in the grout shall be sloped and shall be cleaned and wetted before application is resumed.
- C. Drypack grout shall be cured in accordance with Section 03 30 00, same as concrete.
- D. Grout shall not be placed during freezing weather unless adequate protection is provided.

3.03 CEMENT GROUT

- A. Cement grout shall be used for filling nonbearing portions of equipment pads and pressure grouting.
- B. Except for the specialized equipment for pressure grouting, mixing and placing apparatus shall be similar to that normally used for cast-in-place concrete. Grout shall be mixed for a period of at least 1 minute. Diluted grout shall be agitated to keep ingredients mixed.

3.04 NONSHRINK GROUT

- A. Nonshrink, nonmetallic aggregate grout shall be used for the bearing surfaces of machinery and equipment bases, column base plates and bearing plates. Nonshrink metallic aggregate grout shall be used for setting anchor bolts and grouting reinforcing steel holes. Grout shall meet the requirements of CRD-C621 and shall be placed in accordance with manufacturer's instructions.
- B. Holes required for grouting shall be blown clean with compressed air and left free of dust or standing water. Horizontal holes for grouting shall be drilled at a slight downward angle to facilitate holding the grout until setting is complete. Bolts or reinforcing steel installed in horizontal grout holes shall be bent slightly accordingly.

3.05 EPOXY GROUT

- A. Epoxy grout shall be used for repairing cracks by pressure grouting or gravity flow, repairing structural concrete, and may be used for setting reinforcing dowels or anchor bolts into holes for grouting. Concrete shall be primed in accordance with the grout manufacturer's instructions.
- B. Use of epoxy grout for anchorage of bolts or reinforcing dowels shall be subject to the following conditions:
 - 1. Use shall be limited to locations where exposure, on an intermittent or continuous basis, to acid concentrations higher than 10 percent, to chlorine gas, or to machine or diesel oils, is extremely unlikely.
 - 2. Use shall be limited to applications where exposure to fire or exposure to concrete or rod temperature above the product's heat deflection temperature or 120 degrees F (whichever is less) is extremely unlikely. Overhead applications (such as pipe supports) because of the above concerns, shall be disallowed.
 - 3. Approval from Owner's Representative for specific application and from supplier of equipment to be anchored, if applicable.

4. Anchor diameter and grade of steel shall be per contract documents or per equipment supplier specifications. Anchor shall be threaded or deformed full length of embedment and shall be free of rust, scale, grease, and oils.
5. Embedment depth and hole diameter shall be as specified.
6. Holes shall have rough surfaces, such as can be achieved using a rotary percussion drill.
7. Holes shall be blown clean with compressed air and be free of dust or standing water prior to application of grout.
8. Anchor shall be left undisturbed and unloaded for full curing period.
9. Anchors shall not be placed in concrete below 25 degrees F.

3.06 ADHESIVE CAPSULES AND INJECTION ADHESIVE

- A. Adhesive resin capsules or injection adhesive may be used for setting and anchoring reinforcing dowels or anchor bolts into predrilled holes in concrete. Use of the adhesive resin capsules for anchorage of reinforcing dowels or bolts shall be submitted and approved by the Owner's Representative prior to use. Do not use these materials in locations subject to temperatures above 140 degrees F, supporting fire-resistive construction, or supporting overhead or vertical pull-out forces unless ICBO Report allows such use.

3.07 PRESSURE GROUTING

- A. Prior to grouting, systems and holes to be grouted shall be washed clean. Washing is not required for grouting soil voids outside pipe cylinders or casing pipes. Grouting, once commenced, shall be completed without stoppage. In case of breakdown of equipment, the Contractor shall wash out the grouting system sufficiently to ensure fresh grout and adequate bond and penetration will occur upon restarting the grouting operation. Grout pressure shall be maintained until grout has set.

END OF SECTION

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DIVISION 05 – METALS

SECTION 05 05 23

METAL FASTENINGS AND ANCHOR BOLTS

PART 1—GENERAL

1.01 DESCRIPTION

- A. This section specifies anchor bolts complete with washers and nuts. Anchor bolts shall be Type 316 stainless steel.

1.02 REFERENCES

- A. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.
- B. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued or replaced.

Reference	Title
ASTM A320/A320M	Alloy-Steel Bolting Materials for Low Temperature Service
OSSC	2010 Oregon Structural Specialty Code

PART 2—PRODUCTS

2.01 GENERAL

- A. Anchor bolt holes in equipment support frames shall not exceed the bolt diameters by more than 25 percent, up to a limiting maximum oversizing of 1/4 inch. Unless otherwise specified, minimum anchor bolt diameter shall be 1/2 inch.

- B. Tapered washers shall be provided where mating surface is not square with the nut.
- C. Expansion, wedge, or adhesive anchors set in holes drilled in the concrete after the concrete is placed will not be permitted in substitution for anchor bolts except where otherwise specified. Upset threads shall not be acceptable.

2.02 MATERIALS

- A. Anchor bolt materials shall be as specified in Table A.

Table A, Anchor Bolt Materials

Material	Specification
Stainless steel bolts, nuts, washers	ASTM A320, Type 316
Expansion anchors	HILTI-BOLT, McCulloch Industries, or equal
Wedge anchors	ITT, Phillips Drill Co., or equal.
Adhesive anchors	HILTI-HVA, PARABOND Capsule, or equal

2.03 DESIGN

- A. Anchor bolts for equipment frames and foundations shall be designed in accordance with the OSSC. Bolts shall be as sized on the drawings by the Owners Representative.

2.04 PRODUCT DATA

- A. The following information shall be provided in accordance with Section 01 33 00 for all bolt systems not cast-in-place:
 1. Data indicating load capacities.
 2. Chemical resistance.
 3. Temperature limitations.
 4. Installation instructions.
 5. Evaluation report for expansion and wedge type anchors as specified in paragraph 05 05 23-3.04.

PART 3—EXECUTION

3.01 GENERAL

- A. Dissimilar metals shall be protected from galvanic corrosion by means of pressure tapes, coatings, or isolators. Grouting of anchor bolts with nonshrink or epoxy grouts, where specified, shall be in accordance with Section 03 60 00.

3.02 CAST-IN-PLACE ANCHOR BOLTS

- A. Anchor bolts to be embedded in concrete shall be placed accurately and held in correct position while the concrete is placed or, if specified, recesses or blockouts shall be formed in the concrete and the metalwork shall be grouted in place in accordance with Section 03 30 00. The surfaces of metalwork in contact with concrete shall be thoroughly cleaned.
- B. After anchor bolts have been embedded, their threads shall be protected by grease and the nuts run on.

3.03 ADHESIVE ANCHOR BOLTS

- A. Use of adhesive or capsule anchors shall be subject to the following conditions:
 - 1. Use shall be limited to locations where exposure, on an intermittent or continuous basis, to acid concentrations higher than 10 percent, to chlorine gas, or to machine or diesel oils, is extremely unlikely.
 - 2. Use shall be limited to applications where exposure to fire or exposure to concrete or rod temperature above 120 degrees F is extremely unlikely. Overhead applications (such as pipe supports) because of the above concerns, shall be disallowed.
 - 3. Approval from Owner's Representative for specific application and from supplier of equipment to be anchored, if applicable.
 - 4. Anchor diameter and grade of steel shall be per contract documents or per equipment supplier specifications. Anchor shall be threaded or deformed full length of embedment and shall be free of rust, scale, grease, and oils.
 - 5. Embedment depth shall be as specified. Adhesive capsules of different diameters may be used to obtain proper volume for the embedment, but no more than two capsules per anchor may be used. When installing different diameter capsules in the same hole, the larger diameter capsule shall be installed first. Any extension or protrusion of the capsule from the hole is prohibited.

6. All installation recommendations by the anchor system manufacturer shall be followed carefully, including maximum hole diameter.
7. Holes shall have rough surfaces, such as can be achieved using a rotary percussion drill.
8. Holes shall be blown clean with compressed air and be free of dust or standing water prior to installation.
9. Anchor shall be left undisturbed and unloaded for full adhesive curing period.
10. Concrete temperature (not air temperature) shall be compatible with curing requirements of adhesives per adhesive manufacturer. Anchors shall not be placed in concrete below 25 degrees F.

3.04 EXPANSION ANCHORS

- A. Use of expansion or wedge type anchors shall be subject to conditions 2, 3, 4, 6, 7, and 8 specified in Paragraph 05 05 23-3.03.
- B. The Contractor shall supply the Owner's Representative with the current evaluation report from the International Code Council for the particular brand of expansion anchors to be used.

END OF SECTION

SECTION 05 52 00

METAL RAILINGS

PART 1—GENERAL

1.01 DESCRIPTION

A. This section specifies prefabricated aluminum handrailing (or guardrailing).

1.02 QUALITY ASSURANCE

A. GENERAL:

1. Guardrailing shall conform to the standards of the Occupational Safety and Health Administration (OSHA) and the Oregon Structural Specialty Code.

B. REFERENCES:

1. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

2. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, whether or not the document has been superseded by a version with a later date, discontinued, or replaced.

Reference	Title
ASTM A320/A320M	Alloy-Steel Bolting Materials for Low-Temperature Service
ASTM B241/B241M	Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube

PART 2—PRODUCTS

2.01 MATERIALS

Material	Component
Aluminum	ASTM B241, alloy 6061-T6 or 6063-T6
Bolts, nuts and washers	ASTM A320, Type 304 or 305

2.02 FABRICATION

A. GENERAL:

1. Pipe cuts shall be clean, straight, square and accurate for minimum joint gap. Work shall be done in conformance with the guardrail manufacturer's instructions. Work shall be free from blemishes, defects, and misfits of any type which can affect durability, strength, or appearance.
2. Guardrailing shall be connected by screws or bolts. Holes shall be punched 1/16 inch larger than the nominal size of the bolts, unless otherwise specified. Wherever needed because of the thickness of the metal, holes shall be subpunched and reamed or drilled. Guardrail components with mismatched holes shall be replaced. No drifting of bolts nor enlargement of holes will be allowed to correct misalignment.

B. ALUMINUM GUARDRAILS:

1. Aluminum guardrails shall be Wesrail as manufactured by Moultrie Manufacturing Company; Connectorail as manufactured by Julius Blum and Company, Inc.; C-V Pipe rail as manufactured by Crane-Veyor Corporation; or equal modified to meet specified requirements.
2. Aluminum railing components shall have a clear satin anodized architectural Class I finish of minimum 0.7 mil thickness. Rails, posts, stanchions, and specials shall be fabricated from 1-1/2-inch diameter, Schedule 40 cylindrical sections.
3. Toeboards shall be provided. Toeboards shall be aluminum with a minimum thickness of 3/16 inch and shall be bolted to the vertical railing supports. Toeboards shall be designed to allow for thermal contraction and expansion.

PART 3—EXECUTION

3.01 GENERAL

- A. Guardrailing shall be provided on the Supernatant Boxes shown on the Drawings. Measurements for railings shall be verified before fabrication.
- B. Dissimilar metals shall be protected from galvanic corrosion by means of pressure tapes, coatings, or isolators. Aluminum in contact with concrete or grout shall be protected with a heavy coat of bituminous paint.
- C. Metal to be embedded in concrete shall be placed accurately and held in correct position while the concrete is placed. Recesses or blockouts shall be formed in the concrete, and the metalwork shall be grouted in place after concrete has attained its design strength in accordance with Section 03 30 00.

END OF SECTION

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SECTION 05 53 10

**GRATING, STEEL STAIRS, FLOOR PLATES,
SAFETY STAIR TREADS, AND COVER PLATES**

PART 1—GENERAL

1.01 DESCRIPTION

- A. This section specifies floor grating, floor plates, cover plates, manhole steps, ladders, and safety stair treads.

1.02 REFERENCES

- A. This section contains references to miscellaneous documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.
- B. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, whether or not the document has been superseded by a version with a later date, discontinued, or replaced.

Reference	Title
Aluminum Association	Aluminum Design Manual
AISC	American Institute of Steel Construction, Manual of Steel Construction, Allowable Stress Design-9 th Edition
ASCE Journal Vol. 88-ST6	Suggested Specifications for Structures of Aluminum Alloys 6061-T6 and 6063-T6
ASTM A 276	Stainless Steel Bars and Shapes
ASTM A666	Austenitic Stainless Steel, Sheet and Strip, Plate and Flat Bar for Structural Applications
ASTM B210	Aluminum and Aluminum-Alloy Drawn Seamless Tubes
ASTM B221	Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes

Reference	Title
OSSC	2010 Oregon Structural Specialty Code (based on the 2009 International Building Code)

1.03 SUBMITTALS

- A. Submit stair and fabrication drawings in accordance with Section 01 33 00.

PART 2--PRODUCTS

2.01 MATERIALS

A. ALUMINUM:

- Aluminum grating bearing bars and aluminum floor plates and cover plates shall be of alloy 6061-T6 conforming to ASTM B221. Aluminum grating cross bars shall be of an alloy conforming to either ASTM B221 (extrusions) or B210 (drawn).

B. STEEL:

- Steel grating and supports will not be used on this project.

C. FASTENERS

- All bolts, nuts, anchor bolts, expansion anchors, and fasteners for all applications shall be 316 stainless steel.

2.02 FABRICATION

A. GENERAL:

- Rough weld beads and sharp metal edges on gratings and plates shall be ground smooth. Welds exposed to view shall be uniform and neat.
- Holes shall be punched 1/16 inch larger than the nominal size of the bolts, unless otherwise specified. Whenever needed, because of the thickness of the metal, holes shall be subpunched and reamed or shall be drilled.

B. GRATING:

- GENERAL:** Grating shall be as specified. Both bearing bars and cross bars shall be continuous. Openings shall be banded with bars having the same dimensions as the bearing bars. Perimeter edges shall be banded with bars flush at the top surface of the grating and 1/4 inch clear of the bottom

surface. Bars terminating against edge bars shall be welded to the edge bars when welded construction is used. When crimped or swaged construction is used, bars at edges shall protrude a maximum of 1/16 inch and shall be peened or ground to a smooth surface. No single piece of grating shall weigh more than 80 pounds unless specifically detailed otherwise.

2. **ALUMINUM GRATING:** Unless otherwise specified, grating shall be fabricated of aluminum. Bearing bars shall be punched to receive the cross bars. After insertion in the bearing bars, cross bars shall be deformed by a hydraulic press or similar means to permanently lock the bars into the bearing bar openings. Fabrication methods employing bending or notching of bearing or cross bars will not be permitted. Aluminum grating shall be Gary Galok, Seidelhuber, or equal.

C. FLOOR AND COVER PLATES:

1. Floor and cover plates (Checkered Plate) shall be Alcoa C-102 aluminum tread plate, Reynolds diamond tread plate, or equal. Hinged cover plates shall be as specified and shall be set flush with surrounding floor. No single piece of floor and cover plate shall weigh more than 80 pounds unless specifically detailed otherwise.

D. STAIRS AND LADDERS:

1. Stairs and ladders shall be aluminum or stainless steel.

E. SAFETY STAIR TREADS:

1. Safety stair treads shall be 4 inches wide and shall be Alumogrit, Type 101, as manufactured by Wooster Products, Incorporated; Alumalum, Style A, as manufactured by American Abrasive Metals Company; Style AX as manufactured by Safe-T-Metal Company, Incorporated, or equal.

F. INDIVIDUAL LADDER RUNGS: Ladder rungs shall be plastic with reinforcing steel meeting the requirements of ASTM C 478 and A 615.

1. Plastic coating shall be nonsusceptible to corrosion.
2. Reinforcing steel shall have a minimum diameter of 3/4-inch.
3. Steps shall have tread-like protrusions on the top face of the front crossbar.
4. Steps shall be designed for a minimum live load of 300 pounds.
5. Steps shall be a minimum of 12 inches wide.

PART 3—EXECUTION

3.01 INSTALLATION

A. GENERAL:

1. Dissimilar metals shall be protected from galvanic corrosion by means of pressure tapes, coatings, or isolators. Aluminum in contact with concrete shall be protected by a heavy coat of bituminous paint.
2. Metalwork to be embedded in concrete shall be placed accurately and held in correct position while the concrete is placed or, if specified, recesses or blockouts shall be formed in the concrete after it has attained its design strength and the metalwork grouted in place as specified in Section 03 30 00. The surfaces of metalwork in contact with or embedded in concrete shall be thoroughly cleaned. If accepted, recesses may be neatly cored in the concrete.

B. GRATING, FLOOR, AND COVER PLATES:

1. Grating, floor, and cover plates shall be field measured for proper cutouts and proper sizes. Field welding of aluminum grating and cover plates, where specified, shall be in accordance with ASCE Vol. 88-ST6.

C. STAIRS AND LADDERS:

1. Stairs and ladders shall be fitted accurately and field measured where necessary.

D. INDIVIDUAL LADDER RUNGS:

1. Install ladder rungs in accordance with the manufacturer's instructions.
2. Ladder rungs shall be located at 12 inches on center.

E. SAFETY STAIR TREADS:

1. Unless otherwise specified, safety stair treads shall be installed on all concrete stairs. Treads shall be secured to concrete with suitable anchors at 15 inches on centers and not more than 4 inches from the ends. Rubber tape, 1/8 inch thick, shall be provided at both ends and cut to fit shape of tread prior to concrete placement.

3.02 CLEANING

- #### **A.**
- After installation, damaged surfaces shall be cleaned in accordance with the standard of the industry and by a method approved by the Owner's Representative prior to the repair.

END OF SECTION

SECTION 05 59 00
METAL SPECIALTIES

PART 1—GENERAL

1.01 DESCRIPTION

- A. This section specifies miscellaneous metalwork, which consists of custom fabricated steel metalwork other than structural metalwork.

1.02 QUALITY ASSURANCE

A. GENERAL:

1. Shop and field welding shall conform to the requirements of the AISC Manual of Steel Construction.
2. The use of salvaged, reprocessed or scrap materials will not be permitted.

B. REFERENCES:

1. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.
2. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued, or replaced.

Reference	Title
AISC Manual of Steel Construction	American Institute of Steel Construction, Manual of Steel Construction, Allowable Stress Design-9th Edition
ASTM A276	Stainless Steel Bars and Shapes
ASTM A666	Austenitic Stainless Steel, Sheet, Strip, Plate, and Flat Bar for Structural Applications
ASTM A48	Gray-Iron Castings
ASTM A320/ A320M	Alloy-Steel Bolting Materials for Low Temperature Service

PART 2—PRODUCTS

2.01 MATERIALS

- A. Materials for miscellaneous metalwork are specified in Table A.

Table A, Materials for Miscellaneous Metalwork

Material	Specification
Nonstructural steel bars, angles, clips, and similar items	ASTM A320, Type 316 or 316L
Iron castings	ASTM A48
Structural steel tubing	ASTM A316L
Steel bolts (except flanges and anchor bolts)	ASTM A320, Type 316
Stainless steel plate	ASTM A895, Type 316

2.02 FABRICATION

A. GENERAL:

- Holes shall be punched 1/16 inch larger than the nominal size of the bolts, unless otherwise specified. Whenever needed, because of the thickness of the metal, holes shall be subpunched and reamed or shall be drilled.
- Fabrication including cutting, drilling, punching, threading and tapping required for miscellaneous metal or adjacent work shall be performed prior to hot-dip galvanizing.

B. SEAT ANGLES, SUPPORTS AND BRACKETS:

1. Seat angles over slide gate guides shall be welded to the guides. Seat angles for grating, supports for floor plates, clips for precast panels and brackets for piping shall be stainless steel.

C. POWER DRIVEN PINS: (NOT USED)

D. IRON CASTINGS:

1. Castings shall be as specified on the drawings. Castings weighing less than 100 pounds shall be hot-dip galvanized after machining. Castings weighing greater than 100 pounds shall be galvanized where specified.

E. OTHER MISCELLANEOUS STEEL METALWORK:

1. Other miscellaneous steel metalwork including embedded and non-embedded steel metalwork, hangers and inserts shall be as specified on the drawings and shall be stainless steel.

PART 3—EXECUTION

3.01 INSTALLATION

A. GENERAL:

1. Drilling of bolts or enlargement of holes to correct misalignment will not be allowed.
2. Dissimilar metals shall be protected from galvanic corrosion by means of pressure tapes, coatings or isolators.
3. Metalwork to be embedded in concrete shall be placed accurately and held in correct position while the concrete is placed or, if specified, recesses or blockouts shall be formed in the concrete. The surfaces of metalwork in contact with or embedded in concrete shall be thoroughly cleaned. If accepted, recesses may be neatly cored in the concrete after it has attained its design strength and the metalwork grouted in place. Embedments shall be as specified in Section 03 22 00.

B. SEAT ANGLES, SUPPORTS, AND GUIDES:

1. Seat angles for grating and supports for floor plates shall be set so that they are flush with the floor and also maintain the grating and floor plates flush with the floor.

C. POWER DRIVEN PINS: (NOT USED)

3.02 CLEANING

A. After installation, damaged surfaces of metals shall be cleaned and any damage repaired.

END OF SECTION

**DIVISION 07 – THERMAL & MOISTURE
PROTECTION**

SECTION 07 91 26

JOINT FILLERS

PART 1--GENERAL

1.01 DESCRIPTION

- A. This section specifies preformed joint fillers for general use as indicated on the Drawings or required elsewhere by these specifications.

1.02 QUALITY ASSURANCE

A. REFERENCES:

1. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.
2. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued or replaced.

Reference	Title
ASTM D994	Preformed Expansion Joint Filler for Concrete (Bituminous Type)
ASTM D1751	Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM D1752	Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction

PART 2—PRODUCTS

2.01 MANUFACTURERS

- A. The Owner and Owner's Representative believe the following candidate manufacturers are capable of producing equipment and/or products that will satisfy the requirements of this section. This statement, however, shall not be construed as an endorsement of a particular manufacturer's products, nor shall it be construed that named manufacturers' standard equipment or products will comply with the requirements of this Section.

2.02 PREFORMED ASPHALT FIBERBOARD

- A. Preformed asphalt fiberboard joint filler shall be in accordance with ASTM D994 and shall be 1/2 inch thick unless otherwise specified. Candidate products include: Sealtight Asphalt Expansion Joint Filler by W.R. Meadows, Inc.; Asphalt Expansion Joint by Whitecap, Inc., or approved equal.

2.03 FIBER EXPANSION JOINT

- A. Fiber expansion joint material shall be in accordance with ASTM D1751, shall be 1/2 inch thick unless otherwise specified, and shall be used together with a barrier piece and sealant. Candidate products include: Sealtight Fibre Expansion Joint and Snap-Cap by W.R. Meadows, Inc.; Fiber Expansion Joint by Whitecap, Inc., or approved equal. Sealant shall be a pourable, self-leveling compound as specified in Section 07 92 00.

2.04 PREFORMED RESIN-BONDED CORK

- A. Preformed resin-bonded cork joint filler shall be in accordance with ASTM D1752, Type II. Cork joint filler thickness shall match the specified joint width.

2.05 PRODUCT DATA

- A. The following information shall be provided in accordance with Section 01 33 00:
 - 1. Manufacturer's recommendations for handling and installation of the material.

PART 3—EXECUTION

3.01 GENERAL

- A. Preformed joint fillers shall be placed into position before the concrete is poured. Where it is necessary for the filler to be fixed to existing concrete or other building materials, a suitable adhesive recommended by the filler manufacturer shall be used. Filler surfaces shall be clean and dry prior to the placement of the concrete.

3.02 PREFORMED ASPHALT FIBERBOARD

- A. Preformed asphalt fiberboard joint fillers shall be used for expansion joints in concrete sidewalks, curbs, and roadways as an alternate to Fiber Expansion Joints only if specifically noted on the drawings.

3.03 FIBER EXPANSION JOINT

- A. Fiber expansion joints shall be used for expansion joints in concrete sidewalks, curbs, and roadways typically. Install joint filler 1/2 inch below finished top of concrete and utilize barrier above. After concrete cure, remove barrier and apply joint sealant conforming to specification Section 07 92 00.

3.04 PREFORMED RESIN-BONDED CORK

- A. Preformed resin-bonded cork joint filler shall be used for expansion joints in concrete structures. The expansion joint shall be sealed with backer rod and sealant as specified in Section 07 92 00.

END OF SECTION

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SECTION 07 92 00

JOINT SEALANTS

PART 1—GENERAL

1.01 DESCRIPTION

- A. This section specifies sealants for vertical joints, horizontal joints, and general use as indicated on the Drawings and elsewhere in the specifications.

1.02 QUALITY ASSURANCE

A. REFERENCES:

1. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In case of conflict between the requirements of this section and the listed documents, the requirements of this section shall prevail.
2. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, whether or not the document has been superseded by a version with a later date, discontinued, or replaced.

Reference	Title
FEDSPEC TT-S-00230C	Sealing Compound: Elastomeric Type, Single Component
FEDSPEC TT-S-00227E	Sealing Compound: Elastomeric Type, Multi-Component

PART 2--PRODUCTS

2.01 POLYURETHANE SEALANT

A. ACCEPTABLE PRODUCTS:

1. Acceptable products shall be Sikaflex by Sika Chemical Corporation, Vulkem by Mameco International, U-Seal Joint Sealant by Burke Company, or Rubber Calk by Products Research and Chemical Corporation.

B. GENERAL:

1. Polyurethane sealants shall conform to FEDSPEC TT-S-0230C for one-component systems and FEDSPEC TT-S-00227E for two-component systems. Polyurethane sealant shall be one of the following two types.
 - a. **SELF-LEVELING.** Self-leveling polyurethane sealant shall be Type I, Class A as specified by the FEDSPECs referenced above.
 - b. **NON-SAG.** Non-sag polyurethane sealant shall be Type II, Class A as specified by the FEDSPECs referenced above.

C. PRIMER:

1. Primer shall be as recommended by the sealant manufacturer.

D. BACKER ROD OR BACKER TAPE:

1. Backer rod shall be open cell polyethylene or polyurethane foam. Rod shall be cylindrical unless otherwise specified. Backer tape shall be polyethylene or polyurethane with adhesive on one side.

2.02 MASTIC SEALANT

A. GENERAL:

1. Mastic joint sealant shall consist of a blend of refined asphalts, resins, and plasticizing compounds, reinforced with fiber. Sealant shall be compatible with joint fillers and shall be pressure grade.

B. PRIMER:

1. Primer shall be as recommended by the mastic sealant manufacturer.

2.03 PRODUCT DATA

- A. The following information shall be provided in accordance with Section 01 33 00:
 - 1. Manufacturer's product data showing conformance to the specified products.
 - 2. Manufacturer's recommendations for storage, handling, and application of sealants and primers.

PART 3--EXECUTION

3.01 GENERAL

- A. Sealants and primers shall be applied according to the sealant manufacturer's recommendations. Polyurethane sealants shall be used on all expansion joints and specified construction joints.
- B. Joints and spaces to be sealed shall be clean, dry, and free of dust, loose mortar, concrete and plaster. Additional preparation of joints and spaces shall be provided in accordance with manufacturer's recommendations. Primer shall be applied only to the surfaces that will be covered by the sealant.

3.02 POLYURETHANE SEALANTS

A. GENERAL:

- 1. Non-sag polyurethane sealants shall be used on vertical joints. Self-leveling polyurethane sealants shall be used on horizontal joints.

B. JOINT DIMENSIONS:

- 1. Unless otherwise specified, joints and spaces to be filled shall be constructed to the following criteria. Joints and spaces shall have a minimum width of 1/4 inch and a maximum width of 1 inch. The depth of the sealant shall be one-half the width of the joint, but in no case less than 1/4 inch deep. Sealant depth shall be measured at the point of smallest cross section. When joints exceed the depth requirements, backing rod shall be inserted to provide the joint depth specified. If the joint sealant depth is within the specified tolerances, backer tape shall be placed in the bottom of the joint.

3.03 MASTIC SEALANT

A. JOINT DIMENSIONS:

1. Joints to be sealed shall be 2 inches deep, 1 inch wide at the top, and 3/4 inch wide at the base.

END OF SECTION

DIVISION 09 – FINISHES

SECTION 09 90 00

PAINTING AND COATING

PART 1--GENERAL

1.01 DESCRIPTION

A. SCOPE:

1. This Section specifies coating systems, surface preparations, and application requirements for coating systems.

B. DEFINITIONS: Specific coating terminology used in this Section is in accordance with definitions contained in ASTM D16, ASTM D3960, and the following definitions:

1. Coating System Applicator (CSA): A generic reference to the specialty subcontractor or subcontractors retained by the Contractor to install the coating systems specified in this Section.
2. Coating System Manufacturer (CSM): Refers to the acceptable coating system manufacturer, abbreviated as the CSM.
3. Coating System Manufacturer's Technical Representative(s) (CTR): Refers to the technical representative(s) of the acceptable Coating System Manufacturer and is abbreviated as CTR.
4. Dry Film Thickness (DFT): The primer or coating film's thickness following curing and drying. Dry film thickness is measured in mils or thousandths of an inch (0.001 inch) and is abbreviated DFT.
5. Field Coat: The application or the completion of application of the coating system after installation of the surface at the site of the work.
6. Hold Point: A defined point, specified in this Section, at which work shall be halted for inspection.
7. Shop Coat: One or more coats applied in a shop or plant prior to shipment to the site of the work, where the field or finishing coat is applied.
8. Tie Coat: An intermediate coat used to bond different types of paint coats. Coatings used to improve the adhesion of a succeeding coat.

9. **Touch-Up Painting:** The application of paint on areas of painted surfaces to repair marks, scratches, and areas where the coating has deteriorated to restore the coating film to an unbroken condition.
10. **Volatile Organic Compound (VOC) Content:** The portion of the coating that is a compound of carbon, is photochemically reactive, and evaporates during drying or curing, expressed in grams per liter (g/l) or pounds per gallon (lb/gal).
11. **Wet Film Thickness (WFT):** The primer or coating film's thickness immediately following application. Wet film thickness is measured in mils or thousandths of an inch (0.001 inch) and is abbreviated WFT.

1.02 QUALITY ASSURANCE

A. REFERENCES:

1. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.
2. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued, or replaced.

Reference	Title
ANSI/NSF 61	Drinking Water System Components Health Effects
ANSI B74.18	Grading of Certain Abrasive Grain on Coated Abrasive Material
ASTM D16	Standard Terminology for Paint, Related Coatings, Materials, and Applications
ASTM D2200 (SSPC-V1)	Pictorial Surface Preparation Standards for Painting Steel Surfaces

Reference	Title
ASTM D4787	Standard Practice for Continuity Verification of Liquid or Sheet Linings Applied to Concrete Substrates
ASTM D5162	Standard Practice for Discontinuity (Holiday) Testing of Nonconductive Protective Coating on Metallic Substrates
ASTM E337	Standard Test Method for Measuring Humidity With a Psychrometer
ASTM D3359 A	Standard Test Methods for Measuring Adhesion by Tape Test
ASTM D3960	Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings
ASTM D4262	Standard Test Method for pH of Chemically Cleaned or Etched Concrete Surfaces
ASTM D4263	Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
ASTM D4414	Standard Practice for Measurement of Wet Film Thickness by Notch Gages
ASTM D4417	Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel
ASTM D4541	Standard Test Methods for Pull-Off Strength of Coatings Using Portable Adhesion Testers
ASTM F1869	Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
FS 595b	Federal Standard Colors
ICRI 03732	Guideline for Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays
NAPF 500-03	Surface Preparation Standard for Ductile Iron Pipe and Fittings in Exposed Locations Receiving Special External Coatings and/or Special Internal Linings
NAPF 500-03-04	Abrasive Blast Cleaning for Ductile Iron Pipe
NAPF 500-03-05	Abrasive Blast Cleaning for Cast Ductile Iron Fittings
SSPC	Paint Application Specification No. 1
SSPC-PA Guide 3	A Guide to Safety in Paint Application
SSPC SP1	Solvent Cleaning
SSPC SP2	Hand Tool Cleaning
SSPC SP3	Power Tool Cleaning

Reference	Title
SSPC SP5	White Metal Blast Cleaning
SSPC SP6	Commercial Blast Cleaning
SSPC SP7	Brush-Off Blast Cleaning
SSPC SP10	Near-White Blast Cleaning
SSPC SP11	Power Tool Cleaning to Bare Metal
SSPC SP12	Surface Preparation and Cleaning of Metals by Waterjetting Prior to Recoating
SSPC SP13	Surface Preparation of Concrete
SSPC-PA-2	Measurement of Dry Coating Thickness with Magnetic Gages
SSPC-TR2/ NACE 6G198	Wet Abrasive Blast Cleaning
SSPC-TU-3	Overcoating
SSPC-TU-4	Field Methods for Retrieval and Analysis of Soluble Salts on Substrates.
SSPC V2	Systems and Specifications: Steel Structures Painting Manual, Volume 2
SSPC-Guide 11	Guide for Coating Concrete

B. STANDARDIZATION:

1. Materials and supplies provided shall be the standard products of CSMs. Materials in each coating system shall be the products of a single CSM.
2. The standard products of CSMs other than those specified may be acceptable when it is demonstrated to the Owner's Representative that they are equal in composition, durability, usefulness, and convenience for the purpose intended. Requests for consideration of CSMs other than those specified in this Section will be considered, provided the following minimum conditions are met. Such requests are not a substitution for submittals after the alternative CSMs have been considered and accepted.
 - a. The proposed coating system shall use an equal or greater number of separate coats to achieve the required total dry film thickness.
 - b. The proposed coating system shall use coatings of the same generic type as that specified including curing agent type.

- c. Requests for consideration of products from CSMs other than those specified in this Section shall include information listed in paragraph 1.04, Items 1, 2, and 3, demonstrating that the proposed CSM's product is equal to the specified coating system.
- d. The Contractor and the proposed alternative CSM shall provide a list of references for the proposed product where the coating of the same generic type has been applied. The reference list shall include the project name, city, state, owner, phone number of owner; coating system reference and number from this Section; type of facility in which it was used, generic type, and year coating was applied.

C. QUALITY CONTROL REQUIREMENTS:

- 1. The Contractor is responsible for the workmanship and quality of the coating system application. Inspections by the Owner's Representative will not relieve or limit the Contractor's responsibilities.
- 2. The Contractor's methods shall conform to requirements of this specification and the standards referenced in this Section. Changes in the coating system application requirements will be allowed only with the written acceptance of the Owner's Representative before work commences.
- 3. Only personnel who are trained by the CTR or who are approved by the CSM specifically for the type of work performed under this contract shall be allowed to apply the coating system(s).
- 4. Contaminated, outdated, diluted materials, and/or materials from previously opened containers shall not be used.
- 5. For repairs, the Contractor shall provide the same products, or products recommended by the CSM, as used for the original coating.
- 6. The Contractor shall identify the points of access for inspection by the Owner or the Owner's Representative. The Contractor shall provide ventilation, ingress and egress, and other means necessary for the Owner's Representative's personnel to safely access the work areas.
- 7. The Contractor shall conduct the work so that the coating system is installed as specified and shall inspect the work continually to ensure that the coating system is installed as specified. Coating system work that does not conform to the specifications or is otherwise not acceptable shall be corrected as specified.

8. The Contractor shall complete the Coating System Inspection Checklist, Form 09 90 00-A, included in Section 01 99 00, for coating system applications. Follow the sequential steps required for proper coating system application as specified and as listed in the Coating System Inspection Checklist. For each portion of the work, apply the coating system and complete sign-offs as specified prior to proceeding with the next step. After completing each step as indicated on the Coating System Inspection Checklist, the Contractor shall sign the checklist indicating that the work has been performed and inspected as specified.
 9. The Contractor shall provide written daily reports that present, in summary form, test data, work progress, surfaces covered, ambient conditions, quality control inspection test findings, and other information pertinent to the coating system application.
- D. **INSPECTION AT HOLD POINTS:** The Contractor shall conduct inspections at Hold Points during the coating system application and record the results from those inspections on Form 09 90 00-A. The Contractor shall coordinate such Hold Points with the Owner's Representative such that the Owner's Representative may observe Contractor's inspections on a scheduled basis. The Contractor shall provide the Owner's Representative a minimum of two (2) hours of notice prior to conducting Hold Point Inspections. The Hold Points shall be as follows:
1. **Environment and Site Conditions.** Prior to commencing an activity associated with coating system application, the Contractor shall measure, record, and confirm acceptability of ambient air temperature and humidity as well as other conditions such as proper protective measures for surfaces not to be coated and safety requirements for personnel. The acceptability of the weather and/or environmental conditions within the structure shall be determined by the requirements specified by the CSM of the coating system being used.
 2. **Conditions Prior to Surface Preparation.** Prior to commencing surface preparation, the Contractor shall observe, record, and confirm that oil, grease, and/or soluble salts have been eliminated from the surface.
 3. **Monitoring of Surface Preparation.** Spot checking of degree of cleanliness, surface profile, and surface pH testing, where applicable. In addition, the compressed air shall be checked to confirm it is free from oil and moisture.
 4. **Post Surface Preparation –** Upon completion of the surface preparation, the Contractor shall measure and inspect for proper degree of cleanliness and surface profile as specified in this Section and in the CSM's written instructions.

5. **Monitoring of Coatings Application** – The Contractor shall inspect, measure, and record the wet film thickness and general film quality (visual inspection) for lack of runs, sags, pinholes, holidays, etc. as the application work proceeds.
6. **Post Application Inspection** – The Contractor shall identify defects in application work including pinholes, holidays, excessive runs or sags, inadequate or excessive film thickness and other problems as may be observed.
7. **Post Cure Evaluation** – The Contractor shall measure and inspect the overall dry film thickness. The Contractor shall conduct a DFT survey, as well as perform adhesion testing, holiday detection, or cure testing as required based on the type of project and the specific requirements in this Section and/or in the CSM's written instructions.
8. **Follow-up to Corrective Actions and Final Inspection.** The Contractor shall measure and re-inspect corrective coating work performed to repair defects identified at prior Hold Points. This activity also includes final visual inspection along with follow-up tests such as holiday detection, adhesion tests, and DFT surveys.

1.03 DELIVERY AND STORAGE

- A. **Materials shall be delivered to the job site in their original, unopened containers. Each container shall be properly labeled. Materials shall be handled and stored to prevent damage to or loss of label.**
- B. **Labels on material containers shall show the following information:**
 1. **Name or title of product.**
 2. **CSM's batch number.**
 3. **CSM's name.**
 4. **Generic type of material.**
 5. **Application and mixing instructions.**
 6. **Hazardous material identification label.**
 7. **Shelf life expiration date.**
- C. **Materials shall be stored in enclosed structures and shall be protected from weather and excessive heat or cold in accordance with the CSM's recommendations. Flammable materials shall be stored in accordance with state and local requirements.**
- D. **Containers shall be clearly marked indicating personnel safety hazards associated with the use of or exposure to the materials.**

- E. Material Safety Data Sheets (MSDS) for each material shall be provided to the Owner's Representative.
- F. The Contractor shall store and dispose of hazardous waste according to federal, state and local requirements. This requirement specifically addresses waste solvents and coatings.

1.04 SUBMITTALS:

- A. Provide in accordance with Section 01 33 00:
 - 1. A copy of this specification section, with addendum updates included, and referenced and applicable sections, with addendum updates included, with each paragraph check-marked (✓) to indicate specification compliance or marked to indicate requested deviations from specification requirements or those parts which are to be provided by the Contractor or others. Check marks shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated, and therefore requested by the Contractor, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation. The Owner's Representative shall be the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined shall signify compliance on the part of the Contractor with the specifications. Failure to include a copy of the marked-up specification sections, along with justification(s) for requested deviations to the specification requirements shall be cause for rejection of the entire submittal and no further submittal material will be reviewed.
 - 2. CSM's current printed recommendations and product data sheets for coating systems including:
 - a. Volatile organic compound (VOC) data
 - b. Surface preparation recommendations.
 - c. Primer type, where required.
 - d. Maximum dry and wet mil thickness per coat.
 - e. Minimum and maximum curing time between coats, including atmospheric conditions for each.
 - f. Curing time before submergence in liquid.
 - g. Thinner to be used with each paint.
 - h. Ventilation requirements.
 - i. Minimum atmospheric conditions during which the paint shall be applied.

- j. Allowable application methods.
 - k. Maximum allowable moisture content.
 - l. Maximum shelf life.
3. Affidavits signed and sealed by an officer of the CSM's corporation, attesting to full compliance of each coating system component with current and promulgated federal, state, and local air pollution control regulations and requirements.
 4. Material Safety Data Sheets (MSDS) for materials to be delivered to the job site, including coating system materials, solvents, and abrasive blast media.
 5. List of cleaning and thinner solutions allowed by the CSMs.
 6. Storage requirements including temperature, humidity, and ventilation for Coating System Materials as recommended by the CSMs.
 7. CSM's detailed, written instructions for coating system treatment and graphic details for coating system terminations in the structures to be coated including pipe penetrations, metal embedments, gate frames, and other terminations to be determined from the contract drawings. This information shall also include detail treatment for coating system at joints in concrete.
 8. The Contractor and CSA shall provide a minimum of five project references each including contact name, address, and telephone number where similar coating work has been performed by their companies in the past five years.

1.05 RESPONSIBILITIES OF THE CTR

- A. The Contractor shall retain or obtain the services of the CTR to be on site to periodically inspect and verify that the application personnel have successfully performed surface preparation, filler/surface application, coating system application, and Quality Control Inspection in accordance with this Section 09 90 00. This inspection is in addition to the inspection performed by the Contractor in accordance with this Section 09 90 00.
- B. COATING SYSTEM APPLICATION TRAINING
 1. The CTR shall provide a written letter from the CSM stating that the application personnel (listed by name) who shall perform coating work are approved by the CSM without further or additional training.

2. The training shall include the following as a minimum:
 - a. A detailed explanation of mixing, application, curing, and termination details.
 - b. Hands-on demonstration of how to mix and apply the coating systems.
 - c. A detailed explanation of the ambient condition requirements (temperature and humidity) and surface preparation requirements for application of the coating system as well as a detailed explanation of re-coat times, cure times, and related ambient condition requirements.
 - d. When training is performed, the CTR shall provide a written letter stating that training was satisfactorily completed by the personnel listed by name in the letter.

C. COATING SYSTEM INSPECTION: While on site to periodically inspect and verify, the CTR shall perform the following activities as and when they are applicable at the time of the CTR's site visits to confirm acceptability and conformance with the specifications:

1. Inspect ambient conditions during various coating system application at hold points for conformance with the specified requirements.
2. Inspect the surface preparation of the substrates where the coating system will terminate or will be applied for conformance to the specified application criteria.
3. Inspect preparation and application of coating detail treatment (for example, terminations at joints, metal embedments in concrete, etc.).
4. Inspect application of the filler/surface materials for concrete and masonry substrates.
5. Inspect application of the primers and finish coats.
6. Inspect coating systems for cure.
7. Review adhesion testing of the cured coating systems for conformance to specified criteria.
8. Review coating system continuity testing for conformance to specified criteria.

9. Inspect and record representative localized repairs made to discontinuities identified via continuity testing.
10. Conduct a final review of completed coating system application for conformance to the specifications.
11. Prepare and submit a site visit report following each site visit.

D. FINAL REPORT

1. Upon completion of coating work for the project, the CTR shall prepare a final report. That report shall summarize observations and provide photographs in a report to be submitted in accordance with Paragraph 2.02. Include substrate conditions, ambient conditions, and application procedures, observed during the CTR's site visits. Include a statement that the completed work was performed in accordance with the requirements of this Section.

PART 2—PRODUCTS

2.01 MATERIALS

- A. Notwithstanding the listing of product names in this Section, the Contractor shall provide affidavits, signed and sealed by an officer of the CSM's corporation, attesting to full compliance of each coating system component with current and promulgated federal, state, and local air pollution control regulations and requirements. No coatings shall be applied to a surface until such time as the specified affidavits have been submitted and have been reviewed and accepted. Failure to comply with this requirement shall be cause for rejection and removal of such materials from the site.
- B. The following list specifies the material requirements for coating systems. Coating systems are categorized by generic name followed by an identifying abbreviation. If an abbreviation has a suffix number, it is for the purpose of identifying subgroups within the coating system.

Coating System	CSM	Primer Coat(s)	Finish Coat(s)
Epoxy Polyurethane			
EU-1	PPG PMC	Amercoat	Amercoat 385
	Carboline	68HS	Carboguard 890
	ICI Paints	Carbozinc 859	Devran 233 or 224HS
	Sherwin Williams	Zinc Clad IV	Macropoxy 646
	Tnemec	Series 90-97	Series V69

2.02 PRODUCT DATA

- A. Prior to application of coatings, submit letter(s) from the CTR(s) identifying the application personnel who have satisfactorily completed training as specified in paragraph 09 90 00-1.05 or a letter from the CSM stating that personnel who shall perform the work are approved by the CSM without need for further or additional training.
- B. Submit reports specified in paragraph 1.02 C.9 and 1.05 C.11 when the work is underway.
- C. Submit the Coating System Inspection Checklists, using Form 09 90 00-A, included in Section 01 99 90, for the coating work.
- D. CTR final report in accordance with paragraph 1.05 D.

PART 3--EXECUTION

3.01 COATINGS

A. GENERAL:

- 1. Coating products shall not be used until the Owner's Representative has accepted the affidavits specified in paragraph 09 90 00-1.04 and 2.01, the Owner's Representative has inspected the materials, and the CTR has trained the Contractor and CSA in the surface preparation, mixing and application of each coating system.

B. SHOP AND FIELD COATS:

- 1. **SHOP APPLIED PRIME COAT:** Except as otherwise specified, prime coats may be shop-applied or field-applied. Shop-applied primer shall be compatible with the specified coating system and shall be applied at the minimum dry film thickness recommended by the CSM. Data sheets identifying the shop primer used shall be provided to the on-site coating application personnel. Adhesion tests shall be performed on the shop primer as specified in paragraph 3.01B.3. Damaged, deteriorated, and poorly applied shop coatings that do not meet the requirements of this Section shall be removed and the surfaces recoated. If the shop primer coat meets the requirements of this Section, the field coating may consist of touching up the shop prime coat and then applying the finish coats to achieve the specified film thickness and continuity.

2. **FIELD COATS:** Field coats shall consist of one or more prime coats and one or more finish coats to build up the coating to the specified dry film thickness. Unless otherwise specified, finish coats shall not be applied until other work in the area is complete and until previous coats have been inspected.
3. **ADHESION CONFIRMATION:** The Contractor shall perform an adhesion test after proper cure in accordance with ASTM D3359 to demonstrate that (1) the shop applied prime coat adheres to the substrate, and (2) the specified field coatings adhere to the shop coat. Test results showing an adhesion rating of 5A on immersed surfaces and 4A or better on other surfaces shall be considered acceptable.

C. APPLICATION LOCATION REQUIREMENTS:

1. **EQUIPMENT, NONIMMERSED:** Items of equipment, or parts of equipment which are not immersed in service, shall be shop primed and then finish coated in the field after application with the specified or acceptable color. If the shop primer requires topcoating within a specified period of time, the equipment shall be finish coated in the shop and then touch-up painted after application.
2. **EQUIPMENT, IMMERSED:** Items of equipment, or parts and surfaces of equipment which are immersed when in service, with the exception of pumps and valves, shall have surface preparation and coating work performed in the field. Coating systems applied to immersed equipment shall be pinhole free.
3. **NOT USED**

3.02 PREPARATION

A. GENERAL:

1. Surface preparations for each type of surface shall be in accordance with the specific requirements of each coating specification sheet (COATSPEC) and the following. In the event of a conflict the COATSPEC sheets shall take precedence.
2. Surfaces to be coated shall be clean and dry. Before applying coating or surface treatments, oil, grease, dirt, rust, loose mill scale, old weathered coatings, and other foreign substances shall be removed. Oil and grease shall be removed before mechanical cleaning is started. Where mechanical cleaning is accomplished by blast cleaning, the abrasive used shall be washed, graded and free of contaminants which might interfere with the

adhesion of the coatings. The air used for blast cleaning shall be sufficiently free of oil and moisture to not cause detrimental contamination of the surfaces to be coated.

3. Where deemed necessary, a NACE International certified coatings inspector, provided by the Owner, will inspect and approve surfaces to be coated before application of a coating. Surface defects identified by the inspector shall be corrected by the Contractor.
4. Cleaning and painting shall be scheduled so that dust and spray from the cleaning process shall not fall on wet, newly painted surfaces. Hardware, hardware accessories, nameplates, data tags, machined surfaces, sprinkler heads, electrical fixtures, and similar uncoated items which are in contact with coated surfaces shall be removed or masked prior to surface preparation and painting operations. Following completion of coating, removed items shall be reinstalled. Equipment adjacent to walls shall be disconnected and moved to permit cleaning and painting of equipment and walls and, following painting, shall be replaced and reconnected.

B. BLAST CLEANING: When blast cleaning is required to achieve the specified surface preparation the following requirements for blast cleaning materials and equipment shall be met:

1. Used or spent blast abrasive shall not be reused on this project.
2. The compressed air used for blast cleaning shall be filtered and shall contain no condensed water and no oil. Moisture traps shall be cleaned at least once every four hours or more frequently as required to prevent moisture from entering the supply air to the abrasive blasting equipment.
3. Oil separators shall be installed just downstream of compressor discharge valves and at the discharge of the blast pot discharges. These shall be checked on the same frequency as the moisture traps as defined in item 3 above.
4. Regulators, gauges, filters, and separators shall be in use on compressor air lines to blasting nozzles times during this work.
5. An air dryer or desiccant filter drying unit shall be installed which dries the compressed air prior to blast pot connections. This dryer shall be used and maintained for the duration of surface preparation work.
6. The abrasive blast nozzles used shall be of the venturi or other high velocity type supplied with a minimum of 100 psig air pressure and sufficient volume to obtain the blast cleaning production rates and cleanliness/specified.

7. The Contractor shall provide ventilation for airborne particulate evacuation (meeting pertinent safety standards) to optimize visibility for both blast cleaning and inspection for the substrate during surface preparation work.
8. If, between final surface preparation work and coating system application, contamination of prepared and cleaned metallic substrates occurs, or if the prepared substrates' appearance darkens or changes color, recleaning by water blasting, reblasting and abrasive blast cleaning shall be required until the specified degree of cleanliness is reclaimed.
9. The Contractor is responsible for dust control and for protection of mechanical, electrical, and other equipment adjacent to and surrounding the work area.

C. SOLVENT CLEANING:

1. Any solvent wash, solvent wipe, or cleaner used, including but not limited to those used for surface preparation in accordance with referenced Society for Protective Coatings (SSPC) specifications, shall be of the emulsifying type which emits no more than 2.8 lb/gal (340 g/l) VOCs, contains no phosphates, is biodegradable, removes no zinc, and is compatible with the specified primer.
2. Clean cloths and clean fluids shall be used in solvent cleaning.

D. METALLIC SURFACES:

1. Metallic surfaces shall be prepared in accordance with applicable portions of surface preparation specifications of the Society for Protective Coatings (SSPC) specified in each coating system. The profile depth of the surface to be coated shall be 20 to 25 percent of the coating dry film thickness as measured by Method C of ASTM D4417. Blast particle size shall be selected by the Contractor to produce the specified surface profile. The solvent in solvent cleaning operations shall be as recommended by the CSM.
2. Preparation of metallic surfaces shall be based upon comparison with SSPC-VIS1-89 (ASTM D2200), and as described. If dry abrasive blast cleaning is selected and to facilitate inspection, the Contractor shall, on the first day of cleaning operations, abrasive blast metal panels to the standards specified. Plates shall measure a minimum of 8-1/2 inches by 11 inches. Panels meeting the requirements of the specifications shall be initialed by the Contractor and the Owner's Representative and coated with a clear non-yellowing finish. One of these panels shall be prepared

for each type of abrasive blasting and shall be used as the comparison standard throughout the project.

3. Blast cleaning requirements for steel, ductile iron, and stainless steel substrates are as follows:
 - a. Steel piping shall be prepared in accordance with SSPC SP-6 (Commercial Blast Cleaning) and primed before application. Ductile iron piping surfaces including fittings shall be prepared in accordance with NAPF 500-03, NAPF 500-03-04, and NAPF 500-03-05.
 - b. Stainless steel surfaces shall be abrasive blast cleaned to leave a clean uniform appearance with a minimum surface profile of 1.5 to 2.5 mils which is uniform.
 - c. Remove traces of grit, dust, dirt, rust scale, friable material, loose corrosion products or embedded abrasive from substrate by vacuum cleaning prior to coating application.
 - d. Care must be taken to prevent contamination of the surface after blasting from worker's fingerprints, deleterious substances on workers' clothing, or from atmospheric conditions.
 - e. Ambient environmental conditions in the enclosure must be constantly monitored and maintained to ensure the degree of cleanliness is held and no "rust back" occurs.

3.03 APPLICATION

A. WORKMANSHIP:

1. Coated surfaces shall be free from runs, drips, ridges, waves, laps, and brush marks. Coats shall be applied to produce an even film of uniform thickness completely coating corners and crevices.
2. The Contractor's equipment shall be designed for application of the materials specified. Compressors shall have suitable traps and filters to remove water and oils from the air. A paper blotter test shall be performed by the Contractor when requested by the Owner's Representative to determine if the air is sufficiently free of oil and moisture to not produce deteriorating effects on the coating system. The amount of oil and moisture in spray air shall be less than the amount recommended by the CSM. Spray equipment shall be equipped with mechanical agitators, pressure gages, and pressure regulators, and spray nozzles of the proper sizes.

3. Each coat of paint shall be applied evenly and sharply cut to line. Care shall be exercised to avoid overspraying or spattering paint on surfaces not to be coated. Glass, hardware, floors, roofs, and other adjacent areas and applications shall be protected by taping, drop cloths, or other suitable measures.
4. Coating applications method shall be conventional or airless spray, brush or roller, or trowel as recommended by CSM.
5. Allow each coat to cure or dry thoroughly, according to CSM's printed instructions, prior to recoating.
6. Vary color for each successive coat for coating systems when possible.
7. When coating complex steel shapes, prior to overall coating system application, stripe coat welds, edges of structural steel shapes, metal cut-outs, pits in steel surfaces, or rough surfaces with the primer coat. This involves applying a separate coat using brushes or rollers to ensure proper coverage. Stripe coat via spray application is not permitted.

B. COATING PROPERTIES, MIXING AND THINNING:

1. Coatings, when applied, shall provide a satisfactory film and smooth even surface. Glossy undercoats shall be lightly sanded to provide a surface suitable for the proper application and adhesion of subsequent coats. Coating materials shall be thoroughly stirred, strained, and kept at a uniform consistency during application. Coatings consisting of two or more components shall be mixed in accordance with the CSM's instructions. Where necessary to suit the conditions of the surface, temperature, weather and method of application, the coating may be thinned as recommended by the CSM immediately prior to use. The volatile organic content (VOC) of the coating as applied shall comply with prevailing air pollution control regulations. Unless otherwise specified, coatings shall not be reduced more than necessary to obtain the proper application characteristics. Thinner shall be as recommended by the CSM.

C. ATMOSPHERIC CONDITIONS:

1. Coatings shall be applied only to surfaces that are dry, and only under conditions of evaporation rather than condensation. Coatings systems shall not be applied during rainy, misty weather, or to surfaces upon which there is frost or moisture condensation. During damp weather, when the temperature of the surface to be coated is within 10°F of the dew point, forced dehumidification equipment may be used to maintain a temperature of minimum 40°F and 10°F above the dew point for the surfaces to be

coated, the coated surface, and the atmosphere in contact with the surface. These conditions shall be maintained for a period of at least 8 hours or as recommended by the CSM. Where conditions causing condensation are severe, dehumidification equipment, fans, and/or heaters shall be used inside enclosed areas to maintain the required atmospheric and surface temperature requirements for proper coating application and cure.

D. NOT USED

E. PROTECTION OF COATED SURFACES:

1. Items which have been coated shall not be handled, worked on, or otherwise disturbed, until the coating is completely dry and hard. After delivery at the site, and upon permanent erection or installation, shop-coated metalwork shall be recoated or retouched with specified coating when it is necessary to maintain the integrity of the film.

F. METHOD OF COATING APPLICATION:

1. Where two or more coats are required, alternate coats shall contain sufficient compatible color additive to act as indicator of coverage, or the alternate coats shall be of contrasting colors. Color additives shall not contain lead, or lead compounds, which may be destroyed or affected by hydrogen sulfide or other corrosive gas, and/or chromium.
2. Mechanical equipment, on which the equipment manufacturer's coating is acceptable, shall be touch-up primed and coated with two coats of the specified coating system to match the color scheduled. Electrical and instrumentation equipment specified in Divisions 16 shall be coated as specified in paragraph 3.03 I.
3. Coatings shall not be applied to a surface until it has been prepared as specified. The primer or first coat shall be applied by brush to ferrous surfaces that are not blast-cleaned. Coats for blast-cleaned ferrous surfaces and subsequent coats for nonblast-cleaned ferrous surfaces may be either brush or spray applied. After the prime coat is dry, pinholes and holidays shall be marked, repaired in accordance with CSM's recommendations and retested before succeeding coats are applied. Unless otherwise specified, coats for concrete and masonry shall be brushed or rolled.

G. FILM THICKNESS AND CONTINUITY:

1. WFT of the first coat of the coating system and subsequent coats shall be verified by the Contractor, following application of each coat.

2. The surface area covered per gallon of coating for various types of surfaces shall not exceed those recommended by the CSM. The first coat, referred to as the prime coat, on metal surfaces refers to the first full paint coat and not to solvent wash, grease emulsifiers or other pretreatment applications. Coatings shall be applied to the thickness specified, and in accordance with these specifications. Unless otherwise specified, the average total thickness (dry) of a completed protective coating system on exposed metal surfaces shall be not less than 1.25 mils per coat. The

minimum thickness at any point shall not deviate more than 25 percent from the required average. Unless otherwise specified, no less than two coats shall be applied.

3. In testing for continuity of coating about welds, projections (such as bolts and nuts), and crevices, the Owner's Representative shall determine the minimum conductivity for smooth areas of like coating where the dry mil thickness has been accepted. This conductivity shall be the minimum required for these rough or irregular areas. Pinholes and holidays shall be recoated to the required coverage.
4. The ability to obtain specified film thickness is generally compromised when brush or roller application methods are used and, therefore, more coats are needed to be applied to achieve the specified dry film thickness.
5. Contractor shall apply a complete skim coat of an appropriate filler/surfacer material over the entire substrate prior to application of the coating system if, after completion of surface preparation, the surface profile or roughness of concrete or masonry substrates cannot be hidden or covered by the coating system's film thickness and/or if there are frequent open air voids and "bugholes" in the concrete substrate that cannot be filled by the coating system. The Contractor shall consult with the CSM for the appropriate filler/surfacer material and application recommendations to ensure compatibility with the coating system.

H. SPECIAL REQUIREMENTS:

1. Before erection, the Contractor shall apply all but the final finish coat to interior surfaces of roof plates, roof rafters and supports, pipe hangers, piping in contact with hangers, and contact surfaces which are inaccessible after assembly. The final coat shall be applied after erection. Structural friction connections and high tensile bolts and nuts shall be coated after erection. Areas damaged during erection shall be hand-cleaned or power-tool cleaned and recoated with primer coat prior to the application of subsequent coats. Touch-up of surfaces shall be performed after installation. Surfaces to be coated shall be clean and dry at the time of application. Except for those to be filled with grout, the underside of

equipment bases and supports that have not been galvanized shall be coated with at least two coats of primer specified for system E-2 prior to setting the equipment in place. Provide coating system terminations at leading edges and transitions to other substrates in accordance with the CSM's recommendations or detail drawings.

I. NOT USED.

3.04 CLEANUP

A. Upon completion of coating, the Contractor shall remove surplus materials, protective coverings, and accumulated rubbish, and thoroughly clean surfaces and repair overspray or other coating-related damage.

3.05 COATING SYSTEM SPECIFICATION SHEETS (COATSPEC)

A. Coating systems for different types of surfaces and general service conditions for which these systems are normally applied are specified on the following COATSPEC sheets. Surfaces shall be coated in accordance with the COATSPEC to the system thickness specified. Coating systems shall be as specified in paragraph 09 90 00-3.06, Coating System Schedule. In case of conflict between the schedule and the COATSPECS, the requirements of the schedule shall prevail.

B. Coating Specification Sheets included in Table 09 90 00A are included in paragraph 3.05.

Table 09 90 00 A - Coating Specification Sheets

Coating System ID	Coating	Surface	Service Condition
EU-1	Zinc-epoxy-polyurethane system	Ferrous Metal	Exterior, exposed to direct sunlight, moderately corrosive non-immersed.

3.05 COATING SYSTEM SPECIFICATION SHEETS (COATSPEC)

Coating System Identification:	EU-1
Coating Material:	Zinc-Epoxy-Polyurethane System
Surface:	Ferrous Metal
Service Condition:	Exterior, exposed to direct sunlight, moderately corrosive, non-immersed.
Surface Preparation:	
General:	Shop primed surfaces which are to be incorporated in the work shall be prepared in the field by cleaning surfaces in accordance with SSPC SP-2 (Hand Tool Cleaning). Damaged shop coated areas shall be cleaned in accordance with SSPC SP-3 (Power Tool Cleaning) and recoated with the primer specified.
Ferrous Metal:	Bare ferrous metal surfaces shall be prepared in accordance with SSPC SP-6 (Commercial Blast Cleaning). Ductile iron surfaces to be coated shall be abrasive blast cleaned in accordance with Paragraph 3.02 D.
	Ferrous metal with rust bleeding shall be cleaned in accordance with SSPC-SP-11 (Power Tool Cleaning to Bare Metal). Areas of rust penetration shall be spot blasted to SSPC SP-10 (Near White Blast) and spot primed with the specified primer.
Application:	Field
General:	Prime coat may be thinned and applied as recommended by the CSM, provided the coating as applied complies with prevailing air pollution control regulations.
Ferrous Metal:	Prime coats shall be a zinc rich epoxy or polyurethane primer compatible for use with urethane finish coats and applied in accordance with written instructions of the CSM.

3.05 COATING SYSTEM SPECIFICATION SHEETS (COATSPEC)

Coating System Identification: EU-1 (continued)

System Thickness: 3 to 4 mils of zinc rich primer, one intermediate epoxy coat at 5 to 6 mils and one finish coat of polyurethane at 2 to 3 mils DFT.

Coatings:

Primer: One coat at CSM's recommended dry film thickness.

Intermediate: One coat at CSM's recommended dry film thickness.

Finish: One coat at CSM's recommended dry film thickness per coat to meet the specified system thickness.

3.06 COATING SYSTEMS SCHEDULE (FINISH SCHEDULE)

- A. Specific coating systems, colors, and finishes for rooms, galleries, piping, equipment, and other items which are coated or have other architectural finishes are specified in the following coating system schedule. Unless otherwise specified in the coating system schedule, the word "interior" shall mean the inside of a building or structure, and the word "exterior" shall mean outside exposure to weather elements.

Location Description	Surface	Coating System Identification	Color
Piping and Equipment	a. Piping and Equipment Exposed to Sunlight	EU-1	Match Plant Color Code, Provide labeling per 40 05 13
	b. Ferrous metal parts of Gates and Gate Operators	EU-1	Gray
	c. Bollards, anchor block plates	EU-1 with primer compatible with galvanizing.	Safety Yellow

3.07 INSPECTION AND TESTING BY OWNER

- A. Inspection by the Owner or others does not limit the Contractor's or CSA's responsibilities for quality workmanship or quality control as specified or as required by the CSM's instructions. Inspection by the Owner is in addition to any inspection required to be performed by the Contractor.
- B. The Owner may perform, or contract with an inspection agency to perform, quality control inspection and testing of the coating work covered by this Section. These inspections may include the following:
1. Inspect materials upon receipt to ensure that are supplied by the CSM.
 2. Inspect to verify that specified storage conditions for the coating system materials, solvents, and abrasives are provided.
 3. Inspect and record findings for the degree of cleanliness of substrates.
 4. Inspect and record the pH of concrete and metal substrates.
 5. Inspect and record substrate profile (anchor pattern).
 6. Measure and record ambient air and substrate temperature.
 7. Measure and record relative humidity.

8. Check for the presence of substrate moisture in the concrete.
9. Inspect to verify that correct mixing of coating system materials is performed in accordance with CSM's instructions.
10. Inspect, confirm, and record that the "pot life" of coating system materials is not exceeded during application. Inspect to verify that recoat limitations for coating materials are not exceeded.
11. Perform adhesion testing.
12. Measure and record the thickness of the coating system.
13. Inspect to verify proper curing of the coating system in accordance with the CSM's instructions.
14. Perform holiday or continuity testing for immersed coatings or coatings exposed to aggressively corrosive conditions.

3.08 FINAL INSPECTION

- A. Contractor shall conduct a final inspection to determine whether coating system work meets the requirements of the specifications.
- B. The Owner's Representative will subsequently conduct a final inspection with the Contractor to determine the work is in conformance with requirements of the contract documents.
- C. Any rework required shall be marked. Such areas shall be recleaned and repaired as specified at no additional cost to the Owner.

END OF SECTION

DIVISION 26 – ELECTRICAL

SECTION 26 05 00

COMMON WORK RESULTS FOR ELECTRICAL WORK

PART 1—GENERAL

1.01 DESCRIPTION

A. SCOPE:

1. This section specifies general requirements for electrical work. Detailed requirements for specific electrical items are specified in other sections but are subject to the general requirements of this section. The electrical drawings and schedules included in these Contract Documents are functional in nature and do not specify exact locations of equipment or equipment terminations.

B. DEFINITIONS:

1. **ELEMENTARY OR SCHEMATIC DIAGRAM:** A schematic (elementary) diagram shows, by means of graphic symbols, the electrical connections and functions of a specific circuit arrangement. The schematic diagram facilitates tracing the circuit and its functions without regard to the actual physical size, shape, or location of the component devices or parts.
2. **ONE-LINE DIAGRAM:** A one-line diagram shows by means of single lines and graphical symbols the course of an electrical circuit or system of circuits and the components, devices or parts used therein. Physical relationships are usually disregarded.
3. **BLOCK DIAGRAM:** A block diagram is a diagram of a system, instrument, computer, or program in which selected portions are represented by annotated boxes and interconnecting lines.
4. **WIRING DIAGRAM:** A wiring or connection diagram includes all of the devices in a system and shows their physical relationship to each other including terminals and interconnecting wiring in an assembly. This diagram shall be in a form showing interconnecting wiring by terminal designation.
5. **INTERCONNECTION DIAGRAM:** Interconnection diagrams shall show all external connections between terminals of equipment and outside points, such as motors and auxiliary devices. References shall be shown to all connection diagrams which interface to the interconnection diagrams. Interconnection diagrams shall be of the continuous line type. Bundled wires shall be shown as a single line with the direction of entry/exit of the

individual wires clearly shown. Wireless diagrams and wire lists are not acceptable.

- a. Each wire identification as actually installed shall be shown. The wire identification for each end of the same wire shall be identical. All devices and equipment shall be identified. Terminal blocks shall be shown as actually installed and identified in the equipment complete with individual terminal identification.
 - b. All jumpers, shielding and grounding termination details not shown on the equipment connection diagrams shall be shown on the interconnection diagrams. Wires or jumpers shown on the equipment connection diagrams shall not be shown again on the interconnection diagram. Signal and DC circuit polarities and wire pairs shall be shown. Spare wires and cables shall be shown.
6. **ARRANGEMENT, LAYOUT, AND OUTLINE DRAWINGS:** An arrangement, layout, or outline drawing is one which shows the physical space and mounting requirements of a piece of equipment. It may also indicate ventilation requirements and space provided for connections or the location to which connections are to be made.
 7. **PIPING AND INSTRUMENTATION DIAGRAM (P&ID):** A P&ID is a diagram which shows the piping of the process flow together with the installed equipment and instrumentation. This diagram shows the interconnection of process equipment and the instrumentation used to control the process.
 8. **NETWORK BLOCK DIAGRAM:** A network block diagram is a diagram of the overall SCADA system, with annotated boxes to show the primary network components (controllers, hubs, switches, computers, displays), and annotated interconnecting lines that show the system communication media and communication protocols.
 9. **LOOP DIAGRAMS:** Provide loop diagrams for analog and discrete loops interconnected into the control system circuits:
 - a. Prepare per ISA S5.4 – Loop Diagrams using the Example Loop Diagrams where included.
 - b. Show device element wiring of the system.
 - c. Show circuits for hardwired device interlocks.
 - d. Show circuit cable and wire cable numbers, signal polarities, and terminal block numbers.

1.02 QUALITY ASSURANCE

A. REFERENCES:

1. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

Reference	Title
ACI 318	Building Code Requirements for Structural Concrete
IES	Illuminating Engineering Society
IEEE	Institute of Electrical and Electronics Engineers
ICEA	Insulated Cable Engineers Association
NEMA	National Electrical Manufacturer's Association
NECA-1	National Electrical Contractors Association – Standard Practices for Good Workmanship in Electrical Contracting
NFPA	National Fire Protection Association
NFPA-70	National Electrical Code (NEC), with Oregon amendments
NFPA-70E	National Electrical Safety Code (NESC)
NETA	National Electrical Testing Association
OSHA	Occupational Safety and Health Act
ORS 479.610	Oregon Administrative Rule for Electrical Product Certification
COP	Code of the City of Portland City of Portland Bureau of Environmental Services, Wastewater Group, Control System Philosophy, Operation, Design, and Software Standards, 2003 http://www.portlandonline.com/bes/index.cfm?c=34659

2. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no

replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued or replaced.

B. IDENTIFICATION OF LISTED PRODUCTS:

1. Electrical equipment and materials shall be listed for the purpose for which they are to be used, by an independent testing laboratory. Three such organizations are Underwriters Laboratories (UL), Canadian Standards Association (CSA), and Electrical Testing Laboratories (ETL). Independent testing laboratory shall be acceptable to the inspection authority having jurisdiction.
2. When a product is not available with a testing laboratory listing for the purpose for which it is to serve, the product may be required by the inspection authority, to undergo inspection at the manufacturer's place of assembly. All costs and expenses incurred for such inspections shall be included in the original contract price.

C. FACTORY TESTS:

1. Where specified in the individual product specification section, factory tests shall be performed at the place of fabrication and performed on completion of manufacture or assembly. The costs of factory tests shall be included in the contract price.

1.03 SUBMITTALS

A. The following submittals shall be provided in accordance with Section 01 33 00:

1. A copy of this specification section, with addendum updates included, and all referenced and applicable sections, with addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements. Check marks (✓) shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated, and therefore requested by the Contractor, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation.
 - a. The Owner's Representative shall be the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications.

- b. Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.
2. Catalog cuts of equipment, devices, and materials requested by the individual specification sections. Catalog information shall include technical specifications and application information, including ratings, range, weight, accuracy, etc. Catalog cuts shall be edited to show only the items, model numbers, and information which apply.
 - a. Catalog cuts shall be assembled in a folder. Each folder shall contain a cover sheet, indexed by item, and cross-referenced to the appropriate specification paragraph.
3. Interconnection diagram: The Contractor shall prepare interconnection diagrams depicting all cable requirements together with their actual terminations as specified in paragraph 26 05 00-1.01 B.
4. Conduit layout drawings indicating size, location, and support, for all conduits other than single runs of 1-inch diameter or less cast in concrete construction.
 - a. Conduit layout drawings shall illustrate a system which conforms to the requirements of paragraph 26 05 00-3.01-B.
 - b. For layouts that do not conform to 26 05 00-3.01 B, provide engineering design and calculations signed and sealed by a Professional Engineer registered in the state of the project. Engineering design and calculations shall demonstrate that the proposed layout does not impair or significantly reduce the design structural strength.
5. Power distribution, MCC and safety disconnect switch lists including legend with equipment tag, equipment description, and power feeder circuit source and location information.

1.04 DRAWINGS

- A. Where the Contractor is required to provide information on drawings as part of the specified work, such drawings shall be prepared on 24-inch by 36-inch drafting media complete with borders and title blocks clearly identifying project name, equipment and the scope of the drawing.
- B. Drawing quality and size of presentation shall be such as to permit 50 percent reduction of such drawings for insertion in operation and maintenance manuals.

1.05 PROJECT/SITE CONDITIONS

A. GENERAL:

1. Unless otherwise specified, equipment and materials shall be sized and derated for the ambient conditions specified in Section 01 11 80, but not less than an ambient temperature of 40 degrees C at an elevation ranging from sea level to 1000 feet without exceeding the manufacturer's stated tolerances.

B. CORROSIVE LOCATIONS:

1. The following areas are designated as corrosive:
 - a. Outdoor locations
 - b. Vaults
 - c. Manholes

C. HAZARDOUS (CLASSIFIED) AREAS:

1. The following areas are designated as hazardous (classified) in accordance with the NEC:

Area	Hazardous Classification
Monofill Leachate Manhole	Class I, Division 1, Group D

1.06 STORAGE OF MATERIALS AND EQUIPMENT

- A. Materials and equipment shall be stored indoors and sealed with plastic film wrap.

1.07 ELECTRICAL NUMBERING SYSTEMS

A. RACEWAY and CABLE NUMBERS:

1. Raceways and cables shall be tagged at all terminations. Contractor shall assign numbers in accordance with the following system where raceway numbers have not been assigned:
 - a. Conduit and cable number shall follow the form "CLANNNA" DESTINATION, where:
 - C indicates conduit or cable
 - CLA is a code that represents the project number see conduit and wire schedule
 - NNN identifies conduits assigned in a logical order
 - A is a letter from A to Z that identifies conduits for a parallel circuit

- DESTINATION, indicates the location of the other end of the conduits

b. Cable numbers are not required at the following locations:

- Circuit breaker terminations at the distribution panel
- Termination at lighting fixtures and receptacles.

B. POWER CONDUCTOR NUMBERS:

1. Numbers for power conductors, in particular 480 Vac, 3 phase feeders, shall be assigned as above for conduit and cable numbers but with an additional suffix to identify the conductor number. Example:

Power conductor number = CAAANNA – L1 where:

CAAANNA = cable number
L1 = conductor number

C. CONTROL WIRE NUMBERS:

1. Wire numbers for electrical control wiring shall reflect the project number, print number, and line number that the wire first appears on the print where the wire is shown. The left vertical rail shall be ungrounded conductor (hot wire), and the right vertical rail shall be the grounded conductor (neutral wire). Terminal numbers shall be the same as the wire number. The wire number shall follow the form “AAASNLNA-N” where:
- “AAA” (alpha code) is one to three letters from A to Z that are used to represent the project number the wiring was installed under. Contractors may obtain these numbers from the Owner’s Representative. These letters will be incremented one letter at a time and leading letters will not be used. The letters O, Q, and I shall not be used because they are easily confused with the numbers 1 and 0. The leading letter will not be the letter “C” as it is used to identify a conduit. The two letter code for this Project, 9814, is “LA”.
 - “SN” (sheet number) is a number from 1 to 999 that indicates the sheet number of print on which the wire is documented. Leading zeros are not used.
 - “LN” (line number) is a number from 1 to 99 that indicated the line on the print where the wire is. Leading zeroes will be used.
 - “A”(sequential alpha character) is a letter from A to Z that indicates the individual wires on a line of the print. Wires that are electrically identical shall have the same wire number. Wires that connect to the other side of a device (switch, contact, coil, etc.) shall be assigned the

next letter. The letters O, Q, and I will not be used because they are easily confused with the numbers 1 and 0. The letters G and N shall not be used except where the wires are assigned as ground and neutral respectively.

- e. "-N" is the number given a wire where more than one terminal is given the same wire number.
- f. Neutral wires shall have a distinctive wire number that is not be easily confused with any other wire number.
- g. It shall not be necessary to include the project letters on conductors within a panel or box that is used exclusively for conductors installed under one project. If project letters are excluded from the conductor tags, the project letters must be identified on the panel label. Any conductor leaving the panel or box must have the full tag number including the project letters.
- h. Relay contact line location shall be shown to the right of the right rail for all lines where a relay coil is shown. Normally closed contact locations shall be shown with a line over the contact location number.
- i. Devices and sub assemblies that are not custom manufactured for the job may be documented with the manufactures wire numbers and shall not be required to be renumbered. This does not apply to panels and assemblies made specifically for COP BES projects. VFDs and MCCs are examples of these types of equipment.

D. INSTRUMENT WIRE NUMBERS:

- 1. Numbering for conductors used with analog instruments are numbered differently than those used for electrical systems. Wire numbers for analog instrument loops shall be as W-XXXX-YY-ZZ, where:
 - a. W is either a Z (Position) or S (Speed). This is only to be used for position or speed of a final control element. In all other cases, skip the W and proceed with wire numbering as shown above without the leading "W-".
 - b. XXXX is a four digit loop number. Leading zeros are not used.
 - c. YY is a sequential number that begins with one at the first instrument and increments each time the electrical potential changes. Leading zeros are not used.

d. ZZ is the designation of the terminal block that the wire lands on. This number is different at each end of the wire. The purpose of this number is so that when the wire is disconnected, there will not be any doubt as to where it connects.

2. In instruments loops, conductors for analog signals shall be numbered by the convention shown above. The conductors for discrete signals shall be numbered by the scheme listed under "CONTROL WIRE NUMBERS".

1.08 INDICATING LAMP COLORS

A. Refer to Section 26 09 16 – Miscellaneous Electrical Devices for indicating lights colors for process and electrical equipment.

1.09 ARC FLASH MITIGATION METHODS

A. The following mitigation method requirements shall apply to all power distribution and utilization equipment supplied for any products supplied on the project and applies to all equipment divisions in the Contract Documents. Refer to the NFPA-70 (NEC), and NFPA-70E (NESC) for equipment labeling requirements.

1. EQUIPMENT LABELS:

a. Equipment labels shall be installed on the outside of the electrical equipment enclosure, cabinet, and panels to avoid opening the equipment to access the manufacture's data or the equipment ratings.

B. POWER AND CONTROL EQUIPMENT SEPARATION:

1. Provide separation between power equipment within an enclosure, cabinet, or panel by the uses of barriers, separate access doors, or by other means.
2. Provide separation barriers between main breaker feeders coming into equipment and other termination points or bussing on the load side of the main breaker.

C. ELECTRICAL EQUIPMENT ARC-FLASH LABELING

1. Electrical equipment shall have field marked signs and labeling to warn qualified persons of the potential electric arc flash hazards per NEC Article 110.16 Flash Protection.

1.10 DESCRIPTION OF WORK

A. The work to be performed includes provision of conduit for electrical loads at the locations shown on the drawings. Refer to the conduit and cable schedule in the

drawings. Direct buried conduits and pull strings only are listed for routing to pedestal mounted panels and disconnects for future loads.

- B. The contractor is to relocate, test, and bring into operation the existing starter panels and associated float switch controls for the groundwater pump to the leachate pump manhole as shown on the drawings.

PART 2--PRODUCTS

2.01 EQUIPMENT AND MATERIALS

A. GENERAL:

- 1. Equipment and materials shall be new and free from defects. All material and equipment of the same or a similar type shall be of the same manufacturer throughout the work. Standard production materials shall be used wherever possible.

B. EQUIPMENT FINISH:

- 1. Unless otherwise specified, provide materials and equipment with manufacturers standard finish system with manufacturer's standard color.

2.02 WIRE MARKERS

- A. Cable or conductor tags shall be legible, permanent sleeves of heat shrinkable, cross-linked, flexible polyolefin with machine printed black marking. Tags shall be Kroy shrink tubin (P/N 2404220) used with Kroy label printer TM650, Raychem, Brady, or equal. All circuit identification tags shall be readily accessible for inspection at termination points.

2.03 RACEWAY MARKERS

- A. The Contractor shall provide labeling for all conduits installed under this contract. Where space is sufficient, raceway marker tags shall be provided and applied in accordance with 26 05 00-2.04 and the sample labels provided in the attachment to this section. In cases where it is confirmed with the Owner's Representative that there is insufficient space for applying the labels specified in 26 05 00-2.04 (for example, stub-ups beneath a foot-mounted panel), an alternative method for applying raceway markers is as follows:

- 1. Aluminum or brass with 0.036-inch minimum thickness.
- 2. Raceway number stamped in 3/16-inch minimum height characters
- 3. Attached to the raceway with 316 stainless steel wire.

2.04 NAMEPLATE AND EQUIPMENT IDENTIFICATION:

- A. The Contractor shall provide labeling for all electrical equipment and devices installed under this contract.
1. Electrical distribution equipment and utilization equipment shall be field labeled to identify the power source and the load as specified. Refer to NEC Article 110.22 for Identification of Disconnecting Means installation criteria. Specific information is required such as the equipment tag number and equipment description of both the power source and the load equipment.
 2. Permanent identification labels shall be provided for all electrical equipment that has a designation on drawings or schedules. In addition, all disconnect switches, control stations, cabinets, boxes, and MCC's will have permanent identification labels. For removable equipment, such as motors, labels will be placed near the equipment on a permanent cabinet, structure, or device made expressly for display of the label and so that when an instrument or device is removed, the label remains in place (not attached to the device). Position the label so that it is readily visible and that it is obvious what equipment the label describes.
 3. Information on Labels:
 - a. The specific information that is to be on the label will be listed in the section that covers that equipment or material. In general, the information on the label or tag will fall into four categories:
 - 1) Equipment-specific items.
 - 2) Safety warning(s) and instructions: If power is supplied to equipment, or if the equipment powers other equipment, the source circuit and/or destination equipment information shall be included on the label.
 - 3) Equipment or Instrument tag numbers from the prints or specifications.
 4. Materials used for Labels:
 - a. Labels will be plastic self-adhesive with plain block letters on the following backgrounds: White for the Computer Maintenance (COMA) system equipment number, Blue for component number, White for related equipment tag, Red for foreign voltage, and Yellow for bucket identification. The colors of the letters are as follows: Blue for COMA equipment number, White for component number, Black for related equipment tag, White for foreign voltage, and Black for bucket number. More durable materials may be used for locations exposed to the elements such as engraved laminated plastic/phenolic with White letters

on a Black background. Nameplate sizes will vary as appropriate for the application. (Dymo Tape embossed-style labels are not acceptable, but printed plastic self-adhering labels may be used on suitable surfaces if applied in a craftsperson like fashion.)

- b. The Wastewater Group standard tag material is supplied by the Brady Co., Labelizer Plus Industrial Labeling System using the following tape/color/size combinations:

- 1) White lettering on blue tape, 4", 2.25", 1.25", 1/2"
- 2) Black lettering on white tape, 1.25", 1/2"
- 3) Red lettering on white tape, 1"
- 4) Black lettering on yellow tape 2.25"

5. Label and Tag Attachment:

- a. In general, labels and tags will be permanently attached to the device specified in such location as to be easily read during normal operation of the device. Panel labels will be smoothly attached to the panel will no overlaps, protrusions, or sharp edges and corners. Laminated plastic or phenolic labels will be attached with permanent adhesive. Printed plastic self-adhering labels must be applied in a craftsperson-like manner and will never be applied over existing phenolic labels. Stainless steel tags for field instruments will be attached to the conduit, right at the instrument, using stainless steel wire sufficient to keep the tag from being unintentionally removed.

- b. Normally, labels will be located on the panel as follows:

- 1) Panel 1 through 4 (Parent Equipment tag) is located on the upper right corner of the panel cover with;
- 2) Panel 5 or 6 (Component Equipment tag) lined below.
- 3) Panel 7 (Related Equipment tag) when required, will be located on the lower right hand side of the panel cover near the bottom.
- 4) Panel 8 (Foreign Voltage tag) when required, will be located on the lower right hand side of the panel cover near the bottom.
- 5) Panel 9 (Remote MCC tag) is located as closely as possible to the Motor-component of the parent unit.
- 6) Panel 10 (Instrumentation tag) Centered below; recorders, indicators, controllers, etc. (Behind-Panel Instruments must be labeled.)

- c. See examples at the end of this section.

6. A nameplate schedule showing sizes, layout, and exact location for all nameplates shall be submitted to the Owner's Representative for approval before any nameplates are prepared.

2.05 TERMINAL BLOCKS

- A. Terminal blocks shall be provided in accordance with Section 26 09 16.

2.06 PRODUCT DATA

- A. The following information and product data specified under individual specification sections shall be provided in accordance with Section 01 33 00.
 1. For electrical equipment, operations and maintenance (O&M) manuals shall meet all the requirements of the "CITY OF PORTLAND DEVELOPMENT GUIDE FOR OPERATIONS AND MAINTENANCE MANUALS" and the following requirements:
 2. All materials shall be installed in standard three ring binders.
 3. O&M Manual shall include the following:
 - a. Equipment Index Table – This table is a page index to all the information in the O&M for each piece of equipment.
 - b. Equipment Information – provide the following for each instrument or piece of equipment. Instruments and equipment provided as a package shall have this information also provided.
 - 1) Installation instructions
 - 2) Installation Details on all instrumentation field devices
 - 3) Maintenance manuals. Original only (not photocopies and not on CD).
 - 4) Shipping and handling instructions
 - 5) Outline dimensions
 - 6) Spare parts list
 - 7) Catalog and other identifying information for each type of device including designation of manufacturer, type, and model. Ratings of coils, contacts, switches, push buttons, etc., shall be clearly identified to verify specification compliance. The sheets provided shall only show information for one piece of equipment, and only the equipment provided.

- 8) Drawings:
 - i) P&ID
 - ii) Loop
 - iii) Electrical
 - iv) PLC I/O
 - v) Construction
 - vi) Conduit
 - vii) Physical Installation
 - viii) Elevation
 - ix) Power distribution
- 9) Data Sheets – Fill the data sheets out with as much meaningful information as possible using:
 - i) ISA S20 forms for all instruments, including process measuring switches (pressure, temperature, etc.).
 - ii) Similar type data sheet for all other equipment including VFDs.
- c. Provide all configuration and programming documentation of programmable equipment on the manufacturer's parameter or program sheets. This includes all programmable instruments (example: mag meters, Milltronics level transmitters, controllers, etc.) and all programmable electrical equipment (example: VFDs, soft starts, etc.).
- d. A list of all electrical loads for the project. Give the name of the load (example: Sewage Pump #1), the full load rating listing; hp., amps, volts, and the phases.
- e. Test reports.
- f. Copies of circuit breaker time current characteristics.
- g. Operational description.
- h. Instrument Index. This index shall be a matrix and shall include the following minimum information:
 - 1) Instrument tag number.
 - 2) Loop drawing number.
 - 3) Location and number of the data sheet.
 - 4) The tab of the manuals for the instrument.
 - 5) The number of any other drawings of which the instrument is part.

- i. Before receiving payments for more than 75% of the work, the Contractor shall deliver to the Owner's Representative four (4) sets of O&M manuals.
4. Test results for motors and electrical systems on the forms specified in Section 26 08 00. A file of the original test results shall be maintained by the Contractor. Prior to acceptance of work, the resulting file shall be provided to the Owner's Representative.
5. Description of functional checkout procedures specified under paragraph 26 05 00-3.02 C shall be provided 60 days prior to performing functional checkout tests.
6. Record documents specified in paragraph 26 05 00-3.03.

PART 3--EXECUTION

3.01 GENERAL

A. CONSTRUCTION:

1. The work under Division 26 shall be performed in accordance with these specifications.
2. Refer to the National Electrical Contractors Association's (NECA) National Electrical Installation Standards (NEIS) for Standard Practices for Good Workmanship in Electrical Contracting (NECA-1) as a minimum baseline of quality and workmanship for installing electrical products and systems that defines what is meant by "neat and workmanlike" as required by the National Electrical Code Section 110-12. Specified requirements supersede NECA practices.
3. Electrical layout drawings are diagrammatic, unless otherwise detailed or dimensioned. The Contractor shall coordinate the location of electrical material or equipment with the work.
4. Major electrical openings may compromise the structural integrity of the slab and wall elements. Major electrical openings are defined as openings or penetrations greater than two times the wall thickness in any dimension, and include duct bank transitions into a building through structural elements. Major electrical openings shall be constructed according to standard details on the drawings, up to an opening dimension of 3 feet. For opening dimensions greater than 3 feet, construct walls and slabs as specifically detailed on the drawings for that case. Major electrical

openings proposed by the Contractor shall be submitted to the Structural Engineer of Record for the project for review.

5. Minor changes in location of electrical material or equipment made prior to installation shall be made at no cost to the Owner.
 - a. Conduit and raceway penetrations through walls and slabs where:
 - 1) One side is a conditioned or an occupied space and the other side not, or
 - 2) One side has liquid or groundwater contact and the other not, shall be detailed and constructed to prevent liquid and moisture penetration through the wall or slab section for each conduit.

C. HOUSEKEEPING:

1. Electrical equipment shall be protected from dust, water and damage. Panelboards and Control Panels shall be wiped free of dust and dirt, kept dry, and shall be vacuumed on the inside within 30 days of acceptance of the work.
2. Before final acceptance, the Contractor shall touch up any scratches on equipment as specified in paragraph 09 90 00-3.03 H.
3. Electrical equipment temporarily exposed to weather, debris, liquids, or damage during construction shall be protected.

D. ELECTRICAL EQUIPMENT ARC FLASH LABELING

1. Electrical equipment shall have field marked signs and labeling to warn qualified persons of the potential electric arc flash hazards per NEC Article 110.16 Flash Protection.
2. Electrical distribution equipment and utilization equipment shall be field labels to identify the power source and the load as specified. Refer to NEC Article 110.22 for Identification of Disconnecting Means installation criteria. Specific information is required such as the equipment tag number and equipment description of both the power source and the load equipment.

E. SAFETY DISCONNECT SWITCHES:

1. Safety disconnect switches shall be provided in accordance with Section 26 09 16.

F. MOTOR CONNECTIONS

1. Verify that the motors are purchased with the correct size motor termination boxes for the circuit content specified as shown on the power single line diagrams or submit custom fabrication drawing indicating proposed motor termination box material, size, gasket, termination kit, grounding terminal, motor lead connection method, and motor terminal box connection/support system. Verify the motor termination box location prior to raceway rough-in.

G. CONDUCTOR INSTALLATION

1. An enclosure containing disconnecting means, overcurrent devices, or electrical equipment shall not be used as a wireway or raceway for conductors not terminating within the enclosure. Provide wireways, raceways, termination boxes, or junction boxes external to the enclosure for the other conductors.

3.02 TESTING

A. GENERAL:

1. Prior to energizing the electrical circuits, insulation resistance measurements tests shall be performed using a 1000-volt megohmmeter to verify the conductor is acceptable for use on the project. The test measurements shall be recorded on the specified forms and provided in accordance with paragraph 26 05 00-1.03.

B. INSULATION RESISTANCE MEASUREMENTS:

1. Refer to Section 26 08 00—Electrical Acceptance Testing for Insulation Resistance Testing and Measurements.

C. PRE-FUNCTIONAL TEST:

1. Refer to Section 26 08 00 –Electrical Acceptance Testing for Pre-Functional Test.

3.03 RECORD DOCUMENTS

- A. Contract documents shall be maintained and annotated by the Contractor during construction, including the record drawings and schedules.

- B. Contractor shall use waterproof felt tip pens, to maintain record drawings. Use the following color coding:
1. Red for document changes
 2. Blue for work installed without change
 3. Green Dimensional and other notations
 4. Dark yellow for work deleted
- C. Contractor shall maintain one full sized, black-line print of contract drawings as work set and using marking devices specified above record all required information. Prior to final submittal, transfer recorded information to one additional black-line print.

Tag Examples and Labelizer Plus Specifications

Parent Equipment tag: (Example of Panel 2)



Panel 1

.50 tape with 2 lines of text
Blue tape with "Reverse On"
Framed: Thin
Line 1 at 0.125 - Caps On
Line 2 at 0.10 - Caps Off

Panel 2

1.125" tape with 2 lines of text
Blue tape with "Reverse On"
Framed: Thin
Line 1 at 0.20" - Caps On
Line 2 at 0.12" Italic - Caps Off

Panel 3

2.25" tape with 2 lines of text:
Blue tape with "Reverse On"
Framed: thin
Line 1 at 0.70" - Caps On
Line 2 at 0.40" Italic - Caps Off

Panel 4

4" tape with 2 line of text:
Blue tape with "Reverse On"
Framed: thin
Line 1 at 1.30" - Caps On
Line 2 at 0.70" Italic - Caps Off

Component Equipment tag: (Example of Panel 6)



Panel 5

Panel 6

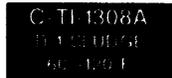
Remote MCC tag:



Panel 9

1.125" tape with 1 line of text
Yellow tape with black lettering
Framed: Thin
Line 1 at 0.50" - Caps On

²²Instrumentation tag:



Panel 10

1.0" tape with 3 (or 4) lines of text
Black tape with white lettering
Line 1 at 0.10" - Caps On
Line 2 at 0.08" - Caps On
Line 3 at 0.08" - Caps Off
Line 4 (as needed) at 0.08" - Caps Off

²² Also Section 17100 4.1.5

END OF SECTION

SECTION 26 05 33

RACEWAYS AND BOXES FOR ELECTRICAL

PART 1--GENERAL

1.01 SCOPE

- A. This section covers the furnishing and installation of electrical conduits, wireways, pull boxes, manholes, handholes, fittings and supports. Raceways shall be provided for lighting, receptacles, power, control, instrumentation, signaling and grounding systems.

1.02 REFERENCES

- A. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.
- B. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued or replaced.

Reference	Title
ANSI C80.1	Rigid Steel Conduit-Zinc Coated
ASTM F512	Smooth-Wall Polyvinylchloride Conduit and Fittings for Underground Installation
FEDSPEC WW-C-581E	Conduit, Metal, Rigid and Intermediate; and Coupling, Elbow, and Nipple, Electrical Conduit; Zinc Coated
FEDSPEC W-C-1094A	Conduit and Conduit Fittings, Plastic, Rigid
NEMA ICS 6	Industrial Control and Systems Enclosures

Reference	Title
NEMA TC2	Electrical Plastic Tubing (EPT) and Conduit (EPC 40 and EPC 80)
NEMA TC6	PVC and ABS Plastic Utilities Duct for Underground Installation
NEMA 250	Enclosures for Electrical Equipment (1000 volts maximum)
NFPA 70	National Electrical Code (NEC)
NFPA 79	Electrical Standards for Industrial Machinery
OSSC	Oregon Structural Specialty Code
UL 1	Flexible Metal Electrical Conduit
UL 6	Rigid Metal Electrical Conduit
UL 360	Liquid Tight Flexible Electrical Conduit
UL 514	Nonmetallic Outlet Boxes, Flush-Device Boxes and Covers
UL 651	Rigid Nonmetal Electrical Conduit
UL 797	Electrical Metallic Tubing
UL 870	Wireways, Auxiliary Gutters, and Associated Fittings
UL 886	Outlet Boxes and Fittings for Hazardous (Classified) Locations

1.03 SUBMITTALS

A. The following information shall be provided in accordance with Section 01 33 00:

1. A copy of this specification section, with addendum updates included, and all referenced and applicable sections, with addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements.

Check marks (✓) shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated, and therefore requested by the Contractor, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation. The Owner's Representative shall be the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications.

Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.

2. Manufacturer's descriptive literature for materials.
3. Installers Proof of Certification for installation techniques provided by the PVC-coated conduit system manufacture.

PART 2--PRODUCTS

2.01 RACEWAYS AND FITTINGS

- A. General requirements for raceway materials specified in this section are listed in the RACESPECS sheets at the end of this section. The type of raceways and raceway fittings to be used for any given area and application shall conform to the requirements in this section.

2.02 BOXES, GUTTERS, AND TERMINAL CABINETS

- A. Provide Type 316L (low carbon), 317, or Type 316 stainless products where specified. Enclosure constructed of mild sheet steel shall be hot-dipped galvanized after fabrication. Hinges shall be continuous type and for NEMA-4X cabinets hinges shall be stainless steel.
- B. Table A specifies the electrical enclosure material and rating for the location and application.

Table A

Location	Electrical Enclosure Material and NEMA Rating
Indoor: Process Areas	NEMA 12: mild steel
Outdoor:	NEMA 4X: Stainless Steel

C. PULL BOXES AND WIRING GUTTERS:

1. Indoor boxes and enclosures larger than FD boxes shall be constructed of sheet steel and galvanized after fabrication. Outdoor boxes and enclosures shall be provided with neoprene gaskets on the hinged doors or removable covers. Box and gutter sizes, metal thickness, and grounding shall comply with the National Electrical Code. Bolt-on junction box covers 3 feet square or larger, or heavier than 25 pounds, shall have a rigid handle. Covers larger than 3 x 4 feet shall be split.

D. TERMINAL CABINETS:

1. Terminal cabinets shall be provided with adjustable terminal strip mounting, back-panels for equipment mounting, print pockets in the doors,

continuous door hinges, and three-point lockable latches. Terminal cabinets located indoors shall be NEMA 12. Terminal cabinets located outdoors and in corrosive areas shall be modified NEMA 4X with stainless steel door hinge, three-point latch, and filtered ventilation, if required. Terminal block shall conform to Section 26 05 00.

E. MANHOLES (VAULTS):

1. Unless otherwise specified, manholes shall be precast concrete, 3000 psi strength at 28 days, with reinforcing with the manhole cover designed for H 20 bridge loading. Necking and shaft shall have 36 inch minimum clear opening.
2. Manhole dimensions shall be as shown on the drawings and where not shown shall be sized in accordance with the NEC. Manhole cover and frame shall be Class 30B gray cast iron per ASTM A48 with machine finished flat bearing surfaces. Manhole covers shall be engraved "ELECTRICAL."
3. Access openings for manholes shall be a minimum of three by three feet (3' x 3') or three feet in diameter with covers seized accordingly.
4. Manholes shall be watertight. Exterior walls of manholes shall be provided with 6 mils of waterproof membrane, Sonneborn HLM 5000 Series, or equal. Manhole walls shall be provided with boxouts with waterstops on all sides of each boxout. Waterstops shall be as specified in the Cast-in-Place Concrete section.
5. Raceway duct entries shall be no less than 14 inches above floor and below ceiling. Raceway boxouts shall be sized to accommodate the penetrating underground duct banks. Raceways bell-ends shall be flush with the interior finished manhole wall. From each duct bank entry into the manhole, the conductor shall be supported and routed around the interior manhole walls and bonded together.
6. Floor shall slope to a sump pit with dimensions shown in the manhole detail or with a minimum of 18 inch length x 18 inch width x 12 inches depth.

F. HANDHOLES:

1. Unless otherwise specified, Handholes shall be precast concrete with checker plate, galvanized, traffic covers designed for H 20 loading. Handholes shall be provided with precast solid concrete slab bottoms with sumps. Handholes shall be constructed of 3000 psi reinforced concrete.

Handhole cover shall be engraved "ELECTRICAL" or "SIGNAL" as applicable.

2. Dimensions shall be as specified on the drawings. Handhole walls shall be provided with boxouts, as specified for manholes.
3. Where "Lightweight Handholes" are called out on the drawings, handholes shall be precast concrete, open bottom, pull box with end and side knockouts, Christy Concrete Products or equal. See drawings for size requirements.

G. MANHOLE AND HANDHOLE CABLE SUPPORTS:

1. Provide heavy-duty, non-metal cable racks for support of conductors. Racks shall be UL listed glass-reinforced nylon consisting of slotted wall brackets for support arms designed for a minimum of a 400-pound load. Each support bracket shall run from the top to the bottom and the arms shall be adjustable and installed on 24-inch centers. Use ½-inch stainless steel bolts, hardware, inserts, and fasteners. Cable supports, clamps or racks shall be provided to support the cable at minimum 2 foot intervals. Concrete inserts shall be embedded on 24-inch centers in walls and ceiling.
2. Cable Support Products or equal:
 - a. Underground Devices Incorporated Type RA arms with CR36 support brackets.
 - b. Unistrut Power-Rack F20N-STA33 Stanchions with F20N-ARM14 Arms.

H. GROUND BUS:

1. Provide a ground bus in concrete manholes, handholes, and electrical pullboxes with dimension of 3-foot width x 3-foot length x 3-foot depth and larger. Provide a NEMA threaded 4-hole grounding plate for connecting two to four 1-hole ground connectors that enter the enclosure from two to four duct banks. Products: Burndy, T&B, or equal.

2.03 RACEWAY SUPPORTS

A. CONDUIT SUPPORTS:

1. Framing channel with end caps and straps shall be provided to support groups of conduit. Individual conduit supports shall be one-hole pipe

straps used with clamp backs and nesting backs where required. Material as specified herein.

2. Conduit supports for PVC coated rigid steel and PVC conduit systems shall be one-hole PVC coated rigid steel clamps or oversized stainless steel clamps.

- B. **MATERIALS:** Table B specifies the type of raceway supports required for each location and application.

Table B

Location	Framing Channel	Threaded Rod, Hardware, and Fittings
Indoor, Process Area	Steel, HDG	Steel, HDG
Outdoor	Stainless Steel	Stainless Steel

HDG = Hot Dip Galvanized Finish

2.04 CONCRETE ENCASED DUCT BANKS

- A. Concrete used for duct banks shall be Class E with a minimum 28-day compressive strength of 2,000 psi as specified in the Cast-in-Place Concrete Section 03 30 00.

2.05 UNDERGROUND MARKING TAPE

- A. Underground detectable marking tape shall be for early warning protection of digging around direct buried cables, conduits, and concrete duct banks. Tape shall be OSHA approved.
- B. Marking tape example: Low density polyethylene plastic, nominally 6 inches wide and 4 mil thickness with metallic lined tape with red polyethylene film on top and clear polyethylene film on the bottom. Tape shall be imprinted with a warning continuously along the length similar to: "CAUTION - STOP DIGGING - BURIED ELECTRIC LINE BELOW."
- C. Tape Products: Brady "Identoline," Services and Materials "Buried Underground Tape," Somerset (Thomas & Betts) "Protect-A-Line," or equal.

2.06 NAMEPLATES

- A. Nameplates shall be provided for boxes in accordance with the requirements of Section 26 05 00. Nameplate wording shall be as shown on the drawings. Provide the functional description of the device on the nameplate, where wording is not specified

2.07 FIRESTOPS

- A. Firestops and seals shall be Flamemastic 77, Vimasco No. 1-A, or equal, and shall be applied in accordance with manufacturer's recommendations. Products which are affected by water are not acceptable.

2.08 RACEWAY IDENTIFICATION

- A. Raceway number tags shall conform to the requirements of raceway markers, Section 26 05 00.

2.09 ELECTRICAL SEALANT

- A. Electrical sealant putty shall be non-hardening, non-oxidizing, non-corrosive, non-poisonous, and non-injurious to human skin with service temperature range of 30 to 200 degrees Fahrenheit. Product shall be used to seal against the entrance of water.

2.10 PULLING LINE

- A. Pulling line shall be polyethylene type, mildew and rot resistant with minimum of 200-pound tensile strength and minimum 1/4-inch diameter. Install in all "future" raceways. Manufacture: Greenlee, Ideal, or equal.

2.11 CONDUIT THREAD LUBRICANT

- A. Thread lubricant shall be conductive with anti-seize and anti-corrosion properties, compatible with steel and aluminum conduit materials. Manufacture: T&B CP8 KOPR-Shield; Robroy Threadcompound; or equal.

PART 3--EXECUTION

3.01 GENERAL

- A. Table C specifies the type of raceway required for each location and application. See RACESPEC descriptions at end of this section.

Table C

Location	Application/Condition	RACESPEC
Indoor noncorrosive	Exposed	GRS
Outdoor	Exposed	PGRS
Direct buried or encased in concrete	Power, control and signal circuits	PVC8
Direct buried or encased in concrete	Bends larger than 30 degrees	PGRS or FRP
Nonhazardous	Final connection to equipment	LFNC

FRP = Epoxy Fiberglass

3.02 CONDUIT

A. GENERAL:

1. The conduit systems, installation, and hazardous location fittings are specified herein.

B. INDOOR AND OUTDOOR CONDUIT SYSTEMS:

1. In general, Contractor shall be responsible for determining conduit routing that conforms to the specified installation requirements.
2. Conduit installation shall conform to the requirements of the RACESPEC sheets and the following specified installation requirements:
 - a. Exposed conduit: Install parallel or perpendicular to structural members and surfaces. Install conduit horizontally and allow minimum headroom of 7.5 feet.
 - b. Route two or more exposed conduits in the same general routing parallel with symmetrical bends.
 - c. Space exposed conduit installed on supports not more than 10 feet apart. Space multiple conduits in parallel and use framing channel.
 - d. Route conduit clear of structural openings and indicated future openings.
 - e. Provide conduits with flashed and watertight seals routed through roofs or metal walls.
 - f. Grout conduits into openings cut into concrete and masonry structures.
 - g. Cap conduits or plug flush conduits during construction to prevent entrance of dirt, trash, and water. Cap or plug empty conduits designated as "future", "spare", or "empty" and include a pulling line accessible at both ends. Use anti-seize compound on cap and plug threads prior to installation.
 - h. Install conduit flush with structural surfaces with galvanized couplings and plugs. Caps and plugs shall match the conduit system.
 - i. Terminate conduits that enter enclosures with fittings that match the NEMA rating of the enclosure.
 - j. Underground metallic or nonmetallic conduit that turn out of concrete, masonry or earth: Install a 90-degree elbow of PVC-coated rigid steel conduit before emergence above ground.
 - k. Conduits connected to electrical boxes or devices in locations subject to moisture/condensation shall be installed so moisture/condensation will not infiltrate the electrical box or device. The use of conduits or

other approved drain fittings shall be used to accomplish this requirement.

C. UNDERGROUND CONDUIT SYSTEM:

1. Excavation, backfilling, and concrete work shall conform to respective sections of these specifications. Underground conduit shall conform to the following requirements:
 - a. Concrete encased conduit shall have minimum concrete thicknesses of 2 inches between conduits, unless shown otherwise in an electrical detail.
 - b. Concrete encasement on exposed outdoor conduit risers shall continue to 3 inches above grade, with top crowned and edges chamfered.
 - c. Underground conduit bend radius shall be not less than 2 feet minimum at vertical risers and shall be not less than 3 feet elsewhere.
 - d. Where conduit and concrete encasement are terminated underground, the conduit shall extend at least 2 feet past the concrete. Conduits shall be capped and threads protected.
 - e. Underground conduits and conduit banks shall have 2 feet minimum earth cover unless otherwise shown.
 - f. Conduits not encased in concrete and passing through walls with one side in contact with earth shall be sealed watertight with special rubber gasketed sleeve and joint assemblies or with sleeves and modular rubber sealing elements.
 - g. Thoroughly swab conduits and raceways on the inside, immediately upon completion of pouring concrete.
 - h. Label raceways in accordance with Section 26 05 00.
 - i. After the concrete has set and before backfilling, pull a mandrel through each conduit. The mandrel shall have a diameter equal to the nominal conduit inside diameter minus 1/2 inch and shall not be less than 4 inches long.
 - j. If the mandrel showed signs of protrusions on the inside of the conduit, the conduit shall be repaired or replaced.
 - k. Provide manufactured plastic conduit spacers anchored to prevent movement during the concrete pour. Manufacture: Carlon, PW Pipe, Underground Devices, or equal.
 - l. Form the concrete pour ten feet from the wall, manhole, or handhole and form to allow for future conduit entry.
 - m. Backfill duct banks with clean fill compacted to 90-percent in 6-inch lifts after concrete has cured. Refer to Section 03 30 00 for concrete

requirements including minimum 7 days of cure time prior to backfill over duct banks.

- n. Allow and provide for two offsets per conduit and raceway for each 100-linear feet to account for unexpected field conditions including for excavation and backfill limited to three feet of extra width and/or depth. Include these specified provisions in the bid price.
- o. Provide PVC threaded adapter with female threads where PVC conduit is joined to steel conduit. Procedure:
 - 1) Before assembly: Double coat steel conduit with Red-Robroy, Green-Permacote, Blue-Ocal or equal product.
 - 2) After assembly: Seal with 65-mil thick, 2-inch wide mastic sealing tape to 1/2 inch beyond threads. Products: 3M Scotch 2228; Plymouth 02625; or equal.
 - 3) Cover with 20-mil corrosion protection tape applied in 1/2-lap layers to 2-inch beyond threads. Products: 3M Scotchwrap 51; Plymouth Plywrap 12; or equal.
- p. Provide PVC conduit with bell ends where duct banks terminated at walls, manholes, or handholes. Install bell ends flush with finished concrete.
- q. Provide PVC conduit with bell ends where conduit rise below grade into a floor mounted electrical panel, electrical cabinet, MCC, switchboard, or switchgear.
- r. Separate power conduits from signal conduit within the same ductbank by 12 inches or greater separation, as shown. Refer to the drawings or schedules for signal to be installed in metal conduits instead of PVC ducts.
- s. Separate high voltage ductbanks from low voltage ductbanks, as shown.
- t. Provide wireways for transition from underslab conduits rising into wall-mounted panels where the number of conduits exceed the NEC allowable panel space in the bottom of the panel. Provide conduit sleeves or fitting for panel transition. Continuous thread or all-thread is prohibited.

3.03 MANHOLES AND HANDHOLES

- A. Unless otherwise specified, manhole and handhole installation shall be as follows:
 - 1. Manholes, handholes, and pull boxes shall be set on a minimum of 6 inches of crushed rock on top of undisturbed or compacted earth.

2. Manholes and handholes shall be set plumb so that water shall drain to the sump.
3. Manhole covers shall be 36-inches in diameter and set at 2 inches above finish grade with surrounding pavement sloping away from the manhole cover.
4. Metallic hardware inside manholes and handholes shall be bonded to the ground plate or ground bus using bolted connections, bonding jumpers and grounding bushings.

3.04 RACEWAY NUMBERING

- A. Each new and reused conduit shall be provided with a number tag at each end and in each manhole, handhole, or pull box.

3.05 RACEWAY SCHEDULE

A. GENERAL:

1. Raceway are scheduled on the drawings.

B. UNSCHEDULED RACEWAY:

1. With the exception of lighting, communication, paging, and receptacle circuits, the type and size of raceway shall be as specified on the drawings or schedules.
2. Unscheduled lighting and receptacle raceways shall be sized by the Contractor in accordance with the NEC. Minimum size shall be 3/4 inch for exposed and 1 inch for embedded raceway.

3.06 RACESPEC SHEETS

- A. The following RACESPECS are included in this section:

3.06 RACEWAY SPECIFICATION SHEETS (RACESPEC)

Raceway Identification:	GRS
Description:	Galvanized Rigid Steel Conduit (GRS)
Compliance:	ANSI and UL
Finish:	Hot-dip galvanized after fabrication, inside and outside. Smooth finished surfaces.
Manufacturers:	Allied Tube and Conduit Corp., Wheatland Tube Co., or equal.
Minimum size:	Unless otherwise specified, 3/4 inch for exposed, 1 inch for embedded, encased, or otherwise inaccessible.
Fittings:	
Locknuts, Rings, Hubs:	Hot-dip galvanized insulated throat with bonding locknut or ring. The hubs shall utilize a neoprene "O" ring and provide a watertight connection. O-Z Gedney, CHM-XXT, or equal
Unions:	Electro-galvanized ferrous alloy type Appleton UNF or UNY, Crouse-Hinds UNF or UNY, or equal. Threadless fittings are not acceptable.
Conduit Bodies:	Oversized conduit bodies: Ferrous alloy type with screw taps for fastening covers to match the conduit system. Gaskets shall be made of neoprene.
Boxes:	
Indoor:	Type FD cast ferrous for all device boxes and for junction boxes less than 6 inches square.
Outdoor:	Type FD cast ferrous for all device boxes and for junction boxes less than 6 inches square.

3.06 RACEWAY SPECIFICATION SHEETS (RACESPEC)

Raceway Identification: GRS (continued)

Corrosive: NEMA 4X stainless steel or nonmetallic, as specified.

Hazardous: NEMA Class 7 cast ferrous.

Elbows:

(3/4" thru 1-1/2") Factory fabricated or field bent.

(2" thru 6") Factory fabricated only.

Conduit Bodies (Oversized):

(3/4" thru 4") Malleable iron, hot-dip galvanized, unless otherwise noted. Neoprene gaskets for all access plates. Tapered threads for conduit entrances.

(5" and 6") Electro-galvanized iron or cast iron box.

Expansion Fittings: Expansion fittings in embedded runs shall be watertight with an internal bonding jumper. The expansion material shall be neoprene allowing for 3/4-inch movement in any direction.

Manufacturers: Appleton, Crouse-Hinds, Hubbell, O. Z. Gedney, or equal.

Installation: Rigid steel conduit shall be made up tight and with conductive thread compound. Joints shall be made with standard couplings or threaded unions. Steel conduit shall be supported away from the structures using hot-dip galvanized malleable iron straps with nesting backs or framing channel.

Conduit entering boxes shall be terminated with a threaded hub with a grounding bushing.

Paint all threads of galvanized conduits with zinc-rich paint before assembling. Exposed male threads on rigid steel conduit shall be coated with zinc-rich paint.

3.06 RACEWAY SPECIFICATION SHEETS (RACESPEC)

Raceway Identification:	LFNC
Description:	Liquidtight Flexible Nonmetallic Conduit
Application:	Final connection to equipment subject to vibration or adjustment.
Compliance:	UL 1660
Construction:	Liquidtight flexible Nonmetallic Conduit shall have a smooth inner surface with integral reinforcement within the conduit wall and be designated as a Type LFNC-B . Liquidtight Flexible Nonmetallic Conduit shall be flame resistant and when used with listed fittings, is approved for the installation of electrical conductors. Liquidtight Flexible Nonmetallic Conduit shall be marked "DIRECT BURIED" for outdoor applications exposed to sunlight and weathering conditions (do not bury).
Minimum size:	3/4 inch
Fittings:	Approved fittings for use with liquid flexible non-metallic conduit. O-ring seals around the conduit and box connection. Provide forty-five and ninety degree fittings where applicable.
Installation:	Use 18-inches minimum, 72-inches maximum lengths. Install as recommended by manufacturer.

3.06 RACEWAY SPECIFICATION SHEETS (RACESPEC)

Raceway Identification:	PGRS
Description:	Rigid Steel Conduit, Corrosion-Resistant, Polyvinyl Chloride (PVC) Coated. Provide factory made and coated elbows.
Compliance:	ANSI, ETL and UL. The PVC coated rigid galvanized steel conduit shall be stamped with the ETL Verification Mark "ETL Verified to PVC-001".
Finish:	PGRS shall be hot-dip galvanized rigid steel conduit as specified in 26 05 33-3.03 GRS, with a PVC Coating. The PVC coating shall be gray, minimum 40 mils thick, bonded to the outside and continuous over the entire length of the conduit except at the threads, and be free of blisters, bubbles, or pinholes. Thread protectors shall be used on the exposed threads of the PVC coated conduit. A 2-mil coat of urethane enamel coating shall be bonded to the inside. Coating shall be free of pinholes. Bond strength shall exceed the tensile strength of the PVC coat.
Minimum size:	3/4 inch
Fittings:	Similarly coated to the same thickness as the conduit and provided with Type 316 stainless steel hardware. Conduit and fittings shall be manufactured by the same company. Conduit and fittings shall be coated by the same company. Male threads on elbows and nipples, and female threads on fittings or conduit couplings shall be protected by application of urethane coating.
Covers:	PVC coated covers shall have V-groove seal and stainless steel hardware.
Hubs:	Hubs for connection of conduit to junction, device, or terminal boxes shall be threaded cast ferrous alloy. Hubs shall have the same PVC coating as the conduit and insulating grounding bushings. Hubs shall utilize a neoprene "O" ring and shall provide a watertight connection.

3.06 RACEWAY SPECIFICATION SHEETS (RACESPEC)

Raceway Identification: PGRS (continued)

Boxes:

Nonhazardous: NEMA Class 4X stainless steel or nonmetallic.

Hazardous: NEMA Class 7 cast ferrous.

Manufacturers: PVC coated conduit that bears the ETL Verified PVC-001 label by Robroy Industries, Plasti-Bond, Perma-Cote, KorKap or equal.

Installation: Plastic coated conduit shall be made up tight, threaded, and installed using tools approved by the PVC-coated conduit manufacturer.

Exposed conduit threads shall be covered by a plastic overlap coated and sealed per manufacturer's recommendations.

Pipe wrenches and channel locks shall not be used for tightening plastic coated conduits. Damaged areas shall be patched, using manufacturer's recommended material. The area to be patched shall be built up to the full thickness of the coating. Painted fittings are not acceptable.

PVC coated conduit shall be supported away from the structure using PVC coated conduit wall hangers or PVC coated conduit mounting hardware.

Damaged work shall be replaced

Training: Installers shall be trained and certified in the proper installation techniques provided by the PVC-coated conduit system manufacture. Proof of certification shall be provided under Paragraph 26 05 33-1.03.

3.06 RACEWAY SPECIFICATION SHEETS (RACESPEC)

Raceway Identification:	PVC8
Description:	Rigid Nonmetallic Conduit
Application:	Extra heavy wall thickness for locations including direct bury under roadways where not exposed to traffic damage and surface mounted in corrosive areas.
Compliance:	NEMA TC2, UL 651
Construction:	Schedule 80, high-impact, polyvinylchloride (PVC)
Minimum size:	3/4 inch exposed; 1 inch embedded or encased
Fittings:	PVC solvent weld type
Boxes:	
Indoor:	NEMA Class 4X, nonmetallic
Outdoor and corrosive:	NEMA Class 4X, nonmetallic
Installation:	Exposed PVC conduit shall be run on supports spaced: <ul style="list-style-type: none">a. 3 feet apart for conduits up to 1 inch.b. 5 feet apart for conduits 1-1/4 inches to 2 inches.c. 6 feet apart for conduits 2 1/2 inches and larger.d. PVC conduit not provided where damaged by heat.e. Bell ends where terminated at walls, boxes and electrical cabinets and control panels.

3.06 RACEWAY SPECIFICATION SHEETS (RACESPEC)

Raceway Identification:	WW
Description:	Wireway and Auxiliary Gutter: Match the conduit or raceway system specified and shown on the drawings. Minimum: Flanged, oiltight type with hinged covers
Application:	As shown on the drawings.
Compliance:	JIC EMP-1
Sizes as shown:	4 inch by 4 inch, 6 inch by 6 inch, 8 inch by 8 inch
Finish:	Hot-dip galvanized after fabrication, inside and outside. Smooth finished surfaces.
Indoor non-corrosive area:	NEMA-1, NEMA-12, NEMA-4 or as shown on the drawings.
Outdoor and corrosive area:	NEMA-3R, NEMA-4X or as shown on the drawings.

END OF SECTION

3.06 RACEWAY SPECIFICATION SHEETS (RACESPEC)

Raceway Identification:	WW
Description:	Wireway and Auxiliary Gutter: Match the conduit or raceway system specified and shown on the drawings. Minimum: Flanged, oiltight type with hinged covers
Application:	As shown on the drawings.
Compliance:	JIC EMP-1
Sizes as shown:	4 inch by 4 inch, 6 inch by 6 inch, 8 inch by 8 inch
Finish:	Hot-dip galvanized after fabrication, inside and outside. Smooth finished surfaces.
Indoor non-corrosive area:	NEMA-1, NEMA-12, NEMA-4 or as shown on the drawings.
Outdoor and corrosive area:	NEMA-3R, NEMA-4X or as shown on the drawings.

END OF SECTION

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DIVISION 31 – EARTHWORK

SECTION 31 00 00

EARTHWORK

PART 1—GENERAL

1.01 DESCRIPTION

A. SCOPE:

1. This section specifies earthwork that consists of excavation, filling, grading, disposal of excess material, and control of water.

B. DEFINITIONS:

1. **COMPACTION:** The degree of compaction is specified as percent compaction. Maximum densities refer to dry soil densities obtainable at optimum moisture content.
2. **EXCAVATION SLOPE:** Excavation slope shall be defined as an inclined surface formed by removing material from below existing grade.
3. **EMBANKMENT SLOPE:** Embankment slope shall be defined as an inclined surface formed by placement of material above existing grade. The new dikes have embankment slopes.
4. **ORGANIC SOLIDS:** Organic material also referred to as sludge that has accumulated in the lagoon as a result of routine lagoon operations. Organic solids are deemed by the Owner's Representative to be unsuitable as a base for dike construction or liner placement. Organic solids in the lagoons typically have organic matter content greater than 20 percent.

1.02 QUALITY ASSURANCE

A. REFERENCES:

1. This section contains references to the miscellaneous documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and the listed documents, the requirements of this section shall prevail.
2. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization,

references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, whether or not the document has been superseded by a version with a later date, discontinued or replaced.

Reference	Title
ASTM D422	Standard Method for Sieve Analysis of Soils
ASTM D1557	Test Methods for Moisture/Density Relations of Soils and Soil-Aggregate Mixtures Using 10-lb (4.5-kg) Rammer and 18-in. (457-mm) Drop
ASTM D6938	Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
ASTM D2419	Standard Test Method For Sand Equivalent Value of Soils and Fine aggregate
ASTM C136	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM D2974	Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils
ODOT	Oregon State Department of Transportation "Std Specifications for Highway Construction"

B. TESTS:

1. The Owner's Representative will take samples and perform moisture content, gradation, compaction, and density tests during placement of backfill materials to check compliance with these specifications. The Contractor shall remove surface material at locations designated by the Owner's Representative and provide such assistance as necessary for sampling and testing. The Owner's Representative may direct the Contractor to construct inspection trenches in compacted or consolidated backfill to determine that the Contractor has complied with these specifications. Payment for inspection trenches not identified in the Contract documents shall be determined as specified in Section 00 72 00.
2. Tests will be made by the Owner's Representative in accordance with the following:

Test	Standard Procedure
Moisture Content and Density-in-place	ASTM D6938
Gradation	ASTM C136
Moisture Density relationships	ASTM D1557

1.03 SUBMITTALS

- A. The following submittals shall be provided in accordance with Section 01 33 00:
1. Samples of fill materials to be used shall be submitted 2 weeks in advance of use. Sample size shall be in conformance with ASTM C136. The standard 0.5 cubic feet may not be adequate for all soil types proposed.
 2. List of material properties of the geotextile.
 3. One 6 foot strip of each geotextile considered for use, the full width of the roll, and not closer than 10 feet from the end of the roll
 4. A detailed dewatering plan to control seepage from the base and sides of Cells 1 and 2 as per 31 00 00-3.01.A.

PART 2--MATERIALS

2.01 FILL MATERIALS

A. TYPE J:

1. Type J material shall be unclassified material which is free from organic solids, peat, wood, roots, bark, organic, debris, garbage, rubbish or other deleterious material. The maximum size of stone shall not exceed 4 inches. The maximum organic content shall be 5 percent by dry weight. If the material excavated from the site meets these requirements, it may be classified as Type J.

B. TYPE C:

1. Type C material shall be mineral soil which is free from peat, wood, roots, bark, debris, garbage, rubbish, and other extraneous materials. The maximum size particle shall not exceed 4 inches in diameter. The maximum organic content shall be 5 percent by dry weight.

C. TYPE A:

1. Type A material shall be hard, sound, durable mineral soil that conforms to the following gradation. It shall not contain organic solids, organic or other deleterious material. At least 75 percent of all particles larger than 1/4 inch must have at least one fracture face.

U.S. standard sieve size	Percent by weight passing
1 inch	100
3/4 inch	90 - 100
1/2 inch	70 - 95
1/4 inch	40 - 80
No. 10	15 - 50
No. 40	5 - 25
No. 200	0 - 10

D. TYPE F:

1. Type F material shall be composed of hard, durable, sound mineral soil having a specific gravity of not less than 2.65. Type F material shall not contain lagoon solids, organic or other deleterious material. At least 75 percent of all particles larger than 1/4 inch must have at least one fracture face. The material must conform to the following gradation:

U.S. standard sieve size	Percent by weight passing
1-1/2 inch	100 - 100
3/4 inch	45 - 100
No. 4	20 - 50
No. 20	10 - 30
No. 200	0 - 12

E. TYPE D:

1. Type D material shall be hard, sound, durable stone that has been crushed or is rounded and shall conform to the following gradation:

U.S. standard sieve size	Percent by weight passing
1-1/2 inch	100
1-1/4 inch	90 - 100
3/4 inch	0 - 15
1/2 inch	0 - 2

F. TYPE H:

1. Type H material shall be hard, sound, durable stone that has been crushed or partially crushed to achieve a gradation conforming to the following:

U.S. standard sieve size	Percent by weight passing
4 inch	100
2 inch	50 – 85
1 inch	20 – 65
1/4 inch	0 – 30
No. 40	15 max.
No. 200	5 max.

G. TYPE B:

1. Type B material shall be a select granular material free from organic matter and of such size and gradation that the specified compaction can be readily attained. Material shall have a sand equivalent value determined in accordance with ASTM D2419 of not less than 20 and shall conform to the following gradation:

U.S. standard sieve size	Percent by weight passing
3 inch	100
No. 4	35 - 100
No. 30	20 - 100

2.02 SUBGRADE GEOTEXTILE

- A. Geotextile shall be used in conjunction with roadways, structural fill, over excavation, in pipe trenches and under pavement and structures. It shall be installed over the prepared subgrade prior to placing rock for road construction and structural fill, and installed when conditions warrant over excavation. In addition, it shall be required to separate sandy soils from Class A1 or F1 fill in pipe trenches under pavement and under structures. The geotextile shall be a woven polypropylene or polyester fabric with the following properties.

Property	Test method	Limitation
Grab Tensile	ASTM D4632	200 lb min
Puncture	ASTM D4833	90 lb min
Trapezoidal Tear	ASTM D4533	75 lbs
Permittivity	ASTM D4491	4 (gal/min/ft ²) min

- B. Installation and material shall conform to ODOT “Standard Specifications for Highway Construction”.

2.03 FILTER FABRIC GEOTEXTILE

- A. Filter Fabric Geotextile shall be used as indicated on the drawings. It shall be a polypropylene needle punched non-woven geotextile.

Property	Test method	Limitation
Grab Tensile	ASTM D4632	100 lb min
Puncture	ASTM D4833	65 lb min
Trapezoidal Tear	ASTM D4533	45 lbs
Permittivity	ASTM D4491	145(gal/min/ft ²) min
AOS	ASTM D4751	#70 or smaller opening size

2.04 GEOGRID REINFORCEMENT

- A. The geogrid shall be Tensar UX1100 or another uniaxial extruded high-density polypropylene geogrid with equal or smaller aperture dimensions, and an equal or higher long-term strength.

Property	Test method	Limitation
Long-term design strength	ASTM D4595 GRI GG4	1200 lb/ ft

PART 3—EXECUTION

3.01 GENERAL

A. CONTROL OF WATER:

1. The Contractor shall keep excavations and the lagoon bottom free from water during excavation. No standing water is allowed above the bottom grade during placement of the subgrade, subliner or liner. The static water level shall be drawn down and maintained at a minimum of 1 foot below the bottom of excavations to maintain the undisturbed state of natural soils, facilitate drying organic solids, allow the placement of fill to the specified density, allow compaction of existing subgrade soils, prevent liner uplift, and allow installation and testing of the liner. The water shall be pumped to either the adjacent lagoon cell or the supernatant return system. The Contractor shall have on hand supplemental pumping equipment in good working condition for emergencies and labor available for its operation. Dewatering systems shall operate continuously until dried solids have been removed, backfill has been completed, liner systems have been installed, tested, and accepted and the Owner has filled the lagoon cell or monofill above the elevation of the ambient groundwater elevation.

Prior to beginning work, the Contractor shall submit a detailed plan of his proposed dewatering system for review. It shall show the arrangement and location of wells and/or sumps, methods of construction, locations of headers and discharge lines, and points of discharge. Pumping shall be done in a manner to minimize the transfer of solids from the area being pumped to the receiving water. Review by the Owner's Representative shall not relieve the Contractor of responsibility for the adequacy of the dewatering system to achieve the specified results.

2. The Contractor shall limit the rate delivered to the supernatant system from the north lagoon cells to 900 gpm unless given permission from the Owner's Representative.
3. Anticipated soil properties for use in the dewatering system design can be found in the geotechnical report. The report is included in Volume 4 Appendix. Historical groundwater levels have also been included in Volume 4 Appendix.
4. The Contractor shall be responsible for and shall repair without cost to the Owner any damage to work in-place, the excavation, or the liner due to uplift due to inadequate or improper installation, maintenance and operation of the dewatering system.

B. OVER EXCAVATION:

1. Where the undisturbed condition of natural soils is inadequate for support of the planned construction, the Owner's Representative will direct the Contractor to excavate to adequate supporting soils. The excavated space shall be filled to the specified elevation with appropriate backfill materials as specified in Table A. The over excavated space under footings may be filled with concrete. The quantity and placement of such material will be paid for as extra work, provided such over excavation requirement is not the result of inadequate groundwater control measures (see 31 00 00-3.01.A).

C. SURPLUS MATERIAL:

1. Unless otherwise specified, surplus excavated material that is suitable for other uses shall be stored at a designated site in accordance with applicable ordinances and environmental requirements. Surplus material shall be stored at a location designated by the Owner's Representative.
2. If the quantity of surplus material is specified in the construction documents, the quantity specified is approximate. The Contractor shall satisfy himself that there is sufficient material available for the completion of embankments before disposing of any suitable material. Premature disposal of suitable

material that could be subsequently used for construction shall be replaced by the Contractor at his expense.

3. Material shall not be stored at a depth greater than 5 feet above finished grade within 25 feet of any excavation, fill slope, or structure except for any areas designated to be pre-consolidated. The Contractor shall maintain stability of the soil adjacent to any excavation.
4. If at the end of the project there is surplus material it shall be the responsibility of the Contractor to dispose of it without cost to the Owner.

D. BORROW MATERIAL:

1. Excavated materials meeting the requirements for Type C or Type J material may be used for dike construction.

E. HAULING:

1. When hauling is done over highways or city streets, the loads shall be trimmed and the vehicle shelf areas shall be cleaned after each loading. Dry loads shall be watered after trimming to prevent dust.

F. HAUL ROADS:

1. The Contractor shall construct haul roads required to transport materials on site. Alignment of haul roads shall be selected to avoid interference with plant operations. Haul roads that interfere with CBWTP operations, liner placement, or other construction shall be removed after completion of embankment construction.
2. The existing dike access roads will be used as haul roads for this contract. The southernmost dike perimeter road has been paved and serves as a public trail. Other portions have been maintained or improved using various materials such as chip seal. This road was built for maintenance traffic loads and may not support heavy truck traffic without damage. Any damage to these roads resulting from construction shall be repaired to the original condition by the Contractor at no expense to the Owner.
3. The Contractor shall maintain the existing dike access roads as required during the work and return the haul roads to the original condition at the completion of construction.
4. Subgrade Geotextile and 8 inches of Type F material were placed on the haul roads surrounding the lagoons under the previous phase of this project; any road surfaced damaged or degraded during construction shall be rebuilt to the same specification (see next item). Haul road surfaces shall be graded smooth and drain toward the lagoon.

5. Where temporary haul roads are to be constructed or where existing haul roads are to be repaired, the subsurface shall be graded smooth and compacted prior to placement of geotextile and gravel. Geotextile shall be laid on the surface over the full width to be trafficked plus at least 2 feet on either side. Geotextile joints shall be overlapped a minimum of 2 feet. A minimum of 8 inches of Type F material shall be placed over the geotextile and compacted in accordance with these Specifications. The Contractor may use other reinforcing materials such as a geogrid or cement modified Type F material with the approval of the Owner's Representative.

G. FINISH GRADING:

1. Finished surfaces shall be smooth, compacted and free from irregularities. The degree of finish shall be that normally obtainable with a blade-grader.
2. Finished grade shall be as specified by the contours plus or minus 0.10 foot except where a local change in elevation is required, or to ensure proper drainage. When the work is at an intermediate stage of completion, the lines and grades shall be as specified plus or minus 0.5 foot and shaped to provide adequate drainage.
3. The bottom of each lagoon cell shall be finish graded with a minimum 2 percent uniform slope from the toe of the dike to the low point in the cell as shown on the contract drawings. Slopes shall be verified at points 25 feet on center. The cell bottom shall also conform to paragraph 3.09 of this section for subgrade under the geomembrane liner.

H. CONTROL OF EROSION:

1. The Contractor shall maintain earthwork surfaces true and smooth and protected from erosion. Where erosion occurs, the Contractor shall provide fill or shall excavate as necessary to return earthwork surfaces to the grade and finish specified.

3.02 CLASSIFICATION OF FILL

- A. Fill material shall be placed in horizontal layers and compacted with power-operated tampers, rollers, idlers, or vibratory equipment. The contractor is responsible for choosing the appropriate compaction equipment and techniques. Material type, maximum layer depth, percent compaction, and general application are specified in Table A. Unless otherwise specified, fill classes shall be used where specified in Table A under general application.

Table A. Fill Classifications

Fill class	Material type	Maximum uncompressed layer depth, inches	Minimum compaction, percent*	General application
J1	J	8	92	Dike construction material;
			90	Fill for lagoons cells
			---	Monofill top cover material
D1	D	---	95	Material surrounding drains
A1	A	12	95	Bedding for pipe, initial pipeline backfill, slabs on grade.
			90	8" Bedding for all surfaces to receive geomembrane
F1	F	12	95	Surfacing for top of dike
C1	C	8	92	Dike construction material;
			90	Fill for lagoon cells
			---	Monofill top cover material
H1	H	12	95	Backfill for foundation stabilization
H2	H	12	90	Backfill for cell bottom stabilization
B2	B	8	92	J trench backfill materials to anchor liner
Native	Native	8	90	Native material for grading bottom of cells

*Except for Dike Construction, the Owners Representative may allow a method specification based on a field demonstration using Contractor-proposed equipment and number of passes to achieve a level of compaction equivalent to the specified percentages above.

3.03 EARTHWORK FOR STRUCTURES

A. STRUCTURE EXCAVATION:

1. The bottom shall not be more than 0.15 foot above or below the lines and grades specified. If the elevation of structure excavation is not specified, the excavation shall be not more than 0.15 foot above or below the elevation specified for fill material below the structure.
2. Should the excavation be carried below the lines and grades specified on the drawings or should the bottom of the excavation be disturbed because of the Contractor's operations and require over excavation and backfill, the Contractor shall refill such excavated space to the proper elevation in accordance with the procedure specified for backfill. The cost of such work shall be borne by the Contractor.
3. Unless otherwise specified, excavations shall extend a sufficient distance from walls and footings to allow for placing and removal of forms, installation of services, and for inspection, except where concrete is specified to be placed directly against excavated surfaces.

B. NOT USED

C. NOT USED

3.04 EARTHWORK FOR PIPELINES AND CONDUITS

A. Earthwork for pipelines and conduits is specified in paragraph 31 00 00-3.02, Table A and in the contract drawings.

3.05 EARTHWORK FOR EXISTING SIDE SLOPES AND CELL BOTTOMS

A. Remove organic material from existing side slopes. Remove any sharp objects, debris, and rocks greater than 4-inches from side slopes. Re-grade to a 2:1 slope as shown on the drawings and compact as necessary. Place 8-inches of Fill Class A1 material on top of the graded slopes.

B. Remove organic material from the existing pond bottom. Remove all sharp objects, debris, and rocks greater than 4-inches. Re-grade and compact the native material as shown on the drawings. Place and compact import material as needed to achieve the contours shown and compact as necessary to the satisfaction of the Owner's Representative. Where fill is not required, compact existing native material after cutting to subgrade. Place 8-inches of Fill Class A1 material on top of the graded and compacted bottoms.

3.06 EARTHWORK FOR DIKES

A. Dike 1 will be constructed after the lagoon has been drained and the dewatering system placed in operation. The fill classification for dike construction is as specified in paragraph 3.02.

B. On-site soils excavated from the lagoon site or soils excavated from neighboring sites are likely to contain high proportions of silt and clay. These soils shall only be used if the required compaction can be achieved and will likely require air-drying prior to use. It is the contractor's choice whether to use on-site soils, moisture condition them, and compact them, or to dispose of the existing soils off site and import fill materials to be moisture conditioned and compacted. The bid quantities assume using on-site materials.

C. Organic lagoon solids shall be removed from the area of the dike foundation prior to placing fill. Existing soils, including soils within a submerged dike, must be removed to Elevation 10' or lower for assessment of subgrade to support dike construction. The initial lift of fill may be a working surface that is between 12 and 18 inches thick consisting of Class H2 material. Fill shall be placed from this working surface to the extent possible to minimize disturbance of subgrade. If necessary, the Contractor may elect to use lime, lime-cement, geosynthetic products, or other means to stabilize the subgrade prior to fill placement. These activities,

including preparation of a working surface shall be included in the single bid-item, "*Import Material and Construct Dike 1*".

- D. Fill soils should be dried or moisture conditioned to within 3 percent of optimum moisture content, placed in loose, horizontal lifts no greater than 8 inches in thickness, and compacted to 92 percent of their maximum dry density as determined by ASTM D-1557 (Modified Proctor).
- E. It is anticipated that Dike 1 will settle an average of 12 to 20 inches. Ninety percent of the settlement is estimated to occur between 3 and 4 years following fill placement. The Contractor shall maintain settlement monitoring equipment during and following construction in accordance with paragraph 3.08.
- F. The bid shall be based on an average of 16 inches of settlement across the bottom of the dike. The Contractor must add more fill if necessary. The percentage of settlement that occurs during placement will be dependent on the Contractor's rate of progress.
- G. Placement of the bedding under the geocomposite shall be initiated after the dikes have been allowed to settle. If greater than 8 inches of settlement has occurred since the dikes were completed and the sides dressed, then build up the dike with Class C1 or J1 material to its design slope before placing the A1 material.
- H. The construction of Dike 1 must be completed by the end of the second construction season to allow sufficient time for dike settlement prior to final surfacing.

3.07 NOT USED

3.08 SETTLEMENT MONITORING

- A. The new dike will be monitored for settlement by the Owner's Representative during and following construction. Settlement plates, installed and maintained by the Contractor, shall be placed at the four locations shown on Sheet C2. The plates shall be consistent with the detail provided in the Drawings. The steel plates shall be placed on the ground surface before any construction is done and initial readings shall be made before any fill is placed within 30-feet of the settlement plate. A sample settlement plate should be presented to the Owner's Representative for approval prior to placement. Fill shall be placed and compacted around riser pipes keeping the pipe within 1 inch in 10 feet of vertical at all times. The Contractor is responsible for the integrity of the settlement plates and for making it possible for the Owner's Representative to monitor them.

3.09 SUBGRADE UNDER LINER SYSTEMS

- A. The bottom and side slopes of the cells to be lined shall be prepared and maintained in accordance with these specifications and the manufacturer's and

installer's recommendations. The subliner shall be placed on fill as shown on the drawings.

- B. The surface shall be compacted in accordance with the specified class of material. If movement of vehicles and welding equipment over the surface causes rutting or other harmful effects, the contractor will restore the surface to a smooth, compacted condition prior to liner material placement. The subgrade shall have no sudden sharp or abrupt changes in grade.
- C. The subgrade shall be constructed such that fill on the subgrade shall have a permeability that is greater than or equal to that of underlying native soil. This requirement extends to the use of any lime for soil stabilization or compaction during placement.
- D. The Contractor shall protect the subgrade from becoming too dry, flooding, or freezing. Protection, if required, may consist of a thin plastic protective cover (or other material approved by the Owner's Representative) installed over the subgrade until placement of the liner begins. Subgrade found to have cracks greater than 1/2 inch in width or depth or which exhibit swelling, heaving, or other similar conditions shall be reworked by the Contractor.
- E. The liner installer shall provide written notice when the subgrade is acceptable for liner installation. This acceptance will be limited to the amount of area that the liner installer is capable of lining in a single work shift. Subsequent repairs of the subgrade shall be required and remain the responsibility of the Contractor.

3.10 GEOMEMBRANE LINER ANCHOR TRENCH (J TRENCH)

- A. The anchor trench as shown on the Contract Drawings shall be excavated by the Contractor to the lines and widths shown on the drawings prior to geomembrane installation. The line of the anchor trenches leading edge shall be straight and smooth to provide continuous contact and uniform support for the liner.
- B. Anchor trenches excavated in clay soils susceptible to desiccation cracks should be excavated only the distance required for that day's liner placement to minimize the potential for cracking of clay soils.
- C. Corners in the anchor trench shall be slightly rounded (approximately a 6 inch radius) where the geomembrane enters the trench to minimize sharp bends in the liner.

3.11 MEASUREMENT AND PAYMENT

- A. See Section 01 22 13 UNIT PRICE MEASUREMENT for measurement and payment information.

END OF SECTION

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SECTION 31 10 00

SITE CLEARING

PART 1 --GENERAL

1.01 DESCRIPTION

A. SCOPE:

1. This section specifies site preparation which consists of clearing, grubbing, and demolition.

B. EXISTING CONDITIONS:

1. The Contractor shall determine the actual condition of the site as it affects this portion of work.

C. PROTECTION:

1. Site preparation shall not damage structures, landscaping, or vegetation adjacent to the site. The Contractor shall repair, or replace any damaged property.

PART 2 --PRODUCTS (NOT USED)

PART 3 --EXECUTION

3.01 CLEARING AND GRUBBING

- A. Unless otherwise specified, the Contractor shall remove obstructions such as brush, trees, logs, stumps, roots, heavy sod, vegetation, rock, stones larger than 6 inches in any dimension, broken or old concrete and pavement, debris, and structures where the completion of the work require their removal.
- B. Material that is removed and is not to be incorporated in the work shall be disposed of off the site.

3.02 DEMOLITION AND REMOVAL

A. STRUCTURES:

1. Demolition and removal of structures consist of removal of abandoned superstructures, foundation walls, footings, slabs and any other structures. Excavations caused by existing foundations shall be cleared of waste, debris and loose soil, and refilled as specified.

B. PAVEMENT:

1. When portions of asphalt pavements and concrete pads are to be removed and later construction is to be connected, edges shall be saw-cut, on a neat line at right angles to the curb face.

C. SALVAGE:

1. The Owner has the right to salvage any items scheduled for demolition and removal. The Contractor shall notify the Owner's Representative 5 days prior to any demolition work to determine the disposition of items to be removed. The Owner's Representative will mark items to be salvaged. Such items shall be properly disconnected, removed from their foundations, cleaned, and stored at a location on the construction site as directed by the Owner's Representative.

D. RECYCLING OF MATERIALS:

1. The Contractor is encouraged to recycle all asphaltic products, concrete products, topsoil, steel, aluminum, copper, and other metals. Wood products should be chipped and combined with removed topsoil. Useable gravels are to be incorporated into the backfill if the material meets the applicable specification requirements.

3.03 UTILITY INTERFERENCE

- A. Where existing utilities interfere with the prosecution of the work, the Contractor shall relocate them in accordance with Section 00 72 00.

END OF SECTION

DIVISION 32 – EXTERIOR IMPROVEMENTS

SECTION 32 12 16

ASPHALT PAVEMENT

PART 1--GENERAL

1.01 SUMMARY

A. Section includes:

1. Asphalt concrete pavement for roadways, parking areas, and walkways on prepared aggregate base course or subgrade and pervious pavement for driveways and walkways, as shown on the Drawings.
2. Removal, preparation, and replacement of existing asphalt concrete pavement as required for the construction of buried utilities, new structures, or potholing that is part of the Work.
3. Removal, preparation, and replacement or repair of existing asphalt concrete pavement that is damaged by Installation Contractor's operations during the construction of the Work.

B. Related Sections. See Related Sections for additional requirements applicable to this Section (typical).

1. Section 31 00 00 – Earthwork.

1.02 REFERENCES

Reference	Title
ASTM D1557	Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-lb Rammer and 18-in Drop.
ASTM D5581	Test Method for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus
AASHTO T 27	Method for Sieve Analysis of Fine and Coarse Aggregate
AASHTO T 90	Test Method for Determining the Plastic Limit and Plasticity Index of Soils
AASHTO T 96	Test Method for Resistance to Abrasion of Small-Size and Large-Size Coarse Aggregate by Use of the Los Angeles Machine
AASHTO T 104	Test Method of for Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate

Reference	Title
AASHTO T 113	Test Method for Lightweight Pieces in Aggregate
AASHTO T 176	Test Method for Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test
ODOT	2008 Standard Specifications
ODOT	Standard Specifications for Asphalt Materials
	Supplemental Oregon Standard Specification for Construction

1.03 SUBMITTALS

- A. Product information shall be submitted in accordance with the requirements of Section 01 33 00.
- B. Product information for asphalt concrete pavement (aggregate materials, asphalt concrete mix design, and prime and tack coats) and pervious pavement (geotextile fabric, granular drainage blanket, hot mixed asphalt concrete [HMAC]). Minimum information shall include source of aggregates and asphalt, gradation, unit weight of mix design, gradation, air void content, and other test results needed for field testing by the Owner’s Representative.

PART 2–PRODUCTS

2.01 MATERIALS

- A. Asphalt Concrete Pavement for roadways and parking areas:
 - 1. Aggregate shall conform to the requirements of ODOT’s Standard Specifications Section 00745.12 and shall consist of crushed or uncrushed rock free of clay, loam or other harmful substances, meeting the following gradation per AASHTO T 27:

Fine Cover	
Sieve Size	Percent Passing (by Weight)
1 inch	100
3/4 inch	90-100
1/2 inch	90
No. 8	23-49
No. 200	2-8

2. Asphalt shall conform to the requirements of ODOT's Standard Specifications Section 00745.11.
 - a. Prime (tack) coat shall be MC-250 asphalt or CSS-1, CSS-1h, or CMS-2S emulsified asphalt.
 - b. Fog coat shall be CSS-1, CSS-1h or HFRS-P1 emulsified asphalt.
 - c. For every part emulsified asphalt, add not more than one part water. Add water at point of supply or point of application and mix with emulsified asphalt.
3. Asphalt or asphalt concrete component quantities not defined herein or specifically defined in the ODOT Standard Specifications shall be those typically used for high quality pavement products.

B. Pervious Pavement for driveways and walkways:

1. Geotextile Fabric shall conform to the requirements of ODOT's Standard Specifications Section 00350.
 - a. Woven or nonwoven geotextiles shall be composed of long chain, synthetic polymeric filaments or yarns formed into a stable network that retains its relative structure during handling, placement and design service life. At least 95 percent by weight of the long chain polymers shall be a polyolefin or polyester.
 - b. Geotextiles shall be free of any chemical treatment or coating which might significantly reduce permeability.
 - c. Geotextiles shall have the selvage finish so the outer fibers are prevented from pulling away from the fabric.
2. Granular Drainage Blankets shall conform to the requirements of ODOT's Standard Specifications Section 00360.
 - a. Granular drainage blanket material shall be clean, free draining, durable crushed or uncrushed rock, conforming to the following gradation limits determined by AASHTO T 27.

Fine Cover	
Sieve Size	Percent Passing (by Weight)
6 inch	100
4 inch	90 – 100
1/2 inch	60 – 80
No. 10	0 – 10
No. 100	0 – 5

3. HMAC pavement shall conform to the requirements of ODOT's Standard Specifications Section 00745. HMAC shall be a hot plant mixed, uniformly coated mixture of asphalt cement, graded aggregate and additives as required.

- a. Provide coarse and fine aggregates for HMAC for soundness testing using sodium sulfate salt according to AASHTO T104. The weighted average percentage of loss shall not exceed 12 percent by weight.
- b. Provide aggregate not exceeding the following maximum values:

Test	Test Method	Coarse Aggregates	Fine Aggregates
Abrasion	AASHTO T 96	30.0%	
Degradation (Passing No. 20 Sieve)	ODOT TM 208	30.0%	30.0%
Sediment Height	ODOT TM 208	3 inches	4 inches

Test	Test Method	Coarse Aggregates	Fine Aggregates
Lightweight Pieces	AASHTO T113	1.0%	
Wood Particles	ODOT TM 225	0.10%	
Elongated Pieces (at a ratio of 5:1)	ODOT TM 229	10%	
Plasticity Index	AASHTO T90		0 or NP
Sand Equivalent	AASHTO T176		45 min

- c. The broadband limits shall meet the following requirements:

3/4-inch Open Graded		
Sieve Size	Minimum Percent Passing by Weight	Maximum Percent Passing by Weight
1 inch	99	100
3/4 inch	85	96
1/2 inch	55	71
No. 4	10	24
No. 8	6	16
No. 200	1.0	6.0

- d. Asphalt cement shall be PG 64-11 or PG 70-22 and shall conform to ODOT's Standard Specification for Asphalt Materials.
- e. The Job Mix Formula (JMF) for the HMAC shall meet the requirements of the ODOT Standard Specifications Section 00744 for Level 2 HMAC.

4. Pervious pavement component quantities not defined herein or specifically defined in the ODOT Standard Specifications shall be those typically used for high quality pavement products.

PART 3—EXECUTION

3.01 CUTTING PAVEMENT

- A. Existing asphalt pavements to be removed shall be cut by a wheel cutter, clay spade, or other device capable of making a neat, reasonably straight, and smooth cut without damaging adjacent pavement that is not to be removed.
- B. The existing pavement shall be saw cut and trimmed off a minimum of an additional 6 inches on each side of the trench or pavement joint after placement of required base course material and just prior to placement of asphalt concrete for pavement replacement, and the trimmed edges shall be painted with a coating of prime coat immediately prior to constructing the new abutting asphalt pavements.
- C. All removed asphalt pavement material is the property and disposal responsibility of the Installation Contractor.

3.02 PAVEMENT INSTALLATION

- A. The construction of pavements of asphalt concrete and pervious pavement shall conform to the requirements of the ODOT Standard Specifications and upon completion the pavement shall be true to grade and cross sections.
- B. The Installation Contractor shall not pass equipment over any pipe, drain, utility line, duct or structure before it is protected by ample fill material, properly compacted. Any damage to such facilities shall be promptly repaired by the Installation Contractor at its own expense.
- C. The subgrade shall be brought to the required grades and cross sections by excavating, filling, blading, and compacting as specified.
- D. Asphalt concrete and pervious pavement shall be constructed only when the surface is dry, when the atmospheric temperature in the shade is 40 degrees F (4 degrees C) and rising or above 50 degrees F (10 degrees C) if falling. No asphalt concrete or pervious pavement shall be placed when the weather is foggy or rainy or when the base on which the material is to be placed is in a wet or frozen condition.
- E. Base and subbase materials shall be bladed to a smooth surface and shall be compacted to 95 percent relative compaction as determined by ASTM D1557. Subgrade for pavement shall not vary more than 0.05 feet (1.5 cm) from the

specified road grade.

- F. Asphalt concrete shall be plant mix having a minimum overall thickness of 3.5 inches unless greater thicknesses are shown on the Drawings. Compact the asphalt concrete to at least 95 percent of the relative compaction achieved by a specimen of the same mix design subjected to 75 blows per ASTM D5581.
- G. All existing asphalt pavement to be paved over or against shall receive a tack coat at a rate of 0.1 gallons per square yard (0.46 liters per square meter).
- H. The total width of the accepted aggregate base material shall receive a bituminous prime coat at the rate of 0.25 gallons per square yard (1.14 liters per square meter). Application shall conform to ODOT Standard Specifications. Adjacent ground, structures, curbing, and fencing shall be protected from spraying operations.
- J. When asphalt concrete is to be applied over existing pavement and local irregularities (with only very minor damage) in the existing surface would result in a course of more than specified thickness, the surface of the existing pavement shall be brought to uniform contour by patching with asphalt concrete, thoroughly tamped or rolled until it conforms with the surrounding surface, and a prime coat applied.
- K. When asphalt concrete is to be applied over existing pavement, existing surfaces adjoining gutters and other permanent features shall be ground to create smooth transitions and to maintain surface water flow lines.
- L. Potholes and depressed areas in existing pavements to be overlaid with new asphalt concrete shall be saw cut and completely removed, subgrade and aggregate base course prepared, and patched with new asphalt concrete before the installation of new pavement overlays.
- M. Spreading shall be as nearly continuous as possible. When asphalt concrete is laid against vertical surfaces such as gutters, the face of the vertical surface shall be roughened for proper bonding, cleaned, and then painted with a light coating of asphalt cement or emulsified asphalt.
- N. At terminations of new surface courses, the asphalt concrete shall be feathered into the existing surface over such a distance as may be required to produce a smooth riding transition. Existing pavements to be over-laid shall be ground or removed as required to avoid feather edges less than 1 inch in depth.
- O. Grind all edges with concrete swales and gutters to provide minimum 1-inch depth at transition and to maintain original drainage flow lines between new and existing surfacing unless otherwise noted.

- P. The finished surface shall be of uniform texture. When tested with a 10-foot (3-meter) straightedge laid on the surface parallel with the centerline of the road, the variation of the surface from the testing edge of the straightedge shall not be more than 1/4 inch (0.63 cm) except at grade changes.
- Q. The top of pavement shall match utility surface features such as valve boxes, electrical pull boxes, utility vaults, etc. Wherever possible drainage should be directed away from such utility structures, except drainage structures such as curb inlets and drop inlets.

3.03 ROADWAY SURFACE REMOVAL

- A. All pavement cuts shall be neat and straight to provide an unfractured and level pavement joint for bonding existing surfacing with pavement replacement. Pavement cuts shall be parallel or at right angles to the road or area centerlines. All cut edges shall provide clean, solid, vertical faces free from all loose material.
- B. All existing crushed aggregate and asphalt concrete removed, and any excess new material shall be hauled away from the project site and legally disposed of by the Installation Contractor.

3.04 RESURFACING

- A. In all existing pavement areas where the surface is removed, broken or damaged by Installation Contractor's equipment or in which the ground has caved in or settled due to the installation of the improvements, or areas designated to be repaved, resurfaced, or modified, the surface shall be restored to the original grade by the Installation Contractor. Prior to resurfacing, the existing surfacing shall be removed as provided above. All broken and jagged edges of the pavement edge shall be straight. Areas to be cut shall be indicated until these edges have been sawed. If during the initial removal of the existing pavement a method of removal was used which disturbed the adjoining pavement, or if during general construction operations the adjacent pavement was disturbed, then this adjoining pavement must also be removed and replaced. Where irregular surfaces are to be surfaced, existing pavement shall be cut parallel to the alignment of the pipe or to the centerline of the roadway. Asphalt concrete pavement shall be saw cut to a minimum depth of 2 inches at a point not less than 6 inches outside the limits of excavation or the previous pavement cut (made by pneumatic tools), whichever limits are the greater. The additional surfacing so cut shall be removed and disposed of by the Installation Contractor prior to resurfacing.
- B. Restoration of asphalt concrete pavement shall be to the same section as the existing roadway/paved area or a minimum thickness of 2 inches, whichever is greater.

- C. Wherever asphalt concrete pavement does not terminate against a curb, gutter, or another pavement, the Installation Contractor shall provide and install a ground contact rated, pressure treated hem-fir, No. 2 or better, 2 by 6 header board, securely staked and backfilled in place.

3.05 PAVEMENT MARKING REPAIR

- A. All traffic markings and signs painted on areas which are covered with new or repair pavement shall be replaced in kind.

3.06 SPECIAL REQUIREMENTS

- A. The restoration of all surfaces, as described herein, disturbed by the installation or repair to underground facilities shall be completed as soon as is reasonable and practical.
- B. Areas trenched by the Installation Contractor and designated to be resurfaced shall be temporarily paved with 1-inch thick minimum, or minimum thickness required by authority having jurisdiction, layer of cold asphalt mix within 3 working days after they are backfilled. After all major work that might damage pavement is completed, complete resurfacing of the entire specified area shall be performed.

3.07 CLEAN-UP

- A. After all installation, repair and restoration of paving has been completed, all excess asphalt, dirt, rock and other debris shall be removed from the roadways. Adjoining curbs, gutters, structures, and other surfaces over-sprayed or splattered shall be cleaned of all asphalt concrete products.

3.08 REPAIR OF PAVEMENT SURFACE

- A. Following Final Acceptance, the Installation Contractor shall repair settled pavement over trenches, excavation, or backfill placed as part of this Work during the period of the warranty of the Work.
- B. All materials and labor required for the repair of paving shall be supplied by the Installation Contractor and the work shall be done in a manner satisfactory to the Owner's Representative.

END OF SECTION

SECTION 32 31 13

CHAIN LINK FENCE

PART 1—GENERAL

1.01 DESCRIPTION

- A. This section specifies galvanized chain link fence comprising fences, gates, and appurtenances. Fence shall match existing,

1.02 QUALITY ASSURANCE

A. FACTORY TESTING:

1. Wire fabric and barbed wire shall be tested for zinc coating weight by the method specified in ASTM A90. Ferrous metal, except the fabric, shall be tested for zinc coating uniformity by the method specified in ASTM A239; zinc coating shall withstand six 1-minute dips.

B. REFERENCES:

1. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.
2. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid. If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued or replaced.

Reference	Title
ASTM A90	Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles
ASTM A53	Pipe, Steel, Black and Hot-Dipped Zinc-Coated, Welded and Seamless
ASTM A121	Zinc-Coated (Galvanized) Steel Barbed Wire
ASTM A123	Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A153	Zinc Coating (Hot Dip) on Iron and Steel Hardware
ASTM A239	Locating the Thinnest Spot in a Zinc (Galvanized) Coating on Iron or Steel Articles by the Preece Test (Copper Sulfate Dip)
ASTM A392	Zinc-Coated Steel Chain-Link Fence Fabric

PART 2—PRODUCTS

2.01 MATERIALS

A. CHAIN LINK FABRIC:

1. Chain link fabric shall be 2-inch mesh 9-gage wire, hot-dip galvanized after fabrication. Width of fabric shall be 6 feet 0 inch (plus or minus 3/4 inch). Fabric shall conform to the requirements of ASTM A392 and shall have a Class 2 zinc coating.

B. TENSION WIRE:

1. Bottom tension wire shall be at least 7-gage galvanized coil spring steel.

C. BARBED WIRE: (NOT USED)

D. POSTS, TOP RAIL, BRACES, AND GATE FRAMES:

1. Pipe used shall be ASTM A53, Schedule 40 steel pipe. Posts, rails, braces and frames shall be hot-dip galvanized per ASTM A53, A123 or A153, whichever is applicable. Galvanizing shall apply at least 2.0 ounces of zinc per square foot of surface.
2. Line posts shall be 2-inch outside diameter SCH 40 ASTM F1083 pipe. Corner and end posts shall be minimum 2-1/2-inch SCH 40 ASTM F1083 pipe. Braces and top rails shall be 1 1/4-inch SCH 40 ASTM F1083 pipe.

E. TRUSS RODS AND MISCELLANEOUS FITTINGS:

1. Truss rods shall be fabricated of 3/8-inch diameter steel rods and shall have turnbuckles or similar means of adjustment. Fittings used shall be hot-dip galvanized iron or steel with a minimum coating of at least 2.0 ounces of zinc per square foot of surface in accordance with ASTM A123 or A153, whichever is applicable.

F. CONCRETE:

1. Concrete for post foundations shall be Class C as specified in Section 03 30 00.

2.02 PRODUCT DATA

A. The following information shall be provided in accordance with Section 01 33 00:

1. Manufacturer's product information designating specific materials provided.
2. Results of the factory testing specified in paragraph 02445-1.02 A.
3. The layout of the chain link fence as it is to be provided illustrating fence height, post sizes, bracing configurations, and accessories.

PART 3—EXECUTION

3.01 FENCE

- A. Line posts shall be equally spaced between corners, end posts, and gate posts at a spacing not exceeding 10 feet. The base top shall be at least 1 inch above grade and sloped for drainage. Posts shall be set vertical, shall be accurately aligned, and shall have their tops level or at a constant slope between changes in grade. Tubular posts shall be fitted with extension arms to permit passage of top rail or rainproof malleable iron caps as applicable.
- B. Corner, end, and gate posts shall be braced to the nearest line post. Corner and end posts shall be diagonally braced. Bracing for gate posts shall be horizontal braces with truss rods. Line posts shall be braced horizontally and trussed in both directions with truss rods at 1000-foot minimum intervals. Top rails shall be in lengths not less than 18 feet and shall be fitted with couplings for connecting lengths into continuous runs. Couplings shall be not less than 6 inches long and allow for expansion and contraction of the rail.

- C. Chain link fabric shall be taut and shall be attached to posts, rails, and wires with galvanized fabric bands or tie wires at a maximum spacing of 12 inches on posts and 18 inches on the rails and tension wires. Stretcher bars shall be provided at ends of fabric. The bottom tension wire shall be stretched tight and shall be located 2 inches maximum above finished grade and on a straight grade between posts by excavating the high points of ground, and in no case shall depressions be filled.

3.02 GATES (NOT USED)

END OF SECTION

SECTION 32 91 19

SEEDING AND GRADING

PART 1--GENERAL

1.01 SECTION INCLUDES

- A. This section covers the work necessary for the finish grading and establishment of seeding, complete, including furnishing and delivery of labor, materials, and equipment.
- B. Related Sections. See related sections for additional requirements applicable to this Section.
 - 1. Section 31 00 00-- Earthwork.

1.02 SUBMITTALS

- A. The following submittals are required as part of this work:
 - 1. Project Schedule indicating dates for delivery of materials, completion of rough grading, preparation of seedbed, lawn and lawn alternative seeding, installation of erosion control matting on planted slopes.
 - 2. At the Contractor's discretion, alternate erosion control matting materials and/or techniques other than specified herein, may be submitted and reviewed for approval. Alternate methods are conditional on the Contractor's responsibility to establish a smooth, uniformly seeded area.

PART 2--MATERIALS

2.01 TOPSOIL

- A. If deemed necessary by the Owner, provide additional imported topsoil meeting specifications, herein.

2.02 IMPORTED TOPSOIL

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

growth or be a hindrance to grading, planting, and maintenance. Imported topsoil supply shall be approved by the Owner's Representative.

2.03 SOIL CONDITIONERS

A. ORGANIC MATERIAL:

1. Peat-A natural material formed by the decomposition of reeds, sedges, or mosses from freshwater sites. Peat shall be free from lumps, roots, or stones, and organic matter shall be not less than 90 percent on a dry weight basis.
2. Rotted Sawdust-Nitrogen stabilized, 1/4-inch minus, clean sawdust or shavings, free from weed seed, and containing no chemicals or materials harmful to plant life.
3. Manure-well-rotted stable or cattle manure, reasonably free from weed seed and refuse, containing no chemicals or materials harmful to plant life. Manure shall be no less than 2 months or more than 1 year old. Sawdust and shavings shall not exceed 50 percent content of manure.
4. Mushroom compost-spent mushroom growing compost.

B. SAND:

1. Clean, coarse, ungraded sand, meeting the requirements of ASTM C 33 for fine aggregate.

2.04 FERTILIZER

A. SLO-RELEASE FERTILIZER:

1. Slow release fertilizer for use in seeding containing 22 percent nitrogen, 16 percent available phosphoric acid, and 8 percent potash, including a minimum of 2 percent sulfur. The fertilizer shall contain not less than 30 percent available water-insoluble nitrogen derived by incorporating urea formaldehyde.

2.05 SEED MIX

A. NATIVE GRASS SEED MIX

1. Native E/C Mix available from Sunmark Seeds International, 503-241-SEED, or seeds@sunmarkseeds.com

2. Seed shall be certified, blue tag, clean, delivered in original, unopened packages bearing an analysis of the contents, guaranteed 95 percent pure and to have a minimum germination rate of 95 percent in one year.

2.06 HYDROSEEDING MULCH

- A. Wood or straw mulch processed so that the fibers are uniformly suspended under agitation in water. Blend the mulch with seed, fertilizer, and other typical additives in a hydroseeding mixture to form a homogeneous slurry. The processed mulch shall have the ability to hold grass seed in contact with soil. Fibers shall have moisture-absorption and percolation properties to form a blotter-like cover on the ground. Ship in packages of uniform weight (+/- 5 percent) and labeled with manufacturer's name and air-dry weight.

2.08 TACKIFIER

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

PART 3--EXECUTION

3.01 FINISH GRADING PROCEDURES

- A. Verify existing ground conditions prior to finish grading. Notify Owner's Representative of any site conditions that would be a hindrance to completing finish grading.
- B. Finish grading: Spread soil material and rake the area to a uniform grade so that all areas drain, as indicated on the Drawings.
- C. Preparation of seed bed: Remove all trash and stones exceeding 2 inches prior to seeding. Lightly water any dry soil, allowing time for free surface water to dissipate prior to receiving seed.
- D. Provide and maintain positive drainage patterns, throughout the construction process, and as directed by the Owner's Representative. If weather or construction activity creates drainage conflicts detrimental to construction process, notify Owner's Representative immediately.

3.02 TIME OF SEEDING

- A. Conduct seeding operations under favorable weather conditions during seasons which are normal for such work generally from February 15 to May 15 and from September 15 to November 15.

- B. Guarantee germination of seeding by November 15 at the latest.

3.03 SEEDING OPERATIONS

- A. Seed native grass mix at a rate of 50 pounds per acre or 1 pound per 1000 square feet.
- B. Hydroseeding operations shall occur in two applications. The first application shall include seed, fertilizer, and mulch. The second application shall consist of tackifier and mulch only and be applied immediately after the first seeding. A second application of fertilizer shall be made two months after initial seeding at the rate indicated below.
- C. Apply seed, mulch, fertilizer and tackifier at manufacturer's recommended rates for each product. Apply materials uniformly using standard hydroseeding methods, equipment and labor practices. Protect surfaces not to receive seed by barriers and sheeting.
- D. Method of seeding may NOT be varied at discretion of Contractor. Review all alternative methods with Owner's Representative prior to execution.

3.04 MAINTENANCE

- A. Contractor shall provide maintenance watering as required to guarantee at least 80 percent of seeded areas to be alive and in vigorous growing condition at completion of project.

END OF SECTION

DIVISION 33 – UTILITIES

SECTION 33 05 13

MANHOLES AND STRUCTURES

PART 1--GENERAL

1.01 SCOPE

- A. This section specifies the construction of all manholes, including the base, risers, reducing cones, and spacer rings. Special fittings and connections shall be provided as required. Manhole frames and covers are specified in Section 33 39 13.

1.02 REFERENCES

- A. This paragraph references miscellaneous documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.
- B. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, whether or not the document has been superseded by a version with a later date, discontinued or replaced.

References	Title
AASHTO M198	Joints for Concrete Pipes, Manholes and Precast Box Section Using Preformed Flexible Joint Sealant
ASTM A48	Grey Iron Castings
ASTM C478	Precast Reinforced Concrete Manhole Sections
Standard Plans	City of Portland Department of Public Works Standard Plans

1.03 SUBMITTALS

- A. The following information shall be provided in accordance with Section 01 33 00.
 - 1. Any proposed exceptions to these specifications along with explanation for each proposed exception.
 - 2. Design calculations for pressure type manholes (if applicable), manholes greater than 20-feet deep or 6-feet in diameter, and manholes with flat top slabs subject to traffic loading.

PART 2--PRODUCTS

2.01 CONCRETE

- A. Concrete shall be as specified in City of Portland Standard Plan 4-08-1 and Section 03 30 00.

2.02 REINFORCING

- A. Reinforcing shall be as specified in Section 03 20 00.

2.03 PRECAST WALLS AND CONES

- A. Precast concrete risers for walls of manholes shall be tongue-and-groove or keylock reinforced concrete sewer risers conforming to ASTM C478 except that elliptical reinforcing shall not be used. Size and type of precast concrete risers for manhole walls shall be as called for on the drawings. Precast eccentric cones shall be reinforced with and shall be cast of materials similar to those used in the precast concrete walls. Dimensions of precast cones shall conform to the details shown.
- B. Pressure type manholes shall resist a 20-foot head of internal water pressure. Design, where required for submittal, shall be by a registered engineer, and calculations submitted to the Owner's Representative for approval.

2.04 JOINTING

- A. All joints on precast manhole sections, including frame and riser rings, shall be sealed with preformed plastic or rubber to form a watertight seal per AASHTO M198, respectively.

2.05 MANHOLE COUPLING FOR HDPE/PVC PIPE

- A. PVC and HDPE pipe shall be connected to manholes using an approved adapter specifically manufactured for the intended service. Pipe adapters shall be X-Cel, from A-Lok Products or approved equal product; cast-in at the time of manhole fabrication. Field-fabricated water stops or improvised adapters shall not be used.

2.06 MANHOLE TOP SLABS, STEPS, FRAME, AND COVER

- A. Manhole top slabs, steps, frame, and covers shall be as shown on the drawings.

2.07 PRODUCT DATA

- A. The following information shall be provided in accordance with Section 01 33 00:
 - 1. Manufacturer's catalogue and/or other data-confirming conformance to specified design, performance and material requirements.

PART 3--EXECUTION

3.01 GENERAL

- A. The invert of the manhole shall conform to details shown on the contract drawings. No sharp edges or rough sections that will tend to obstruct the flow of effluent will be permitted. During construction of the invert section, and for a period of not less than 24 hours following placing of concrete or mortar in the invert sections, the Contractor shall temporarily divert existing flows of groundwater from new concrete or mortar surfaces to prevent damage to the fresh concrete or mortar within the manhole until initial set has been achieved.
- B. Walls of manholes shall be constructed plumb and true in accordance with the details shown. Manhole joints shall be set in jointing mortar.

3.02 TOLERANCE

- A. Maximum deviation of the invert shall be 1/2-inch for line and 1/4-inch for grade, provided that such variation does not result in a level of reverse sloping invert.

3.03 FLEXIBLE JOINTS

- A. Provide joints in pipelines not more than 18 inches from manhole walls. Lay pipes entering manholes on firmly compacted pipe bedding to undisturbed earth. Where the last joint of the line laid up to the manhole is more than 18 inches from the manhole base, a concrete encasement with a 6-inch minimum thickness as measured from the outside pipe wall shall be constructed around the entire pipe

from the manhole base to within 18 inches of the pipe joint. The pipe encasement shall be constructed monolithically with the manhole base. Pipes laid out of the manhole shall be shortened to insure that the first joint is no more than 18 inches from the manhole base.

3.04 EXTENSION RINGS

- A. The manhole frame and cover shall be set to such an elevation that the top of the cover is placed at the proposed grade or the elevation shown. Except for frames cast into flat-top slabs, a minimum of one 24-inch diameter precast extension shall be placed between the top of the eccentric cone and the iron manhole frame. Maximum height of extension rings shall be 12 inches.

3.05 MANHOLE COVERS AND RISER SECTIONS

- A. Seal all manhole covers and riser sections watertight.

3.06 STUBOUTS (NOT USED)

3.07 TESTING

- A. Manholes and appurtenances shall be subject to visual inspection by the Owner's Representative. The Contractor shall correct any defects or leakage noted at the time of such inspection. The visual inspection may be made by the Owner's Representative at any time during the Contractor's one-year guarantee period.

END OF SECTION

SECTION 33 39 13

SANITARY SEWER MANHOLE COVERS

PART 1—GENERAL

1.01 DESCRIPTION

- A. This section specifies manhole frames and covers.

1.02 REFERENCES

- A. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.
- B. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued or replaced.

Reference	Title
ASTM A48	Gray-Iron Castings
Standard Plans	City of Portland Standard Plans

1.03 SUBMITTALS

- A. The following information shall be provided in accordance with Section 01 33 00:
1. A copy of this specification section, with addendum updates included, and all referenced and applicable sections, with addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements. Check marks (✓) shall denote full compliance with a paragraph as a whole.

If deviations from the specifications are indicated, and therefore requested by the Contractor, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation. The Owner's Representative shall be the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications. Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.

2. Manufacturer's catalog data.

PART 2--PRODUCTS

2.01 ACCEPTABLE PRODUCTS

- A. Manhole frames and covers shall be Neenah Foundry Company R-1642 with Self-Sealing Cover, Phoenix Iron Works P-1090 R/G, or equal modified to provide the specified features shown on the Drawings.

2.02 MATERIALS

- A. The materials for manhole frames and covers shall be cast iron in accordance with ASTM A48, Class 30.

2.03 FABRICATION

- A. Unless otherwise specified, manhole frames and covers shall be the heavy-duty type designed for H-20 highway loading, a minimum frame height of 4-1/2 inches and shall be equipped with a continuous-ring type gasket designed to minimize surface water inflow. Cover shall have a checkered pattern design and concealed or closed pick holes with sufficient dimensions to allow for removal without special equipment. Bearing and wedging surfaces shall be machined to ensure a tight fit and to prevent rocking. Frames shall be provided with four 1-inch-diameter holes for anchor bolts. The use of salvaged or scrap materials will not be permitted.
- B. Covers shall be provided with a continuous, machined groove on either the underside bearing lip or the outer wedging edge of the cover. A groove on the bearing lip shall be fitted with a glued, continuous, low compression set gasket; a groove on the outside edge shall be fitted with a neoprene O-ring seal.

- C. Locking type, non-gasketed frames and covers shall be provided where specified. Locking covers shall have two locking wedges in the frame. Covers shall have two fingers which engage the locking wedges when the cover is positioned in the frame and turned.

PART 3—EXECUTION

3.01 GENERAL

- A. Manhole frames and covers shall be set flush with the surrounding surfaces unless otherwise specified.

END OF SECTION

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SECTION 33 47 13

LAGOON GEOSYNTHETICS

PART 1—GENERAL

1.01 DESCRIPTION

- A. This section specifies materials, installation, and quality control requirements associated with the bottom liner in the lagoon cells. Elements defined in this section include the geocomposite and geomembrane that comprise the lagoon bottom liner plus miscellaneous materials.

1.02 QUALITY CONTROL

A. GENERAL:

1. The work of this section requires Quality Control (QC) of the manufacture, fabrication, delivery, and installation of the HDPE liner and associated materials. The Contractor's QC program shall include a Quality Control Manual, inspections and reports, sampling and testing (destructive and nondestructive) of the HDPE resin, the HDPE sheet, and field seams. Daily sampling and testing during installation shall be completed on-site by the Installer. Periodic samples shall also be sent to an independent laboratory for testing to verify the on-site testing results. Field seam samples will be taken from seams representative of the work completed. The Installer must provide a dedicated on-site QC Program Manager to provide inspection, oversee sampling and testing procedures, and to document QC activities during installation. The Owner reserves the right to provide separate inspection during installation.
2. The goal of the QC program is to provide assurance to the Owner that the lining system meets or exceeds the requirements of these specifications and that the liner has been fabricated, installed, and seamed to provide leak-resistant performance during the guarantee period.
3. The QC program shall provide documentation of all inspections and tests such that each panel of material installed in the lagoon can be traced through the entire process including delivery, installation, and testing.

B. QUALITY CONTROL MANUAL:

1. The Contractor shall submit to the Owner a complete Quality Control (QC) Manual prepared by the liner installer (Installer) for review and approval in accordance with Section 01 33 00. The QC Manual shall contain the following information:

- a. General description of the manufacturer's and Installer's QC organization and personnel including resumes with job titles, experience and facilities.
 - b. A geomembrane panel layout drawing. The drawings must be reviewed and approved by the Owner's Representative.
 - c. Inspection, sampling, testing, and report procedures for:
 - 1) Evaluating the quality of raw materials used in the manufacture of the HDPE for this project.
 - 2) Evaluating the quality of the HDPE sheet during manufacture. Manufacturing Quality Control (MQC) test data shall be provided.
 - 3) Inspection and report procedures during delivery and storage at the job site.
2. Installer shall provide the following documentation, initially in hand-written form on a daily-to-weekly basis, and ultimately in neat typed logs, signed by the responsible superintendent.
- a. Subgrade acceptance forms.
 - b. Geosynthetics inventory logs for materials received on site complete with matching MQC data that has been reviewed and verified to meet specification requirements.
 - c. Panel deployment logs for geomembrane and geocomposite panels.
 - d. Trial weld start-up logs.
 - e. Seaming logs for geomembrane including dates, weather conditions, data on welding personnel, welding machine numbers, temperature and speed settings, beginning and ending times for seams, and non-destructive test results.
 - f. Repair logs.
 - g. Destructive test logs.
 - h. Record drawings of geomembrane panels showing all weld and repair locations numbered corresponding to the logs. The drawings should be neat with a north arrow and scale.

3. Methods and procedures for:
 - a. Correcting defective field seams and making repairs during installation.
 - b. Assuring material control.
 - c. Assuring documentation control.
 - d. Testing and calibration of all laboratory and field-testing equipment.
 - e. Maintenance of all records in a project file.
 - f. Development of "as-built" drawings for the project.
4. Number, location, and type of inspections and tests.
5. The QC Manual shall include copies of the Contractor's Standard Guarantees and Warranties for materials and installation.

C. REFERENCES:

1. This subsection contains references to miscellaneous documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and the listed documents, the requirements of this section shall prevail. The references are by general title only; specific test requirements are identified for the individual lining system components.
2. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, whether or not the document has been superseded by a version with a later date, discontinued or replaced.

Reference	Title
ASTM D413	Test Methods for Rubber Property-Adhesion to Flexible Substrate
ASTM D6693	Tensile Properties of Plastics
ASTM D792	Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement
ASTM D1004	Initial Tear Resistance of Plastic Film and Sheeting
ASTM D1238	Flow Rates of Thermoplastics by Extrusion Plastometer
ASTM D1505	Density of Plastics by the Density-Gradient Technique
ASTM D1603	Carbon Black in Olefin Plastics
ASTM D3767	Practice for Rubber-Measurement of Dimensions
ASTM D3895	Oxidative-Induction Time of Polyolefins by Differential Scanning Calorimetry
ASTM D4833	Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products
ASTM D5199	Measuring Nominal Thickness of Geotextiles and Geomembranes
ASTM D5397	Evaluation of Stress Crack Resistance of Polyolefin Geomembranes Using Notched Constant Tensile Load Test
ASTM D5796	Microscopic Evaluation of the Dispersion of Carbon Black in Polyolefin Geosynthetics
ASTM D5641	Standard Practice for Geomembrane Seam Evaluation by Vacuum Chamber
ASTM D5721	Practice for Air-Oven Aging of Polyolefin Geomembranes
ASTM D5820	Standard Practice for Pressurized Air Channel Evaluation of Dual Seamed Geomembranes
ASTM D5994	Test Method for Measuring Core Thickness of Textured Geomembrane
ASTM D6241	Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe
ASTM D5885	Oxidative Induction Time of Polyolefin Geosynthetics by High Pressure Differential Scanning Calorimetry
ASTM D7002	Standard Practice for Leak Location on Exposed Geomembrane Using the Water Puddle System
ASTM D7703	Standard Practice for Electrical Leak Location on Exposed Geomembrane Using the Water Lance System
ASTM D6392	Determining the Integrity of Non-reinforced Geomembrane Seams Produced Using Thermo Fusion Methods

Reference	Title
GRI.GM13	Test Properties, Testing Frequency and Recommended Warranty for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes
GRI-GM19	Seam Strength and Related Properties of Thermally Bonded Polyolefin Geomembranes

D. TESTING:

1. The liner manufacturer is responsible for sampling and testing of raw materials and quality control of HDPE sheet during manufacture.
2. The liner installer shall provide on-site inspection, sampling and testing of HDPE sheet and field seams during installation as discussed in paragraph 3.03. The installer shall provide on-site test results to the Owner's Representative on a daily basis and prior to acceptance of that portion of the work.
3. The installer shall send out periodic samples taken every 500 lineal feet of seam length to an independent laboratory for testing per this section. The Owner's Representative reserves the right to adjust the sampling and testing frequency based upon the test results. The Owner's Representative may also require additional sampling and testing in any areas where there is a potential problem or defect.
4. All testing shall be performed at a Geosynthetic Accreditation Institute-Laboratory Accreditation Program (GAI-LAP) accredited laboratory.

E. EXPERIENCE:

1. Qualification of the subcontractor performing installation of the geomembrane is required. Qualification will be determined by the Owner based on Contractor responses to the requirements listed below.
 - a. Liner installation contractor shall provide project history demonstrating a minimum of five (5) years of experience with HDPE (high density polyethylene) Geomembrane installation, showing installation of a minimum of 30,000,000 sq. ft. (700 acres) of HDPE Geomembrane
 - b. Liner installation contractor shall provide documentation of a least five (5) successfully completed HDPE Geomembrane Installation projects within the U.S., during the last five (5) years. All five (5) projects shall be similar in scope and complexity to the City's proposed project.

- c. Liner installation contractor shall propose and commit to use a minimum of one (1) Installation supervisor with at least five (5) years of experience similar to the City's proposed project. The supervisor must have experience supervising and coordinating projects similar in scope and complexity to the City's proposed project. The supervisor shall provide project history demonstrating supervision of the installation of a minimum of 5,000,000 sq. ft. (115 acres) of HDPE Geomembrane in the past two (2) years.
 - d. Contractor shall propose and commit to use a Master Seamer for work on this project. The Master Seamer shall have a minimum of three (3) years of experience seaming HDPE and/or LLDPE (low linear density polyethylene) geomembrane. The Master Seamer shall provide project history demonstrating seaming of a minimum of 5,000,000 sq. ft. (115 acres) of HDPE or LLDPE geomembrane, using the type of seaming apparatus the contractor applicant intends to use for the City's project. Additional seamers shall provide project history demonstrating a minimum of two (2) years of experience using the type of seaming apparatus proposed for the City's project.
 - e. Contractor shall propose and commit to use a Quality Assurance/Quality Control Manager with a minimum of three (3) years of experience inspecting the installation of HDPE geomembranes and providing quality assurance/control on the projects similar in scope and complexity to the City's proposed project. QA/QC Manager shall provide project history demonstrating three (3) years of experience inspecting the installation of HDPE geomembranes and providing quality assurance/control.
 - f. Proof of that review of OSHA citations over the last five (five) years shall indicate no willful violations.
 - g. Proof of bonding capacity equivalent to work proposed from contractor's surety company to be submitted with this application.
- 2. Liner installation contractor must attend Mandatory Pre-Bid meeting.
 - 3. Prior to starting work, the Contractor will identify and submit qualifications for the following individuals.
 - a. The geomembrane installation subcontractor (Installer) and the supervisor responsible for the Work.
 - b. Construction Quality Control (CQC) Officer for the Installer.
 - c. The Master Welder and seamers.

F. PROJECT FILE:

1. Two duplicate project files shall be maintained. One maintained by the Owner's Representative and the other by on-site QC Program Manager. At the end of each workweek, the files shall be updated and checked to assure that copies of all pertinent project information are included in each file. Sections similar to those in the following table shall be provided by the liner manufacturer/installer in accordance with the approved installation procedures. Daily records and as-built drawings shall be kept throughout the duration of the project, and shall form the permanent construction quality documentation.

Section Title	Information Provided in Section
Startup	<ul style="list-style-type: none"> • Names and qualifications of installation personnel • Number and type of seaming and testing equipment • Schedule for completing the work
Material Pre-Delivery	<ul style="list-style-type: none"> • Inventory of rolls delivered on site that has been positively cross-referenced with BOLs and mfg. QC reports. Evidence of cross referencing shall be provided, such as spreadsheet-checklist or hand check-list with tick marks indicating cross referencing. • Roll numbers and sq. ft of each roll
Material Delivery	<ul style="list-style-type: none"> • Schedule for delivery to job site • Description of storage facility and storage requirements
Daily Checklist	<ul style="list-style-type: none"> • Installer Manual describing procedures for startup welds, trial seam tests, repairs, and test of repairs • Actions in the event of non-conformance
Liner Panel Placement	<ul style="list-style-type: none"> • Daily trial-weld logs • Deployment logs indicating roll numbers, area deployed, panel location, seam numbers
On-site Liner Welding Report	<ul style="list-style-type: none"> • Seaming logs • Logs of results of non destructive seam tests and destructive sample tests
Damage and Failure Correction Report	<ul style="list-style-type: none"> • Methods of inspection and repair • Log of all repairs made, descriptions, technician name, and results of nondestructive tests on the repair
Post-Installation Checklist	<ul style="list-style-type: none"> • Record drawings showing: <ul style="list-style-type: none"> ○ Panel and seam numbers ○ Location of destructive tests ○ Location of repairs • Signoff by Owner's Representative

G. LINER SYSTEM CERTIFICATION:

1. At the completion of the project, the Contractor shall certify in writing that the installed geomembrane liner system meets the requirements of the Specifications and Drawings.

H. ELECTRICAL LEAK TESTING:

1. Following installation, electrical leak testing will be conducted to verify that the liner is leak-free within the limits of the leak-location technology. The initial leak testing will be conducted by the Owner with the Contractor's assistance. Liner or seam repairs will be the responsibility of the Contractor. At the Owner's discretion, additional electrical leak testing may be required at the Contractor's expense. The extent and location of leaks discovered during the initial survey will determine if a follow-on survey is required.

1.03 SUBMITTALS

A. The following information shall be provided in accordance with the requirements of Section 01 33 00:

1. Qualifications of the proposed geomembrane installation subcontractor indicating that they meet all requirements of Section 33 47 13 1.02 E 1.
2. A detailed drawing showing the panel layout for each area to be lined.
3. Shop drawings showing anchoring, pipe liner penetration details, and any other installation details required.
4. Certificate stating compliance with the requirements of the standards and testing methods specified in this section.
5. Name, address, telephone numbers and availability of manufacturer's representative assigned to this project.
6. List of prequalified supervisors, seamers and CQC Officer.
7. A written warranty conforming to requirements of paragraph 2.01 issued to the City of Portland. Provide example warranties for review with bid, and final warranty after installation is accepted.
8. QC manual per paragraph 1.02 B.
9. List of material properties of the geomembrane and geocomposite drainage materials per paragraph 2.02.

10. Manufacturing quality control certificates for each batch of resin and each shift's production. The certificates shall identify the origin of the resin and the manufacturer of the resin. The certificates shall be signed by responsible person employed by the Manufacturer. The quality control certificate shall include:
 - a. Roll numbers and identification
 - b. Sampling procedures
 - c. Results of quality control tests, including a description of the test methods used.
11. Manufacturer's Certificates of Conformance per paragraph 1.02.
12. A statement that geomembrane and welding rod for the project will be made from the same resin, and that geomembrane is manufactured in North America.

PART 2—PRODUCTS

2.01 HDPE GEOMEMBRANE

A. DESCRIPTION:

1. The geomembrane shall be manufactured from high-density polyethylene (HDPE) resin containing no additives, fillers, or extenders and manufactured from virgin material.
2. The nominal core thickness of the geomembrane sheets used in the lagoon cells shall be 80 mils. The material shall be single-sided textured material in accordance with GRI-GM13.

B. ACCEPTABLE PRODUCTS

1. Acceptable manufacturers are GSE Inc. (Houston Texas), AGRU America (Charleston SC), and Solmax International (Montreal), or equal.

C. WARRANTY REQUIREMENTS:

1. The geomembrane manufacturer shall warrant, in writing, the material against deterioration or defects for 20 years pro-rata from the date of acceptance by the Owner. The guarantee shall be against defects in material and against deterioration due to ozone, ultraviolet light, leachate, bacteria, organic solids or aging processes.
2. The Installer shall guarantee, in writing, the installation workmanship for two years from the date of acceptance by the Owner. All warranties shall be made directly to the Owner.

2.02 GEOCOMPOSITE DRAINAGE SYSTEM

A. DESCRIPTION:

1. Double-sided 250-MIL geocomposite drainage net consisting of a geonet core constructed of HDPE with a layer of non-woven needle punched geotextile heat bonded to both sides.

B. ACCEPTABLE PRODUCTS

2. Acceptable manufacturers are GSE Inc. (Houston Texas), AGRU America (Charleston SC), and Solmax International (Montreal), or equal.

C. MATERIAL PROPERTIES:

1. The geocomposite shall have material properties that comply with the table below.

Required Geocomposite Property Values

Properties	Qualifiers	Units	Specified Values	Test Method
Geonet Component:				
Polyethylene Content	minimum	%	97% by weight	--
Resin Density	minimum	g/cc	0.94	ASTM D 1505
Carbon black content	Range	%	2.0-3.0	ASTM D 1603
Thickness	minimum	mils	250	ASTM D 5199
Geotextile Component:				
Polymer Composition	minimum	%	95 virgin	
Construction	type	--	polyester or polypropylene nonwoven needle punch	
Mass per Unit Area	minimum	oz/sy	8	ASTM D 5261
Apparent opening size	maximum	mm	0.22	ASTM D 4751
Permittivity	minimum	sec ⁻¹	1.0	ASTM D 4491
Grab Strength		lb	200	ASTM D 4632
Grab Elongation	minimum	%	50	ASTM D 4632
Tear Strength	minimum	lb	80	ASTM D 4533
Puncture Strength	minimum	lb	550	ASTM D 6241 ASTM D 3786
Geocomposite Drainage Layer				
Transmissivity *	minimum	gpm/ft	2.85	ASTM D 4716
Ply Adhesion	minimum	lb/in	1	ASTM D 413

* Transmissivity measured using water at 21°C with a gradient of 0.1 and confining pressure of 1000 psf between steel plates after 100 hours.

2.05 MISCELLANEOUS MATERIALS:

A. GASKET MATERIAL:

1. Gasket shall be neoprene rubber sheeting, 40 durometer Neoprene, 2 inches wide by 1/2 inch thick.

B. BATTEN STRIPS:

1. Batten strips shall be Type 316L stainless steel with dimensions shown on the Drawings.

C. METAL FASTENERS:

1. Metal fasteners shall be Type 316 stainless steel.

D. EXTRUSION ROD:

1. The extrusion rod for fusion welding shall be formulated from the same resin as the geomembrane and shall meet the applicable physical and chemical property requirements.

F. SEALANT CAULKING:

1. Sealant caulking shall be a one-component sealant formulated of butyl rubber and other selected ingredients, equivalent to Sika Flex 1A, or as recommended by the manufacturer of the membrane materials.

G. GEOCOMPOSITE TIES:

1. Cable ties shall be nylon, 8 inch or larger as manufactured by Ty-Rap or equal.

PART 3—EXECUTION

3.01 DELIVERY AND HANDLING

A. GENERAL:

1. Delivery, storage and handling of the geosynthetics shall conform to ASTM D4873 and the manufacturer's requirements. Provide unloading and handling requirements in the QC Manual.

B. HDPE GEOMEMBRANE:

1. Each roll of geomembrane shall have a waterproof label containing the roll identification number, thickness, width, and length.

C. GEOCOMPOSITE

1. Each roll of geocomposite shall have a waterproof label containing the roll identification number, thickness, width, and length.

3.02 INSTALLATION

A. GENERAL:

1. The liner system shall be installed as shown on the Drawings and the submitted panel layout drawings and in accordance with the liner manufacturer's recommendations.

B. GEOCOMPOSITE

1. Geocomposite shall be placed below the HDPE liner as shown on the Drawings.
2. Ballast the geocomposite with sandbags to prevent displacement by wind. Sandbags should remain in place until the material is covered with sand or soil.
3. Secure geocomposite as needed and then rolled across the subgrade in such a manner as to continually keep the geocomposite in tension. Geocomposite shall not be dragged.
4. Position material by hand after being unrolled to minimize wrinkles.
5. Keep material free of dirt or dust during placement.
6. Cut material using tools approved by the manufacturer.
7. Protect unwrapped geocomposite from sunlight. Materials exposed to sunlight for more than 30 days shall be replaced by the Contractor.
8. Secured and seam the geocomposite at overlaps in accordance with GRI-GN2 and GRI-GC13 and instructions below.
9. Geonet Components:
 - a. The geonet components shall be overlapped by at least 4 inches and tied together which will require peeling back the geotextiles.
 - b. The up-gradient edge shall be placed above the down-gradient edge.
 - c. The two layers shall be tied using non-black nylon fasteners at least every 5-feet.

10. Geotextile Components:

- a. The bottom layers of geotextile should be overlapped by hand. The top layers of geotextiles shall be overlapped then sewn with a J-seam or prayer-seam. Defects and holes shall be patched with geotextile that is sewn or heat-bonded in place. Heat bonding seams is not allowed.
- b. Polymeric thread, with chemical resistance properties equal to or exceeding those of geotextile, shall be used for all sewing. The seam type shall be Federal Standard Type sewn using stitch Type 401.

C. HDPE GEOMEMBRANE:

1. Installation each day shall not begin until the Contractor has submitted to the Owner's Representative the previous working day's quality control documentation, unless otherwise agreed upon by Owner's Representative.
2. The geomembrane shall be installed as soon as practical after placement, inspection, and acceptance of the subgrade and installation of the subliner material. Each sequential section of HDPE liner shall be continuously welded to the adjacent sections. The installer is responsible for temporary protection and anchorage of all geosynthetics. Final anchoring of the geomembrane in the trench shall be made after the liner is provided an opportunity to expand and relax.
3. Only prequalified personnel properly trained and qualified to install synthetic liners will be allowed to install the geomembrane.
4. The installation shall be performed in strict conformance with the approved shop drawings, specifications, or as otherwise directed by the Owner's Representative. The edges of the liner shall be permanently anchored in a trench, in accordance with the Drawings. The subgrade shall be free of rocks protruding larger than 3/8-inch, roots and other debris. The liner shall be placed over the prepared subgrade and subliner in such a manner as to assure minimum handling and in accordance with the manufacturer's approved installation procedures. The liner shall be placed so as to be fully supported by the subgrade and free of bridging during winter conditions.
5. Adequate ballast shall be used during installation to prevent damage to the geomembrane by wind uplift. Personnel working on the liner shall wear smooth soled shoes and not engage in activities that could damage the geomembrane. Smoking shall not be permitted on or near the liner.
6. The geomembrane shall be adequately protected by sacrificial pieces of liner and custom made stands against damage by equipment such as generators and hot air guns placed on it.

7. The Contractor is responsible for maintaining the liner system free of standing water. Dewatering of groundwater shall be as required during installation, testing, and acceptance of the liner until the lined lagoon cell is filled to a water surface elevation above the ambient groundwater level to prevent damage to the geomembrane by groundwater uplift.
8. Deployment:
 - a. The Contractor shall give careful consideration to the timing and temperature during deployment. The Contractor shall focus on verifying that there is enough slack so that there will be no bridging or excessive stress in the geomembrane on the coldest expected weather days. Bridging discovered at a later date shall be cause for repair by the installer at no cost to the owner.
 - b. Panel Identification: Assign an identifying code number to each panel that is consistent with the Contractor's panel layout drawing. The coding shall be coordinated with the Owner's Representative.
 - c. Daily Panel Deployment: Deploy no more panels in one day than can be welded during that same day. Deploy panels so work ends daily at an anchor trench.
 - d. Panels shall be oriented perpendicular to the line of the slope crest (i.e., down and not across slope).
 - e. Do not damage geomembrane by handling, by equipment trafficking, leakage of hydrocarbons, or any other means.
 - f. Unroll geomembrane panels using methods that will not damage, stretch, or crimp the geomembrane.
 - g. Where geomembrane will be deployed in a 90-degree corner, pre-fold the geomembrane in the field.
 - h. Place sandbags or some equivalent form of approved ballast on the geomembrane to prevent uplift from wind during installation.
 - i. Visually inspect the geomembrane for imperfections. Mark faulty or suspect areas for repair.
 - j. The geomembrane surface shall not be used as a work area, for preparing patches, storing tools and supplies or other uses. Cutting patches on the geomembrane is not allowed unless there is a scrap sheet under the areas where cuts are being made.

- k. Protect the geomembrane in areas of heavy traffic by placing a protective cover that is compatible with and shall not damage the Geomembrane. Protective covers would include rub sheets and pads under equipment.
 - l. Do not allow any vehicular traffic directly on geomembrane.
9. Seam Layout:
- a. Seams shall be oriented perpendicular to the line of the slope crest (i.e., down and not across slope).
 - b. Minimize the number of field seams in corners, odd-shaped geometric locations, and exterior corners.
 - c. Keep horizontal seams (seams running approximately parallel to slope contours) at least 5 feet away from the toe or crest of a slope.
 - d. Use a seam numbering system that is compatible with the panel numbering system. Coordinate the seam numbering system with the Owner's Representative.
 - e. Panels shall be shingled on all slopes such that the upper panel is overlapped above the lower panel.
10. General Welding Procedures.
- a. Do not commence welding with welding apparatus until a trial weld test sample, made by that apparatus, passes the trial weld test.
 - b. During all welding operations, at least one Master Welder shall be present and shall provide supervision of other welders.
 - c. Clean the geomembrane surface of grease, moisture, dust, dirt, debris, or other foreign material.
 - d. Overlap panels a minimum 4 inches for extrusion welding and fusion welding.
 - e. Solvents or adhesives shall not be used unless the product is approved, in writing, by the Engineer.
 - f. Place sandbags, or some equivalent form of ballast approved by the Engineer, on the geomembrane to prevent uplift from wind.
 - g. Seams shall be welded to the outside edge of panels placed in anchor trenches.

- h. If required, provide a firm substrate by using a flat board, a conveyor belt, or similar hard surface directly under the weld overlap to achieve firm support.
 - i. Electric generators shall be placed on a smooth protective base such that no damage occurs to the geomembrane.
 - j. The geomembrane shall be protected from damage in heavily trafficked areas.
 - k. Provide adequate illumination, if welding operations are carried out at night.
 - l. Fish mouths or wrinkles at seam overlaps shall be cut along the ridge of the wrinkle to achieve a flat overlap. The cut fish mouths or wrinkles shall be extrusion welded or patched where the overlap is more than 3 inches. When there is less than 3 inches overlap, an oval or round patch extending a minimum of 6 inches beyond the cut in each direction shall be used.
 - m. Log every 2 hours:
 - 1) Ambient temperature directly on the geomembrane surface being welded.
 - 2) Extrudate temperatures in the barrel and at the nozzle (for an extrusion welder).
 - 3) Preheat temperature.
11. Extrusion Welding:
- a. Extrusion welding shall be the primary form of field welds at pipe boots, and repairs.
 - b. Adjacent panels shall be tack bonded together using procedures that do not damage the geomembrane, allow the required tests to be performed, and are not detrimental to final seaming.
 - c. Welding apparatus shall be free of heat-degraded extrudate before welding. Purge extruder prior to beginning seam until all heat-degraded extrudate has been removed from barrel.
 - d. The edge of the top sheet of geomembrane shall be beveled to a minimum of 45 degrees and to the full thickness of geomembrane before extrusion welding.

- e. The geomembrane surface shall be abraded not more than 1 hour before welding. The width of the grinding should be approximately equal to the width of the extrusion weld and minimize excursions beyond the weld width.
- f. The ends of all seams, which are more than 5 minutes old, shall be ground when restarting the weld.
- g. Grinding depth shall not exceed 4 mils.
- h. Grind across, not parallel to, welds.
- i. Change grinding discs frequently. Do not use clogged discs.
- j. Maintain one spare operable extrusion welding apparatus onsite at all times.
- k. Tack-weld using hot air before executing extrusion weld. Circular boot sleeves shall be mechanically strapped around penetration using straps or bands to cinch the boot sleeve tightly around the gasket or mastic before heat tacking the boot sleeve seam. Care and methods shall be exercised to ensure that the underlying gasket or mastic, where applicable, is not displaced during the sleeve installation. The complete width of the overlap shall be thoroughly hot-air-welded at the tops of all penetration boot sleeves.
- l. Boot skirts shall have slack pushed into them at the time of heat-tacking so that free-field liner contractor will not exert force on the boot skirt-to-sleeve connection.

12. Fusion Welding:

- a. Fusion Welding in the field shall be the primary method for main panel seams and for shop fabricated pieces. Shop welds shall be nondestructively tested and test reports provided with material deliveries.
- b. Fusion Welding shall be double wedge welding.
- c. Fusion Welding shall be used for all seams except those that are not accessible with Fusion Welding Equipment.
- d. Edges of cross seams at T's shall have the flap trimmed and then cut to be beveled (top and bottom) prior to welding.
- e. If welding cross seams, conduct field test welds at least every 2 hours, otherwise, once prior to start of work and once at mid-day.

- f. Protect against moisture build-up between panels. All moisture must be 100% removed before welding occurs.
- g. Place smooth insulating plate or fabric beneath hot welding apparatus after usage.
- h. Extrusion weld a rounded repair patch over all seam intersections.
- i. Maintain one spare operable seaming apparatus onsite.
- j. In the event that spark testing or destructive testing of fusion welds fails to produce acceptable results Contractor shall cap-strip all fusion welds with extrusion welds at Contractor's cost.
- k. Following completion of the first full seam weld for each welding machine, the installer/welder shall pause all welding with that machine, and perform a field peel test on a specimen cut from the ends of the seam to assure that the welding equipment is adjusted and working properly. Only after this has been completed will the welding be allowed to continue.

13. Inspection:

- a. Examine all welds and non-weld areas of the geomembrane for defects, holes, blisters, undispersed raw materials, and any sign of contamination by foreign matter. The surface of the geomembrane shall be clean at the time of the examination.
- b. Repair and non-destructively test each suspect location both in weld and non-weld areas.

D. LINER INSTALLATION AT CONCRETE STRUCTURES:

- 1. Care shall be taken when attaching liner to concrete.
- 2. Batten strip installation should follow this sequence:
 - a. Anchor bolt holes shall be drilled, air-blown of any dust, and anchors installed per manufacturer's instructions.
 - b. Anchors shall be located a maximum distance of 3 inches from the end of any batten bar segment, or any corner.
 - c. Verify that concrete surface is smooth with no voids before installing gasket. Rough surfaces with voids should be filled and sanded prior to installing battens.

- d. Install a thin portion (e.g., [1/2 inch]) of the total Neoprene gasket, or other prescribed gasket or mastic, over the anchor bolts and bond to the prepared concrete surface with manufacturer's recommended adhesive. Holes must be punched out, not drilled or cut, to a diameter somewhat less than the diameter of the bolts.
- e. Install the geomembrane over the anchor bolts so that it is smooth and free of wrinkles. Any welds in the zone of the batten bar must be ground smooth to provide a uniform transition so that gasket pressure will be evenly distributed across the weld. Free liner edges along the weld shall be beveled.
- f. Place the Neoprene gasket over the geomembrane and through snug fitting holes in the strip for the anchor bolts. Gasket segments that butt against each other shall be overlapped and cut on angle to provide a smooth, continuous butt joint, and they should be glued. Gasket joints should be offset from batten bar joints.
- g. Install the predrilled batten strip over the anchor bolts onto the sandwich of gaskets and geomembrane. Batten bar segments shall be butted with no overlap, and no more than 1/16 inch space between segments. Coat all SS bolt threads with anti-seize compound before screwing on the nuts.
- h. Install the washer and self-locking nut (Nylok™, or equal) on the anchor bolt and press the system together firmly to eliminate any gaps and bring all layers into contact while tightening the nut by hand or using light pressure on a wrench.
- i. When all the slack is out of the system, tighten the nut to compress the neoprene gasket(s) approximately 15 percent of the original thickness. The number of turns required to compress the gaskets to 15 percent shall be pre-calculated using the original dimension of the gasket and the thread pitch. **Do not over-compress the gaskets.** For example, when the compressive deflection is 15 percent, the total gasket thickness is 1 inch, and the desired deflection is 0.15 inch. Then, using an anchor bolt with 16 threads per inch (i.e. 0.0625 inch per turn), it will take 2.4 turns to tighten the gasket the prescribed amount.
- j. Caulk outer edge of batten assembly to completely cover the gasket material. Caulking material should bridge from concrete to steel batten bar.
- k. Have the attachment inspected by the Owner's Representative.
- l. Finish the connection by welding a cap strip over the attachment point as shown on the detail provided in the Drawings.

E. LINER INSTALLATION OF BOOTS AT CIRCULAR PENETRATIONS

1. Field-fabricated boots shall have the free-field geomembrane be attached to a concrete collar cast around the base of the penetration. The geomembrane can either be attached to embedment strips cast into the concrete, or with batten bars having bolts at 12 inch on center. The skirt at the base of the boot shall extend over these collar attachments and be constructed with a little slack. Addition boot considerations include the following:
 - a. All boot sleeves shall be firmly pre-tightened using banding clamps or straps before tack-welding.
 - b. Exposed edges of overlaps on boots and batten penetrations to be hot-air welded through entire overlap.
 - c. Where boots are around HDPE pipes, the boot end can be welded with no gasket.
 - d. Where boots are clamped to a pipe of another material, apply two weld beads just above circular penetration banding clamps on opposite sides of penetration to prevent bands from working off over time.
 - e. All extrusion welds below banding clamps and batten bars to be ground smooth.
 - f. All hard gasket and cushion materials to be expertly cut on an angle at all butt joints.
 - g. Gasket and mastic materials between the pipe and boot sleeve to be dependably supported in place using temporary means so that they will maintain position until installation of batten bars or banding clamps.

3.03 GEOMEMBRANE TESTING

A. TRIAL SEAMS:

1. The Contractor shall provide a tensiometer for onsite shear and peel testing of geomembrane seams. The tensiometer shall be:
 - a. Motor driven and have jaws capable of traveling at a measured rate of 2 inches per minute.
 - b. Be in good working order, and be accompanied by evidence of calibration within the last 12 months.
 - c. Be equipped with a gauge that measures the force exerted between the jaws to an accuracy of less than 1 pound and has a digital readout.

2. The Contractor shall provide a punch press for the onsite preparation of specimens for testing. The press shall be capable of cutting specimens in accordance with ASTM D6392. Hand-knife cutting of coupons is not acceptable.
3. Trial seams shall be performed to verify that the welding equipment is operating properly. A minimum of two trial seams shall be performed at the beginning of each shift, and every 5 hours, or whenever a piece of welding equipment is shut down and restarted. Trial seams, consisting of welded 5 feet long and having three specimens each for peel and shear, shall be tested for Peel Adhesion and Bonded Seam Strength and shall meet the requirements listed in the standard GRI-GM19.
4. Trial seams that do not meet the requirements shall be repeated in their entirety. Production field seams shall not be allowed until the welding apparatus and personnel have performed two successful trial seams. The trial seams shall be conducted in the same location, with the same materials, and same environmental conditions as the production welds. More frequent trial welds may be required when temperatures drop below 32 degrees, or above 100 degrees. Under these conditions, three specimens shall be tested and all three shall pass before welding can commence.
5. Installer shall keep logs documenting the names of the technician-and-machine pairs that conducted trial welds, the times, and the test values. These logs shall be copied daily for the Owner's Representative and provided for inspection on demand. Failure to provide logs on demand shall be cause for job shutdown until documentation is in order.

B. FIELD SEAMS:

1. GENERAL:

- a. Maintain daily welding logs. Record welding machine number, seam no., length, operator, machine settings, time, and date for each seam welded.

2. QUALITY CONTROL

- a. All welds shall be visually inspected immediately after production. Testing by air channel (ASTM D5820) or vacuum chamber (ASTM D5641) shall be performed on all seams and repairs. Bond efficiency of field welds shall be tested by both destructive and nondestructive test methods on-site. Periodic samples (every 500 LF) shall also be sent to an independent laboratory for verification of field test results.

b. NONDESTRUCTIVE TESTING:

- 1) Nondestructive testing shall be carried out as seaming progresses. Non-destructive testing shall be performed over 100 percent of the seam lengths by the vacuum box method (for extrusion seams) or by the air pressure method (for double fusion seams only).
- 2) The Contractor shall provide a vacuum box for onsite testing of geomembrane seams. In addition to the vacuum box, the Contractor shall provide a soapy solution and applicator. The vacuum box shall have a transparent viewing window on top and a soft, closed-cell neoprene gasket attached to the bottom. The housing shall be rigid and equipped with a bleed valve and vacuum gauge. A separate vacuum source shall be connected to the vacuum box. The equipment shall be capable of inducing and holding a vacuum of 5 pounds per square inch gauge pressure. Vacuum Testing shall be completed using the equipment specified in Paragraph 2.5 and according to the following procedure:
 - a) Apply soapy solution to the seam to be tested.
 - b) Place the box over the wetted seam area ensuring a leak-tight seal is created.
 - c) Energize the vacuum pump and reduce the vacuum box pressure to approximately 5 pounds per square inch - gauge pressure.
 - d) Examine the geomembrane through the viewing window for the presence of soap bubbles for 15 seconds.
 - e) All areas where soap bubbles appear shall be marked and repaired in accordance with this Specification.
 - f) If no bubble(s) appear after 15 seconds, close vacuum valve and open bleed valve, move box over next adjoining area with minimum 3 inches overlap, and repeat the testing process.
- 3) Fusion seam pressure testing shall be performed in general accordance with the following:
 - a) Air pressure test each fusion welded seam. Provide air pump capable of generating and maintaining 60 psi of pressure equipped with a regulator and pressure gauge. Provide pressure feed needles with pressure gauges accurate to 1 psi. Perform the following air pressure test procedure:

- i. Seal both ends of the fusion welded seam with vise-grip plate clamps or extrusion weld. Heat may be applied to the seam ends to aid in sealing the seam in conjunction with the clamps.
- ii. At one end of the seam, insert air pressure needle into the fusion weld channel.
- iii. Pressurized channel to 30 psi. Maintain pressure for 5 minutes.
- iv. Release air from the opposite end of the seam to verify that the entire length of the fusion weld channel was pressurized. If channel does not maintain pressure with a maximum allowable pressure loss of 2 psi over the 5-minute test period or does not stabilize at all, locate defective area, isolate, and repeat air pressure test procedures in both directions from the defective area. If channel does not depressurize when opposite end is cut that means there was a blockage, and the seam must be retested in segments until continuity of testing is established.
- v. Maintain air pressure test logs. Record seam numbers, beginning and ending air pressures, beginning and ending test times, dates, lengths of tested seam, and defective areas.

c. DESTRUCTIVE TESTING:

- 1) One seam sample, measuring 36 x 18 inches, shall be removed as seaming progresses for each 500 linear feet of seam per welder. The Engineer shall be given the opportunity to mark the sample locations by being given 24 hours advance notice of when the Installer wishes to perform testing. The Engineer may delegate the responsibility to other Owner representative, or allow the Installer to randomly select sample locations. The samples shall be labeled with the Sample #, Welder's Number, Operator's Name, Date, Machine Settings, Air Temperature, Sheet Temperature, and Sample Location. The sample locations shall also be noted on the as-built drawings. Coupons from the ends of the samples shall be immediately tested on-site for Peel Adhesion and Bonded Shear Strength utilizing an automatic and calibrated tensile testing device. Full samples of seam destructs shall be sent to an independent GAI-LAP accredited laboratory for test result verification for 5 peel and 5 shear specimens.

- 2) All five peel and all five shear specimens shall pass the destructive testing. If a failure occurs then additional samples shall be taken 10 ft on each side of the failed sample for additional tests until the extent of the failed seam is defined. The failed seam shall be repaired by cap-stripping between the two passing sample locations.
- 3) Once a pattern of acceptable seams is observed, the frequency of removing seam samples may be decreased. The Owner's Representative shall make the decision whether to reduce the frequency and what the frequency shall be. The Owner's Representative can also require additional seam samples in locations with a potential problem or defect. Locations where samples are taken shall be repaired in accordance with the manufacturer's approved repair procedures and these specifications.

d. FAILED SEAM PROCEDURES:

- 1) Seams not meeting the strength, ductility, and separation requirements of these specifications, or defective areas located by the electrical survey, shall be repaired and/or replaced in accordance with approved procedures. All repaired seams shall be retested for water tightness using the testing methods described above.

C. ELECTRICAL LEAK TESTING:

1. At the completion of the liner installation, an electrical leak location survey will be performed and managed by the Owner's Representative to assure the integrity of the liner. The initial leak testing will be conducted by the Owner with the Contractor's assistance. Liner or seam repairs shall be the responsibility of the Contractor. At the Owner's discretion, additional electrical leak testing may be required at the Contractor's expense. The extent and location of leaks discovered during the initial survey will determine if a follow-on survey is required.
2. The Contractor shall be responsible for preparations for the electrical leak testing and for providing assistance to the leak tester. The Contractor's preparation shall include but not be limited to:
 - a. Heavily wetting the underlying geocomposite before placement of the geomembrane to provide a conductive pathway required for the leak survey.
 - b. Covering metal batten strips with a nonconductive mastic or liner material to avoid short-circuiting.

- c. Providing record drawings of the installation.
 - d. Providing proper liner boots over metal and concrete pads and structures.
 - e. Removing sand bags and other debris from the lagoon cells.
 - f. Providing water and lighting (if required) to the leak testing firm.
3. A water puddle or lance survey shall be performed on bottom liner and slopes (ASTM D7007 or D7703) as necessary to find a 1mm defect. Any leaks discovered by the Owner's survey will be repaired by the contractor. If required, the contractor will be responsible to provide additional leak testing using the same leak location contractor or another Owner-approved firm until the survey demonstrates that there are no leaks or defects.

3.04 REPAIR PROCEDURES

A. GEOMEMBRANE REPAIR PROCEDURES

- 1. Damaged geomembrane and defective seams shall be marked and repaired in accordance with the manufacturer's approved repair procedures. The Installer shall be responsible for repair of all defective areas. All geomembrane surfaces shall be clean and dry at the time of repair. Each repair shall be numbered and logged and shall be nondestructively tested. If the damaged or defective area cannot be satisfactorily repaired, the damaged material shall be removed and replaced with acceptable material.
- 2. There shall be no welds on top of, or adjacent to, each other at any location except at T-seams and where patches cross over production welds.

B. GEOCOMPOSITE REPAIR PROCEDURE

- 1. The Contractor shall use all means necessary to protect all prior work, and all materials and completed work of other sections.
- 2. In the event of damage, the Contractor shall immediately make all repairs and replacements necessary, to the approval of the Owner's Representative, and at no additional cost to the Owner.
- 3. Any holes or tears in the geocomposite material, or any of its components, shall be repaired by placing a patch extending 1 foot beyond the edges of the hole or tear. The patch shall be secured by tying fasteners through the bottom of geotextile and the geonet of the patch, and through to the top geotextile and geonet on the slope. The patch shall be secured every 6 inches with approved tying devices. The top geotextile component of the patch shall be heat sealed to the top geotextile of the geocomposite

needing repair. If the hole or tear width across the roll is more than 50 percent of the width of the roll, the damaged area shall be cut removed and replaced

3.05 MEASUREMENT AND PAYMENT

A. LINER SYSTEM: LAGOON CELLS 1 AND 2

1. See Section 01 22 13 for unit price measurement and payment information.

END OF SECTION

SECTION 33 47 16

MONOFILL GEOSYNTHETICS

PART 1—GENERAL

1.01 DESCRIPTION

- A. This section specifies materials, installation, and quality control requirements associated with the geosynthetics used in the monofill. Elements defined in this section include the monofill top liner and associated materials, the geocomposite installed over the existing bottom geomembrane and the temporary cover for dried solids placed within the monofill.

1.02 QUALITY CONTROL

A. GENERAL:

1. The work of this section requires Quality Control (QC) of the manufacture, fabrication, delivery, and installation of the liner low density polyethylene (LLDPE) liner and associated materials. The Contractor's QC program shall include a QC Manual, inspections and reports, sampling and testing (destructive and nondestructive) of the LLDPE resin, the LLDPE sheet, and field seams. Daily sampling and testing during installation shall be completed on-site by the Installer. Periodic samples shall also be sent to an independent laboratory for testing to verify the on-site testing results. Field seam samples will be taken from seams representative of the work completed. The Installer must provide a dedicated on-site QC Program Manager to provide inspection, oversee sampling and testing procedures, and to document QC activities during installation. The Owner reserves the right to provide separate inspection during installation.
2. The goal of the QC program is to provide assurance to the Owner that the lining system meets or exceeds the requirements of these specifications and that the liner has been fabricated, installed, and seamed to provide leak-resistant performance during the guarantee period.
3. The QC program shall provide documentation of all inspections and tests such that each panel of material installed in the lagoon can be traced through the entire process including delivery, installation, and testing.

B. QUALITY CONTROL MANUAL:

1. The Contractor shall submit to the Owner a complete QC Manual prepared by the liner manufacturer/installer for review and approval in accordance with Section 01 33 00.

The QC Manual shall contain the following information:

- a. General description of the manufacturer's and Installer's QC organization, personnel including resumes with job titles, experience and facilities.
 - b. A geomembrane panel layout drawing. The drawings must be reviewed and approved by the Owner's Representative.
 - c. Inspection, sampling, testing, and report procedures for:
 - 1) Evaluating the quality of raw materials used in the manufacture of the LLDPE for this project.
 - 2) Evaluating the quality of the LLDPE sheet during manufacture. Manufacturing Quality Control (MQC) test data shall be provided.
 - 3) Inspection and report procedures during delivery and storage at the job site.
2. Installer shall provide the following documentation, initially in hand-written form on a daily-to-weekly basis, and ultimately in neat typed logs, signed by the responsible superintendent.
 - a. Subgrade acceptance forms.
 - b. Geosynthetics inventory logs for materials received on site complete with matching MQC data that has been reviewed and verified to meet specification requirements.
 - c. Panel deployment logs for geomembrane and geocomposite panels.
 - d. Trial weld start-up logs.
 - e. Seaming logs for geomembrane including dates, weather conditions, data on welding personnel, welding machine numbers, temperature and speed settings, beginning and ending times for seams, and non-destructive test results.
 - f. Repair logs.
 - g. Destructive test logs.

Reference	Title
ASTM D413	Test Methods for Rubber Property-Adhesion to Flexible Substrate
ASTM D6693	Tensile Properties of Plastics
ASTM D792	Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement
ASTM D1004	Initial Tear Resistance of Plastic Film and Sheeting
ASTM D1238	Flow Rates of Thermoplastics by Extrusion Plastometer
ASTM D1505	Density of Plastics by the Density-Gradient Technique
ASTM D1603	Carbon Black in Olefin Plastics
ASTM D3767	Practice for Rubber-Measurement of Dimensions
ASTM D3895	Oxidative-Induction Time of Polyolefins by Differential Scanning Calorimetry
ASTM D4833	Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products
ASTM D5199	Measuring Nominal Thickness of Geotextiles and Geomembranes
ASTM D5397	Evaluation of Stress Crack Resistance of Polyolefin Geomembranes Using Notched Constant Tensile Load Test
ASTM D5796	Microscopic Evaluation of the Dispersion of Carbon Black in Polyolefin Geosynthetics
ASTM D5641	Standard Practice for Geomembrane Seam Evaluation by Vacuum Chamber
ASTM D5721	Practice for Air-Oven Aging of Polyolefin Geomembranes
ASTM D5820	Standard Practice for Pressurized Air Channel Evaluation of Dual Seamed Geomembranes
ASTM D5994	Test Method for Measuring Core Thickness of Textured Geomembrane
ASTM D6241	Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe
ASTM D5885	Oxidative Induction Time of Polyolefin Geosynthetics by High Pressure Differential Scanning Calorimetry
ASTM D6392	Determining the Integrity of Non-reinforced Geomembrane Seams Produced Using Thermo Fusion Methods
GRI.GM17	Test Methods, Test Properties and Testing Frequency for Linear Low Density Polyethylene (LLDPE) Smooth and Textured Geomembranes
GRI-GM19	Seam Strength and Related Properties of Thermally Bonded Polyolefin Geomembranes

D. TESTING:

1. The liner manufacturer is responsible for sampling and testing of raw materials and quality control of LLDPE sheet during manufacture.
2. The liner installer shall provide on-site inspection, sampling, and testing of LLDPE sheet and field seams during installation as discussed in paragraph 3.03. The installer shall provide on-site test results to the Owner's Representative on a daily basis and prior to acceptance of that portion of the work.
3. The installer shall send out periodic samples taken every 500 lineal feet of seam length to an independent laboratory for testing per this section. The Owner's Representative reserves the right to adjust the sampling and testing frequency based upon the test results. The Owner's Representative may also require additional sampling and testing in any areas where there is a potential problem or defect.
4. All testing shall be performed at a GAI-LAP accredited laboratory (Geosynthetic Accreditation Institute-Laboratory Accreditation Program).

E. EXPERIENCE:

1. Qualification of the subcontractor performing installation of the geomembrane is required. Qualification will be determined by the Owner based on Contractor responses to the requirements listed below.
 - a. Liner installation contractor shall provide project history demonstrating a minimum of five (5) years of experience with HDPE (high density polyethylene) Geomembrane installation, showing installation of a minimum of 30,000,000 sq. ft. (700 acres) of HDPE Geomembrane
 - b. Liner installation contractor shall provide documentation of a least five (5) successfully completed HDPE Geomembrane Installation projects within the U.S., during the last five (5) years. All five (5) projects shall be similar in scope and complexity to the City's proposed project.
 - c. Liner installation contractor shall propose and commit to use a minimum of one (1) Installation supervisor with at least five (5) years of experience similar to the City's proposed project. The supervisor must have experience supervising and coordinating projects similar in scope and complexity to the City's proposed project. The supervisor shall provide project history demonstrating

supervision of the installation of a minimum of 5,000,000 sq. ft. (115 acres) of HDPE Geomembrane in the past two (2) years.

- d. Contractor shall propose and commit to use a Master Seamer for work on this project. The Master Seamer shall have a minimum of three (3) years of experience seaming HDPE and/or LLDPE (low linear density polyethylene) geomembrane. The Master Seamer shall provide project history demonstrating seaming of a minimum of 5,000,000 sq. ft. (115 acres) of HDPE or LLDPE geomembrane, using the type of seaming apparatus the contractor applicant intends to use for the City's project. Additional seamers shall provide project history demonstrating a minimum of two (2) years of experience using the type of seaming apparatus proposed for the City's project.
 - e. Contractor shall propose and commit to use a Quality Assurance/Quality Control Manager with a minimum of three (3) years of experience inspecting the installation of HDPE geomembranes and providing quality assurance/control on the projects similar in scope and complexity to the City's proposed project. QA/QC Manager shall provide project history demonstrating three (3) years of experience inspecting the installation of HDPE geomembranes and providing quality assurance/control.
 - f. Proof of that review of OSHA citations over the last five (five) years shall indicate no willful violations.
 - g. Proof of bonding capacity equivalent to work proposed from contractor's surety company to be submitted with this application.
2. Liner installation contractor must attend Mandatory Pre-Bid meeting.
 3. Prior to starting work, the Contractor will identify and submit qualifications for the following individuals.
 - a. The geomembrane installation subcontractor (Installer) and the supervisor responsible for the Work.
 - b. Construction Quality Control (CQC) Officer for the Installer.
 - c. The Master Welder and seamers.

F. PROJECT FILE:

1. Two duplicate project files shall be maintained. One maintained by the Owner's Representative and the other by on-site QC Program Manager. At the end of each workweek, the files shall be updated and checked to assure that copies of all pertinent project information are included in each file. Sections similar to those in the following table shall be provided by the

liner manufacturer/installer in accordance with the approved installation procedures. Daily records and as-built drawings shall be kept throughout the duration of the project, and shall form the permanent construction quality documentation.

Section Title	Information Provided in Section
Startup	<ul style="list-style-type: none"> • Names and qualifications of installation personnel • Number and type of seaming and testing equipment • Schedule for completing the work
Material Pre-Delivery	<ul style="list-style-type: none"> • Inventory of rolls delivered on site that has been positively cross-referenced with BOLs and mfg. QC reports. Evidence of cross referencing shall be provided, such as spreadsheet-checklist or hand check-list with tick marks indicating cross referencing. • Roll numbers and sq. ft of each roll
Material Delivery	<ul style="list-style-type: none"> • Schedule for delivery to job site • Description of storage facility and storage requirements
Daily Checklist	<ul style="list-style-type: none"> • Installer Manual describing procedures for startup welds, trial seam tests, repairs, and test of repairs • Actions in the event of non-conformance
Liner Panel Placement	<ul style="list-style-type: none"> • Daily trial-weld logs • Deployment logs indicating roll numbers, area deployed, panel location, seam numbers
On-site Liner Welding Report	<ul style="list-style-type: none"> • Seaming logs • Logs of results of non destructive seam tests and destructive sample tests
Damage and Failure Correction Report	<ul style="list-style-type: none"> • Methods of inspection and repair • Log of all repairs made, descriptions, technician name, and results of nondestructive tests on the repair
Post-Installation Checklist	<ul style="list-style-type: none"> • Record drawings showing: <ul style="list-style-type: none"> ○ Panel and seam numbers ○ Location of destructive tests ○ Location of repairs • Signoff by Owner's Representative

G. LINER SYSTEM CERTIFICATION:

1. At the completion of the project, the Contractor shall certify in writing that the installed geomembrane liner system meets the requirements of the Specifications and Drawings.

H. ELECTRICAL LEAK TESTING:

1. Not Used

1.03 SUBMITTALS

A. The following information shall be provided in accordance with the requirements of Section 01 33 00:

1. Qualifications of the proposed geomembrane installation subcontractor indicating that they meet all requirements of Section 33 47 13 1.02 E 1.
2. Detailed drawings showing the panel layout for each area to be lined and installation details.
3. A description of the sequence of installation of all components specified in this section including details regarding welding of the top liner to the existing bottom liner.
4. Certificate stating compliance with the requirements of the standards and testing methods specified in this section.
5. Name, address, telephone numbers and availability of manufacturer's representative assigned to this project.
6. List of prequalified supervisors, seamers, and CQC Officer.
7. A written warranty conforming to requirements of paragraph 2.01 issued to the City of Portland. Provide example warranties for review with bid, and final warranty after installation is accepted.
8. QC manual per paragraph 1.02 B.
9. List of all material properties per paragraph 2.02.
10. Manufacturing quality control certificates for each batch of resin and each shift's production. The certificates shall identify the origin of the resin and the manufacturer of the resin. The certificates shall be signed by responsible person employed by the Manufacturer. The quality control certificate shall include:
 - a. Roll numbers and identification
 - b. Sampling procedures
 - c. Results of quality control tests, including a description of the test methods used.
11. Manufacturer's Certificates of Conformance per paragraph 1.02.

12. A statement that all geomembrane and welding rod for the project will be made from the same resin and that geomembrane is manufactured in North America with non-recycled material.

PART 2—PRODUCTS

2.01 LLDPE GEOMEMBRANE

A. DESCRIPTION:

1. The geomembrane shall be manufactured from low linier density polyethylene (LLDPE) resin containing no additives, fillers, or extenders and manufactured from virgin material.
2. The nominal core thickness of the LLDPE geomembrane sheets shall be 60 mils. The material for LLDPE shall be double-sided textured material in accordance with GRI-GM17, with the exception of asperity height. In all cases the asperity height of the texturing shall be a minimum average of 20 mils.

B. ACCEPTABLE PRODUCTS

1. Acceptable manufacturers are GSE Inc. (Houston Texas), AGRU America (Charleston SC), and Solmax International (Montreal), or equal.

C. WARRANTY REQUIREMENTS:

1. The geomembrane manufacturer shall warrant, in writing, the material against deterioration or defects for 20 years pro-rata from the date of acceptance by the Owner. The guarantee shall be against defects in material and against deterioration due to ozone, ultraviolet light, leachate, bacteria, organic solids or aging processes.
2. The Installer shall guarantee, in writing, the installation workmanship for two years from the date of acceptance by the Owner. All warranties shall be made directly to the Owner.

2.02 GEOCOMPOSITE DRAINAGE/GAS VENTING SYSTEM

A. DESCRIPTION:

1. Double-sided 250-MIL geocomposite drainage net consisting of a geonet core constructed of HDPE with a layer of non-woven needle punched geotextile heat bonded to both sides.

B. ACCEPTABLE PRODUCTS

1. Acceptable manufacturers are GSE Inc. (Houston Texas), AGRU America (Charleston SC), and Solmax International (Montreal), or equal.

C. MATERIAL PROPERTIES:

1. The geocomposite shall have material properties that comply with the table below.

Required Geocomposite Property Values

Properties	Qualifiers	Units	Specified Values	Test Method
Geonet Component:				
Polyethylene Content	minimum	percent	97 percent by weight	--
Resin Density	minimum	g/cc	0.94	ASTM D 1505
Carbon black content	Range	percent	2.0-3.0	ASTM D 1603
Thickness	minimum	mils	250	ASTM D 5199
Geotextile Component:				
Polymer Composition	minimum	percent	95 virgin polyester or polypropylene nonwoven	
Construction	type	--	needle punch	
Mass per Unit Area	minimum	oz/sy	8	ASTM D 5261
Apparent opening size	maximum	mm	0.22	ASTM D 4751
Permittivity	minimum	sec ⁻¹	1.0	ASTM D 4491
Grab Strength		lb	200	ASTM D 4632
Grab Elongation	minimum	percent	50	ASTM D 4632
Tear Strength	minimum	lb	80	ASTM D 4533
Puncture Strength	minimum	lb	550	ASTM D 6241 ASTM D 3786
Geocomposite Drainage Layer				
Transmissivity *	minimum	gpm/ft	2.85	ASTM D 4716
Ply Adhesion	minimum	lb/in	1	ASTM D 413

* Transmissivity measured using water at 21°C with a gradient of 0.1 and confining pressure of 1000 psf between steel plates after 100 hours.

2.05 GEOGRID

- A. The geogrid shall be Tensar BX1200 or equal extruded high-density polypropylene geogrid with equal or smaller aperture dimensions, and an equal or higher long-term strength.

2.06. TEMPORARY COVER INSTALLATION ON THE MONOFILL

- A. Temporary cover material shall be Raven Industries, Dura Skrim BBR12 or equal.

2.07 MISCELLANEOUS MATERIALS:

A. EXTRUSION ROD:

1. The extrusion rod for fusion welding shall be formulated from the same resin as the geomembrane and shall meet the applicable physical and chemical property requirements.

B. GEOCOMPOSITE TIES:

1. Cable ties shall be nylon, 8" or larger as manufactured by Ty-Rap or equal.

PART 3—EXECUTION

3.01 DELIVERY AND HANDLING

A. GENERAL:

1. Delivery, storage and handling of the geosynthetics shall conform to ASTM D4873 and the manufacturer's requirements. Provide unloading and handling requirements in the QC Manual.

B. LLDPE GEOMEMBRANE:

1. Each roll of geomembrane shall have a waterproof label containing the roll identification number, thickness, width, and length.

C. GEOCOMPOSITE

1. Each roll of geocomposite shall have a waterproof label containing the roll identification number, thickness, width, and length.

D. GEOGRID

1. Each roll of geogrid shall have a waterproof label containing the roll identification number, properties, width, and length.

E. TEMPORARY COVER FOR MONOFILL

1. Each roll of geogrid shall have a waterproof label containing the roll identification number, properties, width, and length.

3.02 INSTALLATION

- #### A. GENERAL:
- The liner system shall be installed as shown on the Drawings and the panel layout submittal drawings. All materials shall be installed in accordance with the manufacturer's recommendations.

B. GEOGRID

1. The geogrid will be placed below the top liner as shown on the Drawings.
2. The geogrid shall be installed in accordance with the Drawings and the manufacturer's recommendations. Panels shall be overlapped and tied with non-black nylon cable ties.
3. Rolls shall be oriented perpendicular to the line of the slope crest (i.e., down and not across slope).

C. GEOCOMPOSITE

1. Geocomposite shall be placed below and on top of the LLDPE liner as shown on the Drawings.
2. The geocomposite installed over the geomembrane will be covered with barrow material sourced from the lagoon bottoms.
3. Ballast the geocomposite with sandbags to prevent displacement by wind. Sandbags should remain in place until the material is covered with sand or soil.
4. Secure geocomposite as needed and then rolled across the subgrade in such a manner as to continually keep the geocomposite in tension. Geocomposite shall not be dragged.
5. Position material by hand after being unrolled to minimize wrinkles.
6. Keep material free of dirt or dust during placement.
7. Cut material using tools approved by the manufacturer.
8. Protect unwrapped geocomposite from sunlight. Materials exposed to sunlight for more than 30 days shall be replaced by the Contractor.
9. Secured and seam the geocomposite at overlaps in accordance with GRI-GN2 and GRI-GC13 and instructions below.
10. Geonet Components:
 - a. The geonet components shall be overlapped by at least 4 inches and tied together which will require peeling back the geotextiles.
 - b. The up-gradient edge shall be placed above the down-gradient edge.
 - c. The two layers shall be tied using non-black nylon fasteners at least every 5-feet.

11. Geotextile Components:

- a. The bottom layers of geotextile should be overlapped by hand. The top layers of geotextiles shall be overlapped then sewn with a J-seam or prayer-seam. Defects and holes shall be patched with geotextile that is sewn or heat-bonded in place. Heat bonding seams is not allowed.
- b. Polymeric thread, with chemical resistance properties equal to or exceeding those of geotextile, shall be used for all sewing. The seam type shall be Federal Standard Type sewn using stitch Type 401.

D. LLDPE GEOMEMBRANE:

1. Daily work shall not begin until the Contractor has submitted to the Owner's Representative the previous working day's quality control documentation.
2. The geomembrane shall be installed as soon as practical after placement, inspection, and acceptance of the subgrade and installation of the subliner material. Each sequential section of LLDPE liner shall be continuously welded to the adjacent sections. The installer is responsible for temporary protection and anchorage of the geomembrane.
3. Welding of the top liner to the existing bottom liner shall be made after the top liner is provided an opportunity to expand and relax. Following installation of the top liner, trim the edges of the underlying geocomposite and the geomembrane as required and weld the LLDPE top liner to the HDPE bottom liner using the geomembrane manufacturer's recommended welding rod.
4. Only prequalified personnel properly trained and qualified to install synthetic liners will be allowed to install the geomembrane.
5. The installation shall be performed in strict conformance with the approved shop drawings, specifications, or as otherwise directed by the Owner's Representative. The liner shall be placed in such a manner as to assure minimum handling and in accordance with the manufacturer's approved installation procedures. The liner shall be placed so as to be fully supported by the subgrade and free of bridging.
6. Adequate ballast shall be used during installation to prevent damage to the liner and associated materials by wind uplift. Personnel working on the liner shall wear smooth soled shoes and not engage in activities that could damage the geomembrane. Smoking shall not be permitted on or near the liner.

7. The liner shall be adequately protected by sacrificial pieces of material or custom made stands against damage by equipment such as generators and hot air guns.
8. The liner shall be installed in dry weather.
9. Deployment:
 - a. The Contractor shall give careful consideration to the timing and temperature during deployment. The Contractor shall focus on verifying that there is enough slack so that there will be no bridging or excessive stress in the liner on the coldest days. Bridging discovered at a later date shall be cause for repair by the installer at no cost to the Owner.
 - b. Panel Identification: Assign an identifying code number to each panel that is consistent with the Contractor's panel layout drawing. The coding shall be coordinated with the Owner's Representative.
 - c. Daily Panel Deployment: Deploy no more panels in one day than can be welded during that same day. Deploy panels so work ends daily at an anchor trench.
 - d. Panels shall be oriented perpendicular to the line of the slope crest (i.e., down and not across slope).
 - e. Do not damage the liner by handling, by equipment trafficking, leakage of hydrocarbons, or any other means.
 - f. Unroll liner panels using methods that will not damage, stretch, or crimp the geomembrane.
 - g. Where liner will be deployed in a 90-degree corner, pre-fold in the field.
 - h. Place sandbags or some equivalent form of approved ballast on the liner to prevent uplift from wind during installation.
 - i. Visually inspect the liner for imperfections. Mark faulty or suspect areas for repair.
 - j. The liner surface shall not be used as a work area, for preparing patches, storing tools and supplies or other uses. Cutting patches on the liner is not allowed unless there is a scrap sheet under the areas where cuts are being made.
 - k. Protect the liner in areas of heavy traffic by placing a protective cover. Protective covers would include rub sheets and pads under equipment.

1. Do not allow any vehicular traffic on the geomembrane.
10. Seam Layout:
- a. Seams shall be oriented perpendicular to the line of the slope crest (i.e., down and not across slope).
 - b. Minimize the number of field seams in corners, odd-shaped geometric locations, and exterior corners.
 - c. If required, locate horizontal seams (seams running approximately parallel to slope contours) at least 5 feet away from the toe or crest of a slope.
 - d. Use a seam numbering system that is compatible with the panel numbering system. Coordinate the seam numbering system with the Owner's Representative.
 - e. Panels shall be shingled on all slopes such that the upper panel is overlapped above the lower panel.
11. General Welding Procedures.
- a. Do not commence welding until a passing trial weld test sample is made for a specific welding apparatus.
 - b. During all welding operations, at least one Master Welder shall be present providing supervision of other welders.
 - c. Clean the geomembrane surface of grease, moisture, dust, dirt, debris, or other foreign material.
 - d. Overlap panels a minimum 4 inches for extrusion welding and fusion welding.
 - e. Solvents or adhesives shall not be used unless the product is approved, in writing, by the Engineer.
 - f. Place sandbags, or some equivalent form of ballast approved by the Engineer, on the geomembrane to prevent uplift from wind.
 - g. If required, provide a firm substrate by using a flat board, a conveyor belt, or similar hard surface directly under the weld overlap to achieve firm support.
 - h. Electric generators shall be placed on a smooth protective base such that no damage occurs to the geomembrane.

- i. The liner shall be protected from damage in heavily trafficked areas.
- j. Provide adequate illumination, if welding operations are carried out at night.
- k. Fish mouths or wrinkles at seam overlaps shall be cut along the ridge of the wrinkle to achieve a flat overlap. The cut fish mouths or wrinkles shall be extrusion welded or patched where the overlap is more than 3 inches. When there is less than 3 inches overlap, an oval or round patch extending a minimum of 6 inches beyond the cut in each direction shall be used.
- l. Log every two hours:
 - 1) Ambient temperature directly on the geomembrane surface being welded.
 - 2) Extrudate temperatures in the barrel and at the nozzle (for an extrusion welder).
 - 3) Preheat temperature.

12. Extrusion Welding:

- a. Extrusion welding shall be the primary form of field welds at pipe boots, and repairs.
- b. Adjacent panels shall be tack bonded together using procedures that do not damage the geomembrane, allow the required tests to be performed, and are not detrimental to final seaming.
- c. Welding apparatus shall be free of heat-degraded extrudate before welding. Purge extruder prior to beginning seam until all heat-degraded extrudate has been removed from barrel.
- d. The edge of the top sheet of geomembrane shall be beveled to a minimum of 45 degrees and to the full thickness of geomembrane before extrusion welding.
- e. The geomembrane surface shall be abraded not more than 1 hour before welding. The width of the grinding should be approximately equal to the width of the extrusion weld and minimize excursions beyond the weld width.
- f. The ends of all seams, which are more than 5 minutes old, shall be ground when restarting the weld.
- g. Grinding depth shall not exceed 4 mils.

- h. Grind across, not parallel to, welds.
 - i. Change grinding discs frequently. Do not use clogged discs.
 - j. Maintain one spare operable extrusion welding apparatus onsite at all times.
 - k. Tack-weld using hot air before executing extrusion weld. Circular boot sleeves shall be mechanically strapped around penetration using straps or bands to cinch the boot sleeve tightly around the gasket or mastic before heat tacking the boot sleeve seam. Care and methods shall be exercised to ensure that the underlying gasket or mastic, where applicable, is not displaced during the sleeve installation. The complete width of the overlap shall be thoroughly hot-air-welded at the tops of all penetration boot sleeves.
 - l. Boot skirts shall have slack pushed into them at the time of heat-tacking so that free-field liner contractor will not exert force on the boot skirt-to-sleeve connection.
13. Fusion Welding:
- a. Fusion Welding in the field shall be the primary method for main panel seams and for shop fabricated pieces. Shop welds shall be nondestructively tested and test reports provided with material deliveries.
 - b. Fusion Welding shall be double wedge welding.
 - c. Fusion Welding shall be used for all seams except those that are not accessible with Fusion Welding Equipment.
 - d. Edges of cross seams at T's shall have the flap trimmed and then cut to be beveled (top and bottom) prior to welding.
 - e. If welding cross seams, conduct field test welds at least every 2 hours, otherwise, once prior to start of work and once at mid-day.
 - f. Protect against moisture build-up between panels. All moisture must be 100 percent removed before welding occurs.
 - g. Place smooth insulating plate or fabric beneath hot welding apparatus after usage.
 - h. Extrusion weld a rounded repair patch over all seam intersections.
 - i. Maintain one spare operable seaming apparatus onsite.

- j. In the event that spark testing or destructive testing of fusion welds fails to produce acceptable results Contractor shall cap-strip all fusion welds with extrusion welds at Contractor's cost.
 - k. Following completion of the first full seam weld for each welding machine, the installer/welder shall pause all welding with that machine, and perform a field peel test on a specimen cut from the ends of the seam to assure that the welding equipment is adjusted and working properly. Only after this has been completed will the welding be allowed to continue.
14. Inspection:
- a. Examine all welds and non-weld areas of the geomembrane for defects, holes, blisters, undispersed raw materials, and any sign of contamination by foreign matter. The surface of the geomembrane shall be clean at the time of the examination.
 - b. Repair and non-destructively test each suspect location both in weld and non-weld areas.
15. Installation of Boots at Circular Penetrations
- a. Field-fabricated boots shall have the free-field geomembrane be attached to a concrete collar cast around the base of the penetration. The geomembrane can either be attached to embedment strips cast into the concrete, or with batten bars having bolts at 12 inches on center. The skirt at the base of the boot shall extend over these collar attachments and be constructed with a little slack. Additional boot considerations include the following:
 - b. All boot sleeves shall be firmly pre-tightened using banding clamps or straps before tack-welding.
 - c. Exposed edges of overlaps on boots and batten penetrations to be hot-air welded through entire overlap.
 - d. Where boots are around pipes, the boot end can be welded with no gasket.
 - e. Where boots are clamped to a pipe of another material, apply two weld beads just above circular penetration banding clamps on opposite sides of penetration to prevent bands from working off over time.
 - f. All extrusion welds below banding clamps and batten bars to be ground smooth.

- g. All hard gasket and cushion materials to be expertly cut on an angle at all butt joints.
- h. Gasket and mastic materials between the pipe and boot sleeve to be dependably supported in place using temporary means so that they will maintain position until installation of batten bars or banding clamps.

H. TEMPORARY COVER INSTALLATION

- 1. Temporary cover was installed in the monofill over solids placed in Phase 2 of the project. The Phase 3/4 contractor must manage the existing temporary cover and add to it as required to protect dried solids from rainfall.
- 2. Place panels with manufacturer's recommended overlap and weld seams to provide a leak-resistance surface. Place 40-lb sandbag ballast on a 10 x 10 foot roped-grid (3/8-inch poly-ropes) over the entire installation. Secure sandbags at rope intersections by attaching to both ropes with heavy-duty nylon cable ties. Sandbags shall be long-life UV-resistant type. Ballast perimeter with a double row of sandbags whose ends are butted and slightly overlapped.

3.03 GEOMEMBRANE TESTING

A. TRIAL SEAMS:

- 1. The Contractor shall provide a tensiometer for onsite shear and peel testing of geomembrane seams. The tensiometer shall be:
 - a. Motor driven and have jaws capable of traveling at a measured rate of 2 inches per minute.
 - b. Be in good working order, and be accompanied by evidence of calibration within the last 12 months.
 - c. Be equipped with a gauge that measures the force exerted between the jaws to an accuracy of less than 1 pound and has a digital readout.
- 2. The Contractor shall provide a punch press for the onsite preparation of specimens for testing. The press shall be capable of cutting specimens in accordance with ASTM D6392. Hand-knife cutting of coupons is not acceptable.
- 3. Trial seams shall be performed to verify that the welding equipment is operating properly. A minimum of two trial seams shall be performed at the beginning of each shift, and every 5 hours, or whenever a piece of welding equipment is shut down and restarted. Trial seams, consisting of welded 5 feet long and having 3 specimens each for peel and shear, shall

be tested for Peel Adhesion and Bonded Seam Strength and shall meet the requirements listed in the standard GRI-GM19.

4. Trial seams that do not meet the requirements shall be repeated in their entirety. Production field seams shall not be allowed until the welding apparatus and personnel have performed two successful trial seams. The trial seams shall be conducted in the same location, with the same materials, and same environmental conditions as the production welds. More frequent trial welds may be required when temperatures drop below 32 degrees, or above 100 degrees. Under these conditions, three specimens shall be tested and all three shall pass before welding can commence.
5. Installer shall keep logs documenting the names of the technician-and-machine pairs that conducted trial welds, the times, and the test values. These logs shall be copied daily for the Owner's Representative and shown to the Engineer on demand. Failure to provide logs on demand shall be cause for job shutdown until documentation is in order.

B. FIELD SEAMS:

1. **GENERAL:** Maintain daily welding logs. Record welding machine number, seam no., length, operator, machine settings, time, and date for each seam welded.
2. **QUALITY CONTROL**
 - a. All welds shall be visually inspected immediately after production. Testing by air channel (ASTM D5820) or vacuum chamber (ASTM D5641) shall be performed on all seams and repairs. Bond efficiency of field welds shall be tested by both destructive and nondestructive test methods on-site. Periodic samples (every 500 LF) shall also be sent to an independent laboratory for verification of field test results.
 - b. **NONDESTRUCTIVE TESTING:**
 - 1) Nondestructive testing shall be carried out as seaming progresses. Non-destructive testing shall be performed over 100 percent of the seam lengths by the vacuum box method (for extrusion seams) or by the air pressure method (for double fusion seams only).
 - 2) The Contractor shall provide a vacuum box for onsite testing of geomembrane seams. In addition to the vacuum box, the Contractor shall provide a soapy solution and applicator. The vacuum box shall have a transparent viewing window on top and a soft, closed-cell neoprene gasket attached to the bottom. The housing shall be rigid and equipped with a bleed valve and vacuum

gauge. A separate vacuum source shall be connected to the vacuum box. The equipment shall be capable of inducing and holding a vacuum of 5 pounds per square inch gauge pressure. Vacuum Testing shall be completed using the equipment specified in Paragraph 2.5 and according to the following procedure:

- a) Apply soapy solution to the seam to be tested.
- b) Place the box over the wetted seam area ensuring a leak-tight seal is created.
- c) Energize the vacuum pump and reduce the vacuum box pressure to approximately 5 pounds per square inch - gauge pressure.
- d) Examine the geomembrane through the viewing window for the presence of soap bubbles for 15 seconds.
- e) All areas where soap bubbles appear shall be marked and repaired in accordance with this Specification.
- f) If no bubble(s) appear after 15 seconds, close vacuum valve and open bleed valve, move box over next adjoining area with minimum 3 inches overlap, and repeat the testing process.

3. Fusion seam pressure testing shall be performed in general accordance with the following:

- a. Air pressure test each fusion welded seam. Provide air pump capable of generating and maintaining 60 psi of pressure equipped with a regulator and pressure gauge. Provide pressure feed needles with pressure gauges accurate to 1 psi. Perform the following air pressure test procedure:
 - 1) Seal both ends of the fusion welded seam with vise-grip plate clamps or extrusion weld. Heat may be applied to the seam ends to aid in sealing the seam in conjunction with the clamps.
 - 2) At one end of the seam, insert air pressure needle into the fusion weld channel.
 - 3) Pressurized channel to 30 psi. Maintain pressure for 5 minutes.
 - 4) Release air from the opposite end of the seam to verify that the entire length of the fusion weld channel was pressurized. If channel does not maintain pressure with a maximum allowable pressure loss of 2 psi over the 5 minute test period or does not stabilize at all, locate defective area, isolate, and repeat air pressure

test procedures in both directions from the defective area. If channel does not depressurize when opposite end is cut that means there was a blockage, and the seam must be retested in segments until continuity of testing is established.

- 5) Maintain air pressure test logs. Record seam numbers, beginning and ending air pressures, beginning and ending test times, dates, lengths of tested seam, and defective areas.

b. DESTRUCTIVE TESTING:

- 1) One seam sample, measuring 36 x 18 inches, shall be removed as seaming progresses for each 500 linear feet of seam per welder. The Engineer shall be given the opportunity to mark the sample locations by being given 24 hours advance notice of when the Installer wishes to perform testing. The Engineer may delegate the responsibility to other Owner representative, or allow the Installer to randomly select sample locations. The samples shall be labeled with the Sample #, Welder's Number, Operator's Name, Date, Machine Settings, Air Temperature, Sheet Temperature, and Sample Location. The sample locations shall also be noted on the as-built drawings. Coupons from the ends of the samples shall be immediately tested on-site for Peel Adhesion and Bonded Shear Strength utilizing an automatic and calibrated tensile testing device. Full samples of seam destructs shall be sent to an independent GAI-LAP accredited laboratory for test result verification for 5 peel and 5 shear specimens.
- 2) All five peel and all five shear specimens shall pass the destructive testing. If a failure occurs then additional samples shall be taken 10 ft on each side of the failed sample for additional tests until the extent of the failed seam is defined. The failed seam shall be repaired by cap-stripping between the two passing sample locations.
- 3) Once a pattern of acceptable seams is observed, the frequency of removing seam samples may be decreased. The Owner's Representative shall make the decision whether to reduce the frequency and what the frequency shall be. The Owner's Representative can also require additional seam samples in locations with a potential problem or defect. Locations where samples are taken shall be repaired in accordance with the manufacturer's approved repair procedures and these specifications.

c. FAILED SEAM PROCEDURES:

- 1) Seams not meeting the strength, ductility, and separation requirements of these specifications, or defective areas located by the electrical survey, shall be repaired and/or replaced in accordance with approved procedures. All repaired seams shall be retested for water tightness using the testing methods described above.

3.04 REPAIR PROCEDURES

A. GEOMEMBRANE REPAIR PROCEDURES

1. Damaged geomembrane and defective seams shall be marked and repaired in accordance with the manufacturer's approved repair procedures. The Installer shall be responsible for repair of all defective areas. All geomembrane surfaces shall be clean and dry at the time of repair. Each repair shall be numbered and logged and shall be nondestructively tested. If the damaged or defective area cannot be satisfactorily repaired, the damaged material shall be removed and replaced with acceptable material.
2. There shall be no welds on top of, or adjacent to, each other at any location except at T-seams and where patches cross over production welds.

B. GEOCOMPOSITE REPAIR PROCEDURE

1. The Contractor shall immediately make all repairs and replacements necessary, to the approval of the Owner's Representative, and at no additional cost to the Owner.
2. Any holes or tears in the geocomposite material, or any of its components, shall be repaired by placing a patch extending 1 foot beyond the edges of the hole or tear. The patch shall be secured by tying fasteners through the bottom of geotextile and the geonet of the patch, and through to the top geotextile and geonet on the slope. The patch shall be secured every 6 inches with approved tying devices. The top geotextile component of the patch shall be heat sealed to the top geotextile of the geocomposite needing repair. If the hole or tear width across the roll is more than 50 percent of the width of the roll, the damaged area shall be cut, removed and replaced.

3.05 MEASUREMENT AND PAYMENT

A. MONOFILL TOP LINER SYSTEM

1. See Section 01 22 13 for unit price measurement and payment information.

B. MONOFILL GEOCOMPOSITE AND TEMPORARY COVER

1. All labor, equipment, and material required for completing installation of the geocomposite placed under solids and for managing and extending the temporary cover in the monofill will be included in the "All Other Work" pay item.

END OF SECTION

SECTION 33 47 23

LAGOON SOLIDS HANDLING

PART 1--GENERAL

1.01 SCOPE

- A. This section specifies lagoon solids dewatering, drying, placement, and measurement and payment.

1.02 DESCRIPTION

- A. Work related solids handling generally consists of the following elements:
 - 1. Supernatant and excess water in the lagoon will be pumped or drained and the remaining solids air dried to a concentration of at least **50 percent solids by weight** prior to placement in the monofill.
 - 2. In-place air drying of solids by turning and mixing them with low ground pressure equipment was successfully demonstrated during the previous phase of work.
 - 3. Dried solids will be placed in the existing monofill to the extent that capacity is available.
 - 4. Solids quantities exceeding the monofill capacity will be hauled offsite and either land applied or disposed of in a licensed landfill.

1.03 SOLIDS LAGOON BACKGROUND

- A. The 37-acre CBWTP Solids Lagoon was originally constructed in 1970. The facility was bisected by Dike 2 in 2001 forming the north and south lagoons. The north lagoon contains legacy solids resulting from solids thickening and dewatering sidestreams, digested solids and digester cleaning residuals. Solids were removed from the south lagoon in the previous phase of work and dikes were constructed to establish two process cells and a 5-acre monofill. The south lagoon will be returned to service prior to the start of work described in this section.
- B. LAGOON SOLIDS SURVEYS
 - 1. Lagoon solids were surveyed in 2001 and in 2010. The 2001 survey included tests for contaminants whereas the 2010 survey was focused solely on the volume and quantities of solids. Existing lagoon bottom contours shown on the Drawings were developed from a bottom survey

conducted in 2015. Bid quantities for existing solids were calculated using the 2010 solids survey and the 2015 bottom survey.

1.04 LAGOON SOLIDS QUANTITY AND QUALITY

- A. Quantities developed from the 2010 survey in conjunction with estimates for net accumulation of solids since the time the survey was performed were used as the basis for the bid quantity estimates for this project. Estimates for the dry tonnage of existing solids in the north lagoon are provided in the Bid Form and on Sheet G-4 of the Drawings.
- B. The 2001 lagoon survey found solids containing cadmium, lead, PCBs, and dioxin-like compounds primarily concentrated in the south lagoon. The survey indicated that contaminant levels of solids stored in the north lagoon were below regulatory thresholds and these solids should qualify for beneficial use through land application.
- C. Solids quality data is provided in the Drawings on Sheet G-4.

1.05 SPECIAL REQUIREMENTS

A. LAGOON PUMPING RESTRICTIONS

- 1. Depending on the water levels in the active cells, pumping of supernatant, groundwater and stormwater from the north lagoon to the active cells may be limited. Lagoon operations during construction will continue to pump filtrate and digested sludge to the active cells displacing liquid in the active cells. Displaced liquid is returned to the treatment plant through the supernatant pump station located at the lagoon facility and the plant pump station located at the treatment plant. The Contractor must coordinate his pumping operations with plant staff to insure the combined flows do not exceed the capacity of the supernatant or recycle pump stations.
- 2. Unless given explicit permission from the Owner's Representative, the rate that water can be discharged to the active process cells by the Contractor's combined pumping systems cannot exceed 900 gpm.

B. LOW GROUND PRESSURE EQUIPMENT

- 1. All equipment used within the lagoon and monofill shall be equipped with low ground pressure tires or tracks.
- 2. For the purpose of this project, low ground pressure is defined as 6 psi or less.

1.06 SUBMITTALS

- A. The Contractor shall provide the following submittals in accordance with Section 01 33 00.
1. A detailed work plan identifying the means and methods and schedule for the solids handling component of the project. The work plan shall include the following elements at a minimum:
 - a. Detailed description of means and methods and sequence of operation for completing the work.
 - b. Schedule for completing the work. The schedule shall be updated monthly as work progresses.
 - c. Description and general specifications for all equipment used within the lagoon and monofill including manufacturer, model and ground pressure data.
 - d. A plan view of the project site showing the layout of the dewatering system, temporary pumps, piping and discharge points, sludge drying areas, access and haul routes, and a general traffic plan for trucks entering and leaving the work area.
 - e. A detailed description of how solids will be stockpiled and identified for solids concentration determination.
 - f. A detailed description of how solids will be weighed and quantities tracked.
 - g. Details regarding how solids will be transferred into the monofill and how solids will be moved and placed within the monofill.
 - h. Details regarding off-site disposal of solids including loading, transportation, permitting (if required) and method of final disposition.
 - i. Description of health and safety precautions, training and emergency procedures for workers involved with solids handling. The plan should be based on information contained in *Guidance For Controlling Potential Risks To Workers Exposed to Class B Biosolids*, DHHS (NIOSH) Publication Number 2002-149.
 - j. A workplan for off-site biosolids hauling and disposal.
 - k. Contractor's Solids Handling Project Advisor's experience records per Part 2 of this section.

1.07 REGULATORY IMPACTS

- A. If regulations on the use/disposal of the lagoon solids change over the duration of the project the following provisions for mitigating potential impacts will be in effect.
1. If, after execution of the Contract, regulatory changes occur which substantially impact the cost of the project to the Contractor, then the Owner and Contractor may negotiate a change in compensation as directly related to specific changes in the regulations.
 2. To be eligible for additional compensation, the Contractor shall inform the Owner in writing of the specific regulatory changes and their cost impact. Any requests for additional compensation will be processed in accordance with Section 00 72 00.
 3. If the Owner considers the cost impact from changing regulations sufficient to make the Contractor's intended method for solids processing and disposal substantially more expensive than other alternatives, then the Owner reserves the right to either (1) prepare a change order to incorporate alternative solids handling plans with the Contractor, or (2) terminate the Contract and seek proposals from other contractors for alternate solids handling options to complete the work.
 4. Solids being hauled for off-site disposal may require a "paint filter" (no free liquids) and toxicity characteristic leaching procedure (TCLP) testing for the selected landfill. This additional testing will be the responsibility of the contractor.

PART 2—EXPERIENCE

2.01 EXPERIENCE

- A. Contractor is required to have in their employ, or that of a subcontractor, a person or persons who can act as their Solids Handling Project Advisor (Project Advisor) in regards to organic solids drying and/or dewatering.
- B. Contractor's Project Advisor(s), as defined above, shall have verifiable experience with organic solids and solids handling projects. This experience can include projects where the organic solids were dried or dewatered using air, mechanical or thermal methods.
- C. Contractor's Project Advisor's experience shall be verified and must be approved by City via submittal per process outlined in Section 01 33 00. Project Advisor's shall meet the following minimum experience requirements:

1. Project Advisor has participated in at least two (2) projects requiring the handling of organic solids within the last ten (10) years, within the United States.
 2. The two (2) projects cited above were similar in scope and complexity to the City's proposed project.
 3. The portion of the projects that required solids dewatering and drying had a contract value of at least \$250,000.
- D. For each project demonstrating the experience requirement, provide at a minimum:
1. Project name, contract amount, approximate start and end dates, name and address of Owner.
 2. Name and phone number for Owner's Representative and Engineer of Record. Contacts should be familiar with the project and role of Project Advisor.
 3. A brief project narrative including description of drying or dewatering activities, quantity and type of material dried or dewatered, and the role played by the person that will serve as Project Advisor.
- E. If, at any time, the Contractor wishes to replace the approved Project Advisor, the Contractor must submit the replacement's experience requirements as defined in this section for Owner's approval prior to the replacement of the current Project Advisor.

PART 3—EXECUTION

3.01 CONTRACTOR RESPONSIBILITIES

A. GENERAL

1. The Contractor or his subcontractors shall perform all operations and supply all equipment necessary for dewatering, drying, and final placement of the lagoon solids in the monofill or hauled offsite.
2. Environmental information that will influence the Contractor's ability to dry the lagoon solids is presented in Section 01 11 80. Environmental conditions that adversely impact the ability to dry the solids must be demonstrated as a differing site condition by the Contractor. Environmental conditions that are not demonstrated as differing site conditions will not provide the basis for a claim for additional costs, nor shall it be considered as a basis for granting the Contractor additional contract time.

3. The Contractor is ultimately responsible for determining the work sequence and means and methods used to complete the solids handling component of the project.
4. The Contractor is responsible for coordinating the solids handling work with all other work occurring at the lagoon including normal operations of the CBWTP staff. A possible work sequence is provided in Section 01 12 16.
5. The Contractor shall maintain lagoon access roads in safe condition and keep mud and debris off public roads.
6. The Contractor shall provide traffic control measures for vehicles entering and leaving the lagoon facility and implement all appropriate safety measures. See Section 01 14 13 for specific requirements related to traffic control and access to the facility from North Portland Road.
7. The Contractor shall meet all requirements of the Erosion Control Plan.
8. The Contractor will have access to metered power for construction activities.
9. The Contractor must provide all water for construction purposes.
10. The Contractor shall provide a work plan as described in this section. The work plan must be reviewed and approved by the Owner's Representative prior to beginning work.
11. A separate work plan is required for off-site solids hauling and disposal. The work plan shall at a minimum address:
 - Preventing trailer leakage
 - Cleaning the outside of trailers and wheels to prevent tracking or spillage of solids on public roads
 - Tarping trailers and loads
 - Spill control plan
 - Driver safety and hygiene when working with organic solids
 - Statement that no backhauling will be conducted without Owner approval
12. Damage to roads, dikes, equipment, piping, and conduit caused by the Contractor shall be promptly reported to the Owner's Representative and repaired by the Contractor at no cost to the Owner.

13. The Contractor is responsible for promptly cleaning up spills that occur as a result of his actions.
14. The Contractor is responsible for controlling all surface and ground water within the project site for the duration of the contract.

3.02 OWNER RESPONSIBILITIES

A. GENERAL

1. The Owner will make the final determination of solids concentration prior to placement of solids in the monofill following notification by the Contractor that solids stockpiled within defined limits are finished and ready for placement.

3.03 SOLIDS PROCESSING

A. GENERAL

1. Experience gained in the previous phase of the project indicates that air drying of lagoon solids to the specified concentration is achievable given the project duration, schedule, and weather conditions at the project site.
2. All equipment used within the lagoon to turn, mix, handle, load and transport the solids must be equipped with low ground pressure tracks or tires.
3. The Contractor is responsible for mitigating nuisance odors that arise during solids drying as directed by the Owner's Representative. Odor control measures, if required, will be considered extra work and compensated in accordance with the provisions of Section 00 72 00.

B. DEWATERING AND AIR-DRYING

1. To air dry the solids, the Contractor must first remove the liquid "supernatant" layer over the solids by pumping it to the adjacent lagoon. The solids layer will remain in the bottom of the lagoon.
2. Following supernatant removal, the work area must be dewatered. To achieve the initial dewatering of work area, construction of a trench around the perimeter the lagoon is recommended. The trench will allow excess water to drain from the solids layer and provide a means to manage groundwater and stormwater within the work area. Collected water can be pumped to the adjacent lagoon. A means or method to separate excess solids from this stream prior to discharging it to the adjacent lagoon must be devised and implemented by the Contractor. The Owner has the discretion of requiring the Contractor to sample, analyze, and monitor the amount of solids discharged from the trench system. If solids are

determined to be excessive, the Contractor shall devise an improved method to settle suspended solids prior to discharge. As solids become more workable, construction of additional trenches are suggested across the bottom of the work area.

3. Once the work area is dewatered, the solids can be dried in-place using tracked equipment to turn and mix the solids. The Contractor is responsible for selection of equipment and the means and methods used to work and dry the solids.
4. The Contractor may use additives to assist or speed the drying process if approved by the Owner. However, the use of additives should be considered a last resort since additives will increase the volume of the solids and reduce the effective storage capacity of the monofill. The weight of additives used will be subtracted from the payment quantities for solids placed in the monofill. Additives that significantly increase the volume of the dried solids will not be allowed.

C. SOLIDS TRANSFER

1. Dried solids will be checked for solids concentration, loaded, weighed and transferred to the monofill.
2. Determination of solids concentration will be made by the Owner prior to loading and placement of solids; see measurement and payment specifics in Section 01 22 13.
3. The Owner retains the right to retest dried solids for solids concentration prior to placement if solids were exposed to rainfall, surface water runoff, or groundwater after the initial test was conducted.

D. SOLIDS PLACEMENT

1. The Contractor shall notify the Owner's Representative at least 24 hours in advance of any fill placement in the monofill.
2. Protection and repair of the liner is the sole responsibility of the Contractor. Any damage to the liner shall be repaired in accordance with Section 33 47 13 and the liner manufacturer's requirements.
3. Solids shall not be placed in the monofill until the solids testing described in this section has been completed and the Owner's Representative has provided authorization.
4. Remove existing sandbags and temporary protection prior to adding new solids over solids placed in the previous phase of work. Retain the temporary cover for subsequent use or dispose of offsite.

5. Solids must be placed such that any surface water drains toward the leachate collection manhole if placement will continue the next drying season. Otherwise, solids should be placed to facilitate the final grading plan shown on the Drawings.
6. When it is necessary to operate equipment over the liner, a minimum 18 inch thick working layer of solids shall first be established. If required, the working layer may be stabilized with lime. Avoid operating equipment along the edges of the liner where the working cover will be minimal. Finish grading of the areas adjacent to the edge of the liner should be done from outside the monofill or by hand.
7. At the completion of the filling process, the monofill shall be filled to the elevations shown on the Drawings and solids compacted to the degree possible using low ground pressure tracked equipment.
8. Cover all solids in the monofill with the temporary cover specified in Section 33 47 13 prior to the start of rainfall if the filling activities will continue in the next work season. The Contractor shall inspect the temporary cover weekly and repair it as required over the wet season.
9. When the monofill is at capacity, install the permanent cover specified in Section 33 47 16. Remove and dispose of the temporary cover prior to installation of the permanent cover.
10. Haul solids in excess of what can be placed in the monofill offsite for beneficial use or landfilling. Possible options for offsite disposal were investigated; the results are presented in the Appendix. Contractor is responsible for all costs and requirements associated with offsite disposal of excess solids. The OWNER reserves the right of discretion over which solids are hauled offsite rather than placed in the monofill.
11. Contractor shall operate and maintain in good functional condition, the temporary monofill leachate collection, and pumping system. Leachate and stormwater must be continuously pumped from the leachate collection manhole throughout the duration of the project. Relocate the groundwater pumping and appurtenances to the leachate manhole at the completion of the filling process.

3.04 PROTECTION FROM RAINFALL

- A. Solids placed in the monofill prior to installation of the permanent cover must be protected from rainfall in accordance with the requirements of Section 33 47 16.
- B. Contractor shall protect the solids that are being dried from rewetting by managing groundwater and stormwater in the working area over the wet

season(s). The Contractor shall inspect and maintain the dewatering system at least weekly during the wet season.

3.05 SOLIDS CONCENTRATION DETERMINATION

- A. Preliminary determination of the solids concentration during the drying process will be made by the Contractor and does not require Owner verification. The Owner will not be responsible for testing until the Contractor has demonstrated that the minimum solids concentration has been achieved and the Contractor is ready to begin placing solids in the monofill. The Contractor shall keep the Owner informed as to progress of the drying operation and the anticipated dates when solids will be ready for Owner testing.
- B. The quantity of dried solids planned to be either placed in the monofill or hauled offsite on a given day will be segregated and identified such that the pile is easily distinguished from other solids and such that it can be efficiently accessed for sampling. The Contractor will coordinate with the Owner's Representative to determine the appropriate size, shape and location of the piles.
- C. Upon notification by the Contractor, the Owner's Representative will collect a minimum of seven samples from the material to be moved on a given day. The samples will be combined to form a single representative daily composite sample. The Owner's onsite laboratory will provide testing to determine the solids concentration of the sample using a CEM Microwave Moisture/Solids Analyzer. The results of the test will be used to approve the solids for placement in the monofill and payment. Results will be rounded to the nearest 0.1 percent. The test procedure is included as Appendix A to this section.
- D. Solids placed in the monofill must be at or above the minimum specified solids concentration. Solids hauled offsite can be hauled at any concentration but will be paid for on a dry ton basis calculated in accordance with the procedure described in this section. The Owner will not be responsible for additional costs that may result from handling and hauling wetter or dryer material offsite.

3.06 RECORD KEEPING

- A. The Contractor shall be responsible for keeping a record of the quantity of solids placed in the monofill or hauled away each day. This information shall be provided to the Owner's Representative at the end of each work day.

3.07 ADDITIVES

- A. If applicable, the Contractor shall keep accurate records of the quantity of additives used to aid dewatering or drying. This amount will be subtracted from the gross dry tonnage of solids to calculate net dry tons for payment.

3.08 MEASUREMENT AND PAYMENT

- A. See Section 01 22 13 for unit price measurement and payment information.

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APPENDIX A

Operation of the Smart System 5 Microwave (at Sludge Processing)

START UP

Following a power outage, the microwave will take from 30 seconds to 1 minute to boot up the **MAIN MENU** screen. In some instances you will be required to push the **Start/Pause** button before the microwave will work.

NORMAL OPERATIONS

1. From the **MAIN MENU** screen select **(3) Load Method**. If you are not at the **MAIN MENU** screen, push **Exit** until you see the **MAIN MENU** screen.
2. Select the test you want to run by entering the corresponding number on the key pad, then push **Ready**.
3. Lift the top cover of the microwave and place two glass fiber sample pads on the balance pan.
4. Close the cover and press **Tare**.
5. Wait for the instrument to tare the weight of the sample pads. The method test screen will reappear when the tare function is complete.
6. Lift the instrument cover and apply the sample in a thin, even layer to one of the sample pads. Sample weight is usually between 2 and 4 grams.
7. Quickly but gently place the sample pads back on the balance pan.
8. Close the top cover and press **Start**.
 - The instrument reads and records the initial weight of the sample prior to beginning the analysis. As the analysis begins, the flashing microwave indicators in the balance icon appear and the time begins counting up. The sample weight decreases as the moisture is removed.
 - During the drying time, the operation key below **Solids** or **Moisture** may be pressed to display % solids or % moisture.
 - When the weight loss is equal to or less than the selected parameter, five short beeps will be heard. The **DATA RESULTS** screen will appear displaying either the % moisture or % solids, as selected.
9. Press **Ready** to analyze additional samples using the same method. Press **Exit** to return to the **MAIN MENU** screen.

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DIVISION 40 – PROCESS INTEGRATION

SECTION 40 05 13

PIPING SYSTEMS

PART 1—GENERAL

1.01 DESCRIPTION

A. SCOPE:

1. This section specifies systems of process piping and general requirements for piping systems. Detailed specifications for the components listed on the Piping System Specification Sheets are found in other sections of Division 40. This section shall be used in conjunction with those sections. PIPESPEC is located in paragraph 3.07 of this section.

B. DEFINITIONS:

1. Pressure terms used in this section and elsewhere in Division 40 are defined as follows:
 - a. Maximum: The greatest continuous pressure at which the piping system operates.
 - b. Test: The hydrostatic pressure used to determine system acceptance.

1.02 QUALITY ASSURANCE

A. REFERENCES:

1. This section contains references to miscellaneous documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.
2. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued, or replaced.

Reference	Title
ANSI A13.1-81	Scheme for the Identification of Piping Systems
ANSI B1.20.1-83	Pipe Threads, General Purpose (Inch)
ANSI B16.1-89	Cast Iron Pipe Flanges and Flanged Fittings Class 25, 125, 250, and 800
ANSI B16.3-85	Malleable Iron Threaded Fittings Class 150 and 300
ANSI B16.5-88	Pipe Flanges and Flanged Fittings
ANSI B16.11-80	Forged Steel Fittings, Socket Welding and Threaded
ANSI B16.12-83	Cast Iron Threaded Drainage Fittings
ANSI B16.22-89	Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
ANSI B16.26-88	Cast Copper Alloy Fittings for Flared Copper Tubes
ANSI B31.3-87	Chemical Plant and Petroleum Refinery Piping
ASME SECTION IX-89	Boiler and Pressure Vessel Code; Welding and Brazing Qualifications
ASTM A47-84	Malleable Iron Castings
ASTM A53-89	Pipe, Steel, Black and Hot Dipped, Zinc-Coated Welded and Seamless
ASTM A74-87	Cast Iron Soil Pipe and Fittings
ASTM A105/A105M-87a	Forgings, Carbon Steel, for Piping Components
ASTM A120-84	Pipe, steel, Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless, for Ordinary Uses
ASTM A197-87	Cupola Malleable Iron
ASTM A234/A234M-89	Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures
ASTM A312/A312M-89	Seamless and Welded Austenitic Stainless Steel Pipe
ASTM A403/A403M-89	Wrought Austenitic Stainless Steel Piping Fittings
ASTM A536-84	Ductile Iron Castings
ASTM A570/A570M-88	Hot-Rolled Carbon Steel Sheet and Strip, Structural Quality
ASTM B88-89	Seamless Copper Water Tube
ASTM C564-88	Rubber Gaskets for Cast Iron Soil Pipe and Fittings
ASTM D1784-81	Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D1785-89	Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
ASTM D4174-82	Cleaning, Flushing, and Purification of Petroleum Fluid Hydraulic Systems

Reference	Title
AWWA C110-87	Ductile-Iron and Gray-Iron Fittings, 3 Inch Through 48 Inch, for Water and Other Liquids
AWWA C111-85	Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings
AWWA C115-88	Flanged Ductile-Iron and Gray-Iron Pipe with Threaded Flanges
AWWA C151-86	Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids
AWWA C205-89	Cement-Mortar Protective Lining and Coating for Steel Water Pipe--4 In. and Larger--Shop Applied
AWWA C214-83	Tape Coating Systems for the Exterior of Steel Water Pipelines
AWWA C600-87	Installation of Ductile-Iron Water Mains and Their Appurtenances
AWWA C651-86	Disinfecting Water Mains
AWWA C900-89	Polyvinyl Chloride (PVC) Pressure Pipe, 4 Inches Through 12 Inches, for Water
AWWA M11-85	Steel Pipe--A Guide for Design and Installation
CISPI 301-75	Specification Data for Hubless Cast Iron Sanitary System with No-Hub Pipe and Fittings
FEDSPEC L-C-530B(1)-72	Coating, Pipe, Thermoplastic Resin or Thermosetting Epoxy
MIL-H-13528B-87	Hydrochloric Acid, Inhibited, Rust Removing
MIL-STD-810C (1975)	Environmental Test Methods
SAE J1227-86	Assessing Cleanliness of Hydraulic Fluid Power Components and Systems
UPC (1988)	Uniform Plumbing Code

PART 2--PRODUCTS

2.01 PIPING MATERIALS

- A. Unless otherwise specified or shown on the drawings, piping materials, including pipe, gaskets, fittings, connection and joint assemblies, linings and coatings, shall be selected from those listed on the piping system specification sheets. Piping materials shall conform to detailed specifications for each type of pipe and piping appurtenance specified in other paragraphs of Division 15. To assure uniformity and compatibility of piping components, fittings and couplings for grooved end piping systems shall be furnished by the same manufacturers.

2.02 PIPING IDENTIFICATION

A. PLASTIC CODING MARKERS:

1. Plastic markers for coding pipe shall conform to ANSI A13.1 and shall be as manufactured by W. H. Brady Company, Seton Name Plate Corporation, Marking Services Inc., or equal. Markers shall be the mechanically attached type that are easily removable; they shall not be the adhesive applied type. Markers shall consist of pressure sensitive legends applied to plastic backing which is strapped or otherwise mechanically attached to the pipe. Legend and backing shall be resistant to petroleum based oils and grease and shall meet criteria for humidity, solar radiation, rain, salt, fog and leakage fungus, as specified by MIL-STD-810C. Markers shall withstand a continuous operating temperature range of -40 degrees F to 180 degrees F. Plastic coding markers shall not be the individual letter type but shall be manufactured and applied in one continuous length of plastic.
2. Markers bearing the legends on the background colors specified in Section 3.07 shall be provided in the following letter heights:

Outside pipe diameter, ^a inches	Letter height, inches
Less than 1-1/2	1/2
1-1/2 through 3	1-1/8
Greater than 3	2-1/4

^aOutside pipe diameter shall include insulation and jacketing.

3. In addition, pipe markers shall include uni- and bi-directional arrows in the same sizes as the legend. Legends and arrows shall be white on blue or red backgrounds and black on other specified backgrounds.

B. PLASTIC TRACER TAPE:

1. Tracer tape shall be 6 inches wide, colored the same as the background colors as specified in Table A, Paragraph 40 05 13-3.07, and made of inert plastic material suitable for direct burial. Tape shall be capable of stretching to twice its original length and shall be as manufactured by Allen Systems, W. H. Brady Co., Seton Name Plate Corporation, Marking Services Inc., or equal.
2. A message shall be printed on the tape, which reads:

"CAUTION CAUTION CAUTION _____ PIPE BURIED BELOW"

with bold letters approximately 2 inches high. The blank shall be filled with the particular system fluid such as chlorine, oxygen, or sulfur dioxide. The message shall be printed at maximum intervals of 2 feet.

2.03 VALVES

- A. Valves of the same size and service shall be provided by a single valve manufacturer. Packing shall be nonasbestos material. Actual length of valves shall be within 1/16 inch (plus or minus) of the manufacturer's specified length. Flanges shall meet the requirement of ANSI B16.5. Push-on and mechanical joints shall meet the requirements of AWWA C111. Valve operators are specified in Section 40 05 59.13

2.04 PRODUCT DATA

- A. Product data on piping materials shall be provided in accordance with Sections 01 33 00 and 01 78 23 where specified.
- B. Piping layout drawings, including pipe supports, seismic restraints, and the details of the expansion control systems, shall be transmitted to the Owner's Representative a minimum of 2 weeks prior to construction. Drawings shall be original layouts by the Contractor; photocopies of contract drawings are not acceptable. Operation and Maintenance information shall be provided.

PART 3--EXECUTION

3.01 INSTALLATION

A. LOCATION:

- 1. Piping shall be provided as specified except for adjustments approved in writing by the Owner's Representative to avoid architectural and structural features and shall be coordinated with electrical construction.

B. PIPING SIZES:

- 1. Where the size of piping is not specified, the contractor shall provide piping of the sizes required by UPC. Unless specified otherwise, small piping (less than 1 inch in diameter) required for services not described by UPC shall be 1/2 inch.

C. PIPE SUPPORT, SEISMIC BRACING AND EXPANSION CONTROL:

- 1. Piping shall be supported by anchor brackets, guides, saddles or hangers as required or as shown on the Drawings. Pipe supports manufactured of iron or steel shall be hot-dip or mechanically galvanized. Unless otherwise specified, existing pipes and supports shall not be used to support new piping.

D. ANCHORAGE FOR BURIED PIPING:

1. All plugs, caps, tees and bends in buried pressure piping systems shall be anchored by means of reaction backing or restrained joints as specified or shown on the Drawings.

E. BEDDING AND BACKFILL:

1. Bedding and backfill for buried piping shall be as specified or shown on the Drawings.

3.02 PIPING IDENTIFICATION

A. PIPE CODING:

1. After application of the specified coating and insulation systems, exposed piping, interior and exterior, and piping in ceiling spaces, pipe trenches, pipe chases and valve boxes shall be identified with plastic markers as specified in paragraph 2.02 A of this section. Where appropriate legend markers and directional arrows shall be located at each side of walls, floors and ceilings, at one side of each piece of equipment, at piping intersections, and at approximately 50-foot centers.

B. MARKER BALLS:

1. Buried pipe shall be equipped with passive electronic marker balls prior to backfilling.
2. Marker balls shall be Omni Marker Model 162 or approved equal.
2. Provide on all angle points (bends and tees) and on straight sections of pipe at intervals not to exceed 50 feet.
3. Marker balls shall be green in color, 4.5 inches in diameter and made with exterior grade material of HDPE
4. Marker balls shall be locatable with standard electronic marker location devices at depth of up to 5 feet.
5. Marker balls shall produce a spherical RF field and not need to be placed in any particular orientation.
6. Marker balls shall contain no floatable or movable parts and require no batteries or active components.

3.03 NOT USED

3.04 NOT USED

3.05 TESTING

A. GENERAL:

1. Upon completion of piping, but prior to application of insulation on exposed piping, the contractor shall test the piping systems. Pressures, media and test durations shall be as specified in the Section 40 05 13-3.07 PIPESPEC. Equipment which may be damaged by the specified test conditions shall be isolated. Testing shall be performed using calibrated test gauges and calibrated volumetric measuring equipment to determine leakage rates. Each test gauge shall be selected so that the specified test pressure falls within the upper half of the gauge's range. Unless otherwise specified, the contractor shall notify the Owner's Representative 24 hours prior to each test.
2. Unless otherwise specified, new piping systems shall be completely assembled and tested prior to connection to existing pipe systems.
3. The contractor shall document all testing on standard forms containing the following information as a minimum:
 - a. Piping system
 - b. Piping location
 - c. Test media
 - d. Test duration
 - e. Test pressure
 - f. Specified test requirements
 - g. Test results
4. Test results shall be attested on the forms by the signatures of the contractor and Owner's Representative who witnessed the testing. Test forms shall be maintained in a "master testing and training log" as specified in Section 01 99 90 – Standard Forms.

B. NOT USED

C. LIQUID SYSTEMS:

1. Leakage shall be zero at the specified test pressure throughout the specified duration for the following systems: exposed piping, buried insulated piping, and buried or exposed piping carrying liquid chemicals. Unless otherwise specified, leakage from other buried liquid piping systems shall be less than 0.04 gallon per hour per inch diameter per 100 feet of buried piping at the specified test pressure.

D. NOT USED

3.06 CLEANING AND FLUSHING

A. GENERAL:

1. Piping systems shall be cleaned following completion of testing and prior to connection to operating, control, and regulating or instrumentation equipment. The contractor may, at his or her option, clean and test sections of buried or exposed piping systems. Use of this procedure, however, will not waive the requirement for a full pressure test of the completed system. Unless specified otherwise, piping 24 inches in diameter and smaller shall first be cleaned by pulling a tightly fitting cleaning ball or swab through the system. Piping larger than 24 inches in diameter may be cleaned manually or with a cleaning ball or swab.

B. NOT USED

C. NOT USED

D. LIQUID SYSTEMS:

1. After completion of cleaning, liquid systems, unless otherwise specified, shall be flushed with clean water.

E. POTABLE WATER SYSTEMS:

1. Potable water piping systems shall be flushed and disinfected in accordance with the UPC.

3.07 PIPING SPECIFICATION SHEETS (PIPESPEC)

- A. Piping and valves for groupings of similar plant processes or types of service lines are specified on individual piping specification sheets (PIPESPECS). Piping services are grouped according to the chemical and physical properties of the fluid conveyed and/or by the temperature or pressure requirements. Each grouping of services (PIPESPEC) is identified by a piping system number. Piping services specified in the PIPESPECS and on the drawings are alphabetically arranged by designated service symbols as shown in Table A. Table A also indicates the system number, and substance designation.

Table A, Piping Services

Symbol	Service	System	Fluid category	Pipe marker background color
FL/SDS	Filtrate/Secondary Digested Sludge	15	Sludge	Green
GWD	Groundwater Drain	24	Drain/Vent	Green
PD	Pump Discharge	15	Water	Green
LAS	Lagoon Activated Sludge	15	Sludge	Green
SNT	Supernatant	15	Sludge	Green
WN	Non-potable Water	11	Water	Blue

3.07 PIPING SPECIFICATION SHEETS (PIPESPEC)

Piping Symbol/Service:

WN—Non-potable Water

System--11

Test Requirements:

Medium: Water; ref. spec paragraph 40 05 13-3.04 C.
Pressure: 200 psig
Duration: 120 minutes

Gasket Requirements:

Flange: Compressed gasketing consisting of organic fibers (Kevlar) and neoprene binder
Push-on/Mech Cpl: Nitrile or Neoprene

Exposed Pipe and Valves:

(See drawings for pipe size and valve type)

(2" and smaller)

Pipe: Steel; ASTM A53, galvanized. Ref. spec. Section 40 05 13.
Conn; taper threaded, ANSI B1.20.1.
Ftgs; malleable iron, ASTM A197, ANSI B16.3, Class 150, galvanized.

Valves: Hose valves- see Drawings

(FL/SDS Outlets) See FL/SDS Outlet Detail on Drawings

Pipe: Steel; ASTM A53, Ref. spec. Section 40 05 13.
Conn: flanged or welded as required.
Coating: Hot dip galvanize outlet assembly following fabrication.

Valves: NA

Buried and Encased Pipe and Valves:

(See drawings for pipe size and valve type. Omit coating on encased pipe.)

(3" and smaller)

Pipe: Steel; same as exposed with polyethylene tape coating. Field application of coating to all couplings. Ref. spec Section 40 05 13.
Conn; taper threaded, ANSI B1.20.1 with coating. Flanged adapters for 2-1/2-inch, 3-inch valves.
Ftgs; malleable iron, ASTM A197, ANSI B16.3, Class 150, galvanized with coating.

Valves: Gates; as approved by Owner's Representative.
Coating M-1 per spec Section 09 90 00

3.07 PIPING SPECIFICATION SHEETS (PIPESPEC)

Piping Symbol/Service: FL/SDS - Filtrate/ Secondary Digested Sludge System--15
SNT - Supernatant
LAS - Lagoon Activated Sludge
GW - Groundwater Pressure

Test Requirements:

Medium: Water; ref. spec paragraph 40 05 13.
Pressure: 100 psig*
Duration: 120 minutes*

* SNT gravity pipe will be tested at 10 feet of head for 24 hours by mechanically plugging the ends of the pipe and pressurizing the pipe using a filled standpipe.

Gasket Requirements:

Flange: Compressed gasketing consisting of organic fibers (Kevlar) and neoprene binder
Push-on/Mech Cpl: Nitrile or Neoprene

Exposed Pipe and Valves:

(See drawings for pipe size and valve type)

(6" and larger)*

Pipe: Ductile Iron; AWWA C151. Ref. Spec Section 40 05 33.29.
See Remarks.
Conn; flanged.
Ftgs; ductile iron per spec Section 40 05 62.16; coating, lining and ends to match pipe.

Valves: Eccentric plug; ref. spec Section 40 05 62.16.

* See System 11 "Exposed Pipe and Fittings for 8" FL/SDS Outlets" for FL/SDS Outlets; Detail C/106 on Drawings

Buried and Encased Pipe and Valves:

(See drawings for pipe size and valve type. Omit coating on encased pipe.)

(4" thru 14")

Pipe: Ductile Iron; AWWA C151. Ref. Spec Section 40 05 33.29
See Remarks.
Conn; Push-on restrained joint. Flanged adapters for valves.
Ftgs; ductile iron per spec Section 40 05 33.29; coating, lining and ends to match pipe.

Valves: Eccentric plug; same as exposed with extension stem and valve box. Coating per spec Section 09 90 00.

3.07 PIPING SPECIFICATION SHEETS (PIPESPEC)

Piping Symbol/Service: GWD—Groundwater Drain System--24

Test Requirements:

Medium: In accordance with Section 318, Uniform Plumbing Code.
Pressure: In accordance with Section 318, Uniform Plumbing Code.
Duration: In accordance with Section 318, Uniform Plumbing Code.

Gasket Requirements: N/A

Exposed Pipe and Valves: N/A

Buried and Encased Pipe and Valves

(See drawings for pipe size.)

(18" and smaller)

Pipe: Corrugated polyethylene (PE); ASTM F405 heavy duty tubing. Refer to Section 40 05 33.33
Conn; split corrugated coupling, or hub and spigot slip with snap locks
Ftgs; same as pipe and connections

Valves: None

Remarks:

1. Corrugated polyethylene (PE) pipe for groundwater drainage shall be perforated with narrow slots (slotted pipe) between the ribs. Maximum slot width shall be 0.125 inches.
2. Corrugated polyethylene (PE) pipe between the groundwater drainage manhole and the groundwater drainage trench shall be solid. All other groundwater drainage pipe shall be slotted.
3. Supernatant (SNT) pipe and fittings shall be glass-lined in accordance with the requirements of Section 40 05 33.29, 2.07, C.

END OF SECTION

SECTION 40 05 13.10

PIPING CONNECTIONS

PART 1--GENERAL

1.01 DESCRIPTION

- A. This section specifies the following methods of connecting metallic piping: flanges, threading, mechanical couplings, dielectric unions, and welding.

1.02 REFERENCES

- A. This section contains references to miscellaneous documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and the listed documents, the requirements of this section shall prevail.

- B. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, whether or not the document has been superseded by a version with a later date, discontinued or replaced.

Reference	Title
ANSI B1.1-89	Unified Inch Screw Threads (UN and UNR Thread Form)
ANSI B1.20.1-83	Pipe Threads, General Purpose (Inch)
ANSI B16.1-89	Cast Iron Pipe Flanges and Flanged Fittings
ANSI B16.5-88	Pipe Flanges and Flanged Fittings
ANSI B18.2.1-81	Square and Hex Bolts and Screws Inch Series
ANSI B18.2.2-87	Square and Hex Nuts (Inch Series)
ANSI B31.1-92	Power Piping
ANSI B31.3-90	Chemical Plant and Petroleum Refinery Piping
ASME Section IX-92	Boiler and Pressure Vessel Code; Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators Qualifications
ASTM F37-89	Standard Test Methods for Sealability of Gasket Materials

Reference	Title
ASTM F104-88	Standard Classification System for Nonmetallic Gasket Materials
ASTM F152-87	Standard Test Methods for Tension Testing of Nonmetallic Gasket Materials
ASTM F593-91	Stainless Steel Bolts, Hex Cap Screws, and Studs
ASTM F594-91	Stainless Steel Nuts
AWWA C111-90	Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C206-91	Field Welding of Steel Water Pipe
AWWA C207-86	Steel Pipe Flanges for Waterworks Service-Size 4 in. Through 144 in.
AWWA C606-87	Grooved and Shouldered Joints
AWWA M11-89	Steel Pipe-A Guide for Design and Installation

PART 2--PRODUCTS

2.01 FLANGE ASSEMBLIES

A. FLANGES:

1. **GENERAL:** Flanges shall either be flat flanges or convoluted ring flanges as specified in the following paragraphs.
2. **FLAT FLANGES:** Cast iron flanges shall be faced in accordance with ANSI B16.1. Where companion flanges are used, the flanges on pipe shall be refaced to be flush with the companion flange face. Class 150 and Class 300 forged steel flanges shall be raised face conforming to ANSI B16.5. Lightweight slip-on flanges shall be plain face conforming to AWWA 207, Class B and ANSI B16.5. Unless otherwise specified, steel flanges shall be ANSI B16.5, Class 150 or AWWA C207, Class D. Class E AWWA flanges shall be provided where test pressure exceeds 175 psi. Plain faced flanges shall not be bolted to raised face flanges.
3. **CONVOLUTED RING FLANGES:** Convoluted ring flanges shall be ductile iron, forged steel or cast stainless steel, designed to bear on hubs welded to the pipe and shall be as manufactured by Improved Piping Products. The Owner's Representative knows of no equal. The flange joints shall be rated for not less than 150 percent of the test pressures listed in Section 40 05 13 and shall conform to the requirements of ANSI B 16.5 and AWWA C207. The flange manufacturer shall be prepared to demonstrate, by certified pressure test that the flanges will meet these requirements.

B. GASKETS:

1. Gasket material shall be as specified in paragraph 2.03.
2. Gaskets for plain faced flanges shall be the full face type. Thickness shall be 1/16 inch for pipe 10 inches and less in diameter and 1/8 inch for pipe 12 inches and larger in diameter. Unless otherwise specified, gaskets for raised face flanges shall match the raised face and shall be 1/16 inch thick for pipe 3-1/2 inches and less in diameter and 1/8 inch thick for pipe 4 inches and larger.

C. BOLTS:

1. Flange assembly bolts shall be ANSI B18.2.1 standard square or hexagon head bolts with ANSI B18.2.2 standard hexagon nuts. Threads shall be ANSI B1.1, standard coarse thread series; bolts shall be Class 2A, nuts shall be Class 2B. Bolt length shall conform to ANSI B16.5.
2. Bolts and nuts for exposed or submerged service shall be made of Type 316 stainless steel in conformance with ASTM F593 and ASTM F594, markings F593F and F594F. Bolts and nuts for buried service shall be made of noncorrosive high-strength, low-alloy steel having the characteristics specified in ANSI/AWWA C111/A21, regardless of any other protective coating.

2.02 MECHANICAL COUPLINGS

A. SLEEVE-TYPE COUPLINGS:

1. Unless otherwise specified, sleeve-type mechanical pipe couplings shall be Rockwell Type 411, Dresser Style 38, or equal, with the stop removed from the middle ring. Reducing couplings shall be Rockwell Type 415, Dresser Style 62, or equal. Sleeve-type flanged coupling adapters shall be Rockwell Type 913, Dresser Style 128, or equal. Insulating couplings shall be Rockwell Type 416, Dresser Style 39, or equal.
2. Bolts and nuts for submerged or exposed service shall be made of Type 316 stainless steel in conformance with ASTM F593 and ASTM F594, markings F593F and F594F. Bolts and nuts for buried service shall be made of noncorrosive high-strength, low-alloy steel having the characteristics specified in ANSI/AWWA C111/A21, regardless of any other protective coating.
3. Gaskets shall be as specified in paragraph 2.03 and AWWA C111.

B. PLAIN END COUPLINGS:

1. Plain end pipe couplings for pipe sizes 6 inches and smaller shall be Gustin-Bacon 200, Victaulic Style 99, or equal for Schedule 80 pipe and Gustin-Bacon 205, Victaulic Style 90, or equal for lighter weight pipe. Plain end couplings for pipe sizes 8 inches and larger shall be Gustin-Bacon 200, Victaulic Style 99, or equal. Unless otherwise specified, bolts and nuts shall comply with AWWA C606.
2. Gaskets shall be as specified in paragraph 2.03 and AWWA C606.

C. GROOVED END COUPLINGS:

1. Grooved end flexible-type couplings shall be Gustin-Bacon 100, Victaulic Style 77, or equal. Grooved end rigid-type couplings shall be Gustin-Bacon 120 Rigi-Grip, Victaulic Style 07 Zero-Flex, or equal. Flexible-type couplings shall be used for all piping greater than 12 inches in diameter; for pipe 12 inches in diameter and less in rack-mounted tunnel piping applications; and for grooved joints adjacent to pump or blower suction and discharge where grooved couplings are used for noise and vibration control. All other applications for piping 12 inches in diameter and less shall utilize rigid-type couplings. Grooved end flanged coupling adapters shall be either Gustin-Bacon 154, Victaulic Style 741, or equal. Snap-joint grooved end couplings shall be Gustin-Bacon 115, Victaulic Style 78, or equal. Cut grooves are not permitted on fabricated or lightwall pipe.
2. Unless otherwise specified, bolts and nuts shall comply with AWWA C606. Bolts and nuts for submerged service shall be Type 316 stainless steel in conformance with ASTM F593 and ASTM F594, markings F593F and F594F. Bolts and nuts for buried service shall be made of noncorrosive high-strength, low-alloy steel having the characteristics specified in ANSI/AWWA C111/A21, regardless of any other protective coating.
3. Gaskets shall be as specified in paragraph 2.03 and AWWA C 606.

2.03 GASKETS

A. Gaskets designated in this Section shall be as follows:

1. EPDM: ethylene-propylene-diene-terpolymer.
2. Neoprene: neoprene.
3. Nitrile: nitrile (Buna N).

4. Compressed gasketing consisting of organic fibers (Kevlar) and neoprene binder; ASTM F104 (F712400), 2500 psi (ASTM F152), 0.2 ML/HR LEAKAGE FUEL A (ASTM F37).
5. Compressed gasketing consisting of organic fibers (Kevlar) and SBR binder; ASTM F104 (F712400), 2500 PSI (ASTM F152), 0.1 ml/hr leakage Fuel A (ASTM F37).
6. Gylon gasketing, Garlock Style 3500, 2000 psi (ASTM F152), 0.22 ml/hr Fuel A (ASTM F37).
7. Gylon gasketing, Garlock Style 3510, 2000 psi (ASTM F152), 0.04 ml/hr Fuel A (ASTM F37).
8. Gylon gasketing, Garlock Style 3504, 2000 psi (ASTM F152), 0.12 ml/hr Fuel A (ASTM F37).
9. TFE: noncreeping tetrafluoroethylene (TFE) with insert filler.
10. TFE bonded EPDM: TFE bonded to EPDM in full-face gasket having concentric-convex molded rings.

2.04 THREAD

- A. Pipe thread dimensions and size limits shall conform to ANSI Bl.20.1.

2.05 DIELECTRIC UNIONS

- A. Dielectric unions shall be EPCO, Capitol Manufacturing, or equal.

2.06 COATINGS

- A. Unless otherwise specified, flange assemblies and mechanical type couplings for buried installation shall be field coated with System M-1 as specified in Section 09 99 00.

2.07 PRODUCT DATA

- A. In accordance with Sections 01 22 00 submittal information shall be provided. For any products that require operation or maintenance, operation and maintenance information shall be submitted. In addition, the Contractor shall provide for each welder, a welder qualification certificate indicating the welder is certified for pipe welding in accordance with ASME Boiler and Pressure Vessel, Section IX. Each welder's certificate shall be provided to the Owner's Representative prior to that welder working on the job.

PART 3--EXECUTION

3.01 PIPE CUTTING, THREADING, AND JOINTING

- A. Pipe cutting, threading and jointing shall conform to the requirements of ANSI B31.1.

3.02 PIPE WELDING

- A. Pipe shall be welded by ASME-certified welders using shielded metal arc, gas shielded arc or submerged arc welding methods. Welds shall be made in accordance with the requirements of ANSI B31.1 for piping Systems 8, 26, and 28 specified in Section 40 05 13. Welds shall be made in accordance with the requirements of ANSI B31.3 for piping System 20 specified in Section 40 05 13.
- B. Welds for piping systems not specified above shall be made in accordance with AWWA C206.

3.03 TAKEDOWN COUPLINGS

- A. Takedown couplings shall be screw unions, flanged or grooved end mechanical coupling type joints and shall be provided as specified. Flanged or grooved end joints shall be employed on pipelines 2-1/2 inches in diameter and larger. Where piping passes through walls, takedown couplings shall be provided within 3 feet of the wall, unless specified otherwise.
- B. A union or flanged connection shall be provided within 2 feet of each threaded end valve.

3.04 FLEXIBILITY

- A. Unless otherwise specified, piping 2 inches in diameter and larger passing from concrete to earth shall be provided with two pipe couplings or flexible joints as specified within 2 feet or one pipe diameter of the structure, whichever is greater. Where required for resistance to pressure, mechanical couplings shall be restrained in accordance with AWWA Mill, paragraph 13.10, Tables 13-6 and 13-7, and Figure 13-17.

3.05 DIELECTRIC CONNECTIONS

- A. Where a copper pipe is connected to steel or cast iron pipe, an insulating section of rubber or plastic pipe shall be provided. The insulating section shall have a minimum length of 12 pipe diameters. Where copper pipe is supported from hangers, it shall be insulated from the hangers, or copper-plated hangers shall be used.

END OF SECTION

SECTION 40 05 13.12

PIPE HANGERS AND SUPPORTS

PART 1—GENERAL

1.01 DESCRIPTION

A. SCOPE:

1. This section specifies hangers and supports for all piping systems specified in Section 40 05 13. This section does not include pipe supports for fire sprinkler systems, pipe anchors, guides, or seismic restraints.

B. OPERATING CONDITIONS:

1. The hangers and supports specified in this section are provided to resist pipe loads occurring primarily in the downward (gravity) direction. For the purpose of pipe hanger and support selection, this section establishes pipe support classifications based on the operating temperatures of the piping contents. Pipe support classifications are for:

Ambient Systems

33 degrees F to 119 degrees F

C. HANGER AND SUPPORT SELECTION:

1. The Contractor shall design or select pipe hangers and supports. Selections shall be based upon the pipe support classifications specified in this section, and any special requirements that may be necessary to provide adequate support for the pipe.
2. The Contractor shall review the piping layout in relation to the surrounding structure and adjacent piping and equipment before selecting the type of support to be used at each hanger point.
3. Hangers and supports shall withstand all static and specified dynamic conditions of loading to which the piping and associated equipment may be subjected. As a minimum, consideration shall be given to the following conditions:
 - a. Weights of pipe, valves, fittings, insulating materials, suspended hanger components, and normal fluid contents.

- b. Weight of hydrostatic test fluid or cleaning fluid, if normal operating fluid contents are lighter.
 - c. Reaction forces due to the operation of safety or relief valves.
 - d. Wind, snow or ice loadings on outdoor piping.
4. Hangers and supports shall be sized to fit the outside diameter of pipe, tubing, or, where specified, the outside diameter of insulation.
 5. Where negligible movement occurs at hanger locations, rod hangers shall be used for suspended lines, wherever practical. For piping supported from below, bases, brackets or structural cross members shall be used.
 6. Hangers for the suspension of size 2 1/2 inches and larger pipe and tubing shall be capable of vertical hanger component adjustment under load.
 7. The supporting systems shall provide for and control the free or intended movement of the piping including its movement in relation to that of connected equipment.
 8. Where there is horizontal movement at a suspended type hanger location, hanger components shall be selected to allow for swing. The vertical angle of the hanger rod shall not, at any time, exceed 4 degrees.
 9. There shall be no contact between a pipe and hanger or support component of dissimilar metals. Prevent contact between dissimilar metals when supporting copper tubing by use of copper-plated, rubber, plastic or vinyl coated, or stainless steel hanger and support components.
 10. Unless otherwise specified, existing pipes and supports shall not be used to support new piping.
 11. Unless otherwise specified, pipe support components shall not be attached to pressure vessels.
 12. Stock hanger and support components shall be used wherever practical.

1.02 REFERENCES

- A. This section contains references to miscellaneous documents. They are a part of this section as specified and modified. In case of a conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

- B. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, whether or not the document has been superseded by a version with a later date, discontinued, or replaced.

Reference	Title
AISC Manual of Steel Construction	American Institute of Steel Construction, Manual of Steel Construction, Allowable Stress Design - 9th Ed.
FEDSPEC WW-H-171e-78	Hangers and Supports, Pipe
MFMA-2-91	Metal Framing Standards Publication
MSS SP-69-91	Pipe Hangers and Supports - Selection and Application
MSS SP-58-93	Pipe Hangers and Supports - Materials, Design and Manufacture

PART 2—PRODUCTS

2.01 ACCEPTABLE PRODUCTS

- A. Standard pipe supports and components shall be manufactured by B-Line, Carpenter & Patterson, Kin-Line, Grinnell, Michigan, Pipe Shields Incorporated, Superstrut, Unistrut, or equal. Pipe support components shall conform to the requirements of MSS SP-69 and FEDSPEC WW-H-171e. Pipe support materials shall conform to the requirements of MSS SP-58. Metal framing system components shall conform to the metal framing manufacturers' Association Standard MFMA-2.

2.02 MATERIALS

A. GENERAL:

1. Unless otherwise specified, pipe hangers and supports, structural attachments, fittings and accessories shall be hot-dip or mechanically galvanized after fabrication. Nuts, bolts and washers may be zinc-plated except for those subject to moisture or corrosive atmosphere which shall be type 316 stainless steel.

B. PIPE HANGERS AND SUPPORTS:

1. **TYPE 1 - CLEVIS PIPE HANGER:** Clevis hangers shall be carbon steel with configuration and components equivalent to MSS and FEDSPEC Type 1.
 - a. Cast and ductile iron pipe - shall be B-Line B3102, Grinnell Fig. 590, or equal.
2. NOT USED
3. NOT USED
4. NOT USED
5. NOT USED
6. NOT USED
7. **TYPE 7 - U-BOLT:** U-bolts shall be carbon steel with configuration equivalent to MSS and FEDSPEC Type 24.
 - a. Cast and ductile iron pipe - shall be Grinnell Fig. 137, B-Line B3188, or equal.
8. NOT USED
9. **TYPE 9 - WELDED PIPE STANCHION:** Minimum material thickness shall be standard schedule carbon steel pipe, cut to match contour of the pipe elbow. Use of this support shall be limited to ambient systems only.
10. **TYPE 10 - PIPE STANCHION SADDLE:** Saddles and yokes shall be carbon steel and comply with MSS Type 37 and FEDSPEC Type 38.
 - a. Cast and ductile iron pipe - shall be Carpenter & Patterson Fig. 125, B-Line B3090 NS, or equal.
11. **TYPE 11 - OFFSET PIPE CLAMP:**
 - a. Pipe clamp shall be carbon steel with configuration and components as specified and shall be of standard design manufactured by a pipe hanger component manufacturer.
 - 1) Cast and ductile iron pipe - shall be B-Line B3148 NS, Grinnell Fig. 103, or equal.
 - b. Vertical pipe support applications shall be as specified above except that insulation shields shall not be used for insulated pipe.

12. TYPE 12 - RISER CLAMP: Riser clamp shall be carbon steel with configuration and components equivalent to MSS and FEDSPEC Type 8.
 - a. Cast and ductile iron pipe - shall be B-Line B3373, Grinnell Fig. 261, or equal.

13. NOT USED

D. STRUCTURAL ATTACHMENTS:

1. TYPE A - MALLEABLE IRON CONCRETE INSERT: Concrete inserts shall be malleable iron and comply with MSS and FEDSPEC Type 18. Grinnell Fig. 282, Carpenter & Patterson Fig. 108, or equal.
2. TYPE B - SIDE BEAM BRACKET: Bracket shall be malleable iron and comply with MSS Type 34 and FEDSPEC Type 35. Grinnell Fig. 202, B-Line B3062, or equal.
3. TYPE C - MALLEABLE BEAM CLAMP WITH EXTENSION PIECE: Clamp and extension piece shall be malleable iron, tie rod shall be steel. Beam clamp shall comply with MSS and FEDSPEC Type 30. Grinnell Fig. 218 with Fig. 157 extension piece, B-Line B3054, or equal.
4. TYPE D - STEEL BEAM CLAMP WITH EYE NUT: Beam clamp and eye nut shall be forged steel. Configuration and components shall comply with MSS and FEDSPEC Type 28. Grinnell Fig. 292, Carpenter & Patterson Fig. 297, or equal.
5. TYPE E - FRAMING CHANNEL POST BASE: Post bases shall be carbon steel, of standard design manufactured by framing channel manufacturer. Single channel: Unistrut P2072A, B-Line B280, or equal. Double channel: Unistrut P2073A, B-Line B281, or equal.
6. TYPE F - WELDED BEAM ATTACHMENT: Beam attachment shall be carbon steel and comply with MSS and FEDSPEC Type 22. B-Line B3083, Grinnell Fig. 66, or equal.
7. TYPE G - WELDED STEEL BRACKET: Bracket shall be carbon steel and comply with MSS Type 32 and FEDSPEC Type 33 for medium welded bracket. Heavy welded bracket shall comply with MSS Type 33 and FEDSPEC Type 34.
8. TYPE H - CAST IRON BRACKET: Bracket shall be cast iron, Carpenter & Patterson Fig. 340, or equal.

9. TYPE J - ADJUSTABLE BEAM ATTACHMENT: Beam attachment shall be carbon steel, Carpenter & Patterson Fig. 151, B-Line B3082, or equal.
10. TYPE K - DOUBLE CHANNEL BRACKET: Wall channel shall be single channel framing channel as specified in paragraph 40 05 07-2.02 E.5. Cantilever bracket shall be a carbon steel double framing channel assembly, Unistrut P2542 through P2546, B-Line B297-12 through B297-36, or equal.
11. TYPE L - SINGLE CHANNEL BRACKET: Wall channel shall be single channel framing channel as specified in paragraph 40 05 07-2.02 E.5. Cantilever bracket shall be a carbon steel single framing channel assembly, Unistrut P2231 through P2234, B-Line B198-6, B198-12, B196-18 and B196-24, or equal.
12. TYPE M - WALL MOUNTED CHANNEL: Wall channel shall be single channel framing channel as specified in paragraph 40 05 07-2.02 E.5.
13. TYPE N - PIPE STANCHION FLOOR ATTACHMENT: Baseplate shall be carbon steel with 1/2 inch minimum thickness. Anchor bolt holes shall be 1/16 inch larger than the anchor bolt diameter. The space between the baseplate and the floor shall be filled with nonshrink grout.

E. ACCESSORIES:

1. HANGER RODS: Rods shall be carbon steel, threaded on both ends or continuous threaded and sized as specified.
2. WELDLESS EYE NUT: Eye nut shall be forged steel and shall comply with MSS and FEDSPEC Type 17. Eye nut shall be Grinnell Fig. 290, B-Line B3200, or equal.
3. WELDED EYE ROD: Eye rod shall be carbon steel with eye welded closed. Inside diameter of eye shall accommodate a bolt diameter 1/8 inch larger than the rod diameter. Eye rod shall be Grinnell Fig. 278, B-Line B3211, or equal.
4. TURNBUCKLE: Turnbuckle shall be forged steel and shall comply with MSS and FEDSPEC Type 13. Turnbuckle shall be Grinnell Fig. 230, B-Line B3202, or equal.
5. FRAMING CHANNEL: Framing channel shall be 1 5/8 inches square, roll formed, 12-gage carbon steel. Channel shall have a continuous slot along one side with in-turned clamping ridges. Single channel: Unistrut P1000, B-Line B22, or equal. Double channel: Unistrut P1001, B-Line B22A, or equal. Triple channel: Unistrut P1004A, B-Line B22X, or equal.

2.03 LOCATION

A. Pipe support location shall be as indicated on the Drawings.

2.04 PRODUCT DATA

A. In accordance with Sections 01 22 00, submittal information shall be provided. For any products that require operation or maintenance, operation and maintenance information shall be submitted.

PART 3--EXECUTION

3.01 HANGER AND SUPPORT LOCATIONS

A. Pipe support location shall be as indicated on the Drawings.

3.02 INSTALLATION

A. Rollers shall roll freely without binding.

3.03 NOT USED

END OF SECTION

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SECTION 40 05 13.13

STEEL PROCESS PIPE

PART 1–GENERAL

1.01 DESCRIPTION

A. This section specifies steel pipe and fittings.

1.02 QUALITY ASSURANCE

A. REFERENCES:

1. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.
2. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued, or replaced.

Reference	Title
ANSI B16.3	Malleable Iron Threaded Fittings, Class 150 and 300
ANSI B16.9	Factory-Made Wrought Steel Buttwelding Fittings
ANSI B16.11	Forged Steel Fittings, Socket-Welding and Threaded
ASTM A36/A36M	Structural Steel
ASTM A47	Ferritic Malleable Iron Castings
ASTM A53	Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
ASTM A105/A105M	Forgings, Carbon Steel, for Piping Components

Reference	Title
ASTM A106 REV A	Seamless Carbon Steel Pipe for High-Temperature Service
ASTM A197	Cupola Malleable Iron
ASTM A234/A234M	Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures
ASTM A283/A283M REV A	Low and Intermediate Tensile Strength Carbon Steel Plates, Shapes and Bars
ASTM A536	Ductile Iron Castings
ASTM A570/A570M	Hot-Rolled Carbon Steel Sheet and Strip, Structural Quality
ASTM A572/A572M REV B	High Strength Low Alloy Columbium-Vanadium Steels of Structural Quality
AWWA C200	Steel Water Pipe 6 Inches and Larger
AWWA C205	Cement-Mortar Protective Lining and Coating for Steel Water Pipe--4 In. and Larger-- Shop Applied
AWWA C206	Field Welding of Steel Water Pipe
AWWA C207	Steel Pipe Flanges for Waterworks Services--Sizes 4 In. Through 144 In.
AWWA C208	Dimensions for Fabricated Steel Water Pipe Fittings
AWWA C209	Cold-Applied Tape Coating for Special Sections, Connections, and Fittings for Steel Water Pipelines
AWWA C210	Liquid Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipe
AWWA C214	Tape Coating Systems for the Exterior of Steel Water Pipelines
AWWA C600	Installation of Ductile-Iron Water Mains and Their Appurtenances
AWWA M11	Steel Pipe--A Guide for Design and Installation
SSPC-SP10	Near-White Blast Cleaning

B. TESTING:

1. Factory testing shall conform to the requirements of ASTM A53, ASTM A106, or AWWA C200 as applicable.

PART 2—PRODUCTS

2.01 PIPE MATERIALS

- A. Steel pipe and fittings shall be provided in accordance with ASTM A53, ASTM A106, or AWWA C200.
- B. Steel for pipe fabricated to meet requirements of AWWA C200 shall conform to the requirements of ASTM A36, ASTM A572, Grade 42, ASTM A570, Grades 33 and 36, or ASTM A283, Grade D. Steel for ASTM A53 and ASTM A106 pipe shall be Grade B.

2.02 PIPE MANUFACTURE

- A. Unless otherwise specified, ASTM A53 pipe shall be Type E, electric resistance welded or Type S, seamless pipe as specified in Section 40 05 13. The minimum wall thickness for ASTM A53 or ASTM A106 pipe shall be Schedule 40 for pipe 10-inch diameter and less and 3/8 inch for pipe 12 inch through 24 inch diameter. Increased shell thickness shall be provided where specified.
- B. AWWA C200 pipe shall be straight or spiral seam. The minimum wall thickness shall be 7 gauge for pipe 6 inch through 24 inch diameter and 1/4 inch for pipe 26-inch diameter and larger. Increased shell thickness shall be provided where specified.

2.03 CONNECTIONS

- A. Connections shall be as specified in Section 40 05 13.10.

2.04 FITTINGS AND APPURTENANCES

- A. Malleable iron threaded fittings and appurtenances shall conform to the requirements of ASTM A47 or ASTM A197, ANSI B16.3.
- B. Unless otherwise specified, steel fittings and appurtenances shall conform to the requirements of ASTM A234, ASTM A105, or ANSI B16.11; and fabricated steel fittings and appurtenances shall conform to AWWA C208.
- C. Fittings for grooved end piping systems shall be full flow cast fittings, steel fittings, or segmentally welded fittings with grooves or shoulders designed to accept grooved end couplings. Cast fittings shall be cast of ductile iron conforming to ASTM A536 or malleable iron conforming to ASTM A47. Standard steel fittings, including large size elbows, shall be forged steel conforming to ASTM A106. Standard segmentally welded fittings shall be fabricated of Schedule 40 carbon steel pipe.
- D. Unless otherwise specified, all fittings shall be rated for pressure and loadings equal to the pipe.

2.05 PIPE LINING

A. EPOXY:

1. Unless otherwise specified, pipe and fittings shall be lined with a liquid epoxy as specified in Section AWWA C210 with the following exceptions:
 - a. No coal tar products shall be incorporated in the liquid epoxy.
 - b. The curing agent may be an amidoamine as well as the other curing agents listed in AWWA C210.
2. The lining shall be applied to a minimum thickness of 16 mils in not less than two coats.

B. CEMENT MORTAR:

1. Where specified, pipe and fittings shall be lined with cement mortar as specified in AWWA C205.

C. HIGH TEMPERATURE SERVICE EPOXY:

1. Where specified, steel pipe and fittings shall be epoxy lined with not less than 10 mils of epoxy suitable for temperatures of 225 degrees F. Epoxy lining shall be 3M Scotchkote 306, Porter MCR 65 High Solids Epoxy, or equal. Surfaces shall be prepared in accordance with SSPC-SP 10 Near White Blast Cleaning, and the lining applied as recommended by the manufacturer.

D. GLASS LINING:

1. Where specified, pipe and fittings shall be glass lined with a dual layer coating system of vitreous material to a minimum thickness of 10 mils. Glass lining shall provide continuous coverage as tested by a low voltage holiday detector with only isolated voids permitted due to casting anomalies. Voids, other than isolated pinholes, shall be cause for rejection.
2. Pipe and fittings shall have all internal welds ground smooth and any voids or slag holes ground out, re-welded, and ground smooth.
3. Glass lining shall be Ferroch MEH-32, Vitco SG-14, or equal.

2.06 PIPE COATING

A. EPOXY:

1. Unless otherwise specified, pipe and fittings shall be coated with a liquid epoxy as specified in AWWA C210 with the following exceptions:
 - a. No coal tar products shall be incorporated in the liquid epoxy.
 - b. The curing agent may be an amidoamine as well as the other curing agents listed in AWWA C210.
2. The coating shall be applied to a minimum thickness of 16 mils in not less than two coats.

B. POLYETHYLENE TAPE:

1. Where specified, pipe and fittings shall be coated and wrapped with prefabricated multilayer cold applied polyethylene tape coating in accordance with AWWA C214. The coating application shall be a continuous step operation in conformance with AWWA C214, Section 3. The total coating thickness shall be not less than 50 mils for pipe 24 inches and smaller and not less than 80 mils for pipe 26 inches and larger.

C. GALVANIZED COATING

1. Where specified, pipe and fittings shall be hot dipped galvanized following fabrication in accordance with ASTM A123.

2.07 FUSION EPOXY COATING AND LINING

- A. Where specified, steel pipe and fittings shall be fusion epoxy coated and lined. The fusion epoxy coating shall be 3M Scotchkote 203, or equal. Surface preparation shall be in accordance with SSPC-SP 10 Near White Blast Cleaning. The application method shall be by the fluidized bed method and shall attain 12 mils minimum dry film thickness.
- B. Field welds, connections and otherwise damaged areas shall be coated and patched according to the manufacturer's instructions with 3M Scotchkote 306.

2.08 JOINT GASKETS

- A. Joint gaskets shall be as specified in Section 40 05 13.

2.09 PRODUCT DATA

- A. The following information shall be provided in accordance with Section 01 33 00:
1. Affidavits of Compliance with AWWA C200, ASTM A53, or ASTM A106 as applicable.

PART 3—EXECUTION

3.01 INSTALLATION

A. GENERAL:

1. Pipe shall be installed in accordance with AWWA M11, Chapter 16. Welded joints shall be in accordance with AWWA C206 and Section 40 05 13.10.
2. Sleeve-type mechanical pipe couplings shall be provided in accordance with AWWA M11 and paragraph 40 05 13.10.
3. Pipe lining and coatings at field joints shall be applied as specified in paragraphs 40 05 13.10.
4. Unless otherwise specified, buried mechanical couplings and valves shall be field coated as specified in paragraph 40 05 13.10.

B. ANCHORAGE:

1. Anchorage shall be provided as specified. Calculations and drawings for proposed alternative anchorage shall be submitted in accordance with Section 01 33 00.

3.02 TESTING

- A. Hydrostatic testing shall be in accordance with Section 4 of AWWA C600 except that test pressures and allowable leakage shall be as listed in Section 40 05 13.

END OF SECTION

SECTION 40 05 13.53

DUCTILE IRON PIPE

PART 1—GENERAL

1.01 DESCRIPTION

A. SCOPE:

1. This section specifies ductile iron pipe, ductile fittings and gaskets.

B. DEFINITION:

1. Where cast iron pipe is specified, the term and symbol shall mean ductile iron pipe.

1.02 REFERENCES

- A. This section contains references to miscellaneous documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.
- B. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, whether or not the document has been superseded by a version with a later date, discontinued, or replaced.

Reference	Title
ANSI A21.14-79	Ductile-Iron Fittings 3 In. Through 24 In., for Gas
ANSI A21.52-81	Ductile-Iron Pipe, Centrifugally Cast, in Metal Molds or Sand Lined Molds for Gas
ANSI B16.1-89	Cast Iron Pipe Flanges and Flanged Fittings Class 25, 125, 250, and 800
ANSI B16.5-88	Pipe Flanges and Flanged Fittings
ASTM A716-86	Ductile-Iron Culvert Pipe

Reference	Title
ASTM C150-89	Portland Cement
AWWA C104-90 (ANSI A21.4)	Cement-Mortar Lining for Ductile-Iron and Gray-Iron Pipe and Fittings for Water
AWWA C110-87 (ANSI A21.10)	Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In., for Water and Other Liquids
AWWA C111-85 (ANSI A21.11)	Rubber-Gasket Joints for Ductile- Iron and Gray-Iron Pressure Pipe and Fittings
AWWA C115-88 (ANSI A21.15)	Flanged Ductile-Iron and Gray-Iron Pipe With Threaded Flanges
AWWA C150- 81(ANSI A21.50)	Thickness Design of Ductile-Iron Pipe
AWWA C151-86 (ANSI A21.51)	Ductile-Iron Pipe, Centrifugally Cast, in Metal Molds or Sand-Lined Molds, for Water or Other Liquids
AWWA C153-88 (ANSI A21.53)	Ductile-Iron Compact Fittings, 3 In. Through 12 In. for Water and Other Liquids
AWWA C600-87	Installation of Ductile-Iron Water Mains and Their Appurtenances
AWWA C606-87	Grooved and Shouldered Type Joints

PART 2-PRODUCTS

2.01 GENERAL

- A. Pipe design, materials, and manufacture shall comply with the following documents:

Item	Document
Thickness design	AWWA C150
<u>Manufacturing requirements</u>	
Water or other liquid	AWWA C151
Gas	ANSI A21.52
Gravity service pipe	ASTM A716
<u>Joints</u>	
Rubber gasket	AWWA C111
Threaded flange	AWWA C115

Item	Document
<u>Fittings</u>	
Water or other liquid	AWWA C110/AWWA C153
Gas	ANSI A21.14
Cement mortar lining	AWWA C104

2.02 PIPE

- A. Unless otherwise specified, ductile iron pipe shall be Thickness Class 50 and have nominal laying lengths of 18 or 20 feet.

2.03 GASKETS

- A. Unless otherwise specified, gasket stock shall be a synthetic rubber compound in which the elastomer is nitrile or neoprene. The compound shall contain not less than 50 percent by volume nitrile or neoprene and shall be free from factice, reclaimed rubber and other deleterious substances. Gaskets shall, in addition, comply with AWWA C111 for push-on joints and with AWWA C606 for grooved end joints.

2.04 FITTINGS

- A. Unless otherwise specified, fittings shall conform to AWWA C110. Ends shall be push-on restrained joint or flanged adapters for valves.
- B. The AWWA C153 compact ductile iron fittings in sizes 3 through 12 inches are an acceptable substitute for standard fittings unless otherwise specified. Long-radius elbows shall be provided where specified.

2.05 JOINTS

- A. UNRESTRAINED JOINTS:

1. **PUSH-ON JOINTS:** Unrestrained joints, where specified, shall be the rubber ring compression, push-on type joint suitable for buried service. Unrestrained joints shall be the Fastite Joint as manufactured by American Cast Iron Pipe Company, the Tyton Joint as manufactured by U.S. Pipe, or equal. Unless otherwise specified, joints shall have an allowable deflection up to 5 degrees at specified pressures. Joint assembly and field cut joints shall be made in strict conformance with AWWA C600 and manufacturer's recommendations.

2. **MECHANICAL JOINTS:** Where specified, mechanical joints for above or below ground service shall meet the requirements of ANSI/AWWA A21.10/C110 and ANSI/AWWA A21.11/C111. Gaskets and bolts and nuts shall comply with paragraphs 2.03 and 2.05 D, respectively.

B. RESTRAINED JOINTS:

1. **GENERAL:** Unless otherwise specified, restrained joints are required for all exposed and buried piping. Unless otherwise specified, restrained joints shall be flanged or grooved end for exposed service and restrained push-on type for buried service.

2. **PUSH-ON JOINTS:** Restrained push-on joints shall be as specified in paragraph 2.05 A.1., modified for restraint. Joints shall be the Flex-Ring or Lok-Ring Joint as manufactured by American Cast Iron Pipe Company, TR Flex Joint as manufactured by US Pipe, or equal. Restrained joints shall be capable of being deflected after full assembly. Joint assembly shall be in strict conformance with AWWA C600 and manufacturer's recommendations. No field cuts of restrained pipe are permitted without prior approval of the Engineer.

3. **FLANGE ASSEMBLIES:** Unless otherwise specified, flanges shall be ductile iron and shall be threaded-on flanges conforming to ANSI/AWWA A21.15/C115 or cast-on flanges conforming to ANSI/AWWA A21.10/C110. Flanges shall be adequate for 250 psi working pressure. Bolt circle and bolt holes shall match those of ANSI B16.1, Class 125 flanges and ANSI B16.5, Class 150 flanges. Where specified, flanges shall be threaded-on or cast-on flanges conforming to ANSI B16.1, Class 250.

Unless otherwise specified, bolts and nuts for flange assemblies shall conform to paragraph 2.01 C. Gaskets shall be as specified in paragraph 2.01 B.

4. **MECHANICAL JOINTS:** Where specified, restrained mechanical joints shall be the positive restraint type. Mechanical joints with retainer glands are not acceptable.

C. NOT USED

D. BOLTS AND NUTS:

1. Corrosion-resistant bolts and nuts for use with buried ductile iron joints shall be high-strength, low-alloy steel as specified in ANSI/AWWA C111/A21.11.
2. Above grade bolts and nuts shall be 316 SS.

2.06 PIPE COATING

- A. Unless otherwise specified, pipe and fittings shall be coated with asphaltic material as specified in AWWA C151. The Supernatant piping shall be glass lined.

2.07 PIPE LINING

- A. **ASPHALTIC LINING:**

1. Unless otherwise specified, pipe and fittings shall be lined with asphaltic material as specified in AWWA C151. It is acceptable to apply the asphaltic coating over a cement mortar lining.

B. CEMENT MORTAR LINING:

1. Where specified, interior surfaces of pipe and fittings shall be cement mortar lined in accordance with AWWA C104/A21.4-90, double thickness. Cement shall be ASTM C150, Type II or V, low alkali, containing less than 0.60 percent alkalis.

C. GLASS LINING: (All Supernatant (SNT) Pipe and Fittings)

1. Where specified, pipe and fittings shall be glass lined with a dual layer coating system of vitreous material to a minimum thickness of 10 mils. Glass lining shall provide continuous coverage as tested by a low voltage holiday detector with only isolated voids permitted due to casting anomalies. Voids, other than isolated pinholes, shall be cause for rejection.
2. Ductile or cast iron pipe shall be bored, machined, or grit blasted to remove any voids, protrusions or surface irregularities to obtain a smooth continuous surface for glass lining.
3. Pipe shall be at least Class 53 on diameters of 6 inches or greater except for pipe to be bored or machined which shall be of a suitable wall thickness to assure boring or machining will not impair minimum wall thickness required for Class 53. Four-inch pipe shall be Class 56. Fittings shall be ground or grit blasted to remove any voids, protrusions or surface irregularities.
4. Glass lining shall be Ferroch MEH-32, Vitco SG-14, or equal.

2.08 PRODUCT DATA

- A.** The following information shall be provided in accordance with Sections 01300 and 01430:

1. Shop drawings.
2. Alignment drawings.
3. Certifications specified in the following documents:
ANSI A21.14, paragraph 14-4.2
ANSI A21.52, paragraph 52-4.2
ASTM A716, paragraph 4.2
AWWA C110, paragraph 10-5.3
AWWA C111, paragraph 11-7.1

AWWA C115, paragraph 15-4.2
AWWA C151, paragraph 51-5.2
AWWA C153, paragraph 53-6.3
AWWA C606, paragraph 4.1.1.1

PART 3—EXECUTION

3.01 INSTALLATION

A. GENERAL:

1. Piping runs specified on the drawings shall be followed as closely as possible. Proposed deviations shall be submitted in accordance with Section 01300.
2. Pipe shall be installed in accordance with AWWA C600.
3. Connections to existing structures and manholes shall be made so that the finished work will conform as nearly as practicable to the requirements specified for the new manholes, including necessary concrete work, cutting and shaping. Concrete mortar shaping within any structure and manhole shall be as specified.

B. INSULATING SECTIONS:

1. Where a metallic nonferrous pipe or appurtenance is connected to ferrous pipe or appurtenance, an insulating section shall be provided as specified in paragraph 15085-3.05.

C. ANCHORAGE:

1. Anchorage shall be provided as specified. Calculations and drawings for proposed alternative anchorage shall be submitted in accordance with Section 01300.

3.02 ACCEPTANCE TESTING

- A. Hydrostatic pressure tests shall be conducted in accordance with Section 4 of AWWA C600 except that test pressures and allowable leakage shall be as listed in Section 15050.
- B. The Contractor shall conduct the tests in the presence of the Owner's Representative.

END OF SECTION

SECTION 40 05 57.13

MANUAL VALVE AND GATE ACTUATORS

PART 1--GENERAL

1.01 DESCRIPTION

- A. This section specifies manual operators for valves and gates, and operator appurtenances.

1.02 REFERENCES

- A. This section contains references to a miscellaneous document. It is a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed document, the requirements of this section shall prevail.
- B. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, whether or not the document has been superseded by a version with a later date, discontinued or replaced.

Reference	Title
AWWA C500-86	Gate Valves 3 through 48 inch NPS, for Water and Sewage Systems

PART 2--PRODUCTS

2.01 GENERAL

- A. Except as specified in valve and gate specification sections, manual operators shall be as specified herein. Operators shall be mounted on the valve or gate and provided as a unit. Each valve body or operator shall have cast thereon the word "OPEN," an arrow indicating the direction to open, and flow direction arrows.

2.02 OPERATORS

A. GENERAL:

1. Manual operators shall have operating torques less than 80 foot-pounds. Unless specified otherwise, each manual operator shall be provided with an operating wheel. Unless specified otherwise, the direction of rotation of the operator shall be counterclockwise for opening.

B. WRENCH NUTS:

1. Wrench nuts shall comply with Section 3.15 of AWWA C500. A minimum of two operating keys, but no less than one key per every ten valves, shall be provided for operation of the wrench nut operated valves.

C. CHAIN WHEELS: NOT USED

2.03 OPERATOR APPURTENANCES

A. VALVE BOXES:

1. Valve boxes shall be cast iron and shall have suitable base castings to fit properly over the bonnets of their respective valves and heavy top sections with stay-put covers. Covers shall be hot-dip galvanized.

B. FLOOR BOXES:

1. Floor boxes shall be hot-dip galvanized. Where the operating nut is in the concrete slab, the floor box shall be bronze bushed. Where the operating nut is below slab, the opening in the bottom of the box shall be sufficient for passage of the operating key.

C. ADJUSTABLE SHAFT VALVE BOXES:

1. Adjustable shaft valve boxes shall be concrete or cast iron Brooks No. 3RT, Christie G5, Empire 7 1/2 valve extension box, or equal. Box covers on water lines shall be impressed with the letter "W." Gas line covers shall be impressed with the letter "G."

2.04 PRODUCT DATA

- A. Manufacturer's catalog information and other data confirming conformance to design, material requirements, and operation and maintenance information shall be provided in accordance with Sections 01 33 00 and 01 78 23.

PART 3—EXECUTION

3.01 GENERAL

- A. Installation shall be as specified herein. Valve operators shall be located so that they are readily accessible for operation and maintenance. Valve operators shall be mounted for unobstructed access, but mounting shall not obstruct walkways. Valve operators shall not be mounted where shock or vibration will impair their operation. Support systems shall not be attached to handrails, process piping, or mechanical equipment.

3.02 OPERATORS

A. GENERAL:

- 1. Valves and gates shall be provided with manual operators, unless specified otherwise.

B. WRENCH NUTS:

- 1. Wrench nuts shall be provided on buried valves, on valves which are to be operated through floor boxes, and where specified. Extended wrench nuts shall be provided if necessary so that the nut will be within 6 inches of the valve box cover.

C. CHAIN WHEELS: NOT USED

3.03 OPERATOR APPURTENANCES

A. VALVE BOXES:

- 1. Valve boxes extending to finished surfaces shall be provided for buried valves.

B. FLOOR BOXES:

- 1. Floor boxes shall be provided for wrench operation of valves located below concrete slabs. Each floor box and cover shall be of the depth required for installation in the slab.

END OF SECTION

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SECTION 40 05 62.16

ECCENTRIC PLUG VALVES FOR LIQUID SERVICE

PART 1—GENERAL

1.01 DESCRIPTION

A. This section specifies eccentric plug valves.

1.02 QUALITY ASSURANCE

A. REFERENCES:

1. This section contains references to miscellaneous documents. They are a part of this section insofar as specified and modified herein. In case of conflict between the requirements of this section and the listed documents, the requirements of this section shall prevail.
2. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, whether or not the document has been superseded by a version with a later date, discontinued or replaced.

Reference	Title
ANSI B16.1-89	Cast Iron Pipe Flanges and Flanged Fittings Class 25, 125, 250, and 800
ASTM A126-84	Gray Iron Castings for Valves, Flanges, and Pipe Fittings
ASTM A276-90	Stainless and Heat-Resisting Steel Bars and Shapes
ASTM A436-84	Austenitic Gray Iron Castings
ASTM A536-84	Ductile Iron Castings
AWWA C504-87	Rubber Seated Butterfly Valves

B. PROOF OF DESIGN TESTS:

1. The Contractor shall furnish the Owner's Representative three certified copies of a report from an independent testing laboratory certifying successful completion of proof-of-design testing conducted in accordance with AWWA C504, Section 5.2, except that where the word "disc" appears in the standard, it is understood to mean "plug." In lieu of testing the valves at an independent testing laboratory, proof-of-design testing may be performed at the valve manufacturer's laboratory, but must be witnessed by a representative of a qualified independent testing laboratory, and all test reports must be certified by the laboratory representative. Proof-of-design testing shall have been performed on not less than three 6-inch-diameter valves, with all three test units demonstrating full compliance with the test standards. Failure to satisfactorily complete the test shall be deemed sufficient evidence to reject all valves of the proposed make or manufacturer's model number.

PART 2--PRODUCTS

2.01 MATERIALS

A. Materials of construction shall be as follows:

Component	Material
Body	Cast iron, ASTM A126, Class B
Plug	Cast iron, ASTM A126, Class B, or cast iron ASTM A436 (Ni-resist), or ductile iron, ASTM A536
Plug facing	Neoprene or Buna-N
Body seats	
Less than 3 inches	Cast iron, ASTM A126, Class B
3 inches and larger	Nickel
Packing	Buna V-flex or TFE

2.02 MANUFACTURE

A. GENERAL:

1. Valves shall be DeZurik. Valves shall be straight-flow nonlubricated resilient plug type suitable for driptight, bi-directional shutoff at the specified valve design pressure. Port areas for the valve shall be at least 100 percent of the adjacent full pipe area and shall be capable of passing solids of pipe size

and pigs for pigging the lines. Valve body seats consisting of nickel for valves 3 inches and larger shall be constructed of a welded-in overlay of not less than 90 percent pure nickel. Upper and lower journal bearings shall be replaceable, sleeve-type, corrosion resistant, and permanently lubricated. Packing shall be self-adjusting chevron type replaceable without disassembling the valve.

2. Unless otherwise specified, valves shall, as a minimum, conform to the following pressure ratings:

Size, inches	Design pressure, psig
12 and smaller	175
14 through 36	150
42 through 54	125

B. END CONNECTIONS:

1. Valves 3 inches and smaller shall have threaded ends. Valve flange drilling for valves larger than 3 inches shall be per ANSI B16.1, Class 125. Grooved-end valves shall be provided for grooved-end piping systems.

C. MANUAL OPERATORS:

1. Unless otherwise specified, valves 4 inches and smaller shall be provided with a lever type manual operator. Valves larger than 4 inches shall be provided with totally enclosed worm gear operators. Where specified, manual operators shall have an adjustable stop. All operator components shall be sized for the valve design pressure in accordance with AWWA C504, Section 3.8.

2.03 PRODUCT DATA

- A. The following information shall be provided in accordance with Sections 01 33 00 and 01 78 23:
 1. Manufacturer's product data.
 2. Proof-of-design test reports specified in paragraph 40 05 62.16-1.02 B.
 3. Verification that valves are capable of passing solids of pipe size and pigs for pigging the lines.
 4. Operation and Maintenance Information

PART 3-EXECUTION

3.01 GENERAL

- A. Unless otherwise specified, valves shall be provided with the seat downstream away from flow. Valves at tank connections shall be installed with seat away from tank. Valves on pump discharge lines shall be installed with seat adjacent to the pump.

END OF SECTION

SECTION 40 05 94.23

FABRICATED STAINLESS STEEL WEIR GATES

PART 1– GENERAL

1.01 DESCRIPTION

A. SCOPE:

1. This section specifies downward-opening self-contained weir gates for control of supernatant flow from the lagoons to the supernatant pump station. The weir gates are to be installed in the supernatant overflow boxes.

B. TYPE:

1. Weir gates shall be of stainless steel construction with gates, guides, and actuators provided by one manufacturer.

C. DESIGN CONDITIONS:

1. Self-contained weir gates shall be designed for continuous exposure to domestic wastewater containing organic solids, grease, grit and other materials. Fluid temperature is expected to range from 32 degrees F to 75 degrees F.
2. Self-contained weir gates will be installed outdoors in a wastewater treatment lagoon.

D. OPERATING REQUIREMENTS:

Gate size, inch ^a	Gate type ^b	Opening direction ^c	Design head, feet		Operator type ^d
			Seating	Unseating	
24 x 30	W	D	2.5	2.5	II

^aWidth by height

^bC = channel-mounted, W = wall-mounted

^cU = upward, D = downward

^dI = geared crank type, II = handwheel type

1.02 REFERENCES

- A. This section contains references to miscellaneous documents. They are a part of this section as specified and modified. In case of a conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.
- B. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, whether or not the document has been superseded by a version with a later date, discontinued, or replaced.

Reference	Title
ASME	American Society of Mechanical Engineers
ASTM 240	Heat-Resisting Chromium and Chromium Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels
ASTM A276	Stainless and Heat-Resisting Steel Bars and Shapes
ASTM D1248	Polyethylene Plastics Molding and Extrusion Materials for Wire and Cable
ASTM D2000	Rubber Products in Automotive Applications
ASTM D4020	Ultra-High-Molecular-Weight Polyethylene Molding and Extrusion Materials
AWWA C561	Fabricated Stainless Steel Slide Gates
ASTM A276-87	Stainless and Heat-Resisting Steel Bars and Shapes
ASTM B209-88	Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B221-88	Aluminum and Aluminum-Alloy Extruded Bar, Rods, Wire, Shapes, and Tubes

1.03 SUBMITTALS

- A. The following information shall be provided in accordance with Section 01 33 00:
1. A copy of this specification section, with addendum updates included, and all referenced and applicable sections, with addendum updates included, with each paragraph check-marked (✓) to indicate specification compliance or marked to indicate requested deviations from specification requirements.

If deviations from the specifications are indicated and, therefore requested by the Contractor, the submittal shall be accompanied by a detailed, written justification for each deviation. Failure to include a copy of the marked-up specification sections, along with justification for any requested deviations to the specification requirements, with the submittal shall be cause for rejection of the entire submittal with no further consideration.

2. Fabrication drawings with full dimensions.
3. Plan, cross section, and details showing proposed mounting for each size and typical application of gate.
4. Operation and Maintenance Information.

PART 2—PRODUCTS

2.01 ACCEPTABLE PRODUCTS

- A. Stainless Steel Fabricated Weir Gates shall be Model GH-66, manufactured by Golden Harvest to match existing gates installed at this facility.

2.02 MATERIALS

- A. Materials for components shall be as follows:

Component	Material
Frames, slides, rails, and yokes	ASTM A276 or ASTM A240, Type 316L Stainless Steel
Fasteners and anchor bolts	ASTM A276, Type 316 Stainless Steel
Stems	ASTM A276, Type 316 Stainless Steel
Stem guides	ASTM A276, Type 316L Stainless Steel with bronze or UHMW Polyethylene bushing
Seals	ASTM D2000, Grade AA625, Buna-N or neoprene rubber
Guide Liner	ASTM D4020 UHMW polyethylene
Handwheel	Aluminum
Lift nut, coupling	ASTM B584 UNS-C86500 Manganese bronze
Stem cover	ASTM D3935 Polycarbonate

2.03 EQUIPMENT FEATURES

A. FRAME AND GUIDES:

1. The gate frame shall be a rigid, welded unit, composed of the guide rails, cross bars, and deadrails, with a clear opening the same size as the waterway, unless otherwise specified. They shall be flatback or embedded type.
2. The guides shall be of stainless steel incorporating a dual slot design. The primary slot will accept the plate of the disc (slide), and the secondary slot will be sufficiently wide to accept the reinforcing ribs of the disc. The guides shall be designed for maximum rigidity, having a weight of not less than 13 pound per foot. The guides will be of sufficient length to support two-thirds ($2/3$) the height of the slide, when the gate is fully open.
3. The yoke shall be sufficiently strong to support the lift forces when subjected to a load of 80 pounds pull on the operator.

B. SLIDE:

1. The slide shall be plate reinforced with structural steel shapes welded to the plate. The slide shall not deflect more than $1/360$ of the span of the gate under maximum head. Reinforcing ribs shall extend to the guides so that the seating surface of the guide is reinforced. The stem connection shall be either the clevis type, with structural members welded to the slide and a bolt to act as pivot pin, or a threaded and bolted (or keyed) thrust nut supported in welded nut pocket. The pocket and yoke of the gate shall withstand at least twice the rated thrust output of the operator at 40 pounds pull.

C. STEM:

1. The gate shall be a rising stem configuration.
2. The stem diameter shall be capable of withstanding twice the rated output of the operator at 40 pounds pull, and shall be supported such that $1/r$ ratio for the unsupported part of the stem shall not exceed 200.

2.04 OPERATORS

- A. Operators shall be handwheel type. Operators shall meet AWWA C561 specifications, except as otherwise specified, and shall be designed to meet the operating requirements specified in paragraph 40 05 94.23-1.01 D. Clear plastic stem covers shall be provided as specified in AWWA C501, Section 3.14.5.

- B. Manual operators, gears, and bearings shall be enclosed in a weatherproof housing, and pressure type fittings shall be provided for grease lubrication of the bearings and gears. A maximum effort of 40 pounds pull of the crank or handwheel shall operate the gate under the specified operating conditions.
- C. The head of the bench stand operator shall have a solid bronze, internally threaded operating nut. The operator shall be mounted on antifriction roller bearings. Cranks and handwheels shall be removable from the operator.

2.05 PRODUCT DATA

- A. The following information shall be provided in accordance with Sections 01 33 00 and 01 78 23:
 - 1. Product information, charts, or graphs to verify that the product provided meets the requirements set forth in the specification.
 - 2. Affidavits of compliance in accordance with AWWA C561.
 - 3. Applicable operation and maintenance information as specified in Section 01 78 23.

PART 3--EXECUTION

3.01 INSTALLATION

- A. Unless otherwise specified, self-contained weir gates shall be installed in accordance with manufacturer's instructions.

3.02 TESTING

- A. For purpose of this specification, field leakage tests shall be performed as specified in Section 6 of AWWA C501. The maximum allowable leakage rate shall be 0.10 gallons per minute per foot of seating perimeter for the seating and unseating heads specified. Field leakage tests shall be conducted with no head on one side of the gate being tested.

END OF SECTION

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**DIVISION 41 – MATERIAL HANDLING AND
PROCESSING EQUIPMENT**

SECTION 41 14 36
VEHICLE WEIGH SCALES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes methods of measurement by weigh scale.
- B. If the Specifications require measurement by weighing on vehicle weigh scales, the Contractor shall provide vehicle weigh scales and shall transport Materials to the scales.
- C. Contractor-provided scales shall be furnished, installed, and maintained by the Contractor or its supplier, or, subject to the Owner's Representative approval, may be commercial scales located in the vicinity of the Project.
- D. Unless otherwise provided in the Contract, Pay Items to be measured by weight shall include all Contractor costs for providing, maintaining, inspecting, and testing scales; for furnishing appropriate weigh tickets; for self-printing scales; and for transporting Materials to the scales or to check weighing.
- E. Subject to the Owner's Representative approval, weights may be determined by plant or hopper scales.

1.01 REQUIREMENTS

- A. The scales shall conform to ORS Chapter 618 and NIST Handbook 44, and shall be:
 - 1. Licensed by the Oregon Department of Agriculture, or by the analogous regulatory body for scales located outside the State;
 - 2. Technically suitable for weighing the Materials;
 - 3. Properly installed and maintained; and
 - 4. Accurate to the required tolerances.
 - 5. Calibrated daily.
- B. The weight of any Materials weighed by anyone other than the Owner's Representative will be subject to check weighing as the Owner's Representative directs.

1.02 APPROACHES

- A. Vehicle Scale approaches shall be:
 - 1. At each end of the scale platform;
 - 2. Straight and in line with the platform; and
 - 3. Long enough to accommodate combination vehicles longer than the scale platform so that they are level and allow release of brakes before weighing.

1.03 INSPECTIONS

- A. Contractor shall have all scales certified, that is inspected and their accuracy tested, by the Oregon Department of Agriculture or a scale service company as follows:
 - 1. Before use if installed at a new site;
 - 2. 60 Calendar Days after initial inspection;
 - 3. Every 6 months thereafter; and
 - 4. When the Owner's Representative directs additional inspections.
- B. No Materials weighed on scales without current certifications in accordance with this Subsection will be accepted. The Contractor shall provide a copy of all required certifications to the Owner's Representative.
- C. Testing by a scale service company within the State of Oregon shall comply with ORS Chapter 618.
- D. If additional inspections directed by the Owner's Representative confirm that the scale accuracy is within the required tolerances, the Owner will pay the cost for inspecting and testing the scales. If the scale accuracy is not within these tolerances, the Contractor shall pay the cost for inspecting and testing the scales.

1.04 INSPECTIONS RESULTS

- A. If an inspection indicates the scales have been under-weighing (indicating less than the true weight), the Owner will make no additional payment to the Contractor for Materials previously weighed.
- B. If an inspection indicates the scales have been over-weighing (indicating more than the true weight), the weights will be reduced for Materials received after the time the Owner's Representative determines the overweighing began or, if that is

not possible, after the last acceptable certification of the scales. The reduction will be the amount of error in excess of the 0.2% maintenance tolerance allowed in the Contract.

1.05 CONTRACTOR-PROVIDED WEIGH TECHNICIAN

- A. The Contractor shall provide a technician to operate Contractor-provided vehicle weigh scales. The Owner will observe procedures and require check weighing in accordance with the following:
 - 1. Scale with automatic printer:
 - a. If the scales have an automatic weigh memo printer that does not require manual entry of gross weight information, the Owner may periodically have a representative at the scales to observe the weighing procedures. In addition, the Owner's Representative may periodically check the weight for a load of Materials by directing the haul vehicle to reweigh on a different scale that has been inspected and certified in accordance with 41 14 36 -1.01.
 - b. If a different scale is not available within a 30 mile round trip from the regular haul route the Owner will allow check weighing on an approved alternate basis. Check weights within 0.4% of the Contractor-provided weight are acceptable.
 - c. The Owner's Representative will resolve discrepancies found by check weighing. Owner employee costs will be paid by the Owner. The Contractor shall pay all other costs resulting from the check weighings, including without limitation the use of other scales.
 - d. If more than 50 tons per day of all types of Materials are received from a scale, the Contractor shall make random check weighings at least every tenth day on which more than 50 tons is received or at each interval that 10,000 tons has been weighed, whichever occurs first, or as directed by the Owner's Representative. The Contractor shall make at least one check weighing on projects where more than 2,000 tons of all types of materials are received from a scale. The Contractor shall provide the Owner's Representative with the results of the check weighing.

1.06 DUTIES OF WEIGH TECHNICIAN

A. The Contractor's weigh technician shall:

1. Determine twice a day, or as otherwise directed by the Owner's Representative, the empty haul weights (tare weights) of hauling vehicles, unless vehicles are tared before each load;
2. Furnish daily a listing of the tare weights if 10 or more loads are hauled during that day;
3. Furnish a note listing the net weight for each consecutive ten loads with the following load;
4. Furnish a daily listing of the net weights and total weight for each type of Material hauled during that day; and
5. Furnish a legible, serially numbered weigh memo for each load of Materials to the Owner's Materials receiver at the point of delivery, or as directed by the Owner's Representative. The memo shall identify the Project, the Materials, the date, net weight (gross and tare as appropriate), and identification of vehicle, driver and weigh technician.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

**** END OF SECTION ****