

City of Tacoma Tacoma Rail

PROJECT MANUAL

East Locomotive Servicing Facility

SPECIFICATION NO.: TR21-0548F

PROJECT NUMBER RAL-00087

City of Tacoma Tacoma Rail

PROJECT MANUAL

EAST LOCOMOTIVE SERVICING FACILITY

SPECIFICATION NUMBER TR21-0548F

Chris Storey, Project Manager Public Works Department Engineering Division 733 Market Street, Room 40 Tacoma, WA 98402

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EAST LOCOMOTIVE SERVICING FACILITY

SPECIFICATION NO. TR21-0548F

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City of Tacoma PUBLIC WORKS ENGINEERING

REQUEST FOR BIDS TR21-0548F East Locomotive Servicing Facility

Submittal Deadline: 11:00 a.m., Pacific Time, Tuesday, August 3, 2021

Submittals must be received by the City's Procurement and Payables Division prior to 11:00 a.m. Pacific Time.

For electronic submittals, the City of Tacoma will designate the time of receipt recorded by our email, <u>bids@cityoftacoma.org</u>, as the official time of receipt. This clock will be used as the official time of receipt of all parts of electronic bid submittals.

Submittal Delivery: Sealed submittals will be received as follows:

By Email:
bids@cityoftacoma.org
Maximum file size: 35 MB. Multiple emails may be sent for each submittal
By Carrier:
If possible, please include a flash drive of your full submittal.
City of Tacoma Procurement & Payables Division Tacoma Public Utilities 3628 S 35 th Street Tacoma, WA 98409
In Person:
If possible, please include a flash drive of your full submittal.
City of Tacoma Procurement & Payables Division Tacoma Public Utilities Administration Building North Guard House (east side of main building 3628 S 35 th Street Tacoma, WA 98409
Bv Mail:
If possible, please include a flash drive of your full submittal.
City of Tacoma Procurement & Payables Division Tacoma Public Utilities PO Box 11007 Tacoma, WA 98411-0007

Bid Opening: Held virtually each Tuesday at 11AM. Attend <u>via this link</u> or call 1 (253) 215 8782.

Submittals in response to a RFB will be recorded as received. As soon as possible on the day of submittal deadline, preliminary results will be posted to <u>www.TacomaPurchasing.org</u>.

Solicitation Documents: An electronic copy of the complete solicitation documents may be viewed and obtained at the City's plan distribution service provider, ARC, 632 Broadway, Tacoma, WA, or by going to <u>http://www.e-arc.com/location/tacoma</u>. Prospective bidders will be required to pay reproduction costs. A list of vendors registered for this solicitation is also available at their website.

Pre-Proposal Meeting: A pre-proposal meeting will be held at the site Tuesday July 20 at 1PM. Please meet at 2601 SR 509 North Frontage Road Tacoma, WA 98421 and the group will be taken to the site.

Project Scope: Adding new service bays and supporting infrastructure.

Estimate: \$2,900,000

Paid Sick Leave: The City of Tacoma requires all employers to provide paid sick leave as set forth in Title 18 of the Tacoma Municipal Code. For more information, visit <u>our Minimum</u> Employment Standards Paid Sick Leave webpage.

Americans with Disabilities Act (ADA Information: The City of Tacoma, in accordance with Section 504 of the Rehabilitation Act (Section 504) and the Americans with Disabilities Act (ADA), commits to nondiscrimination on the basis of disability, in all of its programs and activities. Specification materials can be made available in an alternate format by emailing Gail Himes at <u>ghimes@cityoftacoma.org</u>, or by calling her collect at 253-591-5785.

Federal Title VI Information: "The City of Tacoma" in accordance with provisions of Title VI of the Civil Rights Act of 1964, (78 Stat. 252, 42 U.S.C. sections 2000d to 2000d-4) and the Regulations, hereby notifies all bidders that it will affirmatively ensure that in any contract entered into pursuant to this advertisement, disadvantaged business enterprises will be afforded full and fair opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, national origin in consideration of award.

Additional Information: Requests for information regarding the specifications may be obtained by contacting Tina Eide, Senior Buyer by email to <u>teide@cityoftacoma.org</u>.

Protest Policy: City of Tacoma protest policy, located at <u>www.tacomapurchasing.org</u>, specifies procedures for protests submitted prior to and after submittal deadline.



Meeting sites are accessible to persons with disabilities. Reasonable accommodations for persons with disabilities can be arranged with 48 hours advance notice by calling 253-502-8468.

CITY OF TACOMA FINANCE/PURCHASING DIVISION SPECIAL NOTICE TO BIDDERS

Public works and improvement projects for the City of Tacoma are subject to Washington state law and Tacoma Municipal Code, including, but not limited to the following:

I. STATE OF WASHINGTON

A. RESPONSIBILITY CRITERIA – STATE OF WASHINGTON

In order to be considered a responsible bidder the bidder must meet the following mandatory state responsibility criteria contained in RCW 39.04.350:

- 1. Have a current certificate of registration as a contractor in compliance with chapter 18.27 RCW, which must have been in effect **at the time of bid submittal**;
- 2. Have a current Washington Unified Business Identifier (UBI) number;
- 3. If applicable:
 - a. Have Industrial Insurance (workers' compensation) coverage for the bidder's employees working in Washington, as required in Title 51 RCW;
 - b. Have a Washington Employment Security Department number, as required in Title 50 RCW;
 - c. Have a Washington Department of Revenue state excise tax registration number, as required in Title 82 RCW and;
- 4. Not be disqualified from bidding on any public works contract under RCW 39.06.010 (unlicensed or unregistered contractors) or 39.12.065(3) (prevailing wage).
- 5. Have received training on the requirements related to public works and prevailing wage under this chapter and chapter 39.12 RCW and must designate a person or persons to be trained on these requirements. The training must be provided by the department of labor and industries or by a training provider whose curriculum is approved by the department. Bidders that have completed three or more public works projects and have had a valid business license in Washington for three or more years are exempt from this subsection.

B. RECIPROCAL PREFERENCE FOR RESIDENT CONTRACTORS:

Effective March 30, 2012, RCW 39.04.380 imposes a reciprocal preference for resident contractors. Any bid received from a non-resident contractor from a state that provides an instate percentage bidding preference is subject application of a comparable percentage disadvantage.

A non-resident contractor from a state that provides an in-state percentage bidding preference means a contractor that:

- 1. Is from a state that provides a percentage bid preference to its resident contractors bidding on public works projects, and
- 2. Does not have a physical office located in Washington at the time of bidding on the City of Tacoma public works project.

The state of residence for a non-resident contractor is the state in which the contractor was incorporated, or if not a corporation, the state in which the contractor's business entity was formed.

The City of Tacoma will evaluate all non-resident contractors for an out of state bidder preference. If the state of the non-resident contractor provides an in state contractor preference, a comparable percentage disadvantage will be applied to the non-resident contractor's bid prior to contract award. The responsive and lowest and best responsible bidder after application of any non-resident disadvantage will be awarded the contract.

The reciprocal preference evaluation does not apply to public works procured pursuant to RCW 39.04.155, RCW 39.04.280, federally funded competitive solicitations where such agencies prohibit the application of bid preferences, or any other procurement exempt from competitive bidding.

Bidders must provide the City of Tacoma with their state of incorporation or the state in which the business entity was formed and include whether the bidder has a physical office located in Washington.

The bidder shall submit documentation demonstrating compliance with above criteria on the enclosed State Responsibility and Reciprocal Bidder Information form.

C. SUBCONTRACTOR RESPONSIBILITY

- 1. The Contractor shall include the language of this subcontractor responsibility section in each of its first tier subcontracts, and shall require each of its subcontractors to include the same language of this section in each of their subcontracts, adjusting only as necessary the terms used for the contracting parties. The requirements of this section apply to all subcontractors regardless of tier.
- 2. At the time of subcontract execution, the Contractor shall verify that each of its first tier subcontractors meets the following bidder responsibility criteria:
 - a. Have a current certificate of registration as a contractor in compliance with chapter 18.27 RCW, which must have been in effect at the time of subcontract bid submittal;
 - b. Have a current Washington Unified Business Identifier (UBI) number;
 - c. If applicable, have:
 - a. Have Industrial Insurance (workers' compensation) coverage for the bidder's employees working in Washington, as required in Title 51 RCW;
 - b. A Washington Employment Security Department number, as required in Title 50 RCW;
 - c. A Washington Department of Revenue state excise tax registration number, as required in Title 82 RCW;
 - d. An electrical contractor license, if required by Chapter 19.28 RCW;
 - e. An elevator contractor license, if required by Chapter 70.87 RCW and;
- 3. Not be disqualified from bidding on any public works contract under RCW 39.06.010 (unlicensed or unregistered contractors) or 39.12.065(3) (prevailing wage).

II. CITY OF TACOMA

A. SUPPLEMENTAL RESPONSIBILITY CRITERIA – CITY OF TACOMA:

In order to be considered a responsible bidder, the prospective bidder shall have all of the following qualifications set forth in Tacoma Municipal Code 1.06.262:

- 1. Adequate financial resources or the ability to secure such resources;
- 2. The necessary experience, stability, organization and technical qualifications to perform the proposed contract;
- 3. The ability to comply with the required performance schedule, taking into consideration all existing business commitments;
- 4. A satisfactory record of performance, integrity, judgment and skills; and
- 5. Be otherwise qualified and eligible to receive an award under applicable laws and regulations.
 - a. Bidder Responsibility. Bidders shall not be in violation of 39.04.350 RCW Bidder Responsibility Criteria Supplemental Criteria.

In addition to the mandatory bidder responsibility criteria listed immediately above, the City may, in addition to price, consider any or all of the following criteria contained in Tacoma Municipal Code Chapter 1.06.262 in determining bidder responsibility:

- 1. The ability, capacity, experience, stability, technical qualifications and skill of the respondent to perform the contract;
- 2. Whether the respondent can perform the contract within the time specified, without delay or interference;
- 3. Integrity, reputation, character, judgment, experience, and efficiency of the respondents, including past compliance with the City's Ethics Code;
- 4. Quality of performance of previous contracts;
- 5. Previous and existing compliance with laws and ordinances relating to contracts or services;
- 6. Sufficiency of the respondent's financial resources;
- 7. Quality, availability, and adaptability of the supplies, purchased services or public works to the particular use required;
- 8. Ability of the respondent to provide future maintenance and service on a timely basis;
- 9. Payment terms and prompt pay discounts;
- 10. The number and scope of conditions attached to the submittal;
- 11. Compliance with all applicable City requirements, including but not limited to the City's Ethics Code and its Small Business Enterprise and Local Employment and Apprenticeship programs;
- 12. Other qualification criteria set forth in the specification or advertisement that the appropriate department or division head determines to be in the best interests of the City.

The City may require bidders to furnish information, sworn or certified to be true, to demonstrate compliance with the City responsibility criteria set forth above. If the city manager or director of utilities is not satisfied with the sufficiency of the information provided, or if the prospective respondent does not substantially meet all responsibility requirements, any submittal from such respondent must be disregarded.

B. ADDITIONAL SUPPLEMENTAL CRITERIA

The Bidder shall demonstrate to the satisfaction of the City of Tacoma that the Bidder and their Subcontractors are qualified to perform the work under this Contract and therefore are a responsible Bidder. To be responsible, the Bidder, including the General Contractor and their subcontractors must demonstrate an appropriate level of experience, technical competence and successful past performance of work. The information in the Statement of Qualifications Form will assist the City of Tacoma in making such determination.

C. MODIFICATIONS TO SUPPLEMENTAL CRITERIA

Potential bidders may request modifications to the City's **supplemental criteria** by submitting a written request to the Purchasing Division via email to <u>bids@cityoftacoma.org</u> no later than 5:00 p.m. Pacific Time, three days prior to the submittal deadline. Please include the Specification No. and Title when submitting such requests. Requests must include justification for why certain criteria should be modified. Requests received after this date and time will not be considered.

The City will respond to a timely submitted request prior to the bid opening date. Changes to the supplemental criteria, if warranted, will be issued by addendum to the solicitation documents and posted to the City's website for the attention of all prospective bidders.

D. DETERMINATION OF BIDDER RESPONSIBILITY

If the City determines the bidder does not meet the criteria above and is therefore not a responsible bidder, the City shall notify the bidder in writing with the reasons for its determination. If the bidder disagrees, the bidder may appeal the determination in a manner consistent with the City's Protest Policy. Appeals are coordinated by the Purchasing Division heard by the Procurement and Payables Division manager for contracts less than or equal to \$500,000 and by Contracts and Awards Board for contracts greater than \$500,000.

SPECIAL REMINDER TO ALL BIDDERS

HEALTH & SAFETY: Be sure to comply with all City of Tacoma health and safety requirements.

 This project has been deemed to be an essential project by the City of Tacoma and it is anticipated that the contract will be operational during the COVID-19 outbreak. Therefore the contractor shall complete a health and safety plan describing how the contractor will complete the work while combating the COVID-19 spread (social distancing practices) and what Personal Protective Equipment (PPE) will be in place.

PLEASE NOTE: Be sure you have complied with all specifications and requirements and have signed all required documents.

YOUR ATTENTION IS PARTICULARLY CALLED to the following forms, which must be executed in full before the bid is submitted:

- 1. <u>BID PROPOSAL</u>: The unit prices bid must be shown in the space provided. Check your computations for omissions and errors.
- 2. <u>SIGNATURE PAGE</u>: To be filled in and executed by a duly authorized officer or representative of the bidding entity. If the bidder is a subsidiary or doing business on behalf of another entity, so state, and provide the firm name under which business is hereby transacted.
- 3. <u>BID BOND</u>: The Bid Bond must be executed by the person legally authorized to sign the bid, and must be properly signed by the representatives of the surety company unless the bid is accompanied by a certified check. If Bid Bond is furnished, the form furnished by the City must be followed; no variations from the language thereof will be accepted. The amount of the Bid Bond must be not less than 5% of the total amount bid.

If submitting your bid electronically, a scanned version of the original bid bond must accompany your electronic bid submittal. The original bid bond shall be sent to the Contracting Agency and postmarked no later than the day of bid opening. **Original bid bonds will be delivered to:**

City of Tacoma Procurement & Payables Division Tacoma Public Utilities P.O. Box 11007 Tacoma, WA 98411-0007

- 4. <u>CERTIFICATION OF COMPLIANCE WITH WAGE PAYMENT STATUTES</u>: Bidder shall complete this form in its entirety to ensure compliance with state legislation (SHB 2017).
- STATE RESPONSIBILITY AND RECIPROCAL BID PREFERENCE INFORMATION: Bidder shall complete this form in its entirety to ensure compliance with state legislation (SHB 2010).
- <u>LIST OF SUBCONTRACTOR CATEGORIES OF WORK</u>: Bidder shall list all subcontractor(s) proposed to perform the work of heating, ventilation and air conditioning, plumbing, as described in Chapter 18.106 RCW, and electrical as described in Chapter 19.28 RCW.

FAILURE TO LIST SUBCONTRACTORS WILL RESULT IN THE BID BEING NON-RESPONSIVE AND THEREFORE VOID.

7. EQUITY IN CONTRACTING (EIC) UTILIZATION FORM

Bidders shall complete the Equity in Contracting Utilization Form in accordance with the City of Tacoma Equity in Contracting Regulations Manual and Chapter 1.07 of the City of Tacoma Municipal Code (TMC). This form shall be fully and accurately completed and returned with submission of the Bid and will be used to determine if the Bidder is in compliance with the EIC regulations and the TMC.

Bidders shall meet the percent sub-contracting requirements listed on the EIC Requirement Form to be considered responsive. Bidders unable to meet the percent subcontracting requirements shall submit an Application of Waiver of EIC Requirements, the Equity in Contracting Utilization Form, and any required attachments with the Bid in accordance with the Equity in Contracting Regulations Manual located in PART III of these Specifications.

FAILURE TO COMPLETE AND SUBMIT EIC FORMS WITH THE BID SUBMITTAL PACKAGE MAY RESULT IN THE BID BEING DECLARED NON-RESPONSIVE AND REJECTED.

8. STATEMENT OF QUALIFICATIONS FOR RAIL CONTRACTORS

This form shall be completed in its entirety and submitted with the bid. Failure to submit and meet the requirements as stated in Division 1, Section 01 1010, Subsection 1.7 of the Special Provisions may be grounds for rejection of the bid.

POST AWARD FORMS EXECUTED UPON AWARD:

- A. CONTRACT: Must be executed by the successful bidder.
- B. CERTIFICATE OF INSURANCE: Shall be submitted with all required endorsements.
- C. PAYMENT BOND TO THE CITY OF TACOMA: Must be executed by the successful bidder and his/her surety company.
- D. PERFORMANCE BOND TO THE CITY OF TACOMA: Must be executed by the successful bidder and his/her surety company.
- E. LEAP UTILIZATION PLAN: Shall be submitted at the Pre-Construction Meeting.
- F. GENERAL RELEASE.

<u>CODE OF ETHICS</u>: The successful bidder agrees that its violation of the City's Code of Ethics contained in TMC Chapter 1.46 shall constitute a breach of the contract subjecting the contract to termination.

LOCAL EMPLOYMENT AND APPRENTICESHIP TRAINING PROGRAM (LEAP):

The Local Employment and Apprenticeship Training Program (LEAP) has been adopted to counteract economic and social ills, which accompany high rates of unemployment within the City of Tacoma. The Tacoma City Council established the mandatory LEAP program for public works contracts pursuant to Ordinance No. 28520. The primary goal is to provide an opportunity for City of Tacoma residents and Tacoma Public Utilities ratepayers to enter apprenticeship programs, acquire skills, and perform work that will provide living wages.

LEAP Goals:

- 1. Local Employment Utilization Goal Prime contractor is required to ensure that 15 percent of the labor hours worked on the project are performed by residents of the City of Tacoma or economically distressed areas of the Tacoma Public Utilities service area.
- 2. Apprentice Utilization Goal Prime contractor is required to ensure that 15 percent of the labor hours worked on the project are performed by apprentices who reside in the Tacoma Public Utilities service area.

NOTE: The two goals can be satisfied concurrently if the prime contractor utilizes individuals who simultaneously meet the requirements of both goals, such as an apprentice who resides in an economically distressed area of the Tacoma Public Utilities service area.

DIVISION 0 - BIDDING & CONTRACT REQUIREMENTS

BID PERIOD FORMS

The following forms shall be used during the bidding process to request clarifications and request substitutions. These forms are not required to be submitted with the Bid.

- 1. Bidder Question Form
- 2. Substitution Request Form

BIDDER QUESTION FORM

EAST LOCOMOTIVE SERVICING FACILITY SPECIFICATION NO.: TR21-0548F

Prospective bidders must submit questions or clarifications in writing on this form allowing time for a written reply to reach all prospective bidders before the submission of the bids. Bidder questions shall be submitted on this form via e-mail to:

Tina Eide, Senior Buyer. E-mail address: teide@cityoftacoma.org

All e-mails must be received by **Noon on Monday**, **July 26**, **2021**. Where changes in the project documents are required, an addendum will be issued to everyone on the plan holder's list and posted on <u>www.tacomapurchasing.org</u>.

I have the following question(s):

Submitted by:

Name

Representing

Address

Fax Number

Phone Number

SUBSTITUTION REQUEST FORM

EAST LOCOMOTIVE SERVICING FACILITY SPECIFICATION NO.: TR21-0548F

Prospective bidders may request substitutions in writing on this form. Substitutions shall be submitted on this form via e-mail to:

Tina Eide, Senior Buyer. E-mail address: teide@cityoftacoma.org

All e-mails must be received by **Noon on Monday**, **July 26**, **2021**. Where changes in the project documents are required, an addendum will be issued to everyone on the plan holder's list and posted on <u>www.tacomapurchasing.org</u>.

Submitted By				
Signature				
Company				
Mailing Address				
City		State	Zip	
Phone	Fax	E-ma	ail	
Please check if ther	e are attachments			
1. We hereby submi Section	it for your consideratio <u>Page</u>	n the following product i Line/Paragraph	instead of the specified iten <u>Specified Item</u>	n for the above project:
2. Proposed Substit	ution.			
3. Reason for Subst	itution.			
 Attach complete be noted with an 	technical data, catalog y deviation noted.	g cuts, drawings, sample:	s, etc. Exact models and de	escription of products shall
5. Include complete	information on chang	es to Drawings, and/or S	pecifications which propos	ed substitution will
require for its prope	er installation.			
6. Does the substitu	ute affect dimensions s	hown on Drawings?		
6a. If so, how?				
7. Describe the effe	ct substitution has on	other trades.		
8. Describe differen	ces between proposed	substitution and specifie	ed item	
9. Manufacturer's v	varranties of the propo	osed and specified items	are: 🔿 Same 🔿 Differe	Nt (explain on attachment)

The undersigned states that the function, appearance and quality are equivalent or superior to the specified item. The undersigned agrees to pay for changes to the building and systems design, including engineering and detailing costs caused by the requested substitution.

SUBSTITUTION REQUEST FORM

EAST LOCOMOTIVE SERVICING FACILITY SPECIFICATION NO.: TR21-0548F

For Reviewer

Approved for Bidding subject to review and approval of Submittals (and as noted below)	Rejected - Inadequate Information
--	-----------------------------------

Not Accepted Received Too Late

By _____ Date _____

Remarks

PROPOSAL FORMS

The following forms must be completed in their entirety and submitted with the bid. Bidders must use the forms provided. Do not modify or substitute forms. Failure to complete and submit all the forms in this section may result in the bid being declared unresponsive and rejected.

- 1. BID PROPOSAL
- 2. SIGNATURE PAGE
- 3. BID BOND
- 4. CERTIFICATION OF COMPLIANCE WITH WAGE PAYMENT STATUTES
- 5. STATE RESPONSIBILITY FORM
- 6. LIST OF SUBCONTRACTOR CATEGORIES OF WORK
- 7. EIC UTILIZATION FORM
- 8. STATEMENT OF QUALIFICATIONS FOR RAIL CONTRACTORS

BID PROPOSAL

Item No.	Item Description	Quantity	Unit	Unit Cost	Bid Price
1	Mobilization and Demobilization ⁴	1	LS	Lump Sum	
2	Trench Safety Systems	1	LS	Lump Sum	
3	Site Preparation and Site Demolition	1	LS	Lump Sum	
4	Site Grading and Earthwork	1	LS	Lump Sum	
5	Track with Standard Ties	200	TF		
6	Track with Precast Concrete Track Panels	174	TF		
7	Crushed Surfacing	270	TN		
8	Service Island Concrete Pavement, Curbs and Grating	186	SY		
9	Concrete Pavement and Curbs	222	SY		
10	Hot Mix Asphalt Pavement	270	TN		
11	Fuel Tank Foundations	1	LS	Lump Sum	
12	Fuel System	1	LS	Lump Sum	
13	Sand Silo Foundation	1	LS	Lump Sum	
14	Sand System	1	LS	Lump Sum	
15	Compressed Air System	1	LS	Lump Sum	
16	Lube Oil System	1	LS	Lump Sum	
17	Storm Drainage System	1	LS	Lump Sum	
18	Electrical System	1	LS	Lump Sum	
19	Water and Sewer Utilities	1	LS	Lump Sum	
20	Oil Retention System	1	LS	Lump Sum	
21	Overhead Support Structures	1	LS	Lump Sum	
22	Crew Shelter	1	LS	Lump Sum	
23	Lube Oil Shed	1	LS	Lump Sum	
24	Disposal & Haul of Contaminated Materials	100	TN		
	Base Bid Subtotal				
	Washington State Sales Tax 10.3%				
	Base Bid Total Incl Tax				

SIGNATURE PAGE

CITY OF TACOMA TACOMA RAIL

All submittals must be in ink or typewritten, executed by a duly authorized officer or representative of the bidding/proposing entity, and received and time stamped as directed in the **Request for Bids page near the beginning of the specification**. If the bidder/proposer is a subsidiary or doing business on behalf of another entity, so state, and provide the firm name under which business is hereby transacted.

REQUEST FOR BIDS SPECIFICATION NO. TR21-0548F East Locomotive Servicing Facility

The undersigned bidder/proposer hereby agrees to execute the proposed contract and furnish all materials, labor, tools, equipment and all other facilities and services in accordance with these specifications.

The bidder/proposer agrees, by submitting a bid/proposal under these specifications, that in the event any litigation should arise concerning the submission of bids/proposals or the award of contract under this specification, Request for Bids, Request for Proposals or Request for Qualifications, the venue of such action or litigation shall be in the Superior Court of the State of Washington, in and for the County of Pierce.

Non-Collusion Declaration

The undersigned bidder/proposer hereby certifies under penalty of perjury that this bid/proposal is genuine and not a sham or collusive bid/proposal, or made in the interests or on behalf of any person or entity not herein named; and that said bidder/proposer has not directly or indirectly induced or solicited any contractor or supplier on the above work to put in a sham bid/proposal or any person or entity to refrain from submitting a bid/proposal; and that said bidder/proposer has not, in any manner, sought by collusion to secure to itself an advantage over any other contractor(s) or person(s).

Printed Name and Title
(Area Code) Telephone Number / Fax Number
State Business License Number
State Contractor's License Number
(See Ch. 18.27, R.C.W.)
£2 #3 #4 #5
·

THIS PAGE MUST BE SIGNED AND RETURNED WITH SUBMITTAL.

Herewith find deposit in the form of a cashier's check in the amount of \$	which
amount is not less than 5-percent of the total bid.	

SIGN HERE_____

BID BOND

KNOW ALL MEN BY THESE PRESENTS:

That we,	, as Principal, and
	, as Surety, are held
and firmly bound unto the City of Tacoma, as Obligee, ir	n the penal sum of
	dollars, for the payment of which the Principal
and the Surety bind themselves, their heirs, executors, a	administrators, successors and assigns, jointly and
severally, by these presents.	

The condition of this obligation is such that if the Obligee shall make any award to the Principal for

according to the terms of the proposal or bid made by the Principal therefor, and the Principal shall duly make and enter into a contract with the Obligee in accordance with the terms of said proposal or bid and award and shall give bond for faithful performance thereof, with Surety or Sureties approved by the Obligee; or if the Principal shall, in case of failure to do so, pay and forfeit to the Obligee the penal amount of the deposit specified in the call for bids, then this obligation shall be null and void; otherwise it shall be and remain in full force and effect and the Surety shall forthwith pay and forfeit to the Obligee, as penalty and liquidated damages, the amount of this bond.

SIGNED, SEALED AND DATED THIS	DAY OF	, 20	
PRINCIPAL:	SURETY:		
		, 20	
Received return of deposit in the sum of \$			



Certification of Compliance with Wage Payment Statutes

The bidder hereby certifies that, within the three-year period immediately preceding the bid solicitation date (July 13, 2021), that the bidder is not a "willful" violator, as defined in RCW 49.48.082, of any provision of chapters 49.46, 49.48, or 49.52 RCW, as determined by a final and binding citation and notice of assessment issued by the Department of Labor and Industries or through a civil judgment entered by a court of limited or general jurisdiction.

I certify under penalty of perjury under the laws of the state of Washington that the foregoing is true and correct.

Bidder			
Signature of Aut	horized Official*		
Detected Name			
Printed Name			
Title			
Date	City		State
Check One:			
Individual 🗆	Partnership 🛛	Joint Venture 🗆	Corporation 🗆
State of Incorpo formed:	ration, or if not a corpoi	ration, the state where b	ousiness entity was
If a co-partnersh	nip, give firm name unde	er which business is tra	nsacted:

^{*} If a corporation, proposal must be executed in the corporate name by the president or vice-president (or any other corporate officer accompanied by evidence of authority to sign). If a co-partnership, proposal must be executed by a partner.

	Specification No.						
Na	me of Bidder:						
State Responsibility and Reciprocal Bid Preference Information							
Certificate of registration as a contractor (Must be in effect at the time of bid submittal):	Number: Effective Date: Expiration Date:						
Current Washington Unified Business Identifier (UBI) Number:	Number:						
Do you have industrial insurance (workers' compensation) Coverage nor your employees working in Washington?	☐ Yes☐ No☐ Not Applicable						
Washington Employment Security Department Number	Number:						
Washington Department of Revenue state excise tax Registration number:	Number: Not Applicable						
Have you been disqualified from bidding any public works contracts under RCW 39.06.010 or 39.12.065(3)?	\Box Yes \Box No If yes, provide an explanation of your disqualification on a separate page.						
Do you have a physical office located in the state of Washington?	□ Yes □ No						
If incorporated, in what state were you incorporated?	State: Not Incorporated						
If not incorporated, in what state was your business entity formed?	State:						
Have you completed the training required by RCW 39.04.350, or are you on the list of exempt businesses maintained by the Department of Labor and Industries?	□ Yes □ No						

Project Name

Subcontractor(s) that are proposed to perform the work of heating, ventilation and air conditioning, and/or plumbing, as described in Chapter 18.106 RCW, and electrical as described in Chapter 19.28 RCW must be listed below. This information must be submitted with the bid proposal or within one hour of the published bid submittal time via email to bids@cityoftacoma.org.

Subcontractor(s) that are proposed to perform the work of structural steel installation and/or rebar installation must be listed below. This information must be submitted with the bid proposal or within forty-eight hours of the published bid submittal time via email to bids@cityoftacoma.org.

Failure to list subcontractors or naming more than one subcontractor to perform the same work will result in your bid being non-responsive. Contractors self-performing must list themselves below. The work to be performed is to be listed below the subcontractor(s) name. If no subcontractor is listed below, the bidder acknowledges that it does not intend to use any subcontractor to perform those items of work.

Subcontractor Name Work to be Performed	
Subcontractor Name Work to be Performed	



City of Tacoma Community & Economic Development Office of Equity in Contracting 747 Market Street, Rm 900 Tacoma WA 98402 253-591-5075

EQUITY IN CONTRACTING UTILIZATION FORM

This form is to document **only** the EIC contractors or material suppliers that will be awarded a contract. This information will be used in calculating the **EVALUATED BID**. Additional forms may be used if needed.

- Prime contractors are encouraged to solicit bids from EIC approved firms.
- Be sure to include this form with your bid submittal in order to receive EIC credit.
- It is the prime contractor's responsibility to check the certification status of EIC contractors prior to the submittal deadline.

Bidder's Name:

Address:			City/State	/Zip:				
Spec. No Base Bid * \$			Complete company names and phone numbers are required to verify your EIC usage.					
a. Company Name and Telephone Number	b. MBE, WBE, or SBE (Write all that apply)	c. NAICS code(s)	Contr Aı (1	d. ractor Bid nount 00%)	e. Material Supplier Bid Amount (20%)	f. Estimated MBE Usage Dollar Amount	g. Estimated WBE Usage Dollar Amount	h. Estimated SBE Usage Dollar Amount
i. MBE Utilization %	j. WBE Utilization	%		k. SBE Util	ization %			

By signing and submitting this form the bidder certifies that the EIC firms listed will be used on this project including all applicable change orders.

Signature of Responsible Officer

INSTRUCTIONS FOR COMPLETING EIC UTILIZATION FORM

The purpose of these instructions is to assist bidders in properly completing the EIC Utilization Form.

This form when submitted with your bid provides information to the City of Tacoma to accurately review and evaluate your proposed EIC usage.

- 1. * Base Bid is the prime contractor's bid, plus any alternates, additives and deductive selected by the City. Also, please refer to Items #10-12 below.
- 2. Column "a" List all EIC companies that you will be awarding a contract to if you are the successful bidder.
- 3. Column "b" Identify if this firm is being utilized as an MBE, WBE, or SBE. (Firms may count towards multiple requirements)
- 4. Column "c" List the appropriate NAICS code for the scope of work, services, or materials/supplies for each contractor.
- 5. Column "d" The bid amount must be indicated for *all* listed **EIC** that you plan on doing business with. This quote is the price that you and the contractor have negotiated prior to bid opening.
- 6. Column "e" The bid amount must be indicated for **all** listed **EIC** that you plan on doing business with. This quote is the price that you and the material supplier have negotiated prior to bid opening.
- 8. Column "f" Estimated MBE Usage Dollar Amount: For all MBE firms used, multiply the amount in Column "d" by 1.0 plus the amount in Column "e" by 0.20. Insert the total amount in this column.
- 9. Column "g" Estimated WBE Usage Dollar Amount: For all WBE firms used, multiply the amount in Column "d" by 1.0 plus the amount in Column "e" by 0.20. Insert the total amount in this column.
- 10. Column "h" Estimated SBE Usage Dollar Amount: For all MBE, WBE, or SBE firms used, Multiply the amount in Column "d" by 1.0 plus the amount in Column "e" by 0.20. Insert the total amount in this column.
- 11. Block "i" The percent of actual MBE utilization calculated on the Base Bid only. (Divide the sum of Estimated MBE Usage Dollar Amount (Column "f") by your Base Bid (*) then multiply by 100 to get a percentage: \$ amounts from column "f" divided by Base Bid (*) x 100 = EIC usage as a percent of the Base Bid.)
- 12. Block "j" The percent of actual WBE utilization calculated on the Base Bid only. (Divide the sum of Estimated WBE Usage Dollar Amount (Column "g") by your Base Bid (*) then multiply by 100 to get a percentage: \$ amounts from column "g" divided by Base Bid (*) x 100 = EIC usage as a percent of the Base Bid.)

13. Block "k" – The percent of actual SBE utilization calculated on the Base Bid only. (Divide the sum of Estimated SBE Usage Dollar Amount (Column "h") by your Base Bid (*) then multiply by 100 to get a percentage: \$ amounts from column "h" divided by Base Bid (*) x 100 = EIC usage as a percent of the Base Bid.)

It is the prime contractor's responsibility to check the status of EIC contractors prior to bid opening. Call the EIC Office at 253- 591- 5075 for additional information.

STATEMENT OF QUALIFICATIONS FOR RAIL CONTRACTORS

This form shall be completed in its entirety and submitted with the bid. Failure to submit and meet the requirements as stated in Division 1, Section 01 1010, Subsection 1.7 of the Special Provisions may be grounds for rejection of the bid.

The City of Tacoma will be the sole judge in determining if the prospective contractor meets the minimum experience requirements.

The successful rail contractor shall have completed at least five self-performed projects of similar scope and purpose within the past three years. The subcontractor superintendent shall also have at least three years of railroad construction experience. Complete the subcontractor project experience summary below and identify the on-site supervisors, one or more of which will be assigned to the project.

Rail Contractor:

Address:	
Phone:	Contact Person:
Project Experience #1 Project Name:	
Owner:	Contact Person:
Description of Work (including size	e of area treated):
Completion Date:	
#2 Project Name:	
Owner:	Contact Person:
Description of Work (including size	e of area treated):
Completion Date:	

#3 Project Name: _		
Owner:	Contact Person:	
Description of Work	(including size of area treated):	
Completion Date:		
#4 Project Name: _		
Owner:	Contact Person:	
Description of Work	(including size of area treated):	
Completion Date:		
#5 Project Name: _		
Owner:	Contact Person:	
Description of Work	(including size of area treated):	
Completion Date:		

STATEMENT OF QUALIFICATIONS FOR **RAIL CONTRACTORS**

<u>On-Site Supervisor:</u> The on-site supervisor shall have at least three years of railroad construction experience. Provide the name of the project on-site supervisor.

On-Site Supervisor:	Years employed by contractor:		
#1 Project Name/Date:			
Owner:	_ Contact Person: _		
Description of Work:			
Completion Date:			
#2 Project Name/Date:			
Owner:	_ Contact Person: _		
Description of Work:			
Completion Date:			
Alternate On-Site Supervisor_		Years employed by contractor:_	
#1 Project Name/Date:			
Owner:	_ Contact Person: _		
Description of Work:			
Completion Date:			
Bidder Name: Specification No. TR21-0548F			Page 3 of 3

CONTRACT FORMS (POST AWARD)

- 1. CONTRACT
- 2. INSURANCE REQUIREMENTS
- 3. PERFORMANCE BOND TO THE CITY OF TACOMA
- 4. PAYMENT BOND TO THE CITY OF TACOMA
- 5. BOND IN LIEU OF RETAINAGE (OPTIONAL)
- 6. ESCROW IN LIEU OF RETAINAGE (OPTIONAL)
- 7. CONTRACTOR'S WORK HAZARD ANALYSIS REPORT
- 8. GENERAL RELEASE TO THE CITY OF TACOMA

CONTRACT

Resolution No. Contract No.

This Contract is made and entered into effective this _____ day of ,20 , ("Effective Date") by and between the City of Tacoma, a Municipal Corporation of the State of Washington ("City"), and legal name of Supplier including type of business entity ("Contractor").

That in consideration of the mutual promises and obligations hereinafter set forth the Parties hereto agree as follows:

- I. Contractor shall fully execute and diligently and completely perform all work and provide all services and deliverables described herein and in the items listed below each of which are fully incorporated herein and which collectively are referred to as "Contract Documents":
 - 1. Specification No. Enter Spec Number and Enter Spec Title together with all authorized addenda.
 - 2. Contractor's submittal (or specifically described portions thereof) dated Enter Submittal Date submitted in response to Specification No. Enter Spec Number and Enter Spec Title.
 - 3. Describe with specific detail and list separately any other documents that will make up the contract (fee schedule, work schedule, authorized personnel, etc.) or any other additional items mutually intended to be binding upon the parties.

Delete this highlighted sentence, paragraph II and sub-bullets #1 and #2 if there are no additional attachments to the contract (attachments would be things other than a specific, contract, or bonds).

- II. In the event of a conflict or inconsistency between the terms and conditions contained in this document entitled Contract and any terms and conditions contained the above referenced Contract Documents the following order of precedence applies with the first listed item being the most controlling and the last listed item the least controlling:
 - 1. Contract
 - 2. List remaining Contract Documents in applicable controlling order.
- III. The Contract terminates on xxxxx. {May remove if not applicable]
- IV. The total price to be paid by City for Contracts full and complete performance hereunder may not exceed:
 - \$, plus any applicable taxes.
- V. Contractor agrees to accept as full payment hereunder the amounts specified herein and in Contract Documents, and the City agrees to make payments at the times and in the manner and upon the terms and conditions specified. Except as may be otherwise provided herein or in Contract Documents Contractor shall provide and bear the expense of all equipment, work and labor of any sort whatsoever that may be required for the transfer of materials and for constructing and completing the work and providing the services and deliverables required by this Contract.
- VI. The City's preferred method of payment is by ePayables (Payment Plus), followed by credit card (aka procurement card), then Electronic Funds Transfer (EFT) by Automated Clearing House (ACH), then check or other cash equivalent. CONTRACTOR may be required to have the capability of accepting the City's ePayables or credit card methods of payment. The City of Tacoma will not accept price changes or pay additional fees when ePayables (Payment Plus) or credit card is used. The City, in its sole discretion, will determine the method of payment for this Contract.
- VII. Failure by City to identify a deficiency in the insurance documentation provided by Contractor or failure of City to demand verification of coverage or compliance by Contractor with these insurance requirements shall not be construed as a waiver of Contractor's obligation to maintain such insurance.
- VIII. Contractor acknowledges, and by signing this Contract agrees, that the Indemnification provisions set forth in the controlling Contract Documents, including the Industrial Insurance immunity waiver (if applicable), are totally and fully part of this Contract and, within the context of the competitive bidding laws, have been mutually negotiated by the Parties hereto.

- IX. Contractor and for its heirs, executors, administrators, successors, and assigns, does hereby agree to the full performance of all the requirements contained herein and in Contract Documents.
- X. It is further provided that no liability shall attach to City by reason of entering into this Contract, except as expressly provided herein.

IN WITNESS WHEREOF, the Parties hereto have accepted and executed, as of the Effective Date stated above, which shall be Effective Date for bonding purposes as applicable.

CITY OF TACOMA:	CONTRACTOR:
By:	By:

(City of Tacoma use only - blank lines are intentional)

Director of Finance:
City Attorney (approved as to form):
Approved By:



The Contractor (Contractor) shall obtain and maintain the minimum insurance set forth below. By requiring such minimum insurance, the City of Tacoma (City) shall not be deemed or construed to have assessed the risk that may be applicable to Contractor under this Contract. Contractor shall assess its own risks and, if it deems appropriate and /or prudent, maintain greater limits and/or broader coverage.

1. GENERAL REQUIREMENTS

The following General Requirements apply to Contractor and to Subcontractor(s) of every tier performing services or activities pursuant to the terms of this Contract. Contractor acknowledges and agrees to the following insurance requirements applicable to Contractor and Contractor's Subcontractor(s):

- 1.1. City reserves the right to approve or reject the insurance provided based upon the insurer, terms and coverage, the Certificate of Insurance, and/or endorsements.
- 1.2. The insurance must be written by companies licensed in the State of Washington pursuant to RCW 48 with an (A-) VII or higher in the A.M. Best's Key Rating Guide <u>www.ambest.com</u>.
- 1.3. Contractor shall keep this insurance in force during the entire term of the Contract and for thirty (30) calendar days after completion of all work required by the Contract, unless otherwise provided herein.
- 1.4. Policies of Insurance, *such as Commercial General Liability or Commercial Auto Liability or Marine General Liability or Aircraft General liability or Excess Liability,* required under this Contract that name City as Additional Insured shall:
 - 1.4.1. Be considered primary and non-contributory for all claims.
 - 1.4.2. Contain a "Severability of Insureds", "Separation of Interest", or "Cross Liability" provision and a "Waiver of Subrogation" clause in favor of City.
- 1.5. A Waiver of Subrogation in favor of City for General Liability and Automobile Liability.
- 1.6. Insurance limits shown below may be written with an excess policy that follows the form of an underlying primary liability policy or an excess policy providing the required limit.
- 1.7. Insurance policy(ies) shall be written on an "occurrence" form, except for Professional Liability/Errors and Omissions, Pollution Liability, and Cyber/Privacy and Security.
- 1.8. If coverage is approved and purchased on a "Claims-Made" basis, Contractor warrants continuation of coverage, either through policy renewals or by the purchase of an extended reporting period endorsement as set forth below.
- 1.9. Contractor shall provide City notice of any cancellation or non-renewal of this required insurance within 30 calendar days.
- 1.10. Contractor shall not begin work under the Contract until the required insurance has been obtained and approved by City.
- 1.11. Contractor shall not allow any insurance to be cancelled or lapse during any term of this Contract, otherwise it shall constitute a material breach of the Contract, upon which City may, after giving five (5) business day notice to Contractor to correct the breach, immediately


terminate the Contract or, at its discretion, procure or renew such insurance and pay any and all premiums in connection therewith; with any sums so expended to be repaid to City by Contractor upon demand, or at the sole discretion of City, offset against funds due Contractor from City.

- 1.12. Contractor shall be responsible for all premiums, deductibles and self-insured retentions. All deductibles and self-insured retained limits shall be shown on the Certificates of Insurance. Any deductible or self-insured retained limits in excess of Ten Thousand Dollars (\$10,000) must be approved by City Risk Management Division.
- 1.13. Insurance coverages specified in this Contract are not intended and will not be interpreted to limit the responsibility or liability of Contractor or Subcontractor(s).
- 1.14. City reserves the right to review insurance requirements during any term of the Contract and to require that Contractor make reasonable adjustments when the scope of services has been expanded.
- 1.15. All costs for insurance shall be incidental to and included in the unit or lump sum prices of the Contract and no additional payment will be made by City to Contractor.
- 1.16. <u>City</u>, including its officers, elected officials, employees, agents, and authorized volunteers, and any other entities, as required by the Contract, <u>shall be named as additional insured(s)</u> by endorsement for all liability insurance policies set forth below. No specific person or department should be identified as the additional insured.
- 1.17. Contractor shall deliver a Certificate of Insurance for each policy of insurance meeting the requirements set forth herein when Contractor delivers the signed Contract for the work to City. Contractor shall deliver copies of any applicable Additional Insured, Waiver of Subrogation, and primary and non-contributory endorsements. <u>Contract or Permit number and the City</u> <u>Department must be shown on the Certificate of Insurance</u>.
- 1.18. Failure by City to identify a deficiency in the insurance documentation provided by Contractor or failure of City to demand verification of coverage or compliance by Contractor with these insurance requirements shall not be construed as a waiver of Contractor's obligation to maintain such insurance.

2. SUBCONTRACTORS

It is Contractor's responsibility to ensure that each subcontractor obtain and maintain adequate liability insurance coverage. Contractor shall provide evidence of such insurance upon City's request.

3. REQUIRED INSURANCE AND LIMITS

The insurance policies shall provide the minimum coverages and limits set forth below. Providing coverage in these stated minimum limits shall not be construed to relieve Contractor from liability in excess of such limits.

3.1. Commercial General Liability (CGL) Insurance

The CGL insurance policy must provide limits not less than One Million Dollars (\$1,000,000) each occurrence and Two Million Dollars (\$2,000,000) annual aggregate.

The CGL policy shall be written on an Insurance Services Office (ISO) form CG 00 01 (04-13) or its equivalent. Products and Completed Operations shall be maintained for a period of one year following final acceptance of the work. The CGL policy shall be endorsed to include:



- 3.1.1 A per project aggregate policy limit.
- 3.1.2 Contractual Liability-Railroad using ISO form CG 24 17 (10-01) or equivalent if Contractor is performing work within fifty (50) feet of a City railroad right of way.
- 3.1.3 City as additional insured using ISO form endorsements CG 20 10 (04-13) and CG 20 37 (04-13) or equivalent for ongoing and completed operations, or using ISO form endorsement CG 20 26 (04-13) or equivalent for Facility Use Agreements. Neither additional insured provisions within an insurance policy form, nor blanket additional insured endorsements will be accepted in lieu of the endorsements specified herein.

3.2 Commercial Automobile Liability (CAL) Insurance

Contractor shall obtain and keep in force during the term of the Contract, a policy of CAL insurance coverage, providing bodily injury and property damage coverage for owned (if any), non-owned, hired, or leased vehicles.

Contractor must also maintain an MCS 90 endorsement or equivalent and a CA 9948 endorsement or equivalent if "Pollutants" are to be transported. CAL policies must provide limits not less than One Million Dollars (\$1,000,000) each accident for bodily injury and property damage. Must use ISO form CA 0001 or equivalent.

3.3 Workers' Compensation

Contractor shall comply with Workers' Compensation coverage as required by the Industrial Insurance laws of the State of Washington, as well as any other similar coverage required for this work by applicable federal laws of other states.

3.4 Employers' Liability (EL) (Stop-Gap) Insurance

Contractor shall maintain EL coverage with limits not less than One Million Dollars (\$1,000,000) each employee, One Million Dollars (\$1,000,000) each accident, and One Million Dollars (\$1,000,000) policy limit.

3.5 Excess or Umbrella Liability (UL) Insurance

Contractor shall provide Excess or UL coverage at limits of not less than Three Million Dollars (\$3,000,000) per occurrence and in the aggregate. This coverage shall apply, at a minimum, in excess of primary underlying Commercial General Liability, Employer's Liability, Marine General Liability, Protection and Indemnity, and Automobile Liability if required herein.

3.6 Pollution Liability (PL) Insurance

Contractor shall procure and maintain a PL or Environmental Liability policy providing coverage, including investigation and defense costs, for bodily injury and property damage, including loss of use of damaged property or of property that has been physically damaged or destroyed. Such coverage shall provide both on-site and off-site cleanup costs and cover gradual and sudden pollution, and include in its scope of coverage City damage claims for loss arising out of Contractor's work with limits not less than One Million Dollars (\$1,000,000) each occurrence and Two Million Dollars (\$2,000,000) aggregate. This policy shall include Environmental Resource Damage coverage.

Such insurance may be provided on an "occurrence" or "claims-made" basis. If such coverage is provided on a "claims-made" basis, the following additional conditions must be met:

- 3.6.1 The policy shall include coverage for Hazardous Substance Removal.
- 3.6.2 The policy must contain no retroactive date, or the retroactive date must precede the



commencement date of this Contract.

3.6.3 The extended reporting period (tail) must be purchased to cover a minimum of six (6) years beyond completion of work.

3.7 Installation Floater Insurance (IFI)

Contractor shall maintain in force during the term of this Contract, at its own expense, an IF insurance covering Contractor's labor, materials, and equipment to be used for completion of the work performed under this Contract against all risks of direct physical loss, excluding earthquake and flood, for an amount equal to the full amount of the Contract improvements.

3.8 Railroad Protective Liability (RPL) Insurance

Contractor shall procure and maintain RPL insurance during the term of the Contract if Contractor's work will involve working on, above, under or being within fifty (50) feet of City railroad right of ways. The RPL insurance shall have policy limits of Two Million Dollars (\$2,000,000) per occurrence and Six Million Dollars (\$6,000,000) annual aggregate. Contractor must use an ISO form CG 00 35 (04-13), or equivalent, with City as a named insured (not named as an additional insured). The policy shall include the following: Limited Seepage and Pollution Endorsement and Evacuation Expense Coverage Endorsement.

3.9 Other Insurance

Other insurance may be deemed appropriate to cover risks and exposures related to the scope of work or changes to the scope of work required by City. The costs of such necessary and appropriate insurance coverage shall be borne by Contractor.

4. CONTRACTOR

As used herein, "Contractor" shall be the Supplier(s) entering a Contract with City, whether designated as a Supplier, Contractor, Vendor, Proposer, Bidder, Respondent, Seller, Merchant, Service Provider, or otherwise.



PERFORMANCE BOND TO THE CITY OF TACOMA

Resolution No. Bond No.

That we, the undersigned,

as principal, and

\$

as a surety, are jointly and severally held and firmly bound to the CITY OF TACOMA, in the penal sum of

, for the payment whereof Contractor and Surety bind themselves,

their executors, administrators, legal representatives, successors and assigns, jointly and severally, firmly by these presents.

This obligation is entered into in pursuance of the statutes of the State of Washington, the Ordinances of the City of Tacoma.

WHEREAS, under and pursuant to the City Charter and general ordinances of the City of Tacoma, the said City has or is about to enter with the above bounden principal, a contract, providing for

Specification No.		
Specification Title:		
Contract No.		

(which contract is referenced to herein and is made a part hereof as though attached hereto), and

WHEREAS, the said principal has accepted, the said contract, and undertake to perform the work therein provided for in the manner and within the time set forth.

This statutory performance bond shall become null and void, if and when the principal, its heirs, executors, administrators, successors, or assigns shall well and faithfully perform all of the Principal's obligations under the Contract and fulfill all terms and conditions of all duly authorized modifications, additions and changes to said Contract that may hereafter be made, at the time and in the manner therein specified; and if such performance obligations have not been fulfilled, this bond shall remain in force and effect.

The Surety for value received agrees that no change, extension of time, alteration or addition to the terms of the Contract, the specifications accompanying the Contract, or to the work to be performed under the Contract shall in any way affect its obligation on this bond, and waives notice of any change, extension of time, alteration or addition to the terms of the Contract or the work performed. The Surety agrees that modifications and changes to the terms and conditions of the Contract that increase the total amount to be paid the Principal shall automatically increase the obligation of the Surety on this bond and notice to Surety is not required for such increase.

If the City shall commence suit and obtain judgment against the Surety for recovery hereunder, then the Surety, in addition to such judgement, shall pay all costs and attorney's fees incurred by the City in enforcement of its rights hereunder. Venue for any action arising out of in in connection with this bond shall be in Pierce County, Washington.

Surety companies executing bonds must be authorized to transact business in the State of Washington as surety and named in the current list of "Surety Companies Acceptable in Federal Bonds" as published in the Federal Register by the Audit Staff Bureau of Accounts, U.S. Department of the Treasury.

One original bond shall be executed, and signed by the parties' duly authorized officers. This bond will only be accepted if it is accompanied by a fully executed power of attorney for the office executing on behalf of the surety.

Principal: Enter Vendor Legal Name	
Ву:	
Surety:	
Ву:	
Agent's Name:	
Agent's Address:	



PAYMENT BOND TO THE CITY OF TACOMA

Resolution No. Bond No.

That we, the undersigned,

as principal, and

\$

as a surety, are jointly and severally held and firmly bound to the CITY OF TACOMA, in the penal sum of,

, for the payment whereof Contractor and Surety bind themselves,

their executors, administrators, legal representatives, successors and assigns, jointly and severally, firmly by these presents.

This obligation is entered into in pursuance of the statutes of the State of Washington, the Ordinances of the City of Tacoma.

WHEREAS, under and pursuant to the City Charter and general ordinances of the City of Tacoma, the said City has or is about to enter with the above bounden principal, a contract, providing for

Specification No.		
Specification Title:		
Contract No.		

(which contract is referenced to herein and is made a part hereof as though attached hereto), and

WHEREAS, the said principal has accepted, the said contract, and undertake to perform the work therein provided for in the manner and within the time set forth.

This statutory payment bond shall become null and void, if and when the Principal, its heirs, executors, administrators, successors, or assigns shall pay all persons in accordance with RCW 39.08, 39.12, and 60.28, including all workers, laborers, mechanics, subcontractors, and materialmen, and all person who shall supply such contractor or subcontractor with provisions and supplies for the carrying on of such work, and all taxes incurred on said Contract under Titles 50 and 51 RCW and all taxes imposed on the Principal under Title 82 RCW; and if such payment obligations have not been fulfilled, this bond shall remain in full force and effect.

The Surety for value received agrees that no change, extension of time, alteration or addition to the terms of the Contract shall in any way affect its obligation on this bond, and waivers notice of any changes, extension of time, alteration or addition to the terms of the Contract or the work performed. The Surety agrees that modifications and changes to the terms and conditions of the Contract that increase the total amount to be paid the Principal shall automatically increase the obligation of the Surety on this bond and notice to Surety is not required for such increased obligation.

No suit or action shall be commenced hereunder by any claimant unless claimant shall have given the written notices to the City, and where required, the Contractor, in accordance with RCW 39.08.030.

The amount of this bond shall be reduced by and to the extent of any payment or payments made in good faith hereunder, inclusive of the payment by Surety of claims which may be properly filed in accordance with RCW 39.08 whether or not suit is commenced under and against this bond.

If any claimant shall commence suit and obtain judgment against the Surety for recovery hereunder, then the Surety, in addition to such judgment and attorney fees as provided by RCW 39.08.030, shall also pay such costs and attorney fees as may be incurred by the City as a result of such suit. Venue for any action arising out of or in connection with this bond shall be in Pierce County, WA.

Surety companies executing bonds must be authorized to transact business in the State of Washington as surety and named in the current list of "Surety Companies Acceptable in Federal Bonds" as published in the Federal Register by the Audit Staff Bureau of Accounts, U.S. Department of the Treasury.

One original bond shall be executed, and be signed by the parties' duly authorized officers. This bond will only be accepted if it is accompanied by a fully executed power of attorney for the office executing on behalf of the surety.

Principal: Enter Vendor Legal Name

Ву:	
Surety:	
By:	
Agent's Name:	
Agent's Address:	



BOND IN LIEU OF RETAINAGE TO THE CITY OF TACOMA

	Bc	ond No
That we	, as PRINCIPAL, and	, a
corporation organized and existing under the	laws of the State of	and
registered to transact business as a surety in	the State of Washington, as SURETY, are	e by these presents held and firmly
bound unto the City of Tacoma, a political sub	odivision of the State of Washington ("OBL	_IGEE"), and are similarly held and
bound unto the beneficiaries of the trust fund	created by Chapter 60.28, RCW, in the su	um of
	, (\$) lawful money of	f the United States of America plus five
percent (5%) of any increase in the contract a materials and/or work, for the payment of white administrators, successors and assigns jointly	mount that may occur due to change order ch sum, well and truly to be made, we bin and severally hereunder.	er or other increases in the quantities of dourselves, our heirs, executors,
WHEREAS, the Principal and the Obligee hav	ve entered into and executed a certain cor	ntract for:

	(Contract No	
dated	, <u>20 </u>	

The Contract requires the City of Tacoma to withhold from the Principal, pursuant to Chapter 60.28, RCW the sum not to exceed five percent (5%) from monies earned by said Principal during the execution and performance of work thereunder, hereinafter referred to as earned retained funds; and

The Principal has requested that the City of Tacoma not withhold any such future earned retained funds and accept this Bond in lieu thereof as allowed under the provisions of Chapter 60.28, RCW.

The Condition of this Obligation is such that if the Principal shall use and apply the earned retained funds released pursuant hereto for the trust and purposes set forth in Chapter 60.28, RCW, and shall further indemnify and save the Obligee harmless from and against all losses, damages, claims, suits, demands, causes, charges and expenses to which the Obligee may be subject or in any way made liable by reason of or in consequence of having made contract payments to Principal without having first reserved, withheld, or retained earned funds therefrom, then the Obligations of Surety hereunder shall be released in accordance with Chapter 60.28. RCW: otherwise, this Bond shall remain in full force and effect.

PROVIDED, HOWEVER, it is expressly understood and agreed that:

- 1. Any suit or action under this Bond must be instituted within the time period provided by applicable law, but in no event more than two (2) years from the date final payment under the Contract falls due;
- The Surety hereby consents to and waives notice of any extension in the time for performance of the Contract, 2. assignment of obligations under the Contract, or Contract alteration, termination, amendment or change order;
- 3. Until written release of this obligation by the Obligee, this Bond may not be terminated or cancelled by the Principal or Surety for any reason: and
- 4. The laws of the State of Washington shall govern the determination of the rights and obligations of the parties hereunder and Venue for any dispute or claim hereunder shall be in Pierce County, Washington.
- No final payment by City to Contractor under the Contract shall serve as a release of the obligations of the Surety 5. hereunder or create any defense to contract performance by the Contractor and/or Surety.

Signed and Sealed this	day of	, <u>20</u> .
Approved as to form:		Principal: Vendor Legal Name
Deputy City Attorney		By: Surety:
		By: Agent's Name: Agent's Address:



Escrow No.
City of Tacoma Select or enter department
Division - Section
Project
Specification No
Contract No.

Escrow Agreement

TO: _____

The undersigned, herein referred to as the "Contractor," has directed the City of Tacoma, Select or enter department, hereinafter referred to as the "City," to deliver to

[Name of Bank/Financial Institution] ("You" or "Your") its warrants which shall be payable to You and the Contractor jointly. Such warrants are to be held and disposed of by You in accordance with the following instructions and upon the terms and conditions hereinafter set forth, as provided in Chapter 60.28, RCW, including but limited to RCW 60.28.011(4)(c).

INSTRUCTIONS

- Warrants or checks made payable to You and the Contractor jointly upon delivery to You shall be endorsed by You and forwarded for collection. The monies will then be used by You to purchase, as directed by the Contractor, bonds or other securities chosen by the Contractor but limited to those securities listed in Exhibit A to this Agreement. Purchase of such bonds or other securities shall be in a form which shall allow You alone to readily reconvert such bonds or other securities into money if You are required to do so by the City as provided in paragraph 4 of this Escrow Agreement.
- 2. When and as <u>interest</u> on the securities held by You pursuant to this Agreement accrues and is paid, You shall collect such interest and <u>forward it to the Contractor</u> at its address designated below unless otherwise directed by the Contractor.
- You are <u>not</u> authorized to deliver to the Contractor all or any part of the securities held by You pursuant to this Agreement (or any monies derived from the sale of such securities, or the negotiation of the City's warrants) <u>except</u> in accordance with written instructions from the City. Compliance with such instructions shall relieve You of any further liability related thereto.
- 4. In the event the City further instructs You to do so in writing, You shall, within seven (7) days of receipt of such written instruction, reconvert into money the securities held by You pursuant to this Agreement and return such money together with any other monies held by You hereunder, to the City.
- 5. The Contractor agrees to pay You as compensation for services hereunder as follows:

Fees: _____

Payment of all fees shall be the sole responsibility of the Contractor and shall not be deducted from any property placed with You pursuant to this Agreement until and unless the City directs the release to the Contractor of the securities and/or monies held hereunder whereupon You shall be granted a first lien upon such property released and shall be entitled to reimburse yourself from such property for the entire amount of Your fee as provided for hereinabove. In the event that You are made a party to any litigation



with respect to the property held by You hereunder, or in the event that the conditions of this Escrow are not promptly fulfilled, or that You are required to render any service not provided for in these instructions or that there is any assignment of the interests of this Escrow or any modification hereof. You shall be entitled to reasonable compensation for such extraordinary services from the Contractor and reimbursement from the Contractor for all costs and expenses, including attorney fees occasioned by such default, delay, controversy or litigation.

- 6. This Agreement shall not be binding until executed by the Contractor and the City and accepted by You.
- 7. This instrument contains the entire agreement between You, the Contractor, and the City with respect to this Escrow and You are not a party to nor bound by any instrument or agreement between the City and Contractor other than this instrument. You shall not be required to take notice of any default or any other matter, nor be bound by nor required to give any notice or demand, nor required to take any action whatever except as herein expressly provided. You shall not be liable for any loss or damage not caused by Your own negligence or willful misconduct.
- 8. The forgoing provisions shall be binding upon the assigns, successors, personal representatives, and heirs of the Parties hereto.

The undersigned have read and hereby approve the instructions as given above governing the administration of this Escrow and do hereby execute this Agreement on this _____ day of _____, <u>20</u>___.

	CITY OF TACOMA	
Name of Contractor		
Ву	Approved as to form:	
Printed Name		
Printed Title Deputy City Attorney		
The above Escrow instructions received and AC (<i>Must be dated</i> by Escrow Company.)	CCEPTED this day of	, <u>20</u>
Print Name of Bank	Bank Tax ID Number	
Bank Address	Bank Phone Number	
and		
Bank Account No.	ABA No.	
By(Authorized Signature)	Title	
Print Name		



Exhibit A Approved Escrow Securities

- 1. *U.S. Treasury Obligations*. Obligations in the form of bills, notes, bonds or certificates of indebtedness backed by the full faith and credit of the United States of America. The maximum maturity for investments in U.S. Treasury Obligations shall be limited to five years.
- 2. *U.S. Agency Obligations*. Obligations issued by or fully guaranteed as to principal and interest by Federal Agencies or United States government-sponsored enterprises ("Agencies"). Subordinate debt of any U.S. Agency is not authorized. The maximum maturity for investments in Agencies shall be limited to five years.
- 3. *Municipal Bonds.* Bonds of the State of Washington or any local government in the state of Washington, including bonds of the City of Tacoma, rated in one of the three highest ratings categories by Standard & Poor's Corporation, Moody's Ratings Corporation or Fitch Ratings Service. The maximum maturity for investments in municipal bonds shall be limited to five years.
- 4. *Certificates of Deposit (CDs).* Certificates of Deposit (CDs) issued by financial institutions qualified by the Washington Public Deposit Protection Commission. The maximum maturity for investments in CDs shall be limited to one year.

CITY OF TACOMA CONTRACTOR'S WORK HAZARD ANALYSIS REPORT

for

(Project Name)

The contractor and his/her subcontractors shall thoroughly review the scope of work described in the proposed project drawings and specifications. Following the review, the contractor will be responsible to indicate below any known or potential safety issues or phases of construction that may require specific safety procedures as identified by WISHA or OSHA regulations, and/or prudent construction practices; i.e., shoring, fall protection, scaffolding, hazardous materials, etc.

Failure to list and comply with safety requirements will be cause for disqualification from future City of Tacoma contracts. A copy of this report shall be posted at the job site at all times.

If, during the course of construction, other safety requirements are identified, they will be added to this report as an addendum. The contractor will be required to adhere to the recommended actions and/or controls identified in the addendum.

SAFETY ISSUES/CONCERNS*	HAZARDS	RECOMMENDED ACTION AND/OR CONTROLS
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		

*USE A SEPARATE SHEET IF MORE ROOM IS NEEDED

Contractor Name and Title

Date

Job Site Superintendent

Date

Company Officer Signature

JOB HAZARDOUS ANALYSIS.DOC



City of Tacoma Contract No.: _____ Specification No.: _____

General Release to the City of Tacoma

The undersigned, named as the Contractor in a certain agreement between <u>contractor name</u> and the City of Tacoma, dated ______, 20____, hereby releases the City of Tacoma, its departmental officers, employees, and agents, from any and all claim or claims known or unknown, in any manner whatsoever, arising out of, or in connection with, or relating to said contract, excepting only the equity of the undersigned in the amount now retained by the City of Tacoma under said contract, to-wit: the sum of

\$

Signed on this ____

day of _____, 20___.

Contractor Name

Contractor Authorized Signature

Title

Type or Print Signature Name

WASHINGTON STATE PREVAILING WAGE RATES

PREVAILING WAGE RATES

This project requires prevailing wages under <u>39.12 RCW</u>. Any worker, laborer, or mechanic employed in the performance of any part of the work shall be paid not less than the applicable prevailing rate of wage.

The project site is located in PIERCE County.

The effective date for prevailing wages on this project will be the **submittal deadline** with these exceptions:

- a. If the project is not awarded within six months of the submittal deadline, the award date is the effective date.
- b. If the project is not awarded pursuant to a competitive solicitation, the date the contract is executed is the effective date.
- c. Janitorial contracts follow WAC 296-127-023.

Except for janitorial contracts, these rates shall apply for the duration of the contract unless otherwise noted in the solicitation.

Look up prevailing rates of pay, benefits, and overtime codes from this link: <u>https://secure.lni.wa.gov/wagelookup/</u>

REQUIRED FILINGS

The contractor and all subcontractors covered under <u>39.12 RCW</u> shall submit to the Department of Labor and Industries (L&I) for work provided under this contract:

- 1. A Statement of Intent to Pay Prevailing Wages must be filed with and approved by L&I upon award of contract.
- 2. An Affidavit of Wages Paid must be filed with and approved by L&I upon job completion.

Payments cannot be released by the City until verification of these filings are received by the engineer. Additional information regarding these filings can be obtained by calling the Department of Labor & Industries, Prevailing Wage at 360-902-5335, <u>https://www.lni.wa.gov/</u> or by visiting their <u>MY L&I</u> account.

CITY PROGRAMS

- 1. EQUITY IN CONTRACTING (EIC) PROGRAM
- 2. LOCAL EMPLOYMENT APPRENTICE PROGRAM (LEAP)

EQUITY IN CONTRACTING (EIC) PROGRAM

EIC REQUIREMENT FORM

EQUITY IN CONTRACTING REQUIREMENTS & PROCEDURES:

All bidders must complete and submit with their bid the following solicitation form contained in the bid submittal package:

City of Tacoma – EIC Utilization Form

IMPORTANT NOTE:

It is the bidder's responsibility to insure that the EIC-eligible subcontractor(s) listed on the EIC Utilization Form are currently certified by the State of Washington's Office of Minority and Women Business Enterprises (OMWBE) at the time of bid opening. This may be verified by contacting the EIC Office at 253-591-5075 between 8 AM and 5 PM, Monday through Friday or the OMWBE Office. Please refer to the City of Tacoma EIC Provisions included elsewhere in these Special Provisions.

Equity in Contracting Requirements

Minority Business Women Business		Small Business Enterprise	
Interprise Requirement Enterprise Requirement		Requirement	
3%	1%	13%	

A list of EIC-eligible companies is available on the following web site addresses:

www.omwbe.diversitycompliance.com*

MATERIAL MISSTATEMENTS CONCERNING COMPLETED ACTIONS BY THE BIDDER IN ANY SWORN STATEMENT OR FAILURE TO MEET COMMITMENTS AS INDICATED ON THE EIC UTILIZATION FORM MAY RENDER THE BIDDER IN DEFAULT OF CITY ORDINANCE 1.07

CCD/SBE: TR21-0548F Date of Record: 06/04/2021

*For the OMWBE list, be sure to look for businesses in Pierce, King, Lewis, Mason, Grays Harbor, Thurston, or any counties adjacent to the county in which the work is performed per 1.07.050(2)(b-c). Contact the EIC Office if you have any questions.

Tacoma Municipal Code

CHAPTER 1.07 EQUITY IN CONTRACTING

Sections: 1.07.010 Policy and purpose. 1.07.020 Definitions. 1.07.030 Discrimination prohibited. 1.07.040 Program administration. 1.07.050 Approval as a Certified Business. 1.07.060 Program requirements. 1.07.070 Evaluation of submittals. 1.07.080 Contract compliance. 1.07.090 Program monitoring. 1.07.100 Enforcement. 1.07.110 Remedies. 1.07.120 Unlawful acts. 1.07.130 Severability. 1.07.140 Review of program.

1.07.010 Policy and purpose.

It is the policy of the City of Tacoma that citizens be afforded an opportunity for full participation in our free enterprise system and that historically underutilized business enterprises shall have an equitable opportunity to participate in the performance of City contracts. The City finds that in its contracting for supplies, services and public works, there has been historical underutilization of small and minority-owned businesses located in certain geographically and economically disfavored locations and that this underutilization has had a deleterious impact on the economic well-being of the City. The purpose of this chapter is to remedy the effects of such underutilization through use of narrowly tailored contracting requirements to increase opportunities for historically underutilized businesses to participate in City contracts. It is the goal of this chapter to facilitate a substantial procurement, education, and mentorship program designed to promote equitable participation by historically underutilized businesses in the provision of supplies, services, and public works to the City. It is not the purpose of this chapter to provide any person or entity with any right, privilege, or claim, not shared by the public, generally, and this chapter shall not be construed to do so. This chapter is adopted in accordance with Chapter 35.22 RCW and

RCW 49.60.400.

(Ord. 28625 Ex. A; passed Nov. 5, 2019: Ord. 27867 Ex. A; passed Dec. 15, 2009)

1.07.020 Definitions.

Terms used in this chapter shall have the following meanings unless defined elsewhere in the Tacoma Municipal Code("TMC"), or unless the context in which they are used clearly indicates a different meaning.

1.07.020.B

"Bid" means an offer submitted by a Respondent to furnish Supplies, Services, and/or Public Works in conformity with the Specifications and any other written terms and conditions included in a City request for such offer.

"Bidder" means an entity or individual who submits a Bid, Proposal or Quote. See also "Respondent."

1.07.020.C

"Certified Business" means an entity that has been certified as a Disadvantaged Business Enterprise ("DBE"), Small Business

Enterprise ("SBE"), Minority Business Enterprise ("MBE"), Women Business Enterprise ("WBE"), or Minority and

Women's Business Enterprise ("MWBE") by the Washington State Office of Minority and Women's Business Enterprise and

meets the criteria set forth in Section 1.07.050 (2) of this chapter and has been approved as meeting that criteria by the Community and Economic Development Department Program Manager.

"City" means all Departments, Divisions and agencies of the City of Tacoma.

"Contract" means any type of legally binding agreement regardless of form or title that governs the terms and conditions for procurement of Public Works and Improvements and/or Non-Public Works and Improvements Supplies and Services.

Contracts include the terms and conditions found in Specifications, Bidder or Respondent Submittals, and purchase orders issued by the City. A "Contract" as used in this chapter shall include an agreement between the City and a non-profit entity to perform construction-related services for Public Works. A "Contract" does not include: (1) awards made by the City with federal/state grant or City general funds monies to a non-profit entity where the City offers assistance, guidance, or supervision on a project or program, and the recipient of the grant awards uses the grant moneys to provide services to the community; (2) sales transactions where the City sells its personal or real property; (3) a loan transaction where the City is acting as a debtor or a creditor; (4) lease, franchise; (5) agreements to use City real property (such as Licenses, Permits and Easements) and, (6) banking and other financial or investment services. "Contractor" means any Person that presents a Submittal to the City, enters into a Contract with

the City, and/or performs all

or any part of a Contract awarded by the City, for the provision of Public Works, or Non-Public Works and Improvements,

Supplies or Services.

1.07.020.G

"Goals" means the annual level of participation by Certified Businesses in City Contracts as established in this chapter, the

Program Regulations, or as necessary to comply with applicable federal and state nondiscrimination laws and regulations.

Goals for individual Contracts may be adjusted as provided for in this chapter and shall not be construed as a minimum for

any particular Contract or for any particular geographical area.

1.07.020.N

"Non-Public Works and Improvements" means all competitively solicited procurement of Supplies and/or Services by the

City not solicited as Public Works.

1.07.020.P

"Person" means individuals, companies, corporations, partnerships, associations, cooperatives, any other legally recognized business entity, legal representative, trustee, or receivers.

"Program Manager" means the individual appointed, from time to time, by the City's Community and Economic Development Director to administer the Program Regulations. "Program Regulations" means the written regulations and procedures adopted pursuant to this chapter for procurement of Supplies, Services and Public Works.

"Proposal" means a written offer to furnish Supplies or Services in response to a Request for Proposals. This term may be further defined in the Purchasing Policy Manual and/or in competitive solicitations issued by the City.

"Public Works (or "Public Works and Improvements)" means all work, construction, alteration, repair, or improvement other than ordinary maintenance, executed at the cost of the City, or that is by law a lien or charge on any property therein. This term includes all Supplies, materials, tools, and equipment to be furnished in accordance with the Contract for such work, construction, alteration, repair, or improvement.

1.07.020.Q

"Quote" means a competitively solicited written offer to furnish Supplies or Services by a method of procurement that is less formalized than a Bid or a Proposal. This term may be further defined in the Purchasing Policy Manual.

1.07.020.R

"Respondent" means any entity or Person, other than a City employee, that provides a Submittal in response to a request for Bids, Request for Proposals, Request for Qualifications, request for quotes or other request for information, as such terms are defined in Section 1.06.251 TMC. This term includes any such entity or Person whether designated as a supplier, seller, vendor, proposer, Bidder, Contractor, consultant, merchant, or service provider that; (1) assumes a contractual responsibility to the City for provision of Supplies, Services, and/or Public Works; (2) is recognized by its industry as a provider of such Supplies, Services, and/or Public works; (3) has facilities similar to those commonly used by Persons engaged in the same or similar business; and/or (4) distributes, delivers, sells, or services a product or performs a Commercially Useful Function. 1.07.020.S

"Services" means non-Public Works and Improvements services and includes professional services, personal services, and purchased services, as such terms are defined in Section 1.06.251 TMC and/or the City's Purchasing Policy Manual.

"Submittal" means Bids, Proposals, Quotes, qualifications or other information submitted in response to requests for Bids, Requests for Proposals, Requests for Qualifications, requests for Quotations, or other City requests for information, as such terms are defined in Section 1.06.251 TMC.

"Supplies" means materials, Supplies, and other products that are procured by the City through a competitive process for either Public Works procurement or Non-Public Works and Improvements procurement unless an approved waiver has been granted by the appropriate authority.

1.07.020.T

"Tacoma Public Utilities Service Area" means any ZIP code in which Tacoma Public Utilities maintains infrastructure or provides retail services. 1.07.020.W

"Waiver" means a discretionary decision by the City that the one or more requirements of this chapter will not be applied to a Contract or Contracts.

(Ord. 28766 Ex. A; passed Jun. 8, 2021: Ord. 28625 Ex. A; passed Nov. 5, 2019: Ord. 28274 Ex. A; passed Dec. 16, 2014: Ord. 28141 Ex. A; passed Mar. 26, 2013: Ord. 27867 Ex. A; passed Dec. 15, 2009)

1.07.030 Discrimination prohibited.

A. No person that is engaged in the construction of public works for the City, engaged in the furnishing of laborers or craftspeople for public works of the City, or is engaged for compensation in the provision of non-public works and improvements supplies and/or services to the City, shall discriminate against any other person on the basis of race, religion, color, national origin or ancestry, sex, gender identity, sexual orientation, age, marital status, familial status, or the presence of any sensory, mental or physical disability in employment. Such discrimination includes the unfair treatment or denial of normal privileges to a person as manifested in employment upgrades, demotions, transfers, layoffs, termination, rates of pay, recruitment of employees, or advertisement for employment.

B. The violation of the terms of RCW 49.60 or Chapter 1.29 TMC by any person that is engaged in the construction of public works for the City, is engaged in the furnishing of laborers or craftspeople for public works of the City, or is engaged for compensation in the provision of non-public works and improvements supplies and/or services shall result in the rebuttable presumption that the terms of this chapter have also been violated. Such violation may result in termination of any City contract the violator may have with the City and/or the violator's ineligibility for further City Contracts.

(Ord. 27867 Ex. A; passed Dec. 15, 2009)

1.07.040 Program administration.

A. The Community and Economic Development Director, or their designated Program Manager, shall be responsible for administering this chapter and obtaining compliance with respect to contracts entered into by the City and/or its contractors. It shall be the duty of the Director to pursue the objectives of this chapter by conference, conciliation, persuasion, investigation, or enforcement action, as may be necessary under the circumstances. The Director is authorized to implement an administrative and compliance program to meet these responsibilities and objectives.

B. The Director is hereby authorized to adopt and to amend administrative regulations known as the Program Regulations, to properly implement and administer the provisions of this chapter. The Program Regulations shall be in conformance with City of Tacoma policies and state and federal laws and be designed to encourage achievement of the Goals set forth herein. (Ord. 28766 Ex. A; passed Jun. 8, 2021: Ord. 28141 Ex. A; passed Mar. 26, 2013: Ord. 28110 Ex. B; passed Dec. 4, 2012:

Ord. 27867 Ex. A; passed Dec. 15, 2009)

1.07.050 Approval as a Certified Business.

A. The Program Manager shall approve an entity as a Certified Business if all of the following criteria are satisfied:

1. The entity is certified as a DBE, SBE, MBE, WBE, or MWBE through the state of Washington's Office of Minority &

Women Business Enterprises; and

2. The entity can demonstrate that it also meets at least one of the following additional requirements:

a. The personal residence of the owner is located within the City of Tacoma or Tacoma Public Utilities Service Area, or

b. The entity's business offices are located in any county of the Tacoma Public Utilities Service Area or any county adjacent to Pierce County, or

c. When the work is performed outside of Pierce County, the entity's business offices may be located in an adjacent county in which the work is performed, or

d. Such additional information as the Program Manager or designee may require.

3. When another governmental entity has an equivalent business classification process, the City may enter into an interlocal cooperative agreement for mutual recognition of certifications. B. Appeals.

The applicant may appeal any approval determination by the Program Manager under this chapter to the Director. The appeal must be made in writing and must set forth the specific reasons for the appeal. The Director shall make a decision on the appeal request within a reasonable time, which decision shall be final unless further appeal is made to the Hearing Examiner.

In that event, the Hearing Examiner Rules of Procedure for Hearings, Chapter 1.23 TMC, shall be applicable to that appeal proceeding.

(Ord. 28766 Ex. A; passed Jun. 8, 2021: Ord. 28625 Ex. A; passed Nov. 5, 2019: Ord. 28274 Ex. A; passed Dec. 16, 2014:

Ord. 28147 Ex. A; passed May 7, 2013: Ord. 28141 Ex. A; passed Mar. 26, 2013: Ord. 28110 Ex. B; passed Dec. 4, 2012:

Ord. 27867 Ex. A; passed Dec. 15, 2009)

1.07.060 Program requirements.

A. The program shall meet the following requirements:

1. Establishment of Annual Goals.

The Program Regulations adopted pursuant to this chapter shall state reasonably achievable cumulative annual goals for utilization of Certified Businesses in the provision of supplies, services, and public works procured by the City. Cumulative annual goals for the participation of Certified Businesses in City contracts shall be based on the number of qualified Certified Businesses operating within the Tacoma Public Utilities Service Area. The dollar value of all contracts awarded by the City to Certified Businesses in the procurement of supplies, services, and public works shall be counted toward the accomplishment of the applicable goal. 2. Application of Annual Goals to Contracts.

The Program Manager shall consult with City departments/divisions to establish department/division specific goals for competitively solicited contracts in accordance with this chapter and the Program Regulations.

B. Exceptions:

City departments/divisions or the Program Manager may request an exception to one or more of the requirements of this chapter as they apply to a particular Contract or Contracts. Exceptions may be granted in any one or more of the following circumstances:

1. Emergency:

The supplies, services and/or public works must be provided with such immediacy that neither the City nor the contractor can comply with the requirements herein. Such emergency will be deemed documented whenever a waiver of competitive solicitation for emergency situations is authorized under Tacoma Municipal Code Chapter 1.06.257 or as may be hereinafter amended. 2. Not Practicable:

The Contract involves special facilities or market conditions or specially tailored or performance criteria-based products, such that compliance with the requirements of this chapter would cause financial loss to the City or an interruption of vital services to the public. Such circumstances must be documented by the department/division awarding the Contract and approved by the senior financial manager or, for Contracts where the estimated cost is over \$500,000 (excluding sales tax), approved by the Board of Contracts and Awards ("C&A Board"). 3. Sole source:

The supplies, services, and/or public works are available from only one feasible source, and subcontracting possibilities do not reasonably exist as documented by the department/division awarding the Contract and approved by the senior financial manager or, for Contracts where the estimated cost is over \$500,000 (excluding sales tax), approved by the C&A Board. 4. Government purchasing.

The Contract or Contracts are the result of a federal, state or inter-local government purchasing agreement and the use of such agreement in lieu of a bid solicitation conducted by the City is approved by the senior financial manager.

5. Lack of certified contractors:

An insufficient number of qualified contractors exist to create any utilization opportunities as documented by the Program Manager.

C. Waiver:

If, after receipt of Submittals but prior to Contract award, it is determined that due to unforeseen circumstances, waiver of goals is in the best interests of the City, the Director or Superintendent of the department/division awarding the Contract may request in writing that the City Manager or designee, on behalf of General Government, or the Director of Utilities or designee, on behalf of the Department of Public Utilities, approve such waiver..

Waivers may be granted only after determination by the City Manager or Director of Utilities that compliance with the requirements of this chapter would impose unwarranted economic burden on, or risk to, the City of Tacoma as compared with the degree to which the purposes and policies of this chapter would be furthered by requiring compliance.

(Ord. 28766 Ex. A; passed Jun. 8, 2021: Ord. 28625 Ex. A; passed Nov. 5, 2019: Ord. 28141 Ex. A; passed Mar. 26, 2013:

Ord. 27867 Ex. A; passed Dec. 15, 2009)

1.07.070 Evaluation of submittals.

A. All submittals for a supplies, services, or public works and improvements contracts shall be evaluated for attainment of the

Certified Business requirements established for that contract in accordance with this chapter and the Program Regulations.

B. The determination of Certified Business usage and the calculation of Certified Business requirements per this section shall include the following considerations:

1. General.

The dollar value of the contract awarded by the City to a Certified Business in the procurement of supplies, services, or public works shall be counted toward achievement of the respective goal.

2. Supplies.

A public works and improvements contractor may receive credit toward attainment of the Certified Business requirement(s) for expenditures for supplies obtained from a Certified Business; provided such Certified Business assumes the actual and contractual responsibility for delivering the supplies with its resources. The contractor may also receive credit toward attainment of the Certified Business goal for the amount of the commission paid to a Certified Business resulting from a supplies contract with the City; provided the Certified Business performs a commercially useful function in the process.

3. Services and Public Works subcontracts.

Any bid by a Certified Business or a bidder that utilizes a Certified Business shall receive credit toward requirement attainment based on the percentage of Certified Business usage demonstrated in the bid. A contractor that utilizes a Certified Business as a subcontractor to provide services or public works shall receive a credit toward the contractor's attainment of the respective requirement based on the value of the subcontract with that firm.

4. Brokers, Fronts, or Similar Pass-Through Arrangements.

Certified Business acting as brokers, fronts, or similar pass-through arrangements (as such terms are defined in the Program Regulations) shall not count toward the requirement attainment unless the activity reflects normal industry practices and the broker performs a commercially useful function.

C. Evaluation of competitively solicited submittals for public works and improvements and for services when a requirement has been established for the contract to be awarded shall be as follows:

1. When contract award is based on price.

The lowest priced bid submitted by a responsive and responsible bidder will be reviewed to determine if it meets the

requirement. Certified Businesses may self-count utilization on such bids if they will perform the work for the scope the requirement is based upon.

a. If the low bidder meets the requirements, the bid shall be presumed the lowest and best responsible bid for contract award.

b. Any bidder that does not meet the stated Certified Business requirements shall be considered a non-responsible bidder unless a waiver of one or more of the requirements of this chapter is granted, in the City's sole discretion, pursuant to the criteria and processes in Tacoma Municipal Code 1.07.060.C.

2. When contract award is based on qualifications or other performance criteria in addition to price, solicitations shall utilize a scoring system that promotes participation by certified contractors. The Program Regulations may establish further requirements and procedures for final selection and contract award, including:

a. Evaluation of solicitations for Architectural and Engineering (A&E) services;

b. Evaluation and selection of submittals in response to requests for proposals; and

c. Selection of contractors from pre-qualified roster(s).

(Ord. 28766 Ex. A; passed Jun. 8, 2021: Ord. 28625 Ex. A; passed Nov. 5, 2019: Ord. 28141 Ex. A; passed Mar. 26, 2013:

Ord. 27867 Ex. A; passed Dec. 15, 2009)

1.07.080 Contract compliance.

A. The contractor awarded a contract based on Certified Business participation shall, during the term of the contract, comply with the requirements established in said contract. To ensure compliance with this requirement following contract award, the following provisions apply:

1. Any substitutions for or failure to utilize Certified Business projected to be used must be approved in advance by the Program Manager. Substitution of one Certified Business with another shall be allowed where there has been a refusal to execute necessary agreements by the original Certified Business, a default on agreements previously made or other reasonable excuse; provided that the substitution does not increase the dollar amount of the bid.

2. Where it is shown that no other Certified Business is available as a substitute and that failure to secure participation by the

Certified Business identified in the solicitation is not the fault of the respondent, substitution with a non-Certified Business shall be allowed; provided, that, the substitution does not increase the dollar amount of the bid.

3. If the Program Manager determines that the contractor has not reasonably and actively pursued the use of replacement Certified Business, such contractor shall be deemed to be in non-compliance.

B. Record Keeping.

All contracts shall require contractors to maintain relevant records and information necessary to document compliance with this chapter and the contractor's utilization of Certified Businesses, and shall include the right of the City to inspect such records.

(Ord. 28766 Ex. A; passed Jun. 8, 2021: Ord. 28625 Ex. A; passed Nov. 5, 2019: Ord. 28141 Ex. A; passed Mar. 26, 2013:

Ord. 27867 Ex. A; passed Dec. 15, 2009)

1.07.090 Program monitoring.

A. An Advisory Committee shall monitor compliance with all provisions of this chapter and the related Regulations. The Program Manager shall establish procedures to collect data and monitor the effect of the provisions of this chapter to assure, insofar as is practical, that the remedies set forth herein do not disproportionately favor one or more racial, gender, ethnic, or other protected groups, and that the remedies do not remain in effect beyond the point that they are required to eliminate the effects of under utilization in City contracting, unless such provisions are supported by a Disparity Study. The Program Manager shall have the authority to obtain from City departments/divisions, respondents, and contractors such relevant records, documents, and other information as is reasonably necessary to determine compliance.

B. The Program Manager shall submit an annual report to the Community and Economic Development Director, Director of Utilities, and the City Manager detailing performance of the program. The report shall document Certified Business utilization levels, waivers, proposed modifications to the program, and such other matters as may be specified in the Program Regulations.

(Ord. 28766 Ex. A; passed Jun. 8, 2021: Ord. 28625 Ex. A; passed Nov. 5, 2019: Ord. 28141 Ex. A; passed Mar. 26, 2013:

Ord. 28110 Ex. B; passed Dec. 4, 2012: Ord. 27867 Ex. A; passed Dec. 15, 2009)

1.07.100 Enforcement.

The Director, or designee, may investigate the employment practices of contractors to determine whether or not the requirements of this chapter have been violated. Such investigation shall be conducted in accordance with the procedures established in the Program Regulations. (Ord. 28625 Ex. A; passed Nov. 5, 2019: Ord. 28141 Ex. A; passed Mar. 26, 2013: Ord. 28110 Ex. B; passed Dec. 4, 2012:

Ord. 27867 Ex. A; passed Dec. 15, 2009)

1.07.110 Remedies.

A. Upon receipt of a determination of contractor violation by the Program Manager, the City Manager or Director of Utilities, as appropriate, may take the following actions, singly or together, as appropriate:

1. Forfeit the contractor's bid bond and/or performance bond;

- 2. Publish notice of the contractor's noncompliance;
- 3. Cancel, terminate, or suspend the contractor's contract, or portion thereof;
- 4. Withhold funds due contractor until compliance is achieved; and/or

5. Recommend appropriate action including, but not limited to, disqualification of eligibility for future contract awards by the City (debarment) per Section 1.06.279 TMC;

B. Prior to exercise of any of the foregoing remedies, the City shall provide written notice to the contractor specifying the violation and the City's intent to exercise such remedy or remedies. The notice shall provide that each specified remedy becomes effective within ten business days of receipt unless the contractor appeals said action to the Hearing Examiner pursuant to Chapter 1.23 TMC.

C. When non-compliance with this chapter or the Program Regulations has occurred, the Program Manager and the department/division responsible for enforcement of the contract may allow continuation of the contract upon the contractor's development of a plan for compliance acceptable to the Director.

(Ord. 28625 Ex. A; passed Nov. 5, 2019: Ord. 28141 Ex. A; passed Mar. 26, 2013: Ord. 28110 Ex. B; passed Dec. 4, 2012:

Ord. 27867 Ex. A; passed Dec. 15, 2009)

1.07.120 Unlawful acts.

It shall be unlawful for any Person to willfully prevent or attempt to prevent, by intimidation, threats, coercion, or otherwise, any Person from complying with the provisions of this chapter. (Ord. 27867 Ex. A; passed Dec. 15, 2009)

1.07.130 Severability.

If any section of this chapter or its application to any Person or circumstance is held invalid by a court of competent jurisdiction, then the remaining sections of this chapter, or the application of the provisions to other Persons or circumstances, shall not be affected. (Ord. 27867 Ex. A; passed Dec. 15, 2009)

1.07.140 Review of program.

This chapter shall be in effect through and until December 31, 2024, unless the City Council shall determine at an earlier date that the requirements of this chapter are no longer necessary. If this chapter has not been repealed by July 1, 2024, the City Council shall determine by the end of that year whether substantial effects or lack of opportunity of MWBEs and/or SBEs remain true

in the relevant market and whether, and for how long, some or all of the requirements of this chapter should remain in effect.

(Ord. 28625 Ex. A; passed Nov. 5, 2019: Ord. 28274 Ex. A; passed Dec. 16, 2014: Ord. 28141 Ex. A; passed Mar. 26, 2013:

Ord. 27867 Ex. A; passed Dec. 15, 2009)

City of Tacoma

Equity In Contracting Program Regulations

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Introduction

This document serves as the administrative manual for the Equity in Contracting policy that is described in Tacoma Municipal Code (TMC) Chapter 1.07.040(B). The manual will explain how compliance, monitoring, oversight, requirement-making, bid incentives, and enforcement actions will be administered. The document will be regularly updated. For any questions related to this document, please contact the Equity in Contracting (EIC) office at (253)591-5075 or <u>SBEOffice@cityoftacoma.org</u>.

Goals/Requirements on Contracts

A. Requirements

- 1. Public Work
 - a. Minority Business Enterprise (MBE), Women Business Enterprise (WBE), and Small Business Enterprise (SBE) requirements are placed on all Public Work projects.
 - i. MBE, WBE, and SBE requirements are **mandatory**. As such, any bidder that does not meet any requirement shall be considered non-responsive by the Equity in Contracting office.

Contractors are also subject to the City's ordinances and regulations pertaining to having an affirmative action program and prohibiting discrimination. If needed, please contact the Equity in Contracting Office at 253-591-5075 for assistance. The list of MBE, WBE, and SBE certified firms from the Washington State Office of Minority and Women Owned Business Enterprises (OMWBE) can be found at: <u>https://omwbe.diversitycompliance.com/</u>

All SBE goals may be met by using DBE's or SBE's from the OMWBE list or the City of Tacoma SBE list. Please contact the Equity in Contracting Office for questions or to verify a firms status.

Contract Compliance

A. Benefits

The City of Tacoma must monitor compliance for all contracts that have requirements related to Equity in Contracting policies. Adequate monitoring allows the City to audit ongoing contracts for compliance, make necessary changes to the Equity in Contracting Regulations Manual based on real data, and to proactively monitor any possible discrimination on City of Tacoma-funded contracts.

B. Requirements

- 1. All contracts that have requirements related to the Equity in Contracting policy must utilize two cloud-based software solutions:
 - a. "B2GNow" for prime-contractor and sub-contractor payment compliance.
 - b. "LCP Tracker" for certified payroll compliance.
- 2. To access both systems, please use the following link: <u>https://cityoftacoma.sbecompliance.com/?TN=cityoftacoma</u>
- 3. For support using these software solutions, please contact the Equity in Contracting office at (253)591-5075.

C. Key Performance Indicators

- 1. B2GNow
 - a. Ethnicity and Gender Summary

- i. Subcontractors Only
- ii. With Primes
- b. Prompt Payment Analysis
- c. Prime Contractor Performance on Active Contracts
- d. Contract Awards Summarized by Department
- 2. LCP Tracker
 - a. Apprentice Hours
 - i. By Trade
 - ii. By Contractor
 - b. Employment By Area
 - i. Zip Code
 - ii. Council Districts
 - c. Employment By Ethnicity

Waivers

B. Waivers. City departments/divisions or the Program Manager may request to waive one or more of the requirements of this chapter as they apply to a particular contract or contracts. Waivers may be granted in any one or more of the following circumstances:

1. Emergency: The supplies, services and/or public works must be provided with such immediacy that neither the City nor the contractor can comply with the requirements herein. Such emergency and waiver must be documented by the department/division awarding the contract.

2. Not Practicable: Compliance with the requirements of this chapter would impose an unwarranted economic burden or risk to the City after consideration of existing budgetary approvals.

3. Sole source: The supplies, services, and/or public works are available from only one source, and subcontracting possibilities do not reasonably exist as determined by the finance purchasing manager.

4. Government purchasing. The City is a party to or included in a federal, state or inter-local government purchasing agreement as approved by the finance purchasing manager.

5. Lack of certified contractors: An insufficient number of qualified contractors exist to create utilization opportunities.

6. Best interests of the City: Waiver of goals is in the best interests of the City due to unforeseen circumstances, provided that said circumstances are set forth in writing by the requestor.

C. Review of Waivers. If, after receipt of Submittals but prior to Contract award, it is determined that due to unforeseen circumstances, waiver of goals is in the best interests of the City, the Director or Superintendent of the department/division awarding the Contract may request in writing that the City Manager or designee, on behalf of General Government, or the Director of Utilities or designee, on behalf of the Department of Public Utilities, approve such waiver.

D. Waivers may be granted only after determination by the City Manager or Director of Utilities that compliance with the requirements of this chapter would impose unwarranted economic burden on, or risk to, the City of Tacoma as compared with the degree to which the purposes and policies of this chapter would be furthered by requiring compliance.

E. (Ord. 28766 Ex. A; passed Jun. 8, 2021: Ord. 28625 Ex. A; passed Nov. 5, 2019: Ord. 28141 Ex. A; passed Mar. 26, 2013: Ord. 27867 Ex. A; passed Dec. 15, 2009)

F. Key Performance Indicators

- 1. Total quantity of Waivers
 - a. By type number
 - b. Type 5 will also need to document the NAICS code referenced.

Version History

The version history is marked by day.month.year.version nomenclature. A higher version number denotes a more recent version. For example, a 1.1.2020.1 version would denote the first version made in January 1st of 2020. A 1.1.2020.3 version would denote the third version made on January 1st of 2020. When referencing a specific contract, be sure to note that the version of the administrative manual matches that which was in the bid specifications.

Current Version 7.01.2021.1

Previous Version(s) 2.21.2020.1, 3.11.2020.1



City of Tacoma Community & Economic Development Office of Equity in Contracting 747 Market Street, Rm 900 Tacoma WA 98402 253-591-5075

EQUITY IN CONTRACTING UTILIZATION FORM

This form is to document **only** the EIC contractors or material suppliers that will be awarded a contract. This information will be used in calculating the **EVALUATED BID**. Additional forms may be used if needed.

- Prime contractors are encouraged to solicit bids from EIC approved firms.
- Be sure to include this form with your bid submittal in order to receive EIC credit.
- It is the prime contractor's responsibility to check the certification status of EIC contractors prior to the submittal deadline.

Bidder's Name:

Address:				City/State/Zip:					
Spec. No Base Bid * \$			Complete company names and phone numbers are required to verify your EIC usage.						
a. Company Name and Certification Number(s)	b. MBE, WBE, or SBE (Write all that apply)	c. NAICS code(s)	Cont A (d. ractor Bid mount 100%)	e. Material Supplier Bid Amount (20%)	f. Estimated MBE Usage Dollar Amount	g. Estimated WBE Usage Dollar Amount	h. Estimated SBE Usage Dollar Amount	
i. MBE Utilization %	j. WBE Utilization %			k. SBE Utilization %					

By signing and submitting this form the bidder certifies that the EIC firms listed will be used on this project including all applicable change orders.

Signature of Responsible Officer

INSTRUCTIONS FOR COMPLETING EIC UTILIZATION FORM

The purpose of these instructions is to assist bidders in properly completing the EIC Utilization Form.

This form when submitted with your bid provides information to the City of Tacoma to accurately review and evaluate your proposed EIC usage.

- 1. * Base Bid is the prime contractor's bid, plus any alternates, additives and deductive selected by the City. Also, please refer to Items #10-12 below.
- 2. Column "a" List all EIC companies that you will be awarding a contract to if you are the successful bidder.
- 3. Column "b" Identify if this firm is being utilized as an MBE, WBE, or SBE. (Firms may count towards multiple requirements)
- 4. Column "c" List the appropriate NAICS code for the scope of work, services, or materials/supplies for each contractor.
- 5. Column "d" The bid amount must be indicated for *all* listed **EIC** that you plan on doing business with. This quote is the price that you and the contractor have negotiated prior to bid opening.
- 6. Column "e" The bid amount must be indicated for **all** listed **EIC** that you plan on doing business with. This quote is the price that you and the material supplier have negotiated prior to bid opening.
- 8. Column "f" Estimated MBE Usage Dollar Amount: For all MBE firms used, multiply the amount in Column "d" by 1.0 plus the amount in Column "e" by 0.20. Insert the total amount in this column.
- 9. Column "g" Estimated WBE Usage Dollar Amount: For all WBE firms used, multiply the amount in Column "d" by 1.0 plus the amount in Column "e" by 0.20. Insert the total amount in this column.
- 10. Column "h" Estimated SBE Usage Dollar Amount: For all MBE, WBE, or SBE firms used, Multiply the amount in Column "d" by 1.0 plus the amount in Column "e" by 0.20. Insert the total amount in this column.
- 11. Block "i" The percent of actual MBE utilization calculated on the Base Bid only. (Divide the sum of Estimated MBE Usage Dollar Amount (Column "f") by your Base Bid (*) then multiply by 100 to get a percentage: \$ amounts from column "f" divided by Base Bid (*) x 100 = EIC usage as a percent of the Base Bid.)
- 12. Block "j" The percent of actual WBE utilization calculated on the Base Bid only. (Divide the sum of Estimated WBE Usage Dollar Amount (Column "g") by your Base Bid (*) then multiply by 100 to get a percentage: \$ amounts from column "g" divided by Base Bid (*) x 100 = EIC usage as a percent of the Base Bid.)

13. Block "k" – The percent of actual SBE utilization calculated on the Base Bid only. (Divide the sum of Estimated SBE Usage Dollar Amount (Column "h") by your Base Bid (*) then multiply by 100 to get a percentage: \$ amounts from column "h" divided by Base Bid (*) x 100 = EIC usage as a percent of the Base Bid.)

It is the prime contractor's responsibility to check the status of EIC contractors prior to bid opening. Call the EIC Office at 253- 591- 5075 for additional information.

CITY OF TACOMA FINANCE/PURCHASING DIVISION

SPECIAL NOTICE TO BIDDERS

Equity in Contracting – EIC

Equity in Contracting (EIC) forms and attachments <u>must be fully and</u> <u>accurately completed and returned at the time of Bids</u>. Failure to do so may <u>result in the proposal being considered nonresponsive</u>. These forms will be <u>used to determine if the firm complies with Tacoma Municipal Code Chapter</u> <u>1.07 and State Law</u>.

Vendors for public works and improvement-type projects are required to be inclusive of Minority Owned Business Enterprises, Women-Owned Business Enterprises, and Small Business Enterprises. The criteria for determining whether inclusion has been made are set forth in the City's EIC regulations. Vendors are also subject to the City's EIC ordinance and regulations pertaining to having an Equal Employment Opportunity policy prohibiting discrimination. Bids will be evaluated on an individual basis to determine compliance with this section. The EIC Utilization Form, when required, should accompany your submittal. Contact the EIC Office at (253) 591-5075 if there are questions about this requirement.

Either the firm submitting the bid or the firms they plan to subcontract with, if qualified, may meet the percent requirements listed on the EIC Requirement Form.

Bidders unable to meet the percent requirements shall submit the Equity in Contracting Utilization Form, and any required attachments with the Bid in accordance with the Equity in Contracting Regulations.

FAILURE TO COMPLETE AND SUBMIT EIC FORMS WITH THE BID SUBMITTAL PACKAGE WILL RESULT IN THE BID BEING DECLARED NON-RESPONSIVE AND REJECTED.
It is the bidder's responsibility to insure that their firm (if EIC-eligible) and/or eligible subcontractor(s) listed on the EIC Utilization Form are <u>currently</u> certified by the the State of Washington's Office of Minority and Women Business Enterprises at the time of bid opening. This may be verified by contacting the EIC Office at 253-591-5075 between 8 AM and 4:30 PM, Monday through Friday.

All SBE goals may be met by using DBEs or SBEs from the OMWBE list or the City of Tacoma SBE list.

A list of EIC-certified companies is available on the following web site addresses:

<u>www.omwbe.diversitycompliance.com</u> – From this list, be sure check for certified MBE, WBE, MWBE, and SBE companies located in Pierce, King, Lewis, Mason, and Grays Harbor counties.

*After December 31, 2020, the list of EIC eligible firms may only be accessed at <u>www.omwbe.diversitycompliance.com</u>

LOCAL EMPLOYMENT APPRENTICE PROGRAM (LEAP)

LOCAL EMPLOYMENT AND APPRENTICESHIP TRAINING PROGRAM (LEAP) INSTRUCTIONS AND GOAL FORM

LEAP REQUIREMENTS & PROCEDURES:

The LEAP office enforces post-award mandatory requirements. Bidders <u>do not</u> have to submit any information in the bid submittal package to be in compliance with LEAP.

Post-award Submittals:

- <u>Prime Contractor LEAP Utilization Plan</u> This form is to be completed and presented at the Pre-Construction Meeting.
- <u>LEAP Apprentice Verification Form</u> This form is to be completed for every qualifying Apprentice employee.

The forms above, LEAP Program Requirements, and all related LEAP documents can be accessed on the City of Tacoma LEAP website by navigating to LEAP Forms at the following link: <u>http://cityoftacoma.org/leap</u>.

The City of Tacoma's LEAP office enforces two mandatory goals on City projects above certain monetary thresholds.

The Local Employment Utilization Goal requires the Prime Contractor performing a qualifying public works project to ensure that 15 percent of the total labor hours worked on the project are performed by residents of the City of Tacoma or Economically Distressed Areas of the Tacoma Public Utilities Service Area.

The Apprentice Utilization Goal requires the Prime Contractor performing a qualifying public works project to ensure that 15 percent of the total labor hours worked on the project are performed by Apprentices who are residents of the City of Tacoma or Tacoma Public Utilities Service Area. The accompanying LEAP Regulations, forms, and maps are included in these specifications.

*Exceptions: If the project is located outside of the retail service area of the Tacoma Public Utilities Service Area, then Apprentices may come from the county in which the work is performed.

This project is above \$1 million and is thusly subject to the:

- 1. 15% Local Employment Utilization Goal
- 2. 15% Apprentice Utilization Goal

LEAP staff can assist contractors in the recruitment, screening and selection of qualified City of Tacoma residents, Economically Distressed Area residents, and Apprentices. Contractors may obtain further information by contacting the City's LEAP Office at (253) 591-5826. The LEAP Office is located in the Tacoma Municipal Building, 747 Market Street, Room 808, Tacoma, WA 98402.



City of Tacoma LEAP Office 747 Market Street, Room 900 Tacoma, WA 98402 Phone (253) 591-5826 FAX (253) 591-5232

LEAP

Document Submittal Schedule

In the attached packet, you will find the LEAP forms that are required to be submitted by the Prime and Sub Contractors.

- **LEAP Instructions and Goal Form**: brief overview of LEAP Program requirements
- Prime Contractor LEAP Utilization Plan: to be submitted at or by the Pre-Construction Meeting (Required by Prime Contractor Only)
- LEAP Apprentice Verification Form: to be submitted on an ongoing basis for each qualified Apprentice employee via LCP Tracker
- Tacoma Public Utilities Service Area List, Economically Distressed ZIP Codes List: for your reference on LEAP-qualified zoning areas

In addition, the LEAP Office will also require from the Prime Contractor and all its Subcontractors:

- **Weekly Certified Payrolls**: to be submitted weekly, biweekly or monthly via LCP Tracker
- **Document Verification**: provide required information when requested from LEAP Office

Please submit above documents as instructed by the Project Manager.

If you have any questions or request further information, please feel free to contact the City of Tacoma's LEAP Program at (253) 591-5826, Fax (253) 591-5232, or email <u>carmstrong@cityoftacoma.org</u>.

Chapter 1.90

LOCAL EMPLOYMENT AND APPRENTICESHIP TRAINING PROGRAM

Sections:

1.90.010	Purpose.
1.90.020	Scope.
1.90.030	Definitions.
1.90.040	LEAP goals.
1.90.050	Repealed.
1.90.060	Effect of program on prime contractor/subcontractor relationship.
1.90.070	Apprentice utilization requirements – Bidding and contractual documents.
1.90.080	Enforcement.
1.90.090	Compliance with applicable law.
1.90.100	Review and reporting.
1.90.105	Authority
1.90.110	Interpretation.

1.90.010 Purpose.

The purpose of this Chapter is to establish a means of providing for the development of a trained and capable workforce possessing the skills necessary to fully participate in the construction trades.

(Ord. 26301 § 1; passed Oct. 6, 1998)

1.90.020 Scope.

The provisions of this Chapter shall apply to all Public Works or Improvements funded in whole or in part with City funds or funds which the City expends or administers in accordance with the terms of a grant.

(Ord. 26301 § 1; passed Oct. 6, 1998)

1.90.030 Definitions.

As used in this chapter, the following terms shall have the following meanings:

A. "Apprentice" shall mean a person enrolled in a course of training specific to a particular construction trade or craft, which training shall be approved by the Washington State Apprenticeship and Training Council established pursuant to RCW 49.04.010.

B. "Building Projects" shall mean all Public Works or Improvements having an Estimated Cost greater than \$750,000.00, and for which a building permit must be issued pursuant to Chapter 1 of the current edition of the state building code (Uniform Building Code).

C. "City" shall mean all divisions and departments of the City of Tacoma, and all affiliated agencies, provided, however, that the Tacoma Community Redevelopment Authority shall not be included within this definition.

D. "Civil Projects" shall mean all Public Works or Improvements that are not defined as a "Building Project," provided that those projects having an Estimated Cost of less than \$250,000.00 shall not be included in this definition.

E. "Contractor or Service Provider" means a person, corporation, partnership, or joint venture entering into a contract with the City to construct a Public Work or Improvement.

<u>F.</u> "Director" shall mean the Director of Community and Economic Development, or the Director's Designee.

G. "Economically Distressed ZIP Codes" shall mean ZIP codes in the Tacoma Public Utilities Service Area that meet two out of three (2/3) of the thresholds of:

- 1. High concentrations of residents living under 200% of the federal poverty line in terms of persons per acre (69th percentile)
- 2. High concentrations of unemployed people in terms of persons per acre (45th percentile)

3. High concentrations of people 25 years or older without a college degree in terms of persons per acre (75th percentile)

Said thresholds shall be updated within 30 days following any Prevailing Wage updates issued by the Washington State Labor and Industry. All updates are to be published on the first business day in August and in February of each calendar year.

H. "Electrical Utility" and "Water Utility" shall mean, respectively, the Light Division of the Department of Public Utilities of the City of Tacoma, and shall include the electrical and telecommunications services of that Division, and the Water Division of the Department of Public Utilities of the City of Tacoma.

I. "Estimated Cost" shall mean the anticipated cost of a Public Work or Improvement, as determined by the City, based upon the expected costs of materials, supplies, equipment, and labor, but excluding taxes and contingency funds.

J. "Estimated Labor Hours" shall mean the anticipated number of Labor Hours determined by the City to be necessary to construct a Public Work or Improvement and set forth in the specifications for the project, or as may be subsequently revised due to contract or project adjustment, or pursuant to an agreed upon change order.

K. "Existing Employee" shall mean an employee whom the Contractor or Service Provider can demonstrate was actively employed by the Contractor or Service Provider for at least 1000 hours in the calendar year prior to bid opening plus one month following bid opening, and who was performing work in the construction trades.

L. "Labor Hours" shall mean the actual number of hours worked by workers receiving an hourly wage who are employed on the site of a Public Work or Improvement, and who are subject to state or federal prevailing wage requirements. The term "Labor Hours" shall include hours performed by workers employed by the Contractor or Service Provider and all Subcontractors, and shall include additional hours worked as a result of a contract or project adjustment or pursuant to an agreed upon change order. The term "Labor Hours" shall not include hours worked by workers who are not subject to the prevailing wage requirements set forth in either RCW 39.12 or the Davis-Bacon Act - 40 U.S.C. 276 (a).

M. "LEAP Coordinator" shall mean the City of Tacoma staff member who administers LEAP.

N. "LEAP Program" or "Program" shall mean the City of Tacoma's Local Employment and Apprenticeship Training Program, as described in this chapter.

O. "LEAP Regulations" or "Regulations" shall mean the rules and practices established in this document.

P. "LEAP Utilization Plan" shall mean the document submitted by the Contractor to the LEAP Coordinator which outlines how the associated goals will be met on the project.

Q. "Priority Hire Resident" shall mean any resident within the Economically Distressed ZIP Codes.

R. "Project Engineer" shall mean the City employee who directly supervises the engineering or administration of a particular construction project subject to this chapter.

S. "Public Work or Improvement" shall have the same meaning as provided in Section 39.04.010 RCW, as that Section may now exist or hereafter be amended.

T. "Resident of Tacoma" shall mean any person, not defined as a Resident of the Economically Distressed ZIP Codes within the Tacoma Public Utilities Service Area, who continues to occupy a dwelling within the boundaries of the City of Tacoma, has a present intent to continue residency within the boundaries of the City, and who demonstrates the genuineness of that intent by producing evidence that the person's presence is more than merely transitory in nature.

U. "Service Area - Electrical" or "Electrical Service Area" shall mean that area served with retail sales by the Electrical Utility of the City of Tacoma at the time a bid is published by the Electrical Utility for a Public Work or Improvement to be performed primarily for the Electrical Utility.

V. "Service Area - Water" or "Water Service Area" shall mean that area served with retail sales by the Water Utility of the City of Tacoma at the time a bid is published by the water utility for a Public Work or Improvement to be performed primarily for the Water Utility.

W. "Service Contract" shall mean all City contracts relating to a Public Work or Improvement which utilize labor at a City site and which are not within the exceptions to nor defined as "Building Projects" or "Civil Projects."

X. "Subcontractor" means a person, corporation, partnership, or joint venture that has contracted with the Contractor or Service Provider to perform all or part of the work to construct a Public Work or Improvement by a Contractor.

Y. "Tacoma Public Utilities Service Area" shall mean every ZIP code listed by Tacoma Public Utilities as an area that either receives services or maintains infrastructure to provide services.

Z. Washington State Labor and Industry Prevailing Wage shall mean the hourly wage, usual benefits and overtime, paid in the largest city in each county, to the majority of workers, laborers, and mechanics. Prevailing wages are established, by the Department of Labor & Industries, for each trade and occupation employed in the performance of public work. They are established separately for each county, and are reflective of local wage conditions.

AA. "Tacoma Public Utilities" means the City of Tacoma, Department of Public Utilities.

(Ord. 28147 Ex. B; passed May 7, 2013: Ord. 28110 Ex. C; passed Dec. 4, 2012: Ord. 27815 Ex. A; passed Jun. 30, 2009: Ord. 27368 § 1; passed Jun. 21, 2005: Ord. 26698 § 1; passed Sept. 12, 2000: Ord. 26301 § 1; passed Oct. 6, 1998)

1.90.040 LEAP goals.

A. Utilization Goals.

1. All Contractors constructing Civil Projects or Building Projects, and all Service Providers involved with the construction of a Public Work or Improvement, shall ensure that at least 15 percent of the total Labor Hours actually worked on the Project are performed by persons having their residence within the boundaries of the City of Tacoma or Economically Distressed ZIP Codes, whether or not any such person is an Apprentice.

a. The thresholds for this section shall be \$250,000.00 for Civil Projects and \$750,000.00 for Building Projects.

2. Fifteen percent (15%) of the Total Labor Hours on contracts above one-million dollars (\$1,000,000.00) shall have work performed by Apprentices who are residents of the Tacoma Public Utilities Service Area consistent with RCW 39.04.320(1)(a), subject to waiver based on exceptions as specified in RCW 39.04.320(2)(a), (b), and (c).

3. Labor Hours performed by non-residents of the State of Washington will be deducted from a project's total Labor Hours for purposes of determining compliance with the requirements of this chapter.

4. All Contractors and Service Providers shall submit a LEAP Utilization Plan as provided for in the regulations adopted under this chapter, and shall meet with the LEAP Coordinator to review said Plan prior to being issued a Notice to Proceed. Failure to submit a LEAP Utilization Plan may be grounds for the City to withhold remittance of a progress payment until such Plan is received from the responsible Contractor or Provider. A meeting with the LEAP Coordinator prior to issuance of a Notice to Proceed shall be excused only when the LEAP Coordinator is unavailable to meet prior to the scheduled date for issuance of the Notice to Proceed and the Contractor and the LEAP Coordinator have otherwise scheduled a meeting for the coordinator to review the Contractor's or Provider's plan.

The Contractor or Service Provider shall be responsible for meeting the LEAP utilization goal requirements of the contract, including all amendments and change orders thereto, and shall be responsible for overall compliance for all hours worked by Subcontractors. To the extent possible, the Contractor or Service Provider shall recruit Apprentices from multiple trades or crafts.

B. Failure to Meet Utilization Goal.

1. Contracts for the construction of Building projects or Civil Projects and Service Contracts shall provide that Contractors or Service Providers failing to meet the LEAP utilization goals shall be assessed an amount for each hour that is not achieved. The amount per hour shall be based on the extent the Contractor or Service Provider met its goal. The amount per hour that shall be assessed shall be as follows:

Percent of Goal Met	Assessment per unmet hour
100%	\$ 0.00
90% - 99%	\$ 2.00
75% to 89%	\$ 3.50
50% to 74%	\$ 5.00
1% to 49%	\$ 7.50
0%	\$10.00

When determining the percent of goal that is met, all rounding shall be down to the nearest whole percent. No penalty shall be waived by the City unless it is determined by the Director to be in the best interests of the City, which determination shall be made after consultation with the LEAP Coordinator.

2. Deposit of Assessments. All assessments imposed pursuant to this section shall be deposited into a separate account and utilized to support the City's pre-apprenticeship and training program. The policies and regulations adopted by the City Manager and Director of Utilities pursuant to this chapter shall address issues pertaining to a Contractor's existing workforce. Contributions need not be made for Labor Hours that have been adjusted in accordance with Section 1.90.040(E).

C. LEAP Reports. Notwithstanding the provisions of TMC 1.90.100, the Director shall, not less than annually, publish a LEAP report setting forth Contractor compliance with this chapter. Said report shall include information on all contracts and all Contractors to which this chapter applies, and shall detail the level and nature of LEAP participation by contract and by Contractor, The Director's LEAP report may include such other information as may be helpful to assuring fair and accurate representation of the contracts, Contractors or projects covered in the report. The Director's LEAP reports may be considered by the Board of Contracts and Awards in its determinations as to bidder responsibility.

D. LEAP Goal Adjustments.

1. LEAP utilization goals may be adjusted prior to bid opening and/or as a result of a contract amendment or change order on a Building Project, Civil Project, or Service Contract.

a. If LEAP utilization goals are adjusted prior to bid opening, they shall be set forth in the bid or Request For Proposal advertisement and specification documents or in an addendum timely provided to prospective bidders, provided that such adjustment shall be based upon a finding by the Project Engineer that the reasonable and necessary requirements of the contract render LEAP utilization unfeasible at the required levels. The Director shall concur with the Project Engineer's finding, provided that should the Project Engineer and the Director fail to reach agreement on the Project Engineer's finding, then in that circumstance the matter shall be referred to the City Manager or the Director of Utilities, as appropriate, for ultimate resolution. Notwithstanding any other provision of this chapter to the contrary, the decision of the City Manager or the Director of Utilities with regard to LEAP goal adjustment may not be appealed.

b. If LEAP utilization goals are adjusted due to contract amendment or change order, the amount of adjustment shall be consistent with the utilization goals set forth in this chapter and shall be determined pursuant to regulations adopted pursuant to this chapter for administration of LEAP utilization goal adjustments.

2. The methodology of determining the appropriate adjustments to LEAP utilization goals shall be determined in consultation with the LEAP Advisory Committee, established pursuant to this ordinance for so long as the LEAP Advisory Committee remains in existence.

3. LEAP utilization goals shall not apply to those portions of a project that are funded by sources other than (a) City funds, or (b) funds which the City expends or administers in accordance with the terms of a grant to the City, provided that the Project Engineer shall notify the Director of such non-application prior to bid advertisement. For the purposes of this paragraph, credits extended by another entity for the purpose of providing project funding shall not be considered to be City funds.

E. Utilization - Electrical Projects Outside Electrical Service Area. Civil Projects or Building Projects that are constructed primarily for the benefit or use by the City's Electrical Utility, which are wholly situated outside the

Electrical Service Area, and for which the estimated cost is less than \$1,000,000.00, are exempt from the requirements of this chapter.

F. Utilization - Water Projects Outside Water Service Area. Civil Projects or Building Projects that are constructed primarily for the benefit or use by the City's Water Utility, which are wholly situated outside the Water Service Area, and for which the estimated cost is less than \$1,000,000.00 are exempt from the requirements of this chapter.

G. Utilization –Projects Outside Tacoma Public Utilities Service Area. Civil Projects or Building Projects that are constructed primarily for the benefit or use by Tacoma Public Utilities, which are wholly situated outside the retail service area of the Tacoma Public Utilities Service Area, and for which the estimated cost is less than \$1,000,000.00 are exempt from the requirements of this chapter. Projects wholly situated outside the Tacoma Public Utilities Service Area, and for which the estimated cost is less than \$1,000,000.00 are exempt from the requirements of this chapter. Projects wholly situated outside the Tacoma Public Utilities Service Area, and for which the estimated cost is more than \$1,000,000.00, shall be exempt from 15% utilization goal specified in subsection A1. of this section. The 15% utilization goal specified in subsection A2. of this section may be met if project work is performed by Apprentices who are enrolled in a course of training specific to a particular construction trade or craft, provided such training has been approved by the Washington State Apprenticeship and Training Council in accordance with Chapter 49.04, RCW.

H. Emergency. This chapter shall not apply in the event of an Emergency. For the purposes of this section, an "Emergency" means unforeseen circumstances beyond the control of the City that either: (a) present a real, immediate threat to the proper performance of essential functions; or (b) will likely result in material loss or damage to property, bodily injury, or loss of life if immediate action is not taken.

I. Conflict with State or Federal Requirements. If any part of this chapter is found to be in conflict with federal or state requirements which are a prescribed condition to the allocation of federal or state funds to the City, then the conflicting part of this chapter is inoperative solely to the extent of the conflict and with respect to the City departments directly affected. This provision does not affect the operation of the remainder of this chapter. Administrative rules or regulations adopted under this chapter shall meet federal and state requirements which are a necessary condition to the receipt of federal or state funds by the City.

(Ord. 28147 Ex. B; passed May 7, 2013: Ord. 27815 Ex. A; passed Jun. 30, 2009: Ord. 27368 § 2; passed Jun. 21, 2005: Ord. 26992 § 1; passed Oct. 15, 2002: Ord. 26698 § 2; passed Sept. 12, 2000: Ord. 26301 § 1; passed Oct. 6, 1998)

1.90.050 Good faith efforts. *Repealed by Ord.* 27368.

(Ord. 27368 § 3; passed Jun. 21, 2005: Ord. 26698 § 3; passed Sept. 12, 2000: Ord. 26301 § 1; passed Oct. 6, 1998)

1.90.060 Effect of program on prime contractor/service provider - subcontractor relationship.

The LEAP Program shall not be construed so as to modify or interfere with any relationship between any Contractor or Service Provider and Subcontractor. The LEAP Program shall not grant the City any authority to control the manner or method of accomplishing any construction work that is additional to any authority retained by the City in a Public Works or Improvement contract.

(Ord. 26698 § 4; passed Sept. 12, 2000: Ord. 26301 § 1; passed Oct. 6, 1998)

1.90.070 Apprentice utilization requirements – Bidding and contractual documents.

All packages of bid documents for every Building Project and every Civil Project shall incorporate provisions satisfactory to the City Attorney so as to allow enforcement of the provisions contained in this Chapter. Such contractual provisions may include liquidated damages, calculated to reimburse the City for the Contractor's breach of these performance requirements, which shall be published with the City's call for bids.

(Ord. 26301 § 1; passed Oct. 6, 1998)

1.90.080 Enforcement.

A. The Director shall review the Contractor's or Service Provider's and all Subcontractor's employment practices during the performance of the work for compliance with LEAP Program requirements. On-site visits may be conducted as necessary to verify compliance with the requirements of the LEAP Program. The Contractor, Service Provider, or Subcontractors shall not deny to the City the right to interview its employees, provided that the Director shall make reasonable efforts to coordinate employee interviews with employers.

B. Any knowing failure or refusal to cooperate in compliance monitoring may disqualify the defaulting Contractor, Service Provider, or Subcontractor from eligibility for other City contracts.

C. The making of any material misrepresentation may disqualify the defaulting Contractor, Service Provider, or Subcontractor from eligibility for other City contracts.

D. Any action by the City, its officers and employees, under the provisions of this Chapter may be reviewed by the Board of Contracts and Awards, upon written application of the party so affected. Application shall be made within twenty (20) days of the date of the action upon which the appeal is based, and provided to the City by certified mail or by personal service. Any action taken by the Board of Contracts and Awards may be appealed to the City Council or Public Utility Board, as appropriate, and thereafter if desired, to the Superior Court of Pierce County, Washington, within fifteen (15) days of the previous decision.

(Ord. 26698 § 5; passed Sept. 12, 2000; Ord. 26301 § 1; passed Oct. 6, 1998)

1.90.090 Compliance with applicable law.

Nothing in this Chapter shall excuse a Prime Contractor, Service Provider, or Subcontractor from complying with all relevant federal, state, and local laws.

(Ord. 26698 § 6; passed Sept. 12, 2000; Ord. 26301 § 1; passed Oct. 6, 1998)

1.90.100 Review and reporting.

The City Manager and Director of Utilities shall review the Program on or before January 1, 2000, and every two (2) years thereafter, and shall report to the City Council and Public Utility Board the Manager's and Director's findings, conclusions, and recommendations as to the continued need for the Program, and any revisions thereto that should be considered by the Council and Board.

(Ord. 26301 § 1; passed Oct. 6, 1998)

1.90.105 Authority.

The City Manager and the Director of Utilities shall have authority to jointly adopt policies and regulations consistent with this chapter to implement the LEAP program.

(Ord. 26698 § 7; passed Sept. 12, 2000: Ord. 26301 § 1; passed Oct. 6, 1998)

1.90.110 Interpretation.

This Chapter shall not be interpreted or construed so as to conflict with any state or federal law, nor shall this Chapter be enforced such that enforcement results in the violation of any applicable judicial order.

(Ord. 26301 § 1; passed Oct. 6, 1998)



Dant A

City of Tacoma LEAP Office 747 Market Street, Room 900 Tacoma WA 98402 Telephone (253) 591-5826 Fax (253) 591-5232

PRIME CONTRACTOR LEAP UTILIZATION PLAN

Failure to submit this plan at the Pre-Construction Meeting may result in Progress Payments being withheld.

rana									
Contractor:						Date:			
Specification Number: Cont			Work Order Numb	er(s):	Contra	ct Dollar Amount:			
Project Description:					Notes:				
PART B PLA	NNED LEAP HOURS*								
Trade or Craft	City of Tacoma Resident	Econ	omic Distressed Area Resident	Tacoma Utilities Ser Apprentice	Public vice Area Resident	WA State Apprent *(Contracts outside TPU Service Area O	ice e of nly)		
	hr	s.	hrs.		hrs.		hrs.		
	hr	s.	hrs.		hrs.		hrs.		Date
	hr	s.	hrs.		hrs.		hrs.		
	hr	s.	hrs.		hrs.		hrs.		
	hr	s.	hrs.		hrs.		hrs.		
	hr	s.	hrs.		hrs.		hrs.	Rejected	
	hr	s.	hrs.		hrs.		hrs.		
	hr	s.	hrs.		hrs.		hrs.		Date
	hr	s.	hrs.		hrs.		hrs.		
Totals									
								TOTAL hrs.	

Part C

Provide a description of how the Contractor plans to ensure that the LEAP Utilization Goals on the project will be met. (Use additional sheets if necessary)

Part A

Contractor/Contract Information Section: The Prime Contractor is responsible for completing this section. Failure to submit this plan at the Pre-Construction Meeting may result in Progress Payments being withheld.

Part B

Planned LEAP Hours Section: This section should be completed by the Prime Contractor. The information required in Part B is described below.

Trade or Craft: Indicate the Trade or Craft being used.

LEAP Employee Categories: Indicate the number of hours that will be utilized by the Prime Contractor and all Sub Contractors for each craft and broken down by City of Tacoma Resident, Economically Distressed Area Resident, Tacoma Public Utilities Service Area Apprentice Resident, WA State Apprentice *(Contracts outside of TPU Service Area Only).

Totals: Total the number of hours in each of the five (5) columns.

Part C

Description of how the Contractor plans to ensure fulfillment of the LEAP Utilization Goal: This section is to be completed by the Prime Contractor. Please describe how you plan to satisfy the LEAP Utilization Goal on this project. Provide a summary of your outreach and recruitment procedures to hire LEAP Qualified Employees to work on this project.



City of Tacoma LEAP Office 747 Market Street, Room 808 Tacoma, WA 98402 (253) 591-5826 fax (253) 591-5232 www.cityoftacoma.org/leap

LEAP APPRENTICE VERIFICATION FORM

Contractor/Sub:	_ Specification Number:
Project Description:	
Employee Name:	_ Craft:
Ethnic Group (optional):	Black D Hispanic D Native American D White D Other
Gender (<i>optional</i>):	E
Complete Physical Address (No PO Boxes):	
City: State: Zip:	Telephone: Date of Hire:
Apprenticeship County: Apprent	tice Registration I.D. (if applicable):
Age: Copy of DD-214:	
*******Please fill out entire form for tracking Ll	EAP performance******
LEAP qualified Apprentice categories: (check all that	apply and provide evidence for each check)
a. WA State Approved Apprentice living in Taco	oma Public Utilities Service Area
b. WA State Approved Apprentice *(Only valid County)	for contracts where 100% of work is performed outside of Pierce
Signature of Employee:	Date:
Contractor Representative:	Date:

LEAP APPRENTICE VERIFICATION FORM

To be Completed by Contractor or Subcontractor

Please attach a <u>legible</u> copy of the following document(s) showing the address of residence as proof of local (Tacoma) and/or Pierce County residency and apprentice status, youth status, or veteran status.
For Youth - Copy of Birth Certificate or WA State ID or WA Driver's License (projects advertised after 05-20-13)
For Veterans – Copy of DD-214(Projects advertised after 05-20-13)
Driver's License with current address
Utility Bill/Phone Bill/Cell Bill/Cable Bill with current address
Copy of current tax form W-4
Rental Agreement/Lease (residential)
Computer Printout From Other Government Agencies
Property Tax Records
Apprentice Registration I.D.
Food Stamp Award Letter
Housing Authority Verification
Insurance Policy (Residence/Auto)

*Any of the above must have a complete physical address verified by the www.govme.org website. No PO Boxes

Contractor Representative:	resentative:
----------------------------	--------------

Date:_____

Title:_____

No Work Performed (NWP) Report

Prime/Sub Contractor:	
Specification Number:	
Project Description:	
Payroll Week Ending Date:	Payroll Number:

NO WORK PERFORMED

I, the undersigned, do hereby certify under penalty of perjury, that the information contained herein is true and correct.

Signature of Responsible Officer

Title

Date

Appendix C: Economically Distressed ZIP Codes Map



Zip Code	200% Pov	Unemployed	25+ College	Area
98002		Y	Y	Auburn
98030	Y	Y		Kent
98032	Y	Y		Kent
98198	Y	Y		Seattle
98304	Y	Y	Y	Ashford
98323		Y	Y	Carbonado
98330	Y		Y	Elbe
98336	Y		Y	Glenoma
98355	Y	Y	Y	Mineral
98356	Y	Y	Y	Morton
98377		Y	Y	Randle
98385		Y	Y	South Prairie
98424	Y	Y		Fife
98433		Y	Y	JBLM
98439	Y	Y		Lakewood
98444	Y	Y	Y	Parkland
98467	Y	Y		University Place
98499	Y	Y		Lakewood
98520	Y	Y		Aberdeen
98528	Y		Y	Belfair
98548	Y	Y	Y	Hoodsport
98564	Y		Y	Mosssyrock
98575		Y	Y	Quinault
98580		Y	Y	Roy
98584	Y	Y		Shelton
98597	Y	Y		Yelm
98925	Y	Y	Y	Easton

Economically Distressed ZIP Codes

"200% Pov" = People at or below 200% of the federal poverty line. (69th percentile) "Unemployed" = Unemployment rate (45th percentile)

"25+ College" = People at or above 25 years old without a college degree. (75th percentile)

Tacoma Public Utility Service Area

98001	Auburn
98002	Auburn
98003	Federal Way
98010	Black Diamond
98022	Enumclaw
98023	Federal Way
98030	Kent
98032	Kent
98038	Maple Valley
98042	Kent
98045	North Bend
98051	Ravensdale
98070	Vashon
98092	Auburn
98198	Seattle
98304	Ashford
98321	Buckley
98323	Carbonado
98327	DuPont
98328	Eatonville
98329	Gig Harbor
98330	Elbe
98332	Gig Harbor
98333	Fox Island
98335	Gig Harbor
98336	Glenoma
98338	Graham
98349	Lakebay
98354	Milton
98355	Mineral

98356	Morton
98360	Orting
98371	Puyallup
98372	Puyallup
98373	Puyallup
98374	Puyallup
98375	Puyallup
98377	Randle
98385	South
50505	Prairie
98387	Spanaway
98388	Spanaway
98390	Sumner
98391	Bonney
98402	Tacoma
98403	Tacoma
98404	Tacoma
98405	Tacoma
98406	Tacoma
98407	Tacoma
98408	Tacoma
98409	Tacoma
98416	UPS
98418	Tacoma
98421	Tacoma
98422	Tacoma
98424	Tacoma
98/130	Camp
50450	Murray
98433	Tacoma
98438	McChord
98439	Lakewood

98443	Tacoma
98444	Tacoma
98445	Tacoma
98446	Tacoma
98447	PLU
98465	Tacoma
98466	Tacoma
98467	University Place
98498	Lakewood
98499	Lakewood
98520	Aberdeen
98524	Allyn
98528	Belfair
98533	Cinebar
98546	Grapeview
98548	Hoodsport
98555	Lilliwaup
98563	Montesano
98564	Mossyrock
98575	Quinault
98580	Roy
98582	Salkum
98584	Shelton
98585	Silver Creek
98591	Toledo
98592	Union
98597	Yelm
98925	Easton

Apprentices may come from **any** of the ZIP codes listed under this page. If an apprentice lives in a Economically Distressed ZIP code, they may count towards those labor hours as well. Journeyman must be from the Economically Distressed ZIP codes.

GENERAL CONDITIONS AND OTHER CONTRACT TERMS & CONDITIONS

- 1. GENERAL PROVISIONS
- 2. MODIFICATIONS TO THE GENERAL CONDITIONS, AS MODIFIED BY THE CITY OF TACOMA
- 3. GENERAL CONDITIONS FOR WASHINGTON STATE FACILITY CONSTRUCTION

GENERAL PROVISIONS

(Revised December 15, 2020)

SECTION I - BIDDING REQUIREMENTS

SECTION I REQUIREMENTS ARE BINDING ON ALL RESPONDENTS.

1.01 USE AND COMPLETION OF CITY PROPOSAL SHEETS

A. Respondent's Proposal

Each Respondent must bid exactly as specified on the Proposal sheets. All proposals must remain open for acceptance by the City for a period of at least 60 calendar days from the date of opening of the bids.

B. Alterations of Proposals Not Allowed

Proposals that are incomplete or conditioned in any way contain alternatives or items not called for in the General Provisions and Specifications, or not in conformity with law may be rejected as being nonresponsive. The City cannot legally accept any proposal containing a substantial deviation from these Specifications.

C. Filling Out City Proposal Sheets

All proposals must be completed using the proposal sheets and forms included with this specification, and the prices must be stated in figures either written in ink or typewritten. No proposal having erasures or interlineations will be accepted unless initialed by the Respondent in ink.

1.02 CLARIFICATION OF PROPOSAL FOR RESPONDENT

If a prospective Respondent has any questions concerning any part of the Proposal, he/she may submit a written request for answer of his/her questions. Any interpretation of the Proposal will be made by an Addendum duly issued and mailed or delivered to each prospective Respondent. Such addendum must be acknowledged in the proposal. The City of Tacoma will not be responsible for any other explanation or interpretation of the bid documents.

1.03 RESPONDENT'S BOND OR CERTIFIED CHECK

Each bid for construction must be accompanied either by a certified or cashier's check for 5 percent of the total amount bid, including tax, payable to the City Treasurer, or an approved bid bond, by a surety company authorized to do business in the State of Washington, for 5 percent of the total amount bid. The person legally authorized to sign the bid must sign all bid bonds. The approved bid bond form attached to these Specifications should be used: no substantial variations from the language thereof will be accepted.

If a bid bond is used, the 5 percent may be shown either in dollars and cents, or the bid bond may be filled in as follows, "5 percent of the total amount of the accompanying proposal."

The check of the successful Respondent will be returned after award of the Contract, acceptance of the Payment and Performance Bond and City's receipt of the signed Contract. The checks of all other Respondents will be returned immediately upon the award of the Contract. Bid bonds will not be returned.

1.04 DELIVERY OF PROPOSALS TO THE CITY'S PURCHASING OFFICE

- A. Proposal packages must be received by the City's Procurement and Payables Division in SAP Ariba (unless another form of delivery is stated), prior to the scheduled time and date stated in the Solicitation.
- **B.** Supplier is solely responsible for timely delivery of its Submittal.
- **C.** Submittals received after the time stated in the solicitation will not be accepted.
- **D.** For purposes of determining whether a Submittal has been timely received in SAP Ariba, the City's Procurement and Payables Division will rely on the submittal clock in SAP Ariba.

1.05 LICENSES/PERMITS

- A. Suppliers, if applicable, must have a Washington state business license at the time of Submittal and throughout the term of the Contract. Failure to include a Washington state business license may be grounds for rejection of the Submittal or cancellation of contract award. Information regarding Washington state business licenses may be obtained at http://bls.dor.wa.gov.
- B. Upon award, it is the responsibility of the Supplier to register with the City of Tacoma's Tax and License Division, 733 South Market Street, Room 21, Tacoma, WA 98402-3768, 253-591-5252, <u>https://www.cityoftacoma.org/government/city_departments/finance/tax_and_license/</u>. Supplier shall obtain a business license as is required by Tacoma Municipal Code Subtitle 6C.20.
- **C.** During the term of the Contract, Supplier, at its expense, shall obtain and keep in force any and all necessary licenses and permits.

1.06 CONTRACTOR'S STATE REGISTRATION NUMBER

Contractors for construction or public works construction are required to be licensed by the state. If the provisions of Chapter 18.27 of the Revised Code of Washington apply to the Respondent, then the Respondent's Washington State Contractor's Registration No. must accompany the bid.

1.07 BID IS NONCOLLUSIVE

The Respondent represents by the submission of the Proposal that the prices in this Bid are neither directly nor indirectly the result of any formal or informal agreement with another Respondent.

1.08 EVALUATION OF BID

A. Price, Experience, Delivery Time and Responsibility

In the evaluation of bids, the Respondent's experience, delivery time, quality of performance or product, conformance to the specifications and responsibility in performing other contracts (including satisfying all safety requirements) may be considered in addition to price. In addition, the bid evaluation factors set forth in City Code Section 1.06.262 may be considered by the City. Respondents who are inexperienced or who fail to properly perform other contracts may have their bids rejected for such cause.

B. Prequalified Electrical Contractor

Certain types of electrical construction require special expertise, experience, and prequalification of the Contractor (or subcontractor) by the City. In such cases, the Respondent must be prequalified or the Respondent must subcontract with a City prequalified electrical contractor for the specialty work.

C. Insertions of Material Conflicting with Specifications

Only material inserted by the Respondent to meet requirements of the Specifications will be considered. Any other material inserted by the Respondent will be disregarded as being nonresponsive and may be grounds for rejection of the Respondent's Proposal.

D. Correction of Ambiguities and Obvious Errors

The City reserves the right to correct obvious errors in the Respondent's proposal. In this regard, if the unit price does not compute to the extended total price, the unit price shall govern.

1.09 WITHDRAWAL OF BID

A. Prior to Bid Opening

Any Respondent may withdraw his/her Proposal prior to the scheduled bid opening time by delivering a written notice to the City's Procurement and Payables Office. The notice may be submitted in person or by mail; however, it must be received by the City's Procurement and Payables Office prior to the time of bid opening.

B. After Bid Opening

No Respondent will be permitted to withdraw his/her Proposal after the time of bid opening, as set forth in the Call for Bids, and before the actual award of the Contract, unless the award of Contract is delayed more than sixty (60) calendar days after the date set for bid opening. If a delay of more than 60 calendar days does occur, then the Respondent must submit written notice withdrawing his/her Proposal to the Purchasing Manager.

1.10 OPENING OF BIDS

At the time and place set for the opening of bids, all Proposals, unless previously withdrawn, will be publicly opened and read aloud, irrespective of any irregularities or informalities in such Proposal.

1.11 CITY COUNCIL/PUBLIC UTILITY BOARD FINAL DETERMINATION

The City Council or Public Utility Board of the City of Tacoma shall be the final judge as to which is the lowest and best bid in the interest of the City of Tacoma. The City reserves the right to reject any and all bids, waive minor deviations or informalities, and if necessary, call for new bids.

1.12 RESPONDENT'S REFUSAL TO ENTER INTO CONTRACT

Any Respondent who refuses to enter into a Contract after it has been awarded to the Respondent will be in breach of the agreement to enter the Contract and the Respondent's certified or cashier's check or bid bond shall be forfeited.

1.13 TAXES

A. Include In Proposal All Taxes

Respondent shall include in his/her Proposal all applicable local, city, state, and federal taxes. It is the Respondent's obligation to state on his/her Proposal sheet the correct percentage and total applicable Washington State and local sales tax. The total cost to the City including all applicable taxes may be the basis for determining the low Respondent.

B. Federal Excise Tax

The City of Tacoma is exempt from federal excise tax. Where applicable, the City shall furnish a Federal Excise Tax Exemption certificate.

C. City of Tacoma Business and Occupation Tax

Sub-Title 6A of the City of Tacoma Municipal Code (TMC) provides that transactions with the City of Tacoma, may be subject to the City of Tacoma's Business and Occupation Tax. It is the responsibility of the Respondent awarded the Contract to register with the City of Tacoma's Department of Tax and License, 733 South Market Street, Room 21, Tacoma, WA 98402-3768, telephone 253-591-5252. The City's Business and Occupation Tax amount shall not be shown separately but shall be included in the unit and/or lump sum prices bid.

1.14 FIRM PRICES/ESCALATION

Except as specifically allowed by the Special Provisions, only firm prices will be accepted.

1.15 AWARD

A. Construction and/or Labor Contracts

Unless specifically noted in the Special Provisions or Proposal sheets, all construction and/or labor contracts will be awarded to only one Respondent.

B. Supply/Equipment Contracts

The City reserves the right to award an equipment or supply contract for any or all items to one or more Respondents as the interests of the City will be best satisfied.

1.16 INCREASE OR DECREASE IN QUANTITIES

The City of Tacoma reserves the right to increase or decrease the quantities of any items under this Contract and pay according to the unit prices quoted in the Proposal (with no adjustments for anticipated profit).

1.17 EXTENSION OF CONTRACT

Contracts resulting from this specification shall be subject to extension by mutual agreement per the same prices, terms and conditions.

1.18 PAYMENT TERMS

- A. Prices will be considered as net 30 calendar days if no cash discount is shown. Payment discount periods of twenty (20) calendar days or more if offered in the submittal, will be considered in determining the apparent lowest responsible submittal. Discounts will be analyzed in context of their overall cumulative effect. Invoices will not be processed for payment nor will the period of cash discount commence until receipt of a properly completed invoice and until all invoiced items are received and satisfactory performance of the Contractor has been attained. If an adjustment in payment is necessary due to damage or dispute, the cash discount period shall commence on the date final approval for payment is authorized.
- **B.** ePayable/Credit Card Acceptance. Submittals offering ePayable/Credit card acceptance may be compared against submittals offering a prompt payment discount to evaluate the overall cumulative effect of the discount against the advantage to the City of the ePayable/Credit card acceptance, and may be considered in determining the apparent lowest responsible submittal.

1.19 PAYMENT METHOD - EPAYABLES - CREDIT CARD ACCEPTANCE - EFT/ACH ACCEPTANCE

- A. Payment methods include:
 - EPayables (Payment Plus). This is payment made via a virtual, single use VISA card number provided by the City's commercial card provider. Suppliers accepting this option will receive "due immediately" payment terms. Two options for acceptance are available to suppliers. Both are accompanied by an emailed advice containing complete payment details:
 - Straight-through processing (buyer initiated). Immediate, exact payments directly deposited to supplier accounts by the City's provider bank; the supplier does not need to know card account details.
 - Supplier retrieves card account through the secure, on-line portal provided via email notifications sent by the City's commercial card provider.
 - Credit card. Tacoma's VISA procurement card program is supported by standard bank credit suppliers and requires that merchants abide by the VISA merchant operating rules. It provides "due immediately" payment terms.
 - Suppliers must be PCI-DSS compliant (secure credit card data management) and federal FACTA (sensitive card data display) compliant.
 - Suppliers must be set up by their card processing equipment provider (merchant acquirer) as a minimum of a Level II merchant with the ability to pass along tax, shipping and merchant references information.
 - Electronic Funds Transfer (EFT) by Automated Clearing House (ACH). Standard terms are net 30 for this payment method.
 - Check or other cash equivalent. Standard terms are net 30 for this payment method.
- **B.** The City's preferred method of payment is by ePayables (Payment Plus) followed by credit card (aka procurement card). Suppliers may be required to have the capability of accepting the City's ePayables or credit card methods of payment. The City of Tacoma will not accept price changes or pay additional fees when ePayables (Payment Plus) or credit card is used.
- **C.** The City, in its sole discretion, will determine the method of payment for goods and/orservices as part of the Contract.

1.20 COOPERATIVE PURCHASING

The Washington State Interlocal Cooperative Act RCW 39.34 provides that other governmental agencies may purchase goods and services on this solicitation or contract in accordance with the terms and prices indicated therein if all parties are agreeable.

1.21 PUBLIC DISCLOSURE: PROPRIETARY OR CONFIDENTIAL INFORMATION

A. Respondent's Submittals, all documents and records comprising any Contract awarded to Respondent, and all other documents and records provided to the City by Respondent are deemed public records subject to disclosure under the Washington State Public Records Act, Chapter 42.56 RCW (Public Records Act). Thus, City may be required, upon request, to disclose the Contract and documents or records related to it unless an exemption under the Public Records Act or other laws applies. In the event CITY receives a request for such disclosure, determines in its legal judgment that no applicable exemption to disclosure applies; and Respondent has complied with the requirements to Respondent has complied with the requirements to mark records considered confidential or proprietary

as such requirements are stated below, City agrees to provide Respondent 10 days written notice of impending release. Should legal action thereafter be initiated by Respondent to enjoin or otherwise prevent such release, all expense of any such litigation shall be borne by Respondent, including any damages, attorneys' fees or costs awarded by reason of having opposed disclosure. City shall not be liable for any release where notice was provided and Respondent took no action to oppose the release of information.

B. If Respondent provides City with records or information that Respondent considers confidential or proprietary, Respondent must mark all applicable pages or sections of said record(s) as "Confidential" or "Proprietary." Further, in the case of records or information submitted in response to a Request for Proposals, an index must be provided indicating the affected pages or sections and locations of all such material identified Confidential or Proprietary. Information not included in the required index will not be reviewed for confidentiality or as proprietary before release. If Supplier fails to so mark or index Submittals and related records, then the City, upon request, may release said record(s) without the need to satisfy the requirements of subsection A above; and Respondent expressly waives its right to allege any kind of civil action or claim against the City pertaining to the release of said record(s). Submission of materials in response to City's Solicitation shall constitute assent by Respondent to the foregoing procedure and Respondent shall have no claim against the City on account of actions taken pursuant to such procedure.

1.22 FEDERAL AID PROJECTS

The City of Tacoma in accordance with Title VI of the Civil Rights Act of 1964, 78 Stat. 252, 42 U.S.C. 2000d to 2000d-4 and Title 49, Code of Federal Regulations, Department of Transportation, subtitle A, Office of the Secretary, part 21, nondiscrimination in federally assisted programs of the Department of Transportation issued pursuant to such Act, hereby notifies all bidders that it will affirmatively insure that in any contract entered into pursuant to this advertisement, disadvantaged business enterprises as defined at 49 CFR, part 26, will be afforded full opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, national origin, or sex in consideration for an award.

SECTION II - CONTRACT REQUIREMENTS

2.01 CONTRACTOR'S RESPONSIBILITY

A. Contract Documents

The Respondent to whom the Contract is awarded, hereinafter called the Contractor, shall enter into a Contract with the City of Tacoma, , within 10 days after receipt from the City of Tacoma of a properly prepared Contract. In addition, the Contractor will do all things required to promptly perform this Contract pursuant to the terms of this Contract. Certain contracts for supplies, goods or equipment may use the City Purchase Order in place of a formal contract document.

B. Surety Bonds

Except as modified by the Special Provisions, the Respondent to whom the Contract is awarded shall provide a payment and performance bond, including power of attorney, for 100 percent of the amount of his/her bid (including sales taxes), to insure complete performance of the Contract including the guarantee. The bonds must be executed by a surety company licensed to do business in the State of Washington. For a supply-type contract, a cashier's check or cash may be substituted for the bonds; however, this cash or cashier's check must remain with the City through the guarantee period and any interest on said amount shall accrue to the City.

C. Independent Contractor

Contractor is an independent contractor; no personnel furnished by the Contractor shall be deemed under any circumstances to be the agent or servant of the City. Contractor shall be fully responsible for all acts or omissions of Subcontractors and its and their suppliers and of persons employed by them, and shall be specifically responsible for sufficient and competent supervision and inspection to assure compliance in every respect with the Contract. There shall be no contractual relationship between any Subcontractors or supplier and the City arising out of or by virtue of this agreement. No provision of the Contract is intended or is to be construed to be for the benefit of any third party.

2.02 CONFLICTS IN SPECIFICATIONS

Anything mentioned in the Specifications and not shown on the Drawings and anything on the Drawings and not mentioned in the Specifications shall be of like effect and shall be understood to be shown and/or mentioned in both. In case of differences between Drawings and Specifications, the Specifications shall govern. In addition, in the event of any conflict between these General Provisions, the Special Provisions, the Technical Provisions and/or the Proposal pages, the following order of precedence shall control:

- 1. Proposal pages prevail if they conflict with the General, Special or Technical Provisions.
- 2. Special Provisions prevail if they conflict with the General Provisions and/or Technical Provisions.
- 3. Technical Provisions prevail if they are in conflict with the General Provisions.

In case of discrepancy of figures between Drawings, Specifications or both, the matter shall immediately be submitted to the Engineer for determination. Failure to submit the discrepancy issue to the Engineer shall result in the Contractor's actions being at his/her own risk and expense. The Engineer shall furnish from time to time such detailed drawings and other information as he/she may consider necessary.

2.03 INSPECTION

A. Of the Work

All materials furnished and work done shall be subject to inspection.

The Inspector administering the Contract shall at all times have access to the work wherever it is in progress or being performed, and the Contractor shall provide proper facilities for such access and inspection. Such inspection shall not relieve the Contractor of the responsibility of performing the work correctly, utilizing the best labor and materials in strict accordance with the Specifications of this Contract. All material or work approved and later found to be defective shall be replaced without cost to the City of Tacoma.

B. Inspector's Authority

The inspector shall have power to reject materials or workmanship which do not fulfill the requirements of these Specifications, but in case of dispute the Contractor may appeal to the Director or Superintendent, whose decision shall be final. The word "Director" means the Director of the City of Tacoma General Government department that is administering the contract. The word "Superintendent" means the Superintendent of the City of Tacoma, Department of Public Utilities Division that is administering the contract.

The Contract shall be carried out under the general control of the representative of the particular City Department or Division administering the Contract, who may exercise such control over the conduct of the work as may be necessary, in his or her opinion, to safeguard the interest of the City of Tacoma. The Contractor shall comply with all orders and instructions given by the representative of the particular Department or Division administering the Contract in accordance with the terms of the Contract.

Provided, that for the purposes of construction contracts, such control shall only apply (a) to the extent necessary to ensure compliance with the provisions of this contract, and (b) to the extent necessary to fulfill any nondelegable duty of the City for the benefit of third parties not engaged in promoting the activity of this contract.

Nothing herein contained, however, shall be taken to relieve the Contractor of his/her obligations or responsibilities under the Contract.

2.04 FEDERAL, STATE AND MUNICIPAL REGULATIONS

All federal, state, municipal and/or local regulations shall be satisfied in the performance of all portions of this Contract. The Contractor shall be solely responsible for all violations of the law from any cause in connection with work performed under this Contract.

2.05 INDEMNIFICATION

A. Indemnification

Contractor acknowledges that pursuant to the terms of this agreement, Contractor is solely and totally responsible for the safety of all persons and property in the performance of this Contract. To the greatest extent allowed by law, Contractor assumes the risk of all damages, loss, cost, penalties and expense and agrees to indemnity, defend and hold harmless the City of Tacoma, from and against any and all liability which may accrue to or be sustained by the City of Tacoma on account of any claim, suit or legal action made or brought against the City of Tacoma for the death of or injury to persons (including Contractor's or subcontractor's employees) or damage to property involving Contractor, or subcontractor(s) and their employees or agents, arising out of and in connection with or incident to the performance of the Contract including if the City is found to have a nondelegable duty to see that work is performed with requisite care, except for injuries or damages caused by the sole negligence of the City. In this regard, Contractor recognizes that Contractor is waiving immunity under industrial Insurance Law, Title 51 RCW. This indemnification extends to the officials, officers and employees of the City and also includes attorney's fees and the cost of establishing the right to indemnification hereunder in favor of the City of Tacoma. In addition, within the context of competitive bidding laws, it is agreed that this indemnification has been mutually negotiated. Provided however, this provision is intended to be applicable to the parties to this agreement and it shall not be interpreted to allow a Contractor's employee to have a claim or cause of action against Contractor.

B. Limitation of Liability for Primarily Supply-Type Contracts

In all contracts where the total cost of the supply of materials and/or equipment constitute at least 70 percent of the total contract price (as determined by the City), the City agrees that it will not hold the contractor, supplier or manufacturer liable for consequential damages for that part of the contract related to the manufacture and/or design of the equipment, materials or supplies.

2.06 CONTRACTOR'S INSURANCE

A. During the course and performance of a Contract, Contractor will provide proof and maintain the insurance coverage in the amounts and in the manner specified in the City of Tacoma Insurance Requirements as is applicable to the services, products, and deliverables provided under the Contract. The City of Tacoma Insurance Requirements document, if issued, is fully incorporated into the Contract by reference.

B. Failure by City to identify a deficiency in the insurance documentation provided by Contractor or failure of City to demand verification of coverage or compliance by Contractor with these insurance requirements shall not be construed as a waiver of Contractor's obligation to maintain such insurance.

2.07 ASSIGNMENT AND SUBLETTING OF CONTRACT

C. Assignment

The Contract shall not be assigned except with the consent of the Superintendent or his/her designee.

Requests for assignment of this contract must be in writing with the written consent of the surety, and the request must show the proposed person or organization to which the contract is assigned is capable, experienced and equipped to perform such work. The proposed substitute person or organization may be required to submit to the City information as to his/her experience, financial ability and give statements covering tools, equipment, organization, plans and methods to fulfill any portion of the Contract prior to approval of assignment.

D. Subletting

The Contract shall not be sublet except with the written consent of the Superintendent or his/her designee. In the event that a prequalified electrical contractor is necessary to perform certain portions of the work, such work may be subcontracted with a City prequalified electrical contractor for the type of work involved.

Requests for subletting of this Contract must be in writing with the written consent of the Surety, and the request must show the proposed person or organization to which the Contract is sublet is capable, experienced and equipped to perform such work. The proposed substitute person or organization may be required to submit to the City information as to his experience, financial ability and give statements covering tools, equipment, organization, plans and methods to fulfill any portion of the Contract prior to approval of subletting.

The written consent approving the subletting of the Contract shall not be construed to relieve the Contractor of his/her responsibility for the fulfillment of the Contract. The Subcontractor shall be considered to be the agent of the Contractor and the Contractor agrees to be responsible for all the materials, work and indebtedness incurred by the agent.

A subcontractor shall not sublet any portion of a subcontract for work with the City without the written consent of the City.

2.08 DELAY

E. Extension of Time

With the written approval of the Superintendent or his/her designee, the Contractor may be granted additional time for completion of the work required under this Contract, if, in the Superintendent's opinion the additional time requested arises from unavoidable delay.

F. Unavoidable Delay

Unavoidable delays in the prosecution of the work shall include only delays from causes beyond the control of the Contractor and which he/she could not have avoided by the exercise of due care, prudence, foresight and diligence. Delay caused by persons other than the Contractor, Subcontractors or their employees will be considered unavoidable delays insofar as they necessarily interfere with the Contractor's completion of the work, and such delays are not part of this Contract.

Unavoidable delay will not include delays caused by weather conditions, surveys, measurements, inspections and submitting plans to the Engineer of the particular Division involved in administering this Contract.

2.09 GUARANTEE

A. Guarantee for Construction, Labor or Services Contract

Neither the final certificate of payment or any provision in the Contract Documents, nor partial or entire occupancy of the premises by the City, shall constitute an acceptance of work not done in accordance with the Contract Documents or relieve the Contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship. The Contractor shall remedy any defects in the work and pay for any damage to other work resulting therefrom, which shall appear within a period of one year from the date of final acceptance of the work unless a longer period is specified. The City will give notice of observed defects with reasonable promptness.

If it has been discovered, before payment is required under the terms of the Contract, that there is a failure to comply with any of the terms and provisions of this Contract, the City has the right and may withhold payment.

In case of a failure of any part of the work, materials, labor and equipment furnished by the Contract or to fully meet all of the requirements of the Contract, the Contractor shall make such changes as may be necessary to fully meet all of the specifications and requirements of this Contract. Such changes shall be made at the Contractor's sole cost and expense without delay and with the least practicable inconvenience to the City of Tacoma. Rejected material and equipment shall be removed from the City's property by and at the expense of the Contractor.

B. Guarantee for Supply Contracts

Unless a longer period is specified, the supplier and/or manufacturer of the supplies, materials and/or equipment furnished pursuant to this Contract agrees to correct any defect or failure of the supplies, materials and/or equipment which occurs within one year from the date of: (1) test energization if electrical or mechanical equipment; (2) commencement of use if supplies or materials, provided, however, said guarantee period shall not extend beyond eighteen months after date of receipt by the City. All of the costs (including shipping, dismantling and reinstallation) of repairs and/or corrections of defective or failed equipment, supplies and/or material is the responsibility of the supplier and/or manufacturer.

When the supplier is not the manufacturer of the item of equipment, supplier agrees to be responsible for this guarantee and supplier is not relieved by a manufacturer's guarantee.

C. Guarantee Period Extension

The Contract guarantee period shall be suspended from the time a significant defect is first documented by the City until the work or equipment is repaired or replaced by Contractor and accepted by the City. In addition, in the event less than ninety (90) days remain on the guarantee period (after recalculating), the guarantee period shall be extended to allow for at least ninety (90) days from the date the work or equipment is repaired or replaced by the City.

2.10 DEDUCTIONS FOR UNCORRECTED WORK

If the City of Tacoma deems it expedient to correct work not done in accordance with the terms of this Contract, an equitable deduction from the Contract price shall be made.

2.11 CITY OF TACOMA'S RIGHT TO TERMINATE CONTRACT

A. Termination for Convenience

1. Supplies. The City may terminate a Contract for supplies at any time upon prior written notice to Contractor. Upon the effective date of termination specified in such notice, and payment by the City, all conforming supplies, materials, or equipment previously furnished hereunder shall become its property.

2. Services. The City may terminate a Contract for services at any time, with or without cause, by giving 10-business day's written notice to Supplier. In the event of termination, all finished and unfinished work prepared by Supplier pursuant to the Contract shall be provided to the City. In the event City terminates the Contract due to the City's own reasons and without cause due to Supplier's actions or omissions, the City shall pay Supplier the amount due for actual work and services necessarily performed under the Contract up to the effective date of termination, not to exceed the total compensation set forth in the Contract.

B. Termination for Cause

1. The City may terminate a Contract for either services or supplies in the event of any material breach of any of the terms and conditions of the Contract if the Contractor's breach continues in effect after written notice of breach and 30 days to cure such breach and fails to cure such breach

2. Bankruptcy. If the Contractor should be adjudged as bankrupt, or makes a general assignment for the benefit of creditors, or a receiver should be appointed on account of his/her insolvency, or if he/she or any of his/her subcontractors should violate any of the provisions of the Contract, or if the work is not being properly and diligently performed, the City of Tacoma may serve written notice upon the Contractor and Surety, executing the Payment and Performance Bond, of its intention to terminate the Contract; such notice will contain the reasons for termination of the Contract, and unless within 10 days after the serving of such notice, such violation shall cease and an arrangement satisfactory to the City of Tacoma for correction thereof shall be made, the Contract shall, upon the expiration of said I 0 days, cease and terminate and all rights of the Contractor hereunder shall be forfeited. In the event the Contract is terminated for cause, Contractor shall not be entitled to any lost profits resulting therefrom.

3. Notice. In the event of any such termination for cause, the City of Tacoma shall immediately send (by regular mail or other method) written notice thereof to the Surety and the Contractor. Upon such termination the Surety shall have the right to take over and perform the Contract, provided however, the Surety must provide written notice to the City of its intent to complete the work within 15 calendar days of its receipt of the original written notice (from the City) of the intent to terminate. Upon termination and if the Surety does not perform the work, the City of Tacoma may take over the work and prosecute the same to completion by any method it may deem advisable, for the account of and at the expense of the Contractor, and the Contractor and the Surety shall be liable to the City of Tacoma for all cost occasioned to the City of Tacoma thereby. The City of Tacoma may without liability for doing so, take possession of and utilize in completing the work, such materials, equipment, plant and other property belonging to the Contractor as may be on the site of the work and necessary therefore.

2.12 LIENS

In the event that there are any liens on file against the City of Tacoma, the City of Tacoma shall be entitled to withhold final or progress payments to the extent deemed necessary by the City of Tacoma to properly protect the outstanding lien claimants until proper releases have been filed with the City Clerk.

2.13 LEGAL DISPUTES

A. General

Washington law shall govern the interpretation of the Contract. The state or federal courts located in Pierce County Washington shall be the sole venue of any mediation, arbitration, or litigation arising out of the Contract.

Respondents providing submittals from outside the legal jurisdiction of the United States of America will be subject to Tacoma's City Attorney's Office (CAO) opinion as to the viability of possible litigation pursuant to a contract resulting from this Specification. If it is the opinion of the CAO that any possible litigation would be beyond reasonable cost and/or enforcement, the submittal may be excluded from evaluation.

B. Attorney Fees

For contracts up to \$250,000, which become the subject of litigation or arbitration, the substantially prevailing party may be entitled to reasonable attorney fees, as provided in RCW 39.04.240. Provided, however, the attorney fee hourly rate for the City of Tacoma's assistant city attorneys is agreed to be \$150 per hour or the same as the hourly rate for Contractor's legal counsel, whichever is greater.

2.14 DELIVERY

Prices must be quoted F.O.B. destination, freight prepaid and allowed with risk of loss during transit remaining with Contractor/Supplier (unless otherwise stated in these Specifications) to the designated address set forth in these Specifications.

Deliveries shall be between 9:00 a.m. and 3:30 p.m.; Monday through Friday only (except legal holidays of the City of Tacoma).

Legal holidays of the City of Tacoma are:

New Year's Day	January I
Martin Luther King's Birthday	3rd Monday in January
Washington's Birthday	3rd Monday in February
Memorial Day	Last Monday in May
Independence Day	July 4
Labor Day	1st Monday in September
Veteran's Day	November 11
Thanksgiving Day	4th Thursday of November
Day after Thanksgiving	4th Friday of November
Christmas Day	December 25

When any of these holidays occur on Saturday or Sunday, the preceding Friday or the following Monday, respectively, is a legal holiday for the City of Tacoma.

2.15 PACKING SLIPS AND INVOICES

A. Packing slips and shipping notices shall be sent to the specific City Division or Department receiving the item(s) at the address stated in City's Solicitation or as otherwise stated in the Contract and include complete description of items, contents of items if crated or cased, quantity, shipping point, carrier, bill of lading number and City of Tacoma purchase order.

B. Each invoice shall show City of Tacoma purchase order number, release number if applicable, quantity, unit of measure, item description, unit price and extended price for each line if applicable, services and deliverables provided if applicable. Line totals shall be summed to give a grand total to which sales tax shall be added, if applicable.

- 1. For transactions conducted in SAP Ariba, invoices shall be submitted through Ariba.
- For invoices paid by ACH or by check, unless stated otherwise, invoices shall be electronically submitted by email with corresponding PO number listed in the subject line to_ accountspayable@cityoftacoma.org.

3. For invoices paid by credit card, invoices shall also display the last name of the cardholder and last four digits (only) of the card number (e.g., Jones/6311). Unless stated otherwise, invoices shall be electronically submitted by email with corresponding PO number listed in the subject line to (do not combine different POs into one invoice or charge) to <u>pcardadmin@cityoftacoma.org</u>.

2.16 APPROVED EQUALS

A. Unless an item is indicated as "No substitute", special brands, when named, are intended to describe the standard of quality, performance or use desired. Equal items will be considered by the City, provided that the respondent specifies the brand and model, and provides all descriptive literature, independent test results, product samples, local servicing and parts availability to enable the City to evaluate the proposed "equal".

B. The decision of the City as to what items are equal shall be final and conclusive. If the City elects to purchase a brand represented by the respondent to be an "equal", the City's acceptance of the item is conditioned on the City's inspection and testing after receipt. If, in the sole judgment of the City, the item is determined not to be an equal, the item shall be returned at the respondent's expense.

C. When a brand name or level of quality is not stated by the respondent, it is understood the offer is exactly as specified. If more than one brand name is specified, respondents must clearly indicate the brand and model/part number being bid.

2.17 ENTIRE AGREEMENT

This written contract represents the entire Agreement between the parties and supersedes any prior oral statements, discussions or understandings between the parties.

2.18 CODE OF ETHICS

The City's Code of Ethics, Chapter 1.46, Tacoma Municipal Code, provides ethical standards for City personnel and prohibits certain unethical conduct by others including respondents and contractors. Violation of the City's Code of Ethics will be grounds for termination of this contract.

2.19 FEDERAL FINANCIAL ASSISTANCE

If federal funds, including FEMA financial assistance to the City of Tacoma, will be used to fund, pay or reimburse all or a portion of the Contract, Contractor will comply with all applicable Federal law, regulations, executive orders, FEMA policies, procedures, and directives and the following clauses will be incorporated into the Contract:

- A. EQUAL EMPLOYMENT OPPORTUNITY During the performance of this Contract, Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to the following:
 - 1. Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.
 - The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin.
 - 3. The contractor will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other

employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the contractor's legal duty to furnish information.

- 4. The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.
- 5. The contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.
- 6. The contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.
- 7. In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.
- 8. The contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (8) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance:

Provided, however, that in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency, the contractor may request the United States to enter into such litigation to protect the interests of the United States.

B. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

- Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.
- 2. Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (B)(1) of this section the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (B)(1) of this section, in the sum of \$27 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (b)(1) of this section.

- 3. Withholding for unpaid wages and liquidated damages. The City shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (B)(2) of this section.
- 4. Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (B)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (B)(1) through (4) of this section.

C. CLEAN AIR ACT

- 1. Contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act, as amended, 42 U.S.C. § 7401 et seq.
- 2. Contractor agrees to report each violation to the City and understands and agrees that the City will, in turn, report each violation as required to assure notification to the Federal Emergency Management Agency, and the appropriate Environmental Protection Agency Regional Office.
- 3. Contractor agrees to include these requirements in each subcontract exceeding \$150,000 financed in whole or in part with Federal assistance provided by FEMA.

D. FEDERAL WATER POLLUTION CONTROL ACT

- 1. Contractor agrees to comply with all applicable standards, orders, or regulations issued pursuant to the Federal Water Pollution Control Act, as amended, 33 U.S.C. 1251 et seq.
- 2. Contractor agrees to report each violation to the City, understands, and agrees that the City will, in turn, report each violation as required to assure notification to the Federal Emergency Management Agency, and the appropriate Environmental Protection Agency Regional Office.
- 3. Contractor agrees to include these requirements in each subcontract exceeding \$150,000 financed in whole or in part with Federal assistance provided by FEMA.

E. DEBARMENT AND SUSPENSION

- This contract is a covered transaction for purposes of 2 C.F.R. pt. 180 and 2 C.F.R. pt. 3000. As such, the contractor is required to verify that none of the contractor's principals (defined at 2 C.F.R. § 180.995) or its affiliates (defined at 2 C.F.R. § 180.905) are excluded (defined at 2 C.F.R. § 180.940) or disqualified (defined at 2 C.F.R. § 180.935).
- 2. Contractor must comply with 2 C.F.R. pt. 180, subpart C and 2 C.F.R. pt. 3000, subpart C, and must include a requirement to comply with these regulations in any lower tier covered transaction it enters into.
- 3. This certification is a material representation of fact relied upon by the City. If it is later determined that the contractor did not comply with 2 C.F.R. pt. 180, subpart C and 2 C.F.R. pt. 3000, subpart C, in addition to remedies available to (insert name of recipient/subrecipient/applicant), the Federal Government may pursue available remedies, including but not limited to suspension and/or debarment.
- 4. Contractor agrees to comply with the requirements of 2 C.F.R. pt. 180, subpart C and 2 C.F.R. pt. 3000, subpart C while this offer is valid and throughout the period of any contract that may arise from this offer. The bidder or proposer further agrees to include a provision requiring such compliance in its lower tier covered transactions.

F. BYRD ANTI-LOBBYING AMENDMENT

- 1. Contractors who apply or bid for an award of \$100,000 or more shall file the required certification with City. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, officer or employee of Congress, or an employee of a Member of Congress in connection with obtaining any Federal contract, grant, or any other award covered by 31 U.S.C. § 1352. Each tier shall also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the recipient who in turn will forward the certification(s) to the City.
- 2. If applicable, Contractor must sign and submit to the City the following certification:

APPENDIX A, 44 C.F.R. PART 18 - CERTIFICATION REGARDING LOBBYING

Certification for Contracts, Grants, Loans, and Cooperative Agreements

The undersigned certifies, to the best of his or her knowledge and belief, that:

- 1. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
- 2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.
- 3. The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

The Contractor, ______, certifies or affirms the truthfulness and accuracy of each statement of its certification and disclosure, if any. In addition, the Contractor understands and agrees that the provisions of 31 U.S.C. Chap.38, Administrative Remedies for False Claims and Statements, apply to this certification and disclosure, if any.

Signature of Contractor's Authorized Official

Name and Title of Contractor's Authorized Official

____Date

G. PROCUREMENT OF RECOVERED MATERIALS

- 1. In the performance of this contract, the Contractor shall make maximum use of products containing recovered materials that are EPA-designated items unless the product cannot be acquired:
 - a. Competitively within a timeframe providing for compliance with the contract performance schedule;
 - b. Meeting contract performance requirements; or
 - c. At a reasonable price.
- 2. Information about this requirement, along with the list of EPA- designated items, is available at EPA's Comprehensive Procurement Guidelines web site, https://www.epa.gov/smm/comprehensive-procurement-guideline-cpg-program.
- Contractor also agrees to comply with all other applicable requirements of Section 6002 of the Solid Waste Disposal Act.

[Section III is for contracts that involve construction and/or labor, and are not applicable to contracts solely for material/supply purchases.]

GENERAL PROVISIONS

SECTION III - CONSTRUCTION AND/OR LABOR CONTRACTS

SECTION III REQUIREMENTS APPLY ONLY TO CONSTRUCTION AND/OR LABOR CONTRACTS AND ARE IN ADDITION TO APPLICABLE REQUIREMENTS CONTAINED IN SECTION II CONTRACT REQUIREMENTS.

3.01 RESPONDENT'S DUTY TO EXAMINE

The Respondent agrees to be responsible for examining the site(s) and to have compared them with the Specifications and Contract Drawings, and to be satisfied as to the facilities and difficulties attending the execution of the proposed Contract (such as uncertainty of weather, floods, nature and condition of materials to be handled and all other conditions, obstacles and contingencies) before the delivery of his/her Proposal. No allowance will be subsequently made by the City on behalf of the Respondent by reason of any error or neglect on Respondent's part, for such uncertainties as aforesaid.

3.02 PERMITS

Except when modified by the Special Provisions, the Contractor shall procure and pay for all permits and licenses necessary for the completion of this Contract including those permits required by the City of Tacoma. The City will obtain county or state road crossing permits if required. In the event a necessary permit is not obtained, the Contractor will not be permitted to work on items subject to said permit and any delays caused thereby will not be subject to extra compensation or extensions.

3.03 NOTIFICATION OF OTHER GOVERNMENTAL AGENCIES AND UTILITIES WHEN UNDERGROUND WORK IS INVOLVED

The Contractor shall notify all other affected governmental agencies and utilities whenever underground work is done under the terms of this Contract. The Contractor is required to obtain permission of the appropriate public and private utilities and governmental agencies before performing underground work pursuant to the terms of this Contract. The Contractor is required to call "one call" at 1-800-424-5555 for all work involving excavation or digging more than 12 inches beneath ground or road surface.

The City may have indicated on the plans and specifications the existence of certain underground facilities that are known to the City department responsible for this Contract. It is the Contractor's responsibility to fully comply with the Underground Utility Locate Law, Chapter 19.122 RCW. If the site conditions are "changed or differing" as defined by RCW 19.122.040(I), the Contractor may pursue the party responsible for not properly marking or identifying the underground facility. The Contractor agrees not to file any claim or legal action against the City (department responsible for this Contract) for said "changed or differing" conditions unless said City department is solely responsible for the delay or damages that the Contractor may have incurred.

3.04 TRENCH EXCAVATION BID ITEM

In the event that "trench excavation" in excess of four feet requires a safety system pursuant to Washington State law and safety shoring, sloping, sheeting, or bracing is used, a separate bid item should be set forth in the Proposal for this work. If a separate bid item is not set forth in the Proposal pages, said installed safety system shall be paid at \$3.00 per lineal foot of trench, which unit price includes both sides of the trench.

3.05 SAFETY

A. General

The Contractor shall, at all times, exercise adequate precautions for the safety of all persons, including its employees and the employees of a Subcontractor, in the performance of this Contract and shall comply with all applicable provisions of federal, state, county and municipal safety laws and regulations. It is the Contractor's responsibility to furnish safety equipment or to contractually require Subcontractors to furnish adequate safety equipment to their responsibilities.

The Contractor shall obtain the necessary line clearance from the inspector before performing any work in, above, below or across energized Light Division circuits.

The Inspector and/or Engineer may advise the Contractor and the Safety Officer of any safety violations. It is the Contractor's responsibility to make the necessary corrections. Failure to correct safety violations is a breach of this Contract and, as such, shall be grounds for an order from the Safety Officer, Inspector or Engineer to cease further work and remove from the job site until the condition is corrected. Time and wages lost due to such safety shutdowns shall not relieve the Contractor of any provisions of Section 3.14 of this Specification and shall be at the sole cost of the Contractor. The purpose of this authority to stop work is to enforce the contract and not to assume control except to the extent necessary to ensure compliance with the provisions of this contract.

Any of the above actions by employees of the City of Tacoma shall in no way relieve the Contractor of his/her responsibility to provide for the safety of all persons, including his/her employees.

B. Work Hazard Analysis Report

The Contractor will be required to complete a work hazard analysis report. This report shall outline how the Contractor proposes to satisfy all safety laws and regulations involved in performing the work. This report shall be completed and submitted to the City Safety Officer before the pre-construction conference. A copy of the report shall be maintained at the work site (accessible to the supervisor).

3.06 PROTECTION OF WORKERS AND PROPERTY

The Contractor shall erect and maintain good and sufficient guards, barricades and signals at all unsafe places at or near the work and shall, in all cases, maintain safe passageways at all road crossings, and crosswalks, and shall do all other things necessary to prevent accident or loss of any kind.

The Contractor shall protect from damage all utilities, improvements, and all other property that is likely to become displaced or damaged by the execution of the work under this Contract.

The Contractor is responsible for all roads and property damaged by his/her operations as shall be determined by the Engineer administering this Contract. The Contractor shall be responsible for repairing all damage to roads caused by his/her operations to the satisfaction of the particular governmental body having jurisdiction over the road.

3.07 CONTRACTOR - SUPERVISION AND CHARACTER OF EMPLOYEES

A. Superintendent to Supervise Contractor's Employees

The Contractor shall keep on his/her work, during its progress, a competent superintendent and any necessary assistants, all of whom must be satisfactory to the City of Tacoma. The Contractor's superintendent shall not be changed except with the consent of the City of Tacoma, unless the Contractor's superintendent proves to be unsatisfactory to the Contractor and ceases to be in his/her employ. The Contractor's superintendent shall represent the Contractor in his/her absence and all directions given to him/her shall be binding as if given to the Contractor directly. The Contractor shall give efficient supervision to the work, using his/her best skill and attention.

B. Character of Contractor's Employees

The Contractor shall employ only competent, skillful, faithful and orderly persons to do the work, and whenever the Engineer administering the Contract shall notify the Contractor in writing that any person on the work is, in his or her opinion, incompetent, unfaithful, disorderly or otherwise unsatisfactory, the Contractor shall forthwith discharge such persons from the work and shall not again employ him or her on this Contract.

3.08 CONTRACTOR'S COMPLIANCE WITH THE LAW

A. Hours of Labor

The Contractor and Subcontractors shall be bound by the provisions of RCW Chapter 49.28 (as amended) relating to hours of labor. Except as set forth in the Special Provisions, eight (8) hours in any calendar day shall constitute a day's work on a job performed under this Contract.

In the event that the work is not performed in accordance with this provision and in accordance with the laws of the State of Washington, then this Contract may be terminated by the City of Tacoma for the reason that the same is not performed in accordance with the public policy of the State of Washington as defined in said statutes.

B. Prevailing Wages

If federal, state, local, or any applicable law requires Supplier to pay prevailing wages in connection with a Contract, and Supplier is so notified by the City, then Supplier shall pay applicable prevailing wages.

If applicable, a Schedule of Prevailing Wage Rates and/or the current prevailing wage determination made by the Secretary of Labor for the locality or localities where the Contract will be performed is attached and made of part of the Contract by this reference. If prevailing wages do apply to the Contract, Supplier and its subcontractors shall:

1. Be bound by and perform all transactions regarding the Contract relating to prevailing wages and the usual fringe benefits in compliance with the provisions of Chapter 39.12 RCW, as amended, the Washington State Prevailing Wage Act and/or the Davis-Bacon Act (40 U.S.C. 3141- 3144, and 3146-3148) and the requirements of 29 C.F.R. pt. 5 as may be applicable, including the federal requirement to pay wages not less than once a week,

2. Ensure that no worker, laborer or mechanic employed in the performance of any part of the Contract shall be paid less than the prevailing rate of wage specified on that Schedule and/or specified in a wage determination made by the Secretary of Labor (unless specifically preempted by federal law, the higher of the Washington state prevailing wage or federal Davis-Bacon rate of wage must be paid)and Additionally, in compliance with applicable federal law, contractors are required to pay wages not less than once a week.

3. Immediately upon award of the Contract, contact the Department of Labor and Industries, Prevailing Wages section, Olympia, Washington and/or the federal Department of Labor, to obtain full information, forms and procedures relating to these matters. Per such procedures, a Statement of Intent to Pay Prevailing Wages and/or other or additional documentation required by applicable federal law, must be submitted by Contractor and its subcontractors to the City, in the manner requested by the City, prior to any payment by the City hereunder, and an Affidavit of Wages Paid and/or other or additional documentation required by federal law must be received or verified by the City prior to final Contract payment. In the event any dispute arises as to what are the prevailing rates of wages for work of a similar nature and such dispute cannot be adjusted by the parties in interest, including labor and management representatives, the matter shall be referred for arbitration to the Director of the State of Washington, Department of Labor and industries whose decision shall be final, conclusive and binding on all parties involved in the dispute.
3.09 COPELAND ANTI-KICKBACK ACT

For contracts subject to Davis Bacon Act the following clauses will be incorporated into the Contract:

A. Contractor. The contractor shall comply with 18 U.S.C. § 874, 40 U.S.C. § 3145, and the requirements of 29 C.F.R. pt. 3 as may be applicable, which are incorporated by reference into this contract.

B. Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clause above and such other clauses as FEMA may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all of these contract clauses.

C. Breach. A breach of the contract clauses above may be grounds for termination of the contract, and for debarment as a contractor and subcontractor as provided in 29 C.F.R. § 5.12.

3.10 CHANGES

A. In Plans or Quantities

The City of Tacoma, without invalidating this Contract, or any part of this Contract, may order extra work or make reasonable changes by altering, adding to or deducting from the materials, work and labor and the Contract sum will be adjusted accordingly. All such work and labor shall be executed under the conditions of the original Contract except that any claim for extension of time caused thereby shall be adjusted at the time of ordering such change. When work or bid items are deducted, reduced or eliminated, it is agreed that no payment will be made to Contractor for anticipated profit.

B. Extra Work

Any claim or order for extra materials, work and labor made necessary by alterations or additions to the plans or by other reasons for which no price is provided in this Contract, shall not be valid unless the Contractor and Engineer administering the Contract have agreed upon a price prior to commencing extra work, and the agreement has been signed by the Contractor and approved by the Superintendent or his/her designee, and approved by the payment and performance bond surety.

C. Extra Work - No Agreed Price

If it is impracticable to fix an increase in price definitely in advance, the order may fix a maximum price which shall not under any circumstances, be exceeded, and subject to such limitation, such alteration, modification, or extra shall be paid for at the actual necessary cost as determined by the City of Tacoma, which cost (including an allowance for profit) shall be determined as the sum of the following items (1) to (7) inclusive:

- Labor, computed at regular wage scale, including premium on compensation insurance and charge for social security taxes, and other taxes, pertaining to labor; no charge for premium pay shall be allowed unless authorized by the Engineer administering the Contract;
- (2) The proportionate cost of premiums on comprehensive general liability and other insurance applicable to the extra work involved and required under this Contract;
- (3) Material, including sales taxes pertaining to materials;
- (4) Plant and equipment rental, to be agreed upon in writing before the work is begun; no charge for the cost of repairs to plant or equipment will be allowed;
- (5) Superintendence, general expense and profit computed at 20 percent of the total of paragraphs (1) to (4) inclusive;
- (6) The proportionate cost of premiums on bonds required by this Contract, computed by 1 1/2 percent of the total of paragraphs (1) to (5) inclusive.
- (7) The City of Tacoma reserves the right to furnish such materials as it may deem expedient, and no allowance will be made for profit thereon.

Whenever any extra work is in progress, for which the definite price has not been agreed on in advance, the Contractor shall each day, report to the Engineer the amount and cost of the labor and material used, and any other expense incurred in such extra work on the preceding day, and no claim for compensation for such extra work will be allowed unless such report shall have been made.

The above-described methods of determining the payment for work and materials shall not apply to the performance of any work or the furnishing of any material, which, in the judgment of the Engineer administering the Contract, may properly be classified under items for which prices are established in the Contract.

D. Claims for Extra Work

If the Contractor claims that any instructions by drawings or otherwise, involve extra cost under this Contract, he/she shall give the City of Tacoma written notice thereof within 30 days after receipt of such instruction, and in any event before proceeding to execute the work, except in an emergency endangering life or property, and the procedures governing the same shall be as provided for immediately above in this paragraph. The method in these paragraphs is the only method available to the Contractor for payment of claims for extra work performed under the terms of this Contract.

3.11 CLEANING UP

The Contractor shall at all times, at his/her own expense, keep the premises free from accumulation of waste materials or debris caused by any workers or the work, at the completion of the work the Contractor shall remove all his waste materials from and about the site and all his/her equipment, sanitary facilities and surplus materials. In the case of dispute, the City of Tacoma may remove the debris and charge the cost to the Contractor as the City of Tacoma shall determine to be just. All material that is deposited or placed elsewhere than in places designated or approved by the Engineer administering the Contract will not be paid for and the Contractor may be required to remove such material and deposit or place it where directed.

3.12 PROGRESS PAYMENT

Progress payments will be made up to the amount of ninety-five percent (95%) of the actual work completed as shall be determined by the Engineer administering the Contract.

The Contractor may request that an escrow account be established as permitted by law, in which event the Contractor will earn interest on the retained funds.

When the time for construction, services and/or installation will exceed thirty (30) days, the Contractor may request, by invoice, to be paid a progress payment based on percentage of work completed. The Engineer will review and approve the progress payment request on a monthly basis.

3.13 FINAL PAYMENT

The final payment of five percent (5%) of the Contract price shall be approved on final acceptance of the work under this Contract by the Superintendent or his/her designee. In addition, before final payment is made, the Contractor shall be required to:

A. Provide a certificate from the Washington State Department of Revenue that all taxes due from the Contractor have been paid or are collectible in accordance with the provisions of Chapter 60.28 and Title 82 of the Revised Code of Washington;

B. Provide the General Release to the City of Tacoma on the form set forth in these Contractdocuments;

C. Provide a release of any outstanding liens that have been otherwise filed against any monies held or retained by the City of Tacoma;

D. File with the City Director of Finance, and with the Director of the Washington State Department of Labor and Industries, on the state form to be provided, an affidavit of wages paid;

E. File with the City Director of Finance, on the state form to be provided, a statement from the State of Washington, Department of Labor and Industries, certifying that the prevailing wage requirements have been satisfied.

F. File with the City Director of Finance, on the state form to be provided, a statement of release from the Public Works Contracts Division of the State of Washington, Department of Labor and Industries, verifying that all industrial insurance and medical aid premiums have been paid.

If there is a fee assessed to the City for any certificate, release or other form required by law, the contractor agrees that the fee amount may be passed on to the Contractor and deducted from the monies paid to the Contractor.

3.14 FAILURE TO COMPLETE THE WORK ON TIME

Should the completion of the work required under the Contract be delayed beyond the expiration of the period herein set for the completion of said work, or such extension of said period as may be allowed by reason of unavoidable delays, there shall be deducted from the total Contract price of work, for each calendar day by which such completion shall be delayed beyond said period of such extension thereof the sum of \$300 or a sum of money as set forth hereinafter in these Specifications, as the amount of such deduction per calendar day.

Said sum shall be considered not as a penalty, but as liquidated damages, which the City will suffer by reason of the failure of the Contractor to perform and complete the work within the period, herein fixed or such extensions of said period as may be allowed by reason of unavoidable delays.

Any money due or to become due the Contractor may be retained by the City to cover said liquidated damages, and should such money not be sufficient to cover such damages, the City shall have the right to recover the balance from the Contractor or his/her Sureties.

The filing of any bid for the work herein contemplated shall constitute acknowledgment by the Respondent that he/she understands, agrees and has ascertained that the City will actually suffer damages to the amount hereinabove fixed for each and every calendar day during which the completion of the work herein required shall be delayed beyond the expiration of the period herein fixed for such completion or such extension of said period as may be allowed by reason of unavoidable delays.

3.15 CITY RESERVES RIGHT TO USE FACILITIES PRIOR TO ACCEPTANCE

The City of Tacoma hereby reserves the right to use the facilities herein contracted prior to final acceptance under this Contract. The use of said facilities, as mentioned herein, shall not be construed as a waiver or relinquishment of any rights that the City of Tacoma has under this Contract.

3.16 LIST OF SUBCONTRACTORS

Bid proposals for construction, alteration or repair of any building or other public works that may exceed \$1,000,000 including tax shall satisfy the following requirement: Respondent shall submit as part of the bid, the names of the subcontractors, with whom the respondent, if awarded the contract, will subcontract performance of the work of heating, ventilation and air conditioning, plumbing as described in chapter 18.106 RCW, and electrical as described in chapter 19.28 RCW, or to name itself for the work. The respondent shall not list more than one subcontractor for each category of work identified, unless subcontractors vary with bid alternates, in which case the respondent must indicate which subcontractor will be used for which alternate. Failure to comply with this provision or the naming of two or more subcontractors to perform the same work shall require the City (pursuant to state law RCW 39.30.060) to determine that respondent's bid is nonresponsive; therefore, the bid will be rejected.

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PART 1 GENERAL PROVISIONS

1.01 DEFINITIONS

Replace the following article in Section 1.01:

Q. "Owner" means the City or its authorized representative with the authority to enter into, administer, and/or terminate the Work in accordance with the Contract Documents and make related determinations and findings.

Add the following articles to Section 1.01:

- AC. "Abbreviations" refer to trade association names and titles of general standards are frequently abbreviated. Where such acronyms or abbreviations are used in the specifications or other contract documents, they mean recognized name of the trade association, standards generating organization, authority having jurisdiction, or other entity applicable to the context of the text provision. Refer to the "Encyclopedia of Associations," published by Gale Research Co., available in most libraries.
- AD. "Alternate Bid" (or Alternate) is an amount stated in the Bid to be added or deducted from the amount of the base Bid if the corresponding change in project scope or materials or methods of construction described in the Bidding Documents is accepted.
- AE. "Base Bid" is the sum stated in the Bid for which the Bidder offers to perform the work described as the base, to which work may be added or deducted for sums stated in Alternate Bids and Unit Prices. The base bid does not include Allowances, Force Account work and Washington State Sales taxes. Owner shall pay Contractor the Contract Sum plus state sales tax for performance of the Work, in accordance with the Contract Documents.
- AF. "Contracting Agency" (or Owner) is the City of Tacoma.
- AG. "Contract Provisions" is the publication addressing the work required for an individual project. At the time of the call for bids, the contract provisions may include, for a specific individual project, the general conditions, supplements to the general conditions, the special provisions, a listing of the applicable standard plans, the prevailing minimum hourly wage rates, contract forms, affirmative action requirements, L.E.A.P. and SBE.
- AH. "Furnish" is used to mean supply and deliver to the project site, ready for unloading, unpacking, assembly, installation and other.
- AI. "Indicated" refers to graphic representations, notes or schedules on the drawings, or other paragraphs or schedules in the specifications, and similar requirements in the contract documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used, it is to help the reader locate the reference; no limit on location is intended.
- AJ. "Install" is used to describe operations at the project site including the actual unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

- AK. "Installer" is the contractor or an entity engaged by the contractor, either as an employee, subcontractor, or contractor of lower tier for performance of a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.
- AL. "Provide" means to furnish and install, complete and ready for intended use.
- AN. "Unit Price" is an amount stated in the Bid as a price per unit of measurement for materials or services as described in the Contract Documents.

1.02 ORDER OF PRECEDENCE

Replace the entire Section 1.02 with the following provisions:

Any conflict or inconsistency in the Contract Documents shall be resolved by giving the documents precedence in the following order.

- 1. Signed Public Works Contract, including Change Orders, and any Special Forms.
- 2. City of Tacoma General Provisions
- 3. City of Tacoma Modifications to the General Conditions for Washington State Facility Construction.
- 4. General Conditions for Washington State Facility Construction.
- 5. General Requirements- provisions in Division 01 shall take precedence over provisions of any other Division.
- 6. Drawings in case of conflict within the Drawings, large scale drawings shall take precedence over small scale drawings.
- 7. Special Notice to Bidders.
- 8. Advertisement for Bids.

1.03 EXECUTION AND INTENT

Add the following to Section 1.03:

4. The intent of the contract is to be prescribing a complete work. Omissions from the contract of details of work, which are necessary to carry out the contract, shall not relieve the Contractor from performing the omitted work.

1.04 OBJECTIONS TO APPLICATION OF PRODUCTS

Add the following new Section 1.04:

Bidders for this project are required to thoroughly familiarize themselves with specified products and installation procedures and submit to the Senior Buyer any questions or objections (in writing) no later than **the date specified on the "Bidder Question Form."** Submittal of Bid constitutes acceptance of products and procedures specified.

1.05 DISQUALIFICATION OF BIDDERS

Add the following new Section 1.05:

A bidder may be deemed not responsible and the proposal rejected by the Owner for any of the following:

- A. More than one bid proposal is submitted for the same project from a bidder under the same or different names;
- B. Evidence of collusion exists with any other bidder. Participants in collusion will be restricted from submitting future bids;
- C. A bidder is not pre-qualified for the work or to the full extent of the bid;
- D. An unsatisfactory performance record exists based on past or current work;
- E. There is incomplete work which may hinder or prevent the prompt completion of the work bid upon;
- F. The bidder failed to settle bills for labor or materials on past or current contracts;
- G. The bidder has failed to complete a written public contract or has been convicted of a crime arising from a previous public contract;
- H. The bidder is unable, financially or otherwise, to perform the work;
- I. A bidder is not authorized to do business in the state of Washington;
- J. Failure by the contractor to properly review the project documents and/or site;
- K. The bid proposal was not received by the submittal deadline;
- L. The contractor fails to meet the EIC requirements as described in these documents;
- M. Receipt of addenda is not acknowledged; or
- N. There are any other reasons deemed proper by the Owner.

1.06 PRE-AWARD INFORMATION

Add the following new Section 1.06:

Before awarding any contract, the Owner may require one or more of these items or actions of the apparent lowest responsible bidder:

- 1. A complete statement of the origin, composition, and manufacture of any or all materials to be used,
- 2. Samples of these materials for quality and fitness tests,
- 3. A progress schedule (in a form the Owner requires) showing the order of and time required for the various phases of the work,
- 4. A breakdown of costs assigned to any bid item,
- 5. Attendance at a conference with the Engineer or representatives of the Engineer,
- 6. Bid evaluation submittals related to the contractors ability to perform the work including experience on similar projects, project personnel and equipment, and financial resources, or
- 7. Any other information or action taken that is deemed necessary to ensure that the bidder is the lowest responsible bidder.

1.12 RELATIONS WITH THE RAILROAD

Add the following new Section 1.12:

Railroad Company, as used in these specifications, shall be the railroad company or companies, or railway company or companies specified in these Special Provisions. The following provisions, though referring to a single Railroad Company, shall be applicable to each of the following railroad companies or railway companies:

Tacoma Rail

Protection of Railroad Property

The Contractor shall exercise care in all operations and shall, at the Contractor's expense, protect the property of the Railroad Company and the Company's appurtenances, property in its custody, or persons lawfully upon its right of way, from damage, destruction, interference or injury caused by the Contractor's operations. The Contractor shall prosecute the work to not interfere with the Railroad Company or its appurtenances, or any of the Railroad Company's trains or facilities, and shall complete the work to a condition that shall not interfere with or menace the integrity or safe and successful operations of the Railroad Company or its appurtenances, or any of the Railroad Company's trains or facilities.

The Contractor shall not transport equipment, machinery, or materials across the Railroad Company's tracks, except at a public crossing, without the written consent of the Railroad Company.

The Contractor shall keep the right of way and ditches of the Railroad Company open and clean from any deposits or debris resulting from its operations. The Contractor shall be responsible for the cost to clean and restore ballast of the Railroad Company which is disturbed or becomes fouled with dirt or materials when such deposits or damage result from the Contractor's operations, except as provided elsewhere.

The Contractor's work shall be conducted in such a manner that there will be a minimum of interference with the operation of railroad traffic. The Railroad Company will specify what periods will be allowed the Contractor for executing any part of the work in which the Railroad Company's tracks will be obstructed or made unsafe for operation of railroad traffic.

In the event that an emergency occurs in connection with the work specified, the Railroad Company reserves the right to do any and all work that may be necessary to maintain railroad traffic. If the emergency is caused by the Contractor, the Contractor shall pay the Railroad Company for the cost of such emergency work.

Protective services to protect the Railroad Company's facilities, property, and movement of its trains or engines, including railroad flagging and other devices, may be required by the Railroad Company as a result of the Contractor's operations.

The nature and extent of protective services, personnel and other measures required will in all cases be determined by the Railroad Company. Nothing in these specifications will limit the Railroad Company's right to determine and assign the number of personnel, the classes of personnel for protective services, nor other protective measures it deems necessary.

When, in the opinion of the Railroad Company, the services of qualified railroad flaggers or security personnel are necessary for the protection of the Railroad Company's facilities by reason of the Contractor's operations, the Contractor will furnish such qualified railroad flaggers or security personnel as may be required.

The Railroad Company's contact is:

Kyle Kellem: Roadmaster, Tacoma Rail: 253-377-3554

No act of the Railroad Company in supervising or approving any work shall reduce or in any way affect the liability of the Contractor for damages, expense, or cost which may result to the Railroad Company from the construction of this Contract.

PART 2 INSURANCE AND BONDS

2.01 CONTRACTOR'S LIABILITY INSURANCE

Replace the entire Section 2.01 with the following:

Insurance shall be per the City's standard "City of Tacoma Insurance Requirements" provided in the Contract Forms section of the Project Manual.

2.02 COVERAGE LIMITS

Replace the entire Section 2.02 with the following:

Insurance shall be per the City's standard "City of Tacoma Insurance Requirements" provided in the Contract Forms section of the Project Manual.

2.03 INSURANCE COVERAGE CERTIFICATES

Replace the entire Section 2.03 with the following:

Insurance shall be per the City's standard "City of Tacoma Insurance Requirements" provided in the Contract Forms section of the Project Manual.

2.04 PAYMENT AND PERFORMANCE BONDS

Add the following to Section 2.04:

A Payment Bond and Performance Bond shall be obtained by the Contractor utilizing the forms entitled "Payment Bond to the City of Tacoma" and "Performance Bond to the City of Tacoma" as found at the front of the Project Manual under "Contract Forms".

2.06 BUILDER'S RISK

Replace the entire Section 2.06 with the following:

Insurance shall be per the City's standard "City of Tacoma Insurance Requirements" provided in the Contract Forms section of the Project Manual.

PART 3 TIME AND SCHEDULE

3.07 DAMAGES FOR FAILURE TO ACHIEVE TIMELY COMPLETION

Delete Section 3.07 B – Actual Damages.

PART 5 PERFORMANCE

5.04 PREVAILING WAGES

Replace Section 5.04 G with the following.

G. <u>Certified Payrolls:</u> Consistent with WAC 296-127-320, the Contractor and any subcontractor shall submit a certified copy of payroll records on a monthly basis.

5.14 AVAILABILITY AND USE OF UTILITY SERVICES

Delete Section 5.14 A – Owner to provide and charge for utilities.

5.15 TESTS AND INSPECTIONS

Replace Section 5.15 A with the following.

A. <u>Testing and inspection of work:</u>

Contractor shall maintain an adequate testing and inspection program and perform such tests and inspections as are necessary or required to ensure that the Work conforms to the requirements of the Contract Documents. Contractor shall be responsible for inspection and quality surveillance of all its Work and all Work performed by any Subcontractor. Unless otherwise provided, Contractor shall make arrangements for such tests, inspections, and approvals or entity acceptable to Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. Contractor shall give Owner timely notice of when and where tests and inspections are to be made. Contractor shall maintain complete inspection records and make them available to Owner.

Owner will contract separately with an independent testing laboratory for code required special inspections, if applicable. Contractor shall give Owner timely notice of when and where special inspections are to be made.

5.20 SUBCONTRACTORS AND SUPPLIERS

Delete Section 5.20 E – Automatic assignment of subcontracts.

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PART 1 – GENERAL PROVISIONS

1.01 **DEFINITIONS**

- A. <u>"Application for Payment"</u> means a written request submitted by Contractor to A/E for payment of Work completed in accordance with the Contract Documents and approved Schedule of Values, supported by such substantiating data as Owner or A/E may require.
- B. <u>"Architect," "Engineer," or "A/E"</u> means a person or entity lawfully entitled to practice architecture or engineering, representing Owner within the limits of its delegated authority.
- C. <u>"Change Order"</u> means a written instrument signed by Owner and Contractor stating their agreement upon all of the following: (1) a change in the Work; (2) the amount of the adjustment in the Contract Sum, if any, and (3) the extent of the adjustment in the Contract Time, if any.
- D. <u>"Claim"</u> means Contractor's exclusive remedy for resolving disputes with Owner regarding the terms of a Change Order or a request for equitable adjustment, as more fully set forth in Part 8.
- E. <u>"Contract Award Amount</u>" is the sum of the Base Bid and any accepted Alternates.
- F. <u>"Contract Documents"</u> means the Advertisement for Bids, Instructions for Bidders, completed Bid Form, General Conditions, Modifications to the General Conditions, Supplemental Conditions, Public Works Contract, other Special Forms, Drawings and Specifications, and all addenda and modifications thereof.
- G. <u>"Contract Sum"</u> is the total amount payable by Owner to Contractor, for performance of the Work in accordance with the Contract Documents, including all taxes imposed by law and properly chargeable to the Work, except Washington State sales tax.
- H. <u>"Contract Time"</u> is the number of calendar days allotted in the Contract Documents for achieving Substantial Completion of the Work.
- I. <u>"Contractor"</u> means the person or entity who has agreed with Owner to perform the Work in accordance with the Contract Documents.
- J. "<u>Day(s):</u> Unless otherwise specified, day(s) shall mean calendar day(s)."
- K. <u>"Drawings"</u> are the graphic and pictorial portions of the Contract Documents showing the design, location, and dimensions of the Work, and may include plans, elevations, sections, details, schedules, and diagrams.
- L. <u>"Final Acceptance"</u> means the written acceptance issued to Contractor by Owner after Contractor has completed the requirements of the Contract Documents, as more fully set forth in Section 6.09 B.
- M. <u>"Final Completion"</u> means that the Work is fully and finally complete in accordance with the Contract Documents, as more fully set forth in Section 6.09 A.
- N. <u>"Force Majeure"</u> means those acts entitling Contractor to request an equitable adjustment in the Contract Time, as more fully set forth in paragraph 3.05A.
- O. <u>"Notice"</u> means a written notice which has been delivered in person to the individual or a member of the firm or entity or to an officer of the corporation for which it was intended or, if delivered or sent by registered or certified mail, to the last business address known to the party giving notice.

- P. <u>"Notice to Proceed"</u> means a notice from Owner to Contractor that defines the date on which the Contract Time begins to run.
- Q. <u>"Owner"</u> means the state agency, institution, or its authorized representative with the authority to enter into, administer, and/or terminate the Work in accordance with the Contract Documents and make related determinations and findings.
- R. <u>"Person"</u> means a corporation, partnership, business association of any kind, trust, company, or individual.
- S. <u>"Prior Occupancy</u>" means Owner's use of all or parts of the Project before Substantial Completion, as more fully set forth in Section 6.08 A.
- T. <u>"Progress Schedule"</u> means a schedule of the Work, in a form satisfactory to Owner, as further set forth in Section 3.02.
- U. <u>"Project"</u> means the total construction of which the Work performed in accordance with the Contract Documents may be the whole or a part and which may include construction by Owner or by separate contractors.
- V. <u>"Project Record"</u> means the separate set of Drawings and Specifications as further set forth in paragraph 4.02A.
- W. <u>"Schedule of Values"</u> means a written breakdown allocating the total Contract Sum to each principal category of Work, in such detail as requested by Owner.
- X. <u>"Specifications"</u> are that portion of the Contract Documents consisting of the written requirements for materials, equipment, construction systems, standards and workmanship for the Work, and performance of related services.
- Y. <u>"Subcontract"</u> means a contract entered into by Subcontractor for the purpose of obtaining supplies, materials, equipment, or services of any kind for or in connection with the Work.
- Z. <u>"Subcontractor"</u> means any person, other than Contractor, who agrees to furnish or furnishes any supplies, materials, equipment, or services of any kind in connection with the Work.
- AA. <u>"Substantial Completion"</u> means that stage in the progress of the Work when the construction is sufficiently complete, as more fully set forth in Section 6.07.
- AB. <u>"Work"</u> means the construction and services required by the Contract Documents, and includes, but is not limited to, labor, materials, supplies, equipment, services, permits, and the manufacture and fabrication of components, performed, furnished, or provided in accordance with the Contract Documents.

1.02 ORDER OF PRECEDENCE

Any conflict or inconsistency in the Contract Documents shall be resolved by giving the documents precedence in the following order:

- 1. Signed Public Works Contract, including any Change Orders.
- 2. Supplemental Conditions.
- 3. Modifications to the General Conditions.
- 4. General Conditions.

- 5. Specifications. Provisions in Division 1 shall take precedence over provisions of any other Division.
- 6. Drawings. In case of conflict within the Drawings, large scale drawings shall take precedence over small scale drawings.
- 7. Signed and Completed Bid Form.
- 8. Instructions to Bidders.
- 9. Advertisement for Bids.

1.03 EXECUTION AND INTENT

Contractor Representations: Contractor makes the following representations to Owner:

- 1. <u>Contract Sum reasonable:</u> The Contract Sum is reasonable compensation for the Work and the Contract Time is adequate for the performance of the Work, as represented by the Contract Documents;
- 2. <u>Contractor familiar with project:</u> Contractor has carefully reviewed the Contract Documents, visited and examined the Project site, become familiar with the local conditions in which the Work is to be performed, and satisfied itself as to the nature, location, character, quality and quantity of the Work, the labor, materials, equipment, goods, supplies, work, services and other items to be furnished and all other requirements of the Contract Documents, as well as the surface and subsurface conditions and other matters that may be encountered at the Project site or affect performance of the Work or the cost or difficulty thereof;
- 3. <u>Contractor financially capable:</u> Contractor is financially solvent, able to pay its debts as they mature, and possesses sufficient working capital to complete the Work and perform Contractor's obligations required by the Contract Documents; and
- 4. <u>Contractor can complete Work:</u> Contractor is able to furnish the plant, tools, materials, supplies, equipment and labor required to complete the Work and perform the obligations required by the Contract Documents and has sufficient experience and competence to do so.

PART 2 – INSURANCE AND BONDS

2.01 <u>CONTRACTOR'S LIABILITY INSURANCE</u>

<u>General insurance requirements:</u> Prior to commencement of the Work, Contractor shall obtain all the insurance required by the Contract Documents and provide evidence satisfactory to Owner that such insurance has been procured. Review of the Contractor's insurance by Owner shall not relieve or decrease the liability of Contractor. Companies writing the insurance to be obtained by this part shall be licensed to do business under Chapter 48 RCW or comply with the Surplus Lines Law of the State of Washington. Contractor shall include in its bid the cost of all insurance and bond costs required to complete the base bid work and accepted alternates. Insurance carriers providing insurance in accordance with the Contract Documents shall be acceptable to Owner, and its A.M. Best rating shall be indicated on the insurance certificates.

A. <u>Term of insurance coverage:</u> Contractor shall maintain the following insurance coverage during the Work and for one year after Final Acceptance. Contractor shall also maintain the following insurance coverage during the performance of any corrective Work required by Section 5.16.

- 1. <u>General Liability Insurance:</u> Commercial General Liability (CGL) on an Occurrence Form. Coverage shall include, but not be limited to:
 - a. Completed operations/products liability;
 - b. Explosion, collapse, and underground; and
 - c. Employer's liability coverage.
- 2. <u>Automobile Liability Insurance:</u> Automobile liability
- B. <u>Industrial Insurance compliance:</u> Contractor shall comply with the Washington State Industrial Insurance Act and, if applicable, the Federal Longshoremen's and Harbor Workers' Act and the Jones Act.
- C. <u>Insurance to protect for the following:</u> All insurance coverages shall protect against claims for damages for personal and bodily injury or death, as well as claims for property damage, which may arise from operations in connection with the Work whether such operations are by Contractor or any Subcontractor.
- D. <u>Owner as Additional Insured:</u> All insurance coverages shall be endorsed to include Owner as an additional named insured for Work performed in accordance with the Contract Documents, and all insurance certificates shall evidence the Owner as an additional insured.

2.02 COVERAGE LIMITS

Insurance amounts: The coverage limits shall be as follows:

- A. Limits of Liability shall not be less than \$1,000,000 Combined Single Limit for Bodily Injury and Property Damage (other than Automobile Liability) Each Occurrence; Personal Injury and Advertising Liability Each Occurrence.
- B. \$2,000,000 Combined Single Limit Annual General Aggregate.
- C. \$2,000,000 Annual Aggregate for Products and Completed Operations Liability.
- D. \$1,000,000 Combined Single Limit for Automobile Bodily Injury and Property Damage Liability, Each Accident or Loss.

2.03 INSURANCE COVERAGE CERTIFICATES

- A. <u>Certificate required:</u> Prior to commencement of the Work, Contractor shall furnish to Owner a completed certificate of insurance coverage.
- B. <u>List Project info:</u> All insurance certificates shall name Owner's Project number and Project title.
- C. <u>Cancellation provisions:</u> All insurance certificates shall specifically require 45 Days prior notice to Owner of cancellation or any material change, except 30 Days for surplus line insurance.

2.04 PAYMENT AND PERFORMANCE BONDS

<u>Conditions for bonds</u>: Payment and performance bonds for 100% of the Contract Award Amount, plus state sales tax, shall be furnished for the Work, using the Payment Bond and Performance Bond form published by and available from the American Institute of Architects (AIA) – form A312. Prior to execution of a Change Order that, cumulatively with previous Change Orders, increases the Contract Award Amount by 15% or more, the Contractor shall provide either new payment and performance bonds for the

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revised Contract Sum, or riders to the existing payment and performance bonds increasing the amount of the bonds. The Contractor shall likewise provide additional bonds or riders when subsequent Change Orders increase the Contract Sum by 15% or more. No payment or performance bond is required if the Contract Sum is \$35,000 or less and Contractor agrees that Owner may, in lieu of the bond, retain 50% of the Contract Sum for the period allowed by RCW 39.08.010.

2.05 <u>ALTERNATIVE SURETY</u>

<u>When alternative surety required:</u> Contractor shall promptly furnish payment and performance bonds from an alternative surety as required to protect Owner and persons supplying labor or materials required by the Contract Documents if:

- A. Owner has a reasonable objection to the surety; or
- B. Any surety fails to furnish reports on its financial condition if required by Owner.

2.06 BUILDER'S RISK

- A. <u>Contractor to buy Property Insurance</u>: Contractor shall purchase and maintain property insurance in the amount of the Contract Sum including all Change Orders for the Work on a replacement cost basis until Substantial Completion. For projects not involving New Building Construction, "Installation Floater" is an acceptable substitute for the Builder's Risk Insurance. The insurance shall cover the interest of Owner, Contractor, and any Subcontractors, as their interests may appear.
- B. <u>Losses covered:</u> Contractor property insurance shall be placed on an "all risk" basis and insure against the perils of fire and extended coverage and physical loss or damage including theft, vandalism, malicious mischief, collapse, false work, temporary buildings, debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for A/E's services and expenses required as a result of an insured loss.
- C. <u>Waiver of subrogation rights:</u> Owner and Contractor waive all subrogation rights against each other, any Subcontractors, A/E, A/E's subconsultants, separate contractors described in Section 5.20, if any, and any of their subcontractors, for damages caused by fire or other perils to the extent covered by property insurance obtained pursuant to this section or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by Owner as fiduciary. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

PART 3 – TIME AND SCHEDULE

3.01 PROGRESS AND COMPLETION

<u>Contractor to meet schedule:</u> Contractor shall diligently prosecute the Work, with adequate forces, achieve Substantial Completion within the Contract Time, and achieve Final Completion within a reasonable period thereafter.

3.02 CONSTRUCTION SCHEDULE

 A. <u>Preliminary Progress Schedule:</u> Unless otherwise provided in Division 1, Contractor shall, within 14 Days after issuance of the Notice to Proceed, submit a preliminary Progress Schedule. The Progress Schedule shall show the sequence in which Contractor proposes to perform the Work, and the dates on which Contractor plans to start and finish major portions of the Work, including dates for shop drawings and other submittals, and for acquiring materials and equipment.

- B. <u>Form of Progress Schedule:</u> Unless otherwise provided in Division 1, the Progress Schedule shall be in the form of a bar chart, or a critical path method analysis, as specified by Owner. The preliminary Progress Schedule may be general, showing the major portions of the Work, with a more detailed Progress Schedule submitted as directed by Owner.
- C. <u>Owner comments on Progress Schedule:</u> Owner shall return comments on the preliminary Progress Schedule to Contractor within 14 Days of receipt. Review by Owner of Contractor's schedule does not constitute an approval or acceptance of Contractor's construction means, methods, or sequencing, or its ability to complete the Work within the Contract Time. Contractor shall revise and resubmit its schedule, as necessary. Owner may withhold a portion of progress payments until a Progress Schedule has been submitted which meets the requirements of this section.
- D. <u>Monthly updates and compliance with Progress Schedule:</u> Contractor shall utilize and comply with the Progress Schedule. On a monthly basis, or as otherwise directed by Owner, Contractor shall submit an updated Progress Schedule at its own expense to Owner indicating actual progress. If, in the opinion of Owner, Contractor is not in conformance with the Progress Schedule for reasons other than acts of Force Majeure as identified in Section 3.05, Contractor shall take such steps as are necessary to bring the actual completion dates of its work activities into conformance with the Progress Schedule, and if directed by Owner, Contractor shall submit a corrective action plan or revise the Progress Schedule to reconcile with the actual progress of the Work.
- E. <u>Contractor to notify Owner of delays:</u> Contractor shall promptly notify Owner in writing of any actual or anticipated event which is delaying or could delay achievement of any milestone or performance of any critical path activity of the Work. Contractor shall indicate the expected duration of the delay, the anticipated effect of the delay on the Progress Schedule, and the action being or to be taken to correct the problem. Provision of such notice does not relieve Contractor of its obligation to complete the Work within the Contract Time.

3.03 OWNER'S RIGHT TO SUSPEND THE WORK FOR CONVENIENCE

- A. <u>Owner may suspend Work:</u> Owner may, at its sole discretion, order Contractor, in writing, to suspend all or any part of the Work for up to 90 Days, or for such longer period as mutually agreed.
- B. <u>Compliance with suspension; Owner's options:</u> Upon receipt of a written notice suspending the Work, Contractor shall immediately comply with its terms and take all reasonable steps to minimize the incurrence of cost of performance directly attributable to such suspension. Within a period up to 90 Days after the notice is delivered to Contractor, or within any extension of that period to which the parties shall have agreed, Owner shall either:
 - 1. Cancel the written notice suspending the Work; or
 - 2. Terminate the Work covered by the notice as provided in the termination provisions of Part 9.
- C. <u>Resumption of Work:</u> If a written notice suspending the Work is cancelled or the period of the notice or any extension thereof expires, Contractor shall resume Work.
- D. <u>Equitable Adjustment for suspensions:</u> Contractor shall be entitled to an equitable adjustment in the Contract Time, or Contract Sum, or both, for increases in the time or cost of performance

directly attributable to such suspension, provided Contractor complies with all requirements set forth in Part 7.

3.04 OWNER'S RIGHT TO STOP THE WORK FOR CAUSE

- A. <u>Owner may stop Work for Contractor's failure to perform:</u> If Contractor fails or refuses to perform its obligations in accordance with the Contract Documents, Owner may order Contractor, in writing, to stop the Work, or any portion thereof, until satisfactory corrective action has been taken.
- B. <u>No Equitable Adjustment for Contractor's failure to perform</u>: Contractor shall not be entitled to an equitable adjustment in the Contract Time or Contract Sum for any increased cost or time of performance attributable to Contractor's failure or refusal to perform or from any reasonable remedial action taken by Owner based upon such failure.

3.05 <u>DELAY</u>

- A. <u>Force Majeure actions not a default; Force Majeure defined:</u> Any delay in or failure of performance by Owner or Contractor, other than the payment of money, shall not constitute a default hereunder if and to the extent the cause for such delay or failure of performance was unforeseeable and beyond the control of the party ("Force Majeure"). Acts of Force Majeure include, but are not limited to:
 - 1. Acts of God or the public enemy;
 - 2. Acts or omissions of any government entity;
 - 3. Fire or other casualty for which Contractor is not responsible;
 - 4. Quarantine or epidemic;
 - 5. Strike or defensive lockout;
 - 6. Unusually severe weather conditions which could not have been reasonably anticipated; and
 - 7. Unusual delay in receipt of supplies or products which were ordered and expedited and for which no substitute reasonably acceptable to Owner was available.
- B. <u>Contract Time adjustment for Force Majeure:</u> Contractor shall be entitled to an equitable adjustment in the Contract Time for changes in the time of performance directly attributable to an act of Force Majeure, provided it makes a request for equitable adjustment according to Section 7.03. Contractor shall not be entitled to an adjustment in the Contract Sum resulting from an act of Force Majeure.
- C. <u>Contract Time or Contract Sum adjustment if Owner at fault</u>: Contractor shall be entitled to an equitable adjustment in Contract Time, and may be entitled to an equitable adjustment in Contract Sum, if the cost or time of Contractor's performance is changed due to the fault or negligence of Owner, provided the Contractor makes a request according to Sections 7.02 and 7.03.
- D. <u>No Contract Time or Contract Sum adjustment if Contractor at fault:</u> Contractor shall not be entitled to an adjustment in Contract Time or in the Contract Sum for any delay or failure of performance to the extent such delay or failure was caused by Contractor or anyone for whose acts Contractor is responsible.

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- E. <u>Contract Time adjustment only for concurrent fault:</u> To the extent any delay or failure of performance was concurrently caused by the Owner and Contractor, Contractor shall be entitled to an adjustment in the Contract Time for that portion of the delay or failure of performance that was concurrently caused, provided it makes a request for equitable adjustment according to Section 7.03, but shall not be entitled to an adjustment in Contract Sum.
- F. <u>Contractor to mitigate delay impacts:</u> Contractor shall make all reasonable efforts to prevent and mitigate the effects of any delay, whether occasioned by an act of Force Majeure or otherwise.

3.06 NOTICE TO OWNER OF LABOR DISPUTES

- A. <u>Contractor to notify Owner of labor disputes:</u> If Contractor has knowledge that any actual or potential labor dispute is delaying or threatens to delay timely performance in accordance with the Contract Documents, Contractor shall immediately give notice, including all relevant information, to Owner.
- B. <u>Pass through notification provisions to Subcontractors:</u> Contractor agrees to insert a provision in its Subcontracts and to require insertion in all sub-subcontracts, that in the event timely performance of any such contract is delayed or threatened by delay by any actual or potential labor dispute, the Subcontractor or Sub-subcontractor shall immediately notify the next higher tier Subcontractor or Contractor, as the case may be, of all relevant information concerning the dispute.

3.07 DAMAGES FOR FAILURE TO ACHIEVE TIMELY COMPLETION

- A. <u>Liquidated Damages</u>
 - 1. <u>Reason for Liquidated Damages:</u> Timely performance and completion of the Work is essential to Owner and time limits stated in the Contract Documents are of the essence. Owner will incur serious and substantial damages if Substantial Completion of the Work does not occur within the Contract Time. However, it would be difficult if not impossible to determine the exact amount of such damages. Consequently, provisions for liquidated damages are included in the Contract Documents.
 - 2. <u>Calculation of Liquidated Damages amount:</u> The liquidated damage amounts set forth in the Contract Documents will be assessed not as a penalty, but as liquidated damages for breach of the Contract Documents. This amount is fixed and agreed upon by and between the Contractor and Owner because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the Owner would in such event sustain. This amount shall be construed as the actual amount of damages sustained by the Owner, and may be retained by the Owner and deducted from periodic payments to the Contractor.
 - 3. <u>Contractor responsible even if Liquidated Damages assessed:</u> Assessment of liquidated damages shall not release Contractor from any further obligations or liabilities pursuant to the Contract Documents.
- B. <u>Actual Damages</u>

<u>Calculation of Actual Damages:</u> Actual damages will be assessed for failure to achieve Final Completion within the time provided. Actual damages will be calculated on the basis of direct architectural, administrative, and other related costs attributable to the Project from the date when Final Completion should have been achieved, based on the date Substantial Completion is actually achieved, to the date Final Completion is actually achieved. Owner may offset these costs against any payment due Contractor.

PART 4 – SPECIFICATIONS, DRAWINGS, AND OTHER DOCUMENTS

4.01 DISCREPANCIES AND CONTRACT DOCUMENT REVIEW

- A. <u>Specifications and Drawings are basis of the Work:</u> The intent of the Specifications and Drawings is to describe a complete Project to be constructed in accordance with the Contract Documents. Contractor shall furnish all labor, materials, equipment, tools, transportation, permits, and supplies, and perform the Work required in accordance with the Drawings, Specifications, and other provisions of the Contract Documents.
- B. <u>Parts of the Contract Documents are complementary:</u> The Contract Documents are complementary. What is required by one part of the Contract Documents shall be binding as if required by all. Anything mentioned in the Specifications and not shown on the Drawings, or shown on the Drawings and not mentioned in the Specifications, shall be of like effect as if shown or mentioned in both.
- C. <u>Contractor to report discrepancies in Contract Documents:</u> Contractor shall carefully study and compare the Contract Documents with each other and with information furnished by Owner. If, during the performance of the Work, Contractor finds a conflict, error, inconsistency, or omission in the Contract Documents, it shall promptly and before proceeding with the Work affected thereby, report such conflict, error, inconsistency, or omission to A/E in writing.
- D. <u>Contractor knowledge of discrepancy in documents responsibility:</u> Contractor shall do no Work without applicable Drawings, Specifications, or written modifications, or Shop Drawings where required, unless instructed to do so in writing by Owner. If Contractor performs any construction activity, and it knows or reasonably should have known that any of the Contract Documents contain a conflict, error, inconsistency, or omission, Contractor shall be responsible for the performance and shall bear the cost for its correction.
- E. <u>Contractor to perform Work implied by Contract Documents:</u> Contractor shall provide any work or materials the provision of which is clearly implied and is within the scope of the Contract Documents even if the Contract Documents do not mention them specifically.
- F. <u>Interpretation questions referred to A/E:</u> Questions regarding interpretation of the requirements of the Contract Documents shall be referred to the A/E.

4.02 PROJECT RECORD

- A. <u>Contractor to maintain Project Record Drawings and Specifications:</u> Contractor shall legibly mark in ink on a separate set of the Drawings and Specifications all actual construction, including depths of foundations, horizontal and vertical locations of internal and underground utilities and appurtenances referenced to permanent visible and accessible surface improvements, field changes of dimensions and details, actual suppliers, manufacturers and trade names, models of installed equipment, and Change Order Proposals (COP). This separate set of Drawings and Specifications shall be the "Project Record."
- B. <u>Update Project Record weekly and keep on site:</u> The Project Record shall be maintained on the project site throughout the construction and shall be clearly labeled "PROJECT RECORD." The Project Record shall be updated at least weekly noting all changes and shall be available to Owner at all times.
- C. <u>Final Project Record to A/E before Final Acceptance</u>: Contractor shall submit the completed and finalized Project Record to A/E prior to Final Acceptance.

4.03 SHOP DRAWINGS

- A. <u>Definition of Shop Drawings:</u> "Shop Drawings" means documents and other information required to be submitted to A/E by Contractor pursuant to the Contract Documents, showing in detail: the proposed fabrication and assembly of structural elements; and the installation (i.e. form, fit, and attachment details) of materials and equipment. Shop Drawings include, but are not limited to, drawings, diagrams, layouts, schematics, descriptive literature, illustrations, schedules, performance and test data, samples, and similar materials furnished by Contractor to explain in detail specific portions of the Work required by the Contract Documents. For materials and equipment to be incorporated into the Work, Contractor submittal shall include the name of the manufacturer, the model number, and other information concerning the performance, capacity, nature, and rating of the item. When directed, Contractor shall submit all samples at its own expense. Owner may duplicate, use, and disclose Shop Drawings provided in accordance with the Contract Documents.
- Β. Approval of Shop Drawings by Contractor and A/E: Contractor shall coordinate all Shop Drawings, and review them for accuracy, completeness, and compliance with the Contract Documents and shall indicate its approval thereon as evidence of such coordination and review. Where required by law, Shop Drawings shall be stamped by an appropriate professional licensed by the state of Washington. Shop Drawings submitted to A/E without evidence of Contractor's approval shall be returned for resubmission. Contractor shall review, approve, and submit Shop Drawings with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of Owner or separate contractors. Contractor's submittal schedule shall allow a reasonable time for A/E review. A/E will review, approve, or take other appropriate action on the Shop Drawings. Contractor shall perform no portion of the Work requiring submittal and review of Shop Drawings until the respective submittal has been reviewed and the A/E has approved or taken other appropriate action. Owner and A/E shall respond to Shop Drawing submittals with reasonable promptness. Any Work by Contractor shall be in accordance with reviewed Shop Drawings. Submittals made by Contractor which are not required by the Contract Documents may be returned without action.
- C. <u>Contractor not relieved of responsibility when Shop Drawings approved:</u> Approval, or other appropriate action with regard to Shop Drawings, by Owner or A/E shall not relieve Contractor of responsibility for any errors or omissions in such Shop Drawings, nor from responsibility for compliance with the requirements of the Contract Documents. Unless specified in the Contract Documents, review by Owner or A/E shall not constitute an approval of the safety precautions employed by Contractor during construction, or constitute an approval of Contractor's means or methods of construction. If Contractor fails to obtain approval before installation and the item or work is subsequently rejected, Contractor shall be responsible for all costs of correction.
- D. <u>Variations between Shop Drawings and Contract Documents:</u> If Shop Drawings show variations from the requirements of the Contract Documents, Contractor shall describe such variations in writing, separate from the Shop Drawings, at the time it submits the Shop Drawings containing such variations. If A/E approves any such variation, an appropriate Change Order will be issued. If the variation is minor and does not involve an adjustment in the Contract Sum or Contract Time, a Change Order need not be issued; however, the modification shall be recorded upon the Project Record.
- E. <u>Contractor to submit 5 copies of Shop Drawings:</u> Unless otherwise provided in Division 1, Contractor shall submit to A/E for approval 5 copies of all Shop Drawings. Unless otherwise indicated, 3 sets of all Shop Drawings shall be retained by A/E and 2 sets shall be returned to Contractor.

4.04 ORGANIZATION OF SPECIFICATIONS

<u>Specification organization by trade:</u> Specifications are prepared in sections which conform generally with trade practices. These sections are for Owner and Contractor convenience and shall not control Contractor in dividing the Work among the Subcontractors or in establishing the extent of the Work to be performed by any trade.

4.05 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS, AND OTHER DOCUMENTS

- A. <u>A/E, not Contractor, owns Copyright of Drawings and Specifications:</u> The Drawings, Specifications, and other documents prepared by A/E are instruments of A/E's service through which the Work to be executed by Contractor is described. Neither Contractor nor any Subcontractor shall own or claim a copyright in the Drawings, Specifications, and other documents prepared by A/E, and A/E shall be deemed the author of them and will, along with any rights of Owner, retain all common law, statutory, and other reserved rights, in addition to the copyright. All copies of these documents, except Contractor's set, shall be returned or suitably accounted for to A/E, on request, upon completion of the Work.
- B. <u>Drawings and Specifications to be used only for this Project:</u> The Drawings, Specifications, and other documents prepared by the A/E, and copies thereof furnished to Contractor, are for use solely with respect to this Project. They are not to be used by Contractor or any Subcontractor on other projects or for additions to this Project outside the scope of the Work without the specific written consent of Owner and A/E. Contractor and Subcontractors are granted a limited license to use and reproduce applicable portions of the Drawings, Specifications, and other documents prepared by A/E appropriate to and for use in the execution of their Work.
- C. <u>Shop Drawing license granted to Owner:</u> Contractor and all Subcontractors grant a non-exclusive license to Owner, without additional cost or royalty, to use for its own purposes (including reproduction) all Shop Drawings, together with the information and diagrams contained therein, prepared by Contractor or any Subcontractor. In providing Shop Drawings, Contractor and all Subcontractors warrant that they have authority to grant to Owner a license to use the Shop Drawings, and that such license is not in violation of any copyright or other intellectual property right. Contractor agrees to defend and indemnify Owner pursuant to the indemnity provisions in Section 5.03 and 5.22 from any violations of copyright or other intellectual property rights arising out of Owner's use of the Shop Drawings hereunder, or to secure for Owner, at Contractor's own cost, licenses in conformity with this section.
- D. <u>Shop Drawings to be used only for this Project:</u> The Shop Drawings and other submittals prepared by Contractor, Subcontractors of any tier, or its or their equipment or material suppliers, and copies thereof furnished to Contractor, are for use solely with respect to this Project. They are not to be used by Contractor or any Subcontractor of any tier, or material or equipment supplier, on other projects or for additions to this Project outside the scope of the Work without the specific written consent of Owner. The Contractor, Subcontractors of any tier, and material or equipment suppliers are granted a limited license to use and reproduce applicable portions of the Shop Drawings and other submittals appropriate to and for use in the execution of their Work under the Contract Documents.

PART 5 – PERFORMANCE

5.01 CONTRACTOR CONTROL AND SUPERVISION

A. <u>Contractor responsible for Means and Methods of construction:</u> Contractor shall supervise and direct the Work, using its best skill and attention, and shall perform the Work in a skillful manner. Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences, and procedures and for coordinating all portions of the Work, unless the

Contract Documents give other specific instructions concerning these matters. Contractor shall disclose its means and methods of construction when requested by Owner.

- B. <u>Competent Superintendent required:</u> Performance of the Work shall be directly supervised by a competent superintendent who has authority to act for Contractor. The superintendent must be satisfactory to the Owner and shall not be changed without the prior written consent of Owner. Owner may require Contractor to remove the superintendent from the Work or Project site, if Owner reasonably deems the superintendent incompetent, careless, or otherwise objectionable, provided Owner has first notified Contractor in writing and allowed a reasonable period for transition.
- C. <u>Contractor responsible for acts and omissions of self and agents</u>: Contractor shall be responsible to Owner for acts and omissions of Contractor, Subcontractors, and their employees and agents.
- D. <u>Contractor to employ competent and disciplined workforce:</u> Contractor shall enforce strict discipline and good order among all of the Contractor's employees and other persons performing the Work. Contractor shall not permit employment of persons not skilled in tasks assigned to them. Contractor's employees shall at all times conduct business in a manner which assures fair, equal, and nondiscriminatory treatment of all persons. Owner may, by written notice, request Contractor to remove from the Work or Project site any employee Owner reasonably deems incompetent, careless, or otherwise objectionable.
- E. <u>Contractor to keep project documents on site:</u> Contractor shall keep on the Project site a copy of the Drawings, Specifications, addenda, reviewed Shop Drawings, and permits and permit drawings.
- F. <u>Contractor to comply with ethical standards:</u> Contractor shall ensure that its owner(s) and employees, and those of its Subcontractors, comply with the Ethics in Public Service Act RCW 42.52, which, among other things, prohibits state employees from having an economic interest in any public works contract that was made by, or supervised by, that employee. Contractor shall remove, at its sole cost and expense, any of its, or its Subcontractors' employees, if they are in violation of this act.

5.02 PERMITS, FEES, AND NOTICES

- A. <u>Contractor to obtain and pay for permits</u>: Unless otherwise provided in the Contract Documents, Contractor shall pay for and obtain all permits, licenses, and inspections necessary for proper execution and completion of the Work. Prior to Final Acceptance, the approved, signed permits shall be delivered to Owner.
- B. <u>Allowances for permit fees:</u> If allowances for permits or utility fees are called for in the Contract Documents and set forth in Contractor's bid, and the actual costs of those permits or fees differ from the allowances in the Contract Documents, the difference shall be adjusted by Change Order.
- C. <u>Contractor to comply with all applicable laws:</u> Contractor shall comply with and give notices required by all federal, state, and local laws, ordinances, rules, regulations, and lawful orders of public authorities applicable to performance of the Work.

5.03 PATENTS AND ROYALTIES

<u>Payment, indemnification, and notice</u>: Contractor is responsible for, and shall pay, all royalties and license fees. Contractor shall defend, indemnify, and hold Owner harmless from any costs, expenses, and liabilities arising out of the infringement by Contractor of any patent, copyright, or other intellectual property right used in the Work; however, provided that Contractor gives prompt notice, Contractor shall not be responsible for such defense or indemnity when a particular design, process, or product of a

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particular manufacturer or manufacturers is required by the Contract Documents. If Contractor has reason to believe that use of the required design, process, or product constitutes an infringement of a patent or copyright, it shall promptly notify Owner of such potential infringement.

5.04 PREVAILING WAGES

- A. <u>Contractor to pay Prevailing Wages:</u> Contractor shall pay the prevailing rate of wages to all workers, laborers, or mechanics employed in the performance of any part of the Work in accordance with RCW 39.12 and the rules and regulations of the Department of Labor and Industries. The schedule of prevailing wage rates for the locality or localities of the Work, is determined by the Industrial Statistician of the Department of Labor and Industries. It is the Contractor's responsibility to verify the applicable prevailing wage rate.
- B. <u>Statement of Intent to Pay Prevailing Wages:</u> Before payment is made by the Owner to the Contractor for any work performed by the Contractor and subcontractors whose work is included in the application for payment, the Contractor shall submit, or shall have previously submitted to the Owner for the Project, a Statement of Intent to Pay Prevailing Wages, approved by the Department of Labor and Industries, certifying the rate of hourly wage paid and to be paid each classification of laborers, workers, or mechanics employed upon the Work by Contractor and Subcontractors. Such rates of hourly wage shall not be less than the prevailing wage rate.
- C. <u>Affidavit of Wages Paid:</u> Prior to release of retainage, the Contractor shall submit to the Owner an Affidavit of Wages Paid, approved by the Department of Labor and Industries, for the Contractor and every subcontractor, of any tier, that performed work on the Project.
- D. <u>Disputes:</u> Disputes regarding prevailing wage rates shall be referred for arbitration to the Director of the Department of Labor and Industries. The arbitration decision shall be final and conclusive and binding on all parties involved in the dispute as provided for by RCW 39.12.060.
- E. <u>Statement with pay application; Post Statements of Intent at job site:</u> Each Application for Payment submitted by Contractor shall state that prevailing wages have been paid in accordance with the prefiled statement(s) of intent, as approved. Copies of the approved intent statement(s) shall be posted on the job site with the address and telephone number of the Industrial Statistician of the Department of Labor and Industries where a complaint or inquiry concerning prevailing wages may be made.
- F. <u>Contractor to pay for Statements of Intent and Affidavits:</u> In compliance with chapter 296-127 WAC, Contractor shall pay to the Department of Labor and Industries the currently established fee(s) for each statement of intent and/or affidavit of wages paid submitted to the Department of Labor and Industries for certification.
- G. <u>Certified Payrolls:</u> Consistent with WAC 296-127-320, the Contractor and any subcontractor shall submit a certified copy of payroll records if requested.

5.05 HOURS OF LABOR

A. <u>Overtime:</u> Contractor shall comply with all applicable provisions of RCW 49.28 and they are incorporated herein by reference. Pursuant to that statute, no laborer, worker, or mechanic employed by Contractor, any Subcontractor, or any other person performing or contracting to do the whole or any part of the Work, shall be permitted or required to work more than eight hours in any one calendar day, provided, that in cases of extraordinary emergency, such as danger to life or property, the hours of work may be extended, but in such cases the rate of pay for time employed in excess of eight hours of each calendar day shall be not less than one and one-half times the rate allowed for this same amount of time during eight hours of service.

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B. <u>4-10 Agreements:</u> Notwithstanding the preceding paragraph, RCW 49.28 permits a contractor or subcontractor in any public works contract subject to those provisions, to enter into an agreement with its employees in which the employees work up to ten hours in a calendar day. No such agreement may provide that the employees work ten-hour days for more than four calendar days a week. Any such agreement is subject to approval by the employees. The overtime provisions of RCW 49.28 shall not apply to the hours, up to forty hours per week, worked pursuant to any such agreement.

5.06 NONDISCRIMINATION

A. <u>Discrimination prohibited by applicable laws</u>: Discrimination in all phases of employment is prohibited by, among other laws and regulations, Title VII of the Civil Rights Act of 1964, the Vietnam Era Veterans Readjustment Act of 1974, Sections 503 and 504 of the Vocational Rehabilitation Act of 1973, the Equal Employment Act of 1972, the Age Discrimination Act of 1967, the Americans with Disabilities Act of 1990, the Civil Rights Act of 1991, Presidential Executive Order 11246, Executive Order 11375, the Washington State Law Against Discrimination, RCW 49.60, and Gubernatorial Executive Order 85-09. These laws and regulations establish minimum requirements for affirmative action and fair employment practices which Contractor must meet.

B. <u>During performance of the Work:</u>

- 1. <u>Protected Classes:</u> Contractor shall not discriminate against any employee or applicant for employment because of race, creed, color, national origin, sex, age, marital status, or the presence of any physical, sensory, or mental disability, Vietnam era veteran status, or disabled veteran status, nor commit any other unfair practices as defined in RCW 49.60.
- 2. <u>Advertisements to state nondiscrimination:</u> Contractor shall, in all solicitations or advertisements for employees placed by or for it, state that all qualified applicants will be considered for employment, without regard to race, creed, color, national origin, sex, age, marital status, or the presence of any physical, sensory, or mental disability.
- 3. <u>Contractor to notify unions and others of nondiscrimination</u>: Contractor shall send to each labor union, employment agency, or representative of workers with which it has a collective bargaining agreement or other contract or understanding, a notice advising the labor union, employment agency, or workers' representative of Contractor's obligations according to the Contract Documents and RCW 49.60.
- 4. <u>Owner and State access to Contractor records:</u> Contractor shall permit access to its books, records, and accounts, and to its premises by Owner, and by the Washington State Human Rights Commission, for the purpose of investigation to ascertain compliance with this section of the Contract Documents.
- 5. <u>Pass through provisions to Subcontractors:</u> Contractor shall include the provisions of this section in every Subcontract.

5.07 SAFETY PRECAUTIONS

- A. <u>Contractor responsible for safety:</u> Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Work.
- B. <u>Contractor safety responsibilities:</u> In carrying out its responsibilities according to the Contract Documents, Contractor shall protect the lives and health of employees performing the Work and other persons who may be affected by the Work; prevent damage to materials, supplies, and equipment whether on site or stored off-site; and prevent damage to other property at the site or adjacent thereto. Contractor shall comply with all applicable laws, ordinances, rules, regulations,

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and orders of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury, or loss; shall erect and maintain all necessary safeguards for such safety and protection; and shall notify owners of adjacent property and utilities when prosecution of the Work may affect them.

- C. <u>Contractor to maintain safety records:</u> Contractor shall maintain an accurate record of exposure data on all incidents relating to the Work resulting in death, traumatic injury, occupational disease, or damage to property, materials, supplies, or equipment. Contractor shall immediately report any such incident to Owner. Owner shall, at all times, have a right of access to all records of exposure.
- D. <u>Contractor to provide HazMat training:</u> Contractor shall provide all persons working on the Project site with information and training on hazardous chemicals in their work at the time of their initial assignment, and whenever a new hazard is introduced into their work area.
 - 1. <u>Information</u>. At a minimum, Contractor shall inform persons working on the Project site of:
 - a. <u>WAC:</u> The requirements of chapter 296-62 WAC, General Occupational Health Standards;
 - b. <u>Presence of hazardous chemicals:</u> Any operations in their work area where hazardous chemicals are present; and
 - c. <u>Hazard communications program</u>: The location and availability of written hazard communication programs, including the required list(s) of hazardous chemicals and material safety data sheets required by chapter 296-62 WAC.
 - 2. <u>Training</u>. At a minimum, Contractor shall provide training for persons working on the Project site which includes:
 - a. <u>Detecting hazardous chemicals:</u> Methods and observations that may be used to detect the presence or release of a hazardous chemical in the work area (such as monitoring conducted by the employer, continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released, etc.);
 - b. <u>Hazards of chemicals:</u> The physical and health hazards of the chemicals in the work area;
 - c. <u>Protection from hazards:</u> The measures such persons can take to protect themselves from these hazards, including specific procedures Contractor, or its Subcontractors, or others have implemented to protect those on the Project site from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and personal protective equipment to be used; and
 - d. <u>Hazard communications program</u>: The details of the hazard communications program developed by Contractor, or its Subcontractors, including an explanation of the labeling system and the material safety data sheet, and how employees can obtain and use the appropriate hazard information.
- E. <u>Hazardous, toxic or harmful substances:</u> Contractor's responsibility for hazardous, toxic, or harmful substances shall include the following duties:
 - 1. <u>Illegal use of dangerous substances:</u> Contractor shall not keep, use, dispose, transport, generate, or sell on or about the Project site, any substances now or hereafter designated as, or which are subject to regulation as, hazardous, toxic, dangerous, or

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harmful by any federal, state or local law, regulation, statute or ordinance (hereinafter collectively referred to as "hazardous substances"), in violation of any such law, regulation, statute, or ordinance, but in no case shall any such hazardous substance be stored more than 90 Days on the Project site.

- 2. <u>Contractor notifications of spills, failures, inspections, and fines:</u> Contractor shall promptly notify Owner of all spills or releases of any hazardous substances which are otherwise required to be reported to any regulatory agency and pay the cost of cleanup. Contractor shall promptly notify Owner of all failures to comply with any federal, state, or local law, regulation, or ordinance; all inspections of the Project site by any regulatory entity concerning the same; all regulatory orders or fines; and all responses or interim cleanup actions taken by or proposed to be taken by any government entity or private party on the Project site.
- F. <u>Public safety and traffic:</u> All Work shall be performed with due regard for the safety of the public. Contractor shall perform the Work so as to cause a minimum of interruption of vehicular traffic or inconvenience to pedestrians. All arrangements to care for such traffic shall be Contractor's responsibilities. All expenses involved in the maintenance of traffic by way of detours shall be borne by Contractor.
- G. <u>Contractor to act in an emergency:</u> In an emergency affecting the safety of life or the Work or of adjoining property, Contractor is permitted to act, at its discretion, to prevent such threatened loss or injury, and Contractor shall so act if so authorized or instructed.
- H. <u>No duty of safety by Owner or A/E</u>: Nothing provided in this section shall be construed as imposing any duty upon Owner or A/E with regard to, or as constituting any express or implied assumption of control or responsibility over, Project site safety, or over any other safety conditions relating to employees or agents of Contractor or any of its Subcontractors, or the public.

5.08 OPERATIONS, MATERIAL HANDLING, AND STORAGE AREAS

- A. <u>Limited storage areas:</u> Contractor shall confine all operations, including storage of materials, to Owner-approved areas.
- B. <u>Temporary buildings and utilities at Contractor expense</u>: Temporary buildings (e.g., storage sheds, shops, offices) and utilities may be provided by Contractor only with the consent of Owner and without expense to Owner. The temporary buildings and utilities shall be removed by Contractor at its expense upon completion of the Work.
- C. <u>Roads and vehicle loads</u>: Contractor shall use only established roadways or temporary roadways authorized by Owner. When materials are transported in prosecuting the Work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by federal, state, or local law or regulation.
- D. <u>Ownership and reporting by Contractor of demolished materials:</u> Ownership and control of all materials or facility components to be demolished or removed from the Project site by Contractor shall immediately vest in Contractor upon severance of the component from the facility or severance of the material from the Project site. Contractor shall be responsible for compliance with all laws governing the storage and ultimate disposal. Contractor shall provide Owner with a copy of all manifests and receipts evidencing proper disposal when required by Owner or applicable law.
- E. <u>Contractor responsible for care of materials and equipment on-site:</u> Contractor shall be responsible for the proper care and protection of its materials and equipment delivered to the Project site. Materials and equipment may be stored on the premises subject to approval of

Owner. When Contractor uses any portion of the Project site as a shop, Contractor shall be responsible for any repairs, patching, or cleaning arising from such use.

F. <u>Contractor responsible for loss of materials and equipment:</u> Contractor shall protect and be responsible for any damage or loss to the Work, or to the materials or equipment until the date of Substantial Completion, and shall repair or replace without cost to Owner any damage or loss that may occur, except damages or loss caused by the acts or omissions of Owner. Contractor shall also protect and be responsible for any damage or loss to the Work, or to the materials or equipment, after the date of Substantial Completion, and shall repair or replace without cost to Owner any such damage or loss that might occur, to the extent such damages or loss are caused by the acts or omissions of Contractor, or any Subcontractor.

5.09 PRIOR NOTICE OF EXCAVATION

A. <u>Excavation defined; Use of locator services:</u> "Excavation" means an operation in which earth, rock, or other material on or below the ground is moved or otherwise displaced by any means, except the tilling of soil less than 12 inches in depth for agricultural purposes, or road ditch maintenance that does not change the original road grade or ditch flow line. Before commencing any excavation, Contractor shall provide notice of the scheduled commencement of excavation to all owners of underground facilities or utilities, through locator services.

5.10 UNFORESEEN PHYSICAL CONDITIONS

- A. <u>Notice requirement for concealed or unknown conditions:</u> If Contractor encounters conditions at the site which are subsurface or otherwise concealed physical conditions which differ materially from those indicated in the Contract Documents, or unknown physical conditions of an unusual nature which differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, then Contractor shall give written notice to Owner promptly and in no event later than 7 Days after the first observance of the conditions. Conditions shall not be disturbed prior to such notice.
- B. <u>Adjustment in Contract Time and Contract Sum:</u> If such conditions differ materially and cause a change in Contractor's cost of, or time required for, performance of any part of the Work, the Contractor may be entitled to an equitable adjustment in the Contract Time or Contract Sum, or both, provided it makes a request therefore as provided in Part 7.

5.11 <u>PROTECTION OF EXISTING STRUCTURES, EQUIPMENT, VEGETATION, UTILITIES AND</u> <u>IMPROVEMENTS</u>

- A. <u>Contractor to protect and repair property:</u> Contractor shall protect from damage all existing structures, equipment, improvements, utilities, and vegetation: at or near the Project site; and on adjacent property of a third party, the locations of which are made known to or should be known by Contractor. Contractor shall repair any damage, including that to the property of a third party, resulting from failure to comply with the requirements of the Contract Documents or failure to exercise reasonable care in performing the Work. If Contractor fails or refuses to repair the damage promptly, Owner may have the necessary work performed and charge the cost to Contractor.
- B. <u>Tree and vegetation protection</u>: Contractor shall only remove trees when specifically authorized to do so, and shall protect vegetation that will remain in place.

5.12 LAYOUT OF WORK

A. <u>Advanced planning of the Work:</u> Contractor shall plan and lay out the Work in advance of operations so as to coordinate all work without delay or revision.

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B. <u>Layout responsibilities:</u> Contractor shall lay out the Work from Owner-established baselines and bench marks indicated on the Drawings, and shall be responsible for all field measurements in connection with the layout. Contractor shall furnish, at its own expense, all stakes, templates, platforms, equipment, tools, materials, and labor required to lay out any part of the Work. Contractor shall be responsible for executing the Work to the lines and grades that may be established. Contractor shall be responsible for maintaining or restoring all stakes and other marks established.

5.13 MATERIAL AND EQUIPMENT

- A. <u>Contractor to provide new and equivalent equipment and materials</u>: All equipment, material, and articles incorporated into the Work shall be new and of the most suitable grade for the purpose intended, unless otherwise specifically provided in the Contract Documents. References in the Specifications to equipment, material, articles, or patented processes by trade name, make, or catalog number, shall be regarded as establishing a standard quality and shall not be construed as limiting competition. Contractor may, at its option, use any equipment, material, article, or process that, in the judgment of A/E, is equal to that named in the specifications, unless otherwise specifically provided in the Contract Documents.
- B. <u>Contractor responsible for fitting parts together:</u> Contractor shall do all cutting, fitting, or patching that may be required to make its several parts fit together properly, or receive or be received by work of others set forth in, or reasonably implied by, the Contract Documents. Contractor shall not endanger any work by cutting, excavating, or otherwise altering the Work and shall not cut or alter the work of any other contractor unless approved in advance by Owner.
- C. <u>Owner may reject defective Work:</u> Should any of the Work be found defective, or in any way not in accordance with the Contract Documents, this work, in whatever stage of completion, may be rejected by Owner.

5.14 AVAILABILITY AND USE OF UTILITY SERVICES

- A. <u>Owner to provide and charge for utilities:</u> Owner shall make all reasonable utilities available to Contractor from existing outlets and supplies, as specified in the Contract Documents. Unless otherwise provided in the Contract Documents, the utility service consumed shall be charged to or paid for by Contractor at prevailing rates charged to Owner or, where the utility is produced by Owner, at reasonable rates determined by Owner. Contractor will carefully conserve any utilities furnished.
- B. <u>Contractor to install temporary connections and meters:</u> Contractor shall, at its expense and in a skillful manner satisfactory to Owner, install and maintain all necessary temporary connections and distribution lines, together with appropriate protective devices, and all meters required to measure the amount of each utility used for the purpose of determining charges. Prior to the date of Final Acceptance, Contractor shall remove all temporary connections, distribution lines, meters, and associated equipment and materials.

5.15 TESTS AND INSPECTION

A. <u>Contractor to provide for all testing and inspection of Work:</u> Contractor shall maintain an adequate testing and inspection program and perform such tests and inspections as are necessary or required to ensure that the Work conforms to the requirements of the Contract Documents. Contractor shall be responsible for inspection and quality surveillance of all its Work and all Work performed by any Subcontractor. Unless otherwise provided, Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. Contractor shall give Owner timely notice of when and

where tests and inspections are to be made. Contractor shall maintain complete inspection records and make them available to Owner.

- B. <u>Owner may conduct tests and inspections:</u> Owner may, at any reasonable time, conduct such inspections and tests as it deems necessary to ensure that the Work is in accordance with the Contract Documents. Owner shall promptly notify Contractor if an inspection or test reveals that the Work is not in accordance with the Contract Documents. Unless the subject items are expressly accepted by Owner, such Owner inspection and tests are for the sole benefit of Owner and do not:
 - 1. Constitute or imply acceptance;
 - 2. Relieve Contractor of responsibility for providing adequate quality control measures;
 - 3. Relieve Contractor of responsibility for risk of loss or damage to the Work, materials, or equipment;
 - 4. Relieve Contractor of its responsibility to comply with the requirements of the Contract Documents; or
 - 5. Impair Owner's right to reject defective or nonconforming items, or to avail itself of any other remedy to which it may be entitled.
- C. <u>Inspections or inspectors do not modify Contract Documents:</u> Neither observations by an inspector retained by Owner, the presence or absence of such inspector on the site, nor inspections, tests, or approvals by others, shall relieve Contractor from any requirement of the Contract Documents, nor is any such inspector authorized to change any term or condition of the Contract Documents.
- D. <u>Contractor responsibilities on inspections:</u> Contractor shall promptly furnish, without additional charge, all facilities, labor, material and equipment reasonably needed for performing such safe and convenient inspections and tests as may be required by Owner. Owner may charge Contractor any additional cost of inspection or testing when Work is not ready at the time specified by Contractor for inspection or testing, or when prior rejection makes reinspection or retest necessary. Owner shall perform its inspections and tests in a manner that will cause no undue delay in the Work.

5.16 CORRECTION OF NONCONFORMING WORK

- A. <u>Work covered by Contractor without inspection</u>: If a portion of the Work is covered contrary to the requirements in the Contract Documents, it must, if required in writing by Owner, be uncovered for Owner's observation and be replaced at the Contractor's expense and without change in the Contract Time.
- B. <u>Payment provisions for uncovering covered Work:</u> If, at any time prior to Final Completion, Owner desires to examine the Work, or any portion of it, which has been covered, Owner may request to see such Work and it shall be uncovered by Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an adjustment in the Contract Sum for the costs of uncovering and replacement, and, if completion of the Work is thereby delayed, an adjustment in the Contract Time, provided it makes such a request as provided in Part 7. If such Work is not in accordance with the Contract Documents, the Contractor shall pay the costs of examination and reconstruction.
- C. <u>Contractor to correct and pay for non-conforming Work:</u> Contractor shall promptly correct Work found by Owner not to conform to the requirements of the Contract Documents, whether observed before or after Substantial Completion and whether or not fabricated, installed, or

completed. Contractor shall bear all costs of correcting such nonconforming Work, including additional testing and inspections.

- D. <u>Contractor's compliance with warranty provisions:</u> If, within one year after the date of Substantial Completion of the Work or designated portion thereof, or within one year after the date for commencement of any system warranties established under Section 6.08, or within the terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, Contractor shall correct it promptly after receipt of written notice from Owner to do so. Owner shall give such notice promptly after discovery of the condition. This period of one year shall be extended, with respect to portions of Work first performed after Substantial Completion, by the period of time between Substantial Completion and the actual performance of the Work. Contractor's duty to correct with respect to Work repaired or replaced shall run for one year from the date of repair or replacement. Obligations under this paragraph shall survive Final Acceptance.
- E. <u>Contractor to remove non-conforming Work:</u> Contractor shall remove from the Project site portions of the Work which are not in accordance with the requirements of the Contract Documents and are neither corrected by Contractor nor accepted by Owner.
- F. <u>Owner may charge Contractor for non-conforming Work:</u> If Contractor fails to correct nonconforming Work within a reasonable time after written notice to do so, Owner may replace, correct, or remove the nonconforming Work and charge the cost thereof to the Contractor.
- G. <u>Contractor to pay for damaged Work during correction</u>: Contractor shall bear the cost of correcting destroyed or damaged Work, whether completed or partially completed, caused by Contractor's correction or removal of Work which is not in accordance with the requirements of the Contract Documents.
- H. <u>No Period of limitation on other requirements:</u> Nothing contained in this section shall be construed to establish a period of limitation with respect to other obligations which Contractor might have according to the Contract Documents. Establishment of the time period of one year as described in Section 5.16D relates only to the specific obligation of Contractor to correct the Work, and has no relationship to the time within which the Contractor's obligation to comply with the Contract Documents may be sought to be enforced, including the time within which such proceedings may be commenced.
- I. <u>Owner may accept non-conforming Work and charge Contractor</u>: If Owner prefers to accept Work which is not in accordance with the requirements of the Contract Documents, Owner may do so instead of requiring its removal and correction, in which case the Contract Sum may be reduced as appropriate and equitable.

5.17 <u>CLEAN UP</u>

<u>Contractor to keep site clean and leave it clean:</u> Contractor shall at all times keep the Project site, including hauling routes, infrastructures, utilities, and storage areas, free from accumulations of waste materials. Before completing the Work, Contractor shall remove from the premises its rubbish, tools, scaffolding, equipment, and materials. Upon completing the Work, Contractor shall leave the Project site in a clean, neat, and orderly condition satisfactory to Owner. If Contractor fails to clean up as provided herein, and after reasonable notice from Owner, Owner may do so and the cost thereof shall be charged to Contractor.

5.18 ACCESS TO WORK

<u>Owner and A/E access to Work site:</u> Contractor shall provide Owner and A/E access to the Work in progress wherever located.

5.19 OTHER CONTRACTS

<u>Owner may award other contracts; Contractor to cooperate:</u> Owner may undertake or award other contracts for additional work at or near the Project site. Contractor shall reasonably cooperate with the other contractors and with Owner's employees and shall carefully adapt scheduling and perform the Work in accordance with these Contract Documents to reasonably accommodate the other work.

5.20 SUBCONTRACTORS AND SUPPLIERS

- A. <u>Subcontractor Responsibility:</u> The Contractor shall include the language of this paragraph in each of its first tier subcontracts, and shall require each of its subcontractors to include the same language of this section in each of their subcontracts, adjusting only as necessary the terms used for the contracting parties. Upon request of the Owner, the Contractor shall promptly provide documentation to the Owner demonstrating that the subcontractor meets the subcontractor responsibility criteria below. The requirements of this paragraph apply to all subcontractors regardless of tier. At the time of subcontract execution, the Contractor shall verify that each of its first tier subcontractors meets the following bidder responsibility criteria:
 - 1. Have a current certificate of registration as a contractor in compliance with chapter 18.27 RCW, which must have been in effect at the time of subcontract bid submittal;
 - 2. Have a current Washington Unified Business Identifier (UBI) number;
 - 3. If applicable, have:
 - a. Industrial Insurance (workers' compensation) coverage for the subcontractor's employees working in Washington, as required in Title 51 RCW;
 - b. A Washington Employment Security Department number, as required in Title 50 RCW;
 - c. A Washington Department of Revenue state excise tax registration number, as required in Title 82 RCW;
 - d. An electrical contractor license, if required by Chapter 19.28 RCW;
 - e. An elevator contractor license, if required by Chapter 70.87 RCW.
 - 4. Not be disqualified from bidding on any public works contract under RCW 39.06.010 or 39.12.065 (3).
 - 5. On a project subject to the apprenticeship utilization requirements in RCW 39.04.320, not have been found out of compliance by the Washington state apprenticeship and training council for working apprentices out of ratio, without appropriate supervision, or outside their approved work processes as outlined in their standards of apprenticeship under chapter 49.04 RCW for the one-year period immediately preceding the date of the Owner's first advertisement of the project.
- B. <u>Provide names of Subcontractors and use qualified firms:</u> Before submitting the first Application for Payment, Contractor shall furnish in writing to Owner the names, addresses, and telephone numbers of all Subcontractors, as well as suppliers providing materials in excess of \$2,500. Contractor shall utilize Subcontractors and suppliers which are experienced and qualified, and meet the requirements of the Contract Documents, if any. Contractor shall not utilize any Subcontractor or supplier to whom the Owner has a reasonable objection, and shall obtain Owner's written consent before making any substitutions or additions.

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- C. <u>Subcontracts in writing and pass through provision</u>: All Subcontracts must be in writing. By appropriate written agreement, Contractor shall require each Subcontractor, so far as applicable to the Work to be performed by the Subcontractor, to be bound to Contractor by terms of the Contract Documents, and to assume toward Contractor all the obligations and responsibilities which Contractor assumes toward Owner in accordance with the Contract Documents. Each Subcontract shall preserve and protect the rights of Owner in accordance with the Contract Documents. Each Subcontract shall preserve and protect the rights of Owner in accordance with the Contract pocuments with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights. Where appropriate, Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. However, nothing in this paragraph shall be construed to alter the contractual relations between Contractor and its Subcontractors with respect to insurance or bonds.
- D. <u>Coordination of Subcontractors; Contractor responsible for Work:</u> Contractor shall schedule, supervise, and coordinate the operations of all Subcontractors. No Subcontracting of any of the Work shall relieve Contractor from its responsibility for the performance of the Work in accordance with the Contract Documents or any other obligations of the Contract Documents.
- E. <u>Automatic assignment of subcontracts:</u> Each subcontract agreement for a portion of the Work is hereby assigned by Contractor to Owner provided that:
 - 1. <u>Effective only after termination and Owner approval:</u> The assignment is effective only after termination by Owner for cause pursuant to Section 9.01 and only for those Subcontracts which Owner accepts by notifying the Subcontractor in writing; and
 - 2. <u>Owner assumes Contractor's responsibilities:</u> After the assignment is effective, Owner will assume all future duties and obligations toward the Subcontractor which Contractor assumed in the Subcontract.
 - 3. <u>Impact of bond:</u> The assignment is subject to the prior rights of the surety, if any, obligated under any bond provided in accordance with the Contract Documents.

5.21 WARRANTY OF CONSTRUCTION

- A. <u>Contractor warranty of Work:</u> In addition to any special warranties provided elsewhere in the Contract Documents, Contractor warrants that all Work conforms to the requirements of the Contract Documents and is free of any defect in equipment, material, or design furnished, or workmanship performed by Contractor.
- B. <u>Contractor responsibilities:</u> With respect to all warranties, express or implied, for Work performed or materials furnished according to the Contract Documents, Contractor shall:
 - 1. <u>Obtain warranties:</u> Obtain all warranties that would be given in normal commercial practice;
 - 2. <u>Warranties for benefit of Owner:</u> Require all warranties to be executed, in writing, for the benefit of Owner;
 - 3. <u>Enforcement of warranties:</u> Enforce all warranties for the benefit of Owner, if directed by Owner; and
 - 4. <u>Contractor responsibility for subcontractor warranties</u>: Be responsible to enforce any subcontractor's, manufacturer's, or supplier's warranties should they extend beyond the period specified in the Contract Documents.
- C. <u>Warranties beyond Final Acceptance:</u> The obligations under this section shall survive Final Acceptance.

5.22 INDEMNIFICATION

- A. <u>Contractor to indemnify Owner:</u> Contractor shall defend, indemnify, and hold Owner and A/E harmless from and against all claims, demands, losses, damages, or costs, including but not limited to damages arising out of bodily injury or death to persons and damage to property, caused by or resulting from:
 - 1. <u>Sole negligence of Contractor:</u> The sole negligence of Contractor or any of its Subcontractors;
 - 2. <u>Concurrent negligence:</u> The concurrent negligence of Contractor, or any Subcontractor, but only to the extent of the negligence of Contractor or such Subcontractor; and
 - 3. <u>Patent infringement:</u> The use of any design, process, or equipment which constitutes an infringement of any United States patent presently issued, or violates any other proprietary interest, including copyright, trademark, and trade secret.
- B. <u>Employee action and RCW Title 51:</u> In any action against Owner and any other entity indemnified in accordance with this section, by any employee of Contractor, its Subcontractors, Sub-subcontractors, agents, or anyone directly or indirectly employed by any of them, the indemnification obligation of this section shall not be limited by a limit on the amount or type of damages, compensation, or benefits payable by or for Contractor or any Subcontractor under RCW Title 51, the Industrial Insurance Act, or any other employee benefit acts. In addition, Contractor waives immunity as to Owner and A/E only, in accordance with RCW Title 51.

PART 6 – PAYMENTS AND COMPLETION

6.01 CONTRACT SUM

<u>Owner shall pay Contract Sum:</u> Owner shall pay Contractor the Contract Sum plus state sales tax for performance of the Work, in accordance with the Contract Documents.

6.02 SCHEDULE OF VALUES

<u>Contractor to submit Schedule of Values:</u> Before submitting its first Application for Payment, Contractor shall submit to Owner for approval a breakdown allocating the total Contract Sum to each principal category of work, in such detail as requested by Owner ("Schedule of Values"). The approved Schedule of Values shall include appropriate amounts for demobilization, record drawings, O&M manuals, and any other requirements for Project closeout, and shall be used by Owner as the basis for progress payments. Payment for Work shall be made only for and in accordance with those items included in the Schedule of Values.

6.03 APPLICATION FOR PAYMENT

- A. <u>Monthly Application for Payment with substantiation</u>: At monthly intervals, unless determined otherwise by Owner, Contractor shall submit to Owner an itemized Application for Payment for Work completed in accordance with the Contract Documents and the approved Schedule of Values. Each application shall be supported by such substantiating data as Owner may require.
- B. <u>Contractor certifies Subcontractors paid</u>: By submitting an Application for Payment, Contractor is certifying that all Subcontractors have been paid, less earned retainage in accordance with RCW 60.28.011, as their interests appeared in the last preceding certificate of payment. By submitting an Application for Payment, Contractor is recertifying that the representations set forth in Section 1.03, are true and correct, to the best of Contractor's knowledge, as of the date of the Application for Payment.
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- C. <u>Reconciliation of Work with Progress Schedule:</u> At the time it submits an Application for Payment, Contractor shall analyze and reconcile, to the satisfaction of Owner, the actual progress of the Work with the Progress Schedule.
- D. <u>Payment for material delivered to site or stored off-site:</u> If authorized by Owner, the Application for Payment may include request for payment for material delivered to the Project site and suitably stored, or for completed preparatory work. Payment may similarly be requested for material stored off the Project site, provided Contractor complies with or furnishes satisfactory evidence of the following:
 - 1. <u>Suitable facility or location:</u> The material will be placed in a facility or location that is structurally sound, dry, lighted and suitable for the materials to be stored;
 - <u>Facility or location within 10 miles of Project:</u> The facility or location is located within a 10-mile radius of the Project. Other locations may be utilized, if approved in writing, by Owner;
 - Facility or location exclusive to Project's materials: Only materials for the Project are stored within the facility or location (or a secure portion of a facility or location set aside for the Project);
 - 4. <u>Insurance provided on materials in facility or location:</u> Contractor furnishes Owner a certificate of insurance extending Contractor's insurance coverage for damage, fire, and theft to cover the full value of all materials stored, or in transit;
 - <u>Facility or location locked and secure:</u> The facility or location (or secure portion thereof) is continuously under lock and key, and only Contractor's authorized personnel shall have access;
 - 6. <u>Owner right of access to facility or location:</u> Owner shall at all times have the right of access in company of Contractor;
 - 7. <u>Contractor assumes total responsibility for stored materials:</u> Contractor and its surety assume total responsibility for the stored materials; and
 - 8. <u>Contractor provides documentation and Notice when materials moved to site:</u> Contractor furnishes to Owner certified lists of materials stored, bills of lading, invoices, and other information as may be required, and shall also furnish Notice to Owner when materials are moved from storage to the Project site.

6.04 PROGRESS PAYMENTS

- A. <u>Owner to pay within 30 Days</u>: Owner shall make progress payments, in such amounts as Owner determines are properly due, within 30 Days after receipt of a properly executed Application for Payment. Owner shall notify Contractor in accordance with chapter 39.76 RCW if the Application for Payment does not comply with the requirements of the Contract Documents.
- B. <u>Withholding retainage; Options for retainage:</u> Owner shall retain 5% of the amount of each progress payment until 45 Days after Final Acceptance and receipt of all documents required by law or the Contract Documents, including, at Owner's request, consent of surety to release of the retainage. In accordance with chapter 60.28 RCW, Contractor may request that monies reserved be retained in a fund by Owner, deposited by Owner in a bank or savings and loan, or placed in escrow with a bank or trust company to be converted into bonds and securities to be held in escrow with interest to be paid to Contractor. Owner may permit Contractor to provide an appropriate bond in lieu of the retained funds.

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- C. <u>Title passes to Owner upon payment:</u> Title to all Work and materials covered by a progress payment shall pass to Owner at the time of such payment free and clear of all liens, claims, security interests, and encumbrances. Passage of title shall not, however, relieve Contractor from any of its duties and responsibilities for the Work or materials, or waive any rights of Owner to insist on full compliance by Contractor with the Contract Documents.
- D. <u>Interest on unpaid balances:</u> Payments due and unpaid in accordance with the Contract Documents shall bear interest as specified in chapter 39.76 RCW.

6.05 PAYMENTS WITHHELD

- A. <u>Owner's right to withhold payment:</u> Owner may withhold or, on account of subsequently discovered evidence, nullify the whole or part of any payment to such extent as may be necessary to protect Owner from loss or damage for reasons including but not limited to:
 - 1. <u>Non-compliant Work:</u> Work not in accordance with the Contract Documents;
 - 2. <u>Remaining Work to cost more than unpaid balance:</u> Reasonable evidence that the Work required by the Contract Documents cannot be completed for the unpaid balance of the Contract Sum;
 - 3. <u>Owner correction or completion Work:</u> Work by Owner to correct defective Work or complete the Work in accordance with Section 5.16;
 - 4. <u>Contractor's failure to perform:</u> Contractor's failure to perform in accordance with the Contract Documents; or
 - 5. <u>Contractor's negligent acts or omissions:</u> Cost or liability that may occur to Owner as the result of Contractor's fault or negligent acts or omissions.
- B. <u>Owner to notify Contractor of withholding for unsatisfactory performance:</u> In any case where part or all of a payment is going to be withheld for unsatisfactory performance, Owner shall notify Contractor in accordance with chapter 39.76 RCW.

6.06 RETAINAGE AND BOND CLAIM RIGHTS

<u>Chapters 39.08 RCW and 60.28 RCW incorporated by reference:</u> Chapters 39.08 RCW and 60.28 RCW, concerning the rights and responsibilities of Contractor and Owner with regard to the performance and payment bonds and retainage, are made a part of the Contract Documents by reference as though fully set forth herein.

6.07 SUBSTANTIAL COMPLETION

<u>Substantial Completion defined:</u> Substantial Completion is the stage in the progress of the Work (or portion thereof designated and approved by Owner) when the construction is sufficiently complete, in accordance with the Contract Documents, so Owner has full and unrestricted use and benefit of the facilities (or portion thereof designated and approved by Owner) for the use for which it is intended. All Work other than incidental corrective or punch list work shall be completed. Substantial Completion shall not have been achieved if all systems and parts are not functional, if utilities are not connected and operating normally, if all required occupancy permits have not been issued, or if the Work is not accessible by normal vehicular and pedestrian traffic routes. The date Substantial Completion is achieved shall be established in writing by Owner. Contractor may request an early date of Substantial Completion which must be approved by Change Order. Owner's occupancy of the Work or designated portion thereof does not necessarily indicate that Substantial Completion has been achieved.

6.08 PRIOR OCCUPANCY

- A. <u>Prior Occupancy defined; Restrictions:</u> Owner may, upon written notice thereof to Contractor, take possession of or use any completed or partially completed portion of the Work ("Prior Occupancy") at any time prior to Substantial Completion. Unless otherwise agreed in writing, Prior Occupancy shall not: be deemed an acceptance of any portion of the Work; accelerate the time for any payment to Contractor; prejudice any rights of Owner provided by any insurance, bond, guaranty, or the Contract Documents; relieve Contractor of the risk of loss or any of the obligations established by the Contract Documents; establish a date for termination or partial termination of the assessment of liquidated damages; or constitute a waiver of claims.
- B. <u>Damage; Duty to repair and warranties:</u> Notwithstanding anything in the preceding paragraph, Owner shall be responsible for loss of or damage to the Work resulting from Prior Occupancy. Contractor's one year duty to repair any system warranties shall begin on building systems activated and used by Owner as agreed in writing by Owner and Contractor.

6.09 FINAL COMPLETION, ACCEPTANCE, AND PAYMENT

- A. <u>Final Completion defined:</u> Final Completion shall be achieved when the Work is fully and finally complete in accordance with the Contract Documents. The date Final Completion is achieved shall be established by Owner in writing, but in no case shall constitute Final Acceptance which is a subsequent, separate, and distinct action.
- B. <u>Final Acceptance defined:</u> Final Acceptance shall be achieved when the Contractor has completed the requirements of the Contract Documents. The date Final Acceptance is achieved shall be established by Owner in writing. Prior to Final Acceptance, Contractor shall, in addition to all other requirements in the Contract Documents, submit to Owner a written notice of any outstanding disputes or claims between Contractor and any of its Subcontractors, including the amounts and other details thereof. Neither Final Acceptance, nor final payment, shall release Contractor or its sureties from any obligations of these Contract Documents or the payment and performance bonds, or constitute a waiver of any claims by Owner arising from Contractor's failure to perform the Work in accordance with the Contract Documents.
- C. <u>Final payment waives Claim rights:</u> Acceptance of final payment by Contractor, or any Subcontractor, shall constitute a waiver and release to Owner of all claims by Contractor, or any such Subcontractor, for an increase in the Contract Sum or the Contract Time, and for every act or omission of Owner relating to or arising out of the Work, except for those Claims made in accordance with the procedures, including the time limits, set forth in Part 8.

PART 7 – CHANGES

7.01 CHANGE IN THE WORK

- A. <u>Changes in Work, Contract Sum, and Contract Time by Change Order:</u> Owner may, at any time and without notice to Contractor's surety, order additions, deletions, revisions, or other changes in the Work. These changes in the Work shall be incorporated into the Contract Documents through the execution of Change Orders. If any change in the Work ordered by Owner causes an increase or decrease in the Contract Sum or the Contract Time, an equitable adjustment shall be made as provided in Section 7.02 or 7.03, respectively, and such adjustment(s) shall be incorporated into a Change Order.
- B. <u>Owner may request COP from Contractor:</u> If Owner desires to order a change in the Work, it may request a written Change Order Proposal (COP) from Contractor. Contractor shall submit a Change Order Proposal within 14 Days of the request from Owner, or within such other period as mutually agreed. Contractor's Change Order Proposal shall be full compensation for

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implementing the proposed change in the Work, including any adjustment in the Contract Sum or Contract Time, and including compensation for all delays in connection with such change in the Work and for any expense or inconvenience, disruption of schedule, or loss of efficiency or productivity occasioned by the change in the Work.

- C. <u>COP negotiations:</u> Upon receipt of the Change Order Proposal, or a request for equitable adjustment in the Contract Sum or Contract Time, or both, as provided in Sections 7.02 and 7.03, Owner may accept or reject the proposal, request further documentation, or negotiate acceptable terms with Contractor. Pending agreement on the terms of the Change Order, Owner may direct Contractor to proceed immediately with the Change Order Work. Contractor shall not proceed with any change in the Work until it has obtained Owner's approval. All Work done pursuant to any Owner-directed change in the Work shall be executed in accordance with the Contract Documents.
- D. <u>Change Order as full payment and final settlement:</u> If Owner and Contractor reach agreement on the terms of any change in the Work, including any adjustment in the Contract Sum or Contract Time, such agreement shall be incorporated in a Change Order. The Change Order shall constitute full payment and final settlement of all claims for time and for direct, indirect, and consequential costs, including costs of delays, inconvenience, disruption of schedule, or loss of efficiency or productivity, related to any Work either covered or affected by the Change Order, or related to the events giving rise to the request for equitable adjustment.
- E. <u>Failure to agree upon terms of Change Order; Final offer and Claims:</u> If Owner and Contractor are unable to reach agreement on the terms of any change in the Work, including any adjustment in the Contract Sum or Contract Time, Contractor may at any time in writing, request a final offer from Owner. Owner shall provide Contractor with its written response within 30 Days of Contractor's request. Owner may also provide Contractor with a final offer at any time. If Contractor rejects Owner's final offer, or the parties are otherwise unable to reach agreement, Contractor's only remedy shall be to file a Claim as provided in Part 8.
- F. <u>Field Authorizations:</u> The Owner may direct the Contractor to proceed with a change in the work through a written Field Authorization (also referred to as a Field Order) when the time required to price and execute a Change Order would impact the Project.

The Field Authorization shall describe and include the following:

- 1. The scope of work
- 2. An agreed upon maximum not-to-exceed amount
- 3. Any estimated change to the Contract Time
- 4. The method of final cost determination in accordance with the requirements of Part 7 of the General Conditions
- 5. The supporting cost data to be submitted in accordance with the requirements of Part 7 of the General Conditions

Upon satisfactory submittal by the Contractor and approval by the Owner of supporting cost data, a Change Order will be executed. The Owner will not make payment to the Contractor for Field Authorization work until that work has been incorporated into an executed Change Order.

7.02 CHANGE IN THE CONTRACT SUM

A. <u>General Application</u>

- 1. <u>Contract Sum changes only by Change Order:</u> The Contract Sum shall only be changed by a Change Order. Contractor shall include any request for a change in the Contract Sum in its Change Order Proposal.
- 2. <u>Owner fault or negligence as basis for change in Contract Sum:</u> If the cost of Contractor's performance is changed due to the fault or negligence of Owner, or anyone for whose acts Owner is responsible, Contractor shall be entitled to make a request for an equitable adjustment in the Contract Sum in accordance with the following procedure. No change in the Contract Sum shall be allowed to the extent: Contractor's changed cost of performance is due to the fault or negligence of Contractor, or anyone for whose acts Contractor is responsible; the change is concurrently caused by Contractor and Owner; or the change is caused by an act of Force Majeure as defined in Section 3.05.
 - (a) Notice and record keeping for equitable adjustment: A request for an equitable adjustment in the Contract Sum shall be based on written notice delivered to Owner within 7 Days of the occurrence of the event giving rise to the request. For purposes of this part, "occurrence" means when Contractor knew, or in its diligent prosecution of the Work should have known, of the event giving rise to the request. If Contractor believes it is entitled to an adjustment in the Contract Sum, Contractor shall immediately notify Owner and begin to keep and maintain complete, accurate, and specific daily records. Contractor shall give Owner access to any such records and, if requested shall promptly furnish copies of such records to Owner.
 - (b) <u>Content of notice for equitable adjustment; Failure to comply:</u> Contractor shall not be entitled to any adjustment in the Contract Sum for any occurrence of events or costs that occurred more than 7 Days before Contractor's written notice to Owner. The written notice shall set forth, at a minimum, a description of: the event giving rise to the request for an equitable adjustment in the Contract Sum; the nature of the impacts to Contractor and its Subcontractors of any tier, if any; and to the extent possible the amount of the adjustment in Contract Sum requested. Failure to properly give such written notice shall, to the extent Owner's interests are prejudiced, constitute a waiver of Contractor's right to an equitable adjustment.
 - (c) Contractor to provide supplemental information: Within 30 Days of the occurrence of the event giving rise to the request, unless Owner agrees in writing to allow an additional period of time to ascertain more accurate data, Contractor shall supplement the written notice provided in accordance with subparagraph a. above with additional supporting data. Such additional data shall include, at a minimum: the amount of compensation requested, itemized in accordance with the procedure set forth herein; specific facts, circumstances, and analysis that confirms not only that Contractor suffered the damages claimed, but that the damages claimed were actually a result of the act, event, or condition complained of and that the Contract Documents provide entitlement to an equitable adjustment to Contractor for such act, event, or condition; and documentation sufficiently detailed to permit an informed analysis of the request by Owner. When the request for compensation relates to a delay, or other change in Contract Time, Contractor shall demonstrate the impact on the critical path, in accordance with Section 7.03C. Failure to provide such additional information and documentation within the time allowed or within the format required shall, to the extent Owner's interests are prejudiced, constitute a waiver of Contractor's right to an equitable adjustment.

- (d) <u>Contractor to proceed with Work as directed:</u> Pending final resolution of any request made in accordance with this paragraph, unless otherwise agreed in writing, Contractor shall proceed diligently with performance of the Work.
- (e) <u>Contractor to combine requests for same event together</u>: Any requests by Contractor for an equitable adjustment in the Contract Sum and in the Contract Time that arise out of the same event(s) shall be submitted together.
- 3. <u>Methods for calculating Change Order amount:</u> The value of any Work covered by a Change Order, or of any request for an equitable adjustment in the Contract Sum, shall be determined by one of the following methods:
 - a. <u>Fixed Price</u>: On the basis of a fixed price as determined in paragraph 7.02B.
 - b. <u>Unit Prices:</u> By application of unit prices to the quantities of the items involved as determined in paragraph 7.02C.
 - c. <u>Time and Materials</u>: On the basis of time and material as determined in paragraph 7.02D.
- 4. <u>Fixed price method is default; Owner may direct otherwise:</u> When Owner has requested Contractor to submit a Change Order Proposal, Owner may direct Contractor as to which method in subparagraph 3 above to use when submitting its proposal. Otherwise, Contractor shall determine the value of the Work, or of a request for an equitable adjustment, on the basis of the fixed price method.

B. <u>Change Order Pricing – Fixed Price</u>

<u>Procedures:</u> When the fixed price method is used to determine the value of any Work covered by a Change Order, or of a request for an equitable adjustment in the Contract Sum, the following procedures shall apply:

- 1. <u>Breakdown and itemization of details on COP</u>: Contractor's Change Order Proposal, or request for adjustment in the Contract Sum, shall be accompanied by a complete itemization of the costs, including labor, material, subcontractor costs, and overhead and profit. The costs shall be itemized in the manner set forth below, and shall be submitted on breakdown sheets in a form approved by Owner.
- 2. <u>Use of industry standards in calculating costs:</u> All costs shall be calculated based upon appropriate industry standard methods of calculating labor, material quantities, and equipment costs.
- 3. <u>Costs contingent on Owner's actions:</u> If any of Contractor's pricing assumptions are contingent upon anticipated actions of Owner, Contractor shall clearly state them in the proposal or request for an equitable adjustment.
- 4. <u>Markups on additive and deductive Work:</u> The cost of any additive or deductive changes in the Work shall be calculated as set forth below, except that overhead and profit shall not be included on deductive changes in the Work. Where a change in the Work involves additive and deductive work by the same Contractor or Subcontractor, small tools, overhead, profit, bond and insurance markups will apply to the net difference.
- 5. <u>Breakdown not required if change less than \$1,000:</u> If the total cost of the change in the Work or request for equitable adjustment does not exceed \$1,000, Contractor shall not be required to submit a breakdown if the description of the change in the Work or request for equitable adjustment is sufficiently definitive for Owner to determine fair value.

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- 6. <u>Breakdown required if change between \$1,000 and \$2,500:</u> If the total cost of the change in the Work or request for equitable adjustment is between \$1,000 and \$2,500, Contractor may submit a breakdown in the following level of detail if the description of the change in the Work or if the request for equitable adjustment is sufficiently definitive to permit the Owner to determine fair value:
 - a. lump sum labor;
 - b. lump sum material;
 - c. lump sum equipment usage;
 - d. overhead and profit as set forth below; and
 - e. insurance and bond costs as set forth below.
- 7. <u>Components of increased cost</u>: Any request for adjustment of Contract Sum based upon the fixed price method shall include only the following items:
 - a. <u>Craft labor costs:</u> These are the labor costs determined by multiplying the estimated or actual additional number of craft hours needed to perform the change in the Work by the hourly labor costs. Craft hours should cover direct labor, as well as indirect labor due to trade inefficiencies. The hourly costs shall be based on the following:
 - (1) <u>Basic wages and benefits:</u> Hourly rates and benefits as stated on the Department of Labor and Industries approved "statement of intent to pay prevailing wages" or a higher amount if approved by the Owner. Direct supervision shall be a reasonable percentage not to exceed 15% of the cost of direct labor. No supervision markup shall be allowed for a working supervisor's hours.
 - (2) <u>Worker's insurance:</u> Direct contributions to the state of Washington for industrial insurance; medical aid; and supplemental pension, by the class and rates established by the Department of Labor and Industries.
 - (3) <u>Federal insurance:</u> Direct contributions required by the Federal Insurance Compensation Act; Federal Unemployment Tax Act; and the State Unemployment Compensation Act.
 - (4) <u>Travel allowance:</u> Travel allowance and/or subsistence, if applicable, not exceeding those allowances established by regional labor union agreements, which are itemized and identified separately.
 - (5) <u>Safety:</u> Cost incurred due to the Washington Industrial Safety and Health Act, which shall be a reasonable percentage not to exceed 2% of the sum of the amounts calculated in (1), (2), and (3) above.
 - b. <u>Material costs:</u> This is an itemization of the quantity and cost of materials needed to perform the change in the Work. Material costs shall be developed first from actual known costs, second from supplier quotations or if these are not available, from standard industry pricing guides. Material costs shall consider all available discounts. Freight costs, express charges, or special delivery charges, shall be itemized.

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- c. <u>Equipment costs</u>: This is an itemization of the type of equipment and the estimated or actual length of time the construction equipment appropriate for the Work is or will be used on the change in the Work. Costs will be allowed for construction equipment only if used solely for the changed Work, or for additional rental costs actually incurred by the Contractor. Equipment charges shall be computed on the basis of actual invoice costs or if owned, from the current edition of one of the following sources:
 - (1) Associated General Contractors Washington State Department of Transportation (AGC WSDOT) Equipment Rental Agreement current edition, on the Contract execution date.
 - (2) The National Electrical Contractors Association for equipment used on electrical work.
 - (3) The Mechanical Contractors Association of America for equipment used on mechanical work.

The EquipmentWatch Rental Rate Blue Book shall be used as a basis for establishing rental rates of equipment not listed in the above sources. The maximum rate for standby equipment shall not exceed that shown in the AGC WSDOT Equipment Rental Agreement, current edition on the Contract execution date.

- d. <u>Allowance for small tools, expendables & consumable supplies:</u> Small tools consist of tools which cost \$250 or less and are normally furnished by the performing contractor. The maximum rate for small tools shall not exceed the following:
 - (1) <u>3% for Contractor</u>: For Contractor, 3% of direct labor costs.
 - (2) <u>5% for Subcontractors</u>: For Subcontractors, 5% of direct labor costs.

Expendables and consumables supplies directly associated with the change in Work must be itemized.

- e. <u>Subcontractor costs:</u> This is defined as payments Contractor makes to Subcontractors for changed Work performed by Subcontractors of any tier. The Subcontractors' cost of Work shall be calculated and itemized in the same manner as prescribed herein for Contractor.
- f. <u>Allowance for overhead:</u> This is defined as costs of any kind attributable to direct and indirect delay, acceleration, or impact, added to the total cost to Owner of any change in the Contract Sum. If the Contractor is compensated under Section 7.03D, the amount of such compensation shall be reduced by the amount Contractor is otherwise entitled to under this subsection (f). This allowance shall compensate Contractor for all noncraft labor, temporary construction facilities, field engineering, schedule updating, as-built drawings, home office cost, B&O taxes, office engineering, estimating costs, additional overhead because of extended time, and any other cost incidental to the change in the Work. It shall be strictly limited in all cases to a reasonable amount, mutually acceptable, or if none can be agreed upon to an amount not to exceed the rates below:
 - (1). <u>Projects less than \$3 million</u>: For projects where the Contract Award Amount is under \$3 million, the following shall apply:

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- (a) <u>Contractor markup on Contractor Work:</u> For Contractor, for any Work actually performed by Contractor's own forces, 16% of the first \$50,000 of the cost, and 4% of the remaining cost, if any.
- (b) <u>Subcontractor markup for Subcontractor Work:</u> For each Subcontractor (including lower tier subcontractors), for any Work actually performed by its own forces, 16% of the first \$50,000 of the cost, and 4% of the remaining cost, if any.
- (c) <u>Contractor markup for Subcontractor Work:</u> For Contractor, for any work performed by its Subcontractor(s) 6% of the first \$50,000 of the amount due each Subcontractor, and 4% of the remaining amount if any.
- (d) <u>Subcontractor markup for lower tier Subcontractor Work:</u> For each Subcontractor, for any Work performed by its Subcontractor(s) of any lower tier, 4% of the first \$50,000 of the amount due the sub-Subcontractor, and 2% of the remaining amount if any.
- (e) <u>Basis of cost applicable for markup:</u> The cost to which overhead is to be applied shall be developed in accordance with Section 7.02B 7a. e.
- (2). <u>Projects more than \$3 million</u>: For projects where the Contract Award Amount is equal to or exceeds \$3 million, the following shall apply:
 - (a) <u>Contractor markup on Contractor Work:</u> For Contractor, for any Work actually performed by Contractor's own forces, 12% of the first \$50,000 of the cost, and 4% of the remaining cost, if any.
 - (b) <u>Subcontractor markup for Subcontractor Work:</u> For each Subcontractor (including lower tier subcontractors), for any Work actually performed by its own forces, 12% of the first \$50,000 of the cost, and 4% of the remaining cost, if any.
 - (c) <u>Contractor markup for Subcontractor Work:</u> For Contractor, for any Work performed by its Subcontractor(s), 4% of the first \$50,000 of the amount due each Subcontractor, and 2% of the remaining amount if any.
 - (d) <u>Subcontractor markup for lower tier Subcontractor Work:</u> For each Subcontractor, for any Work performed by its Subcontractor(s) of any lower tier, 4% of the first \$50,000 of the amount due the sub-Subcontractor, and 2% of the remaining amount if any.
 - (e) <u>Basis of cost applicable for markup:</u> The cost to which overhead is to be applied shall be developed in accordance with Section 7.02B 7a. e.
- g. <u>Allowance for profit</u>: Allowance for profit is an amount to be added to the cost of any change in contract sum, but not to the cost of change in Contract Time for which contractor has been compensated pursuant to the conditions set forth in Section 7.03. It shall be limited to a reasonable amount, mutually acceptable, or if none can be agreed upon, to an amount not to exceed the rates below:
 - <u>Contractor / Subcontractor markup for self-performed Work:</u> For Contractor or Subcontractor of any tier for work performed by their forces, 6% of the cost developed in accordance with Section 7.02B 7a. – e.

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- (2) <u>Contractor / Subcontractor markup for Work performed at lower tier</u>: For Contractor or Subcontractor of any tier for work performed by a subcontractor of a lower tier, 4% of the subcontract cost developed in accordance with Section 7.02B 7a. – h.
- h. <u>Insurance and bond premiums:</u> Cost of change in insurance or bond premium: This is defined as:
 - (1) <u>Contractor's liability insurance:</u> The cost of any changes in Contractor's liability insurance arising directly from execution of the Change Order; and
 - (2) <u>Payment and Performance Bond:</u> The cost of the additional premium for Contractor's bond arising directly from the changed Work.

The cost of any change in insurance or bond premium shall be added after overhead and allowance for profit are calculated in accordance with subparagraph f. and g above.

C. <u>Change Order Pricing – Unit Prices</u>

- 1. <u>Content of Owner authorization</u>: Whenever Owner authorizes Contractor to perform Work on a unit-price basis, Owner's authorization shall clearly state:
 - a. <u>Scope:</u> Scope of work to be performed;
 - b. <u>Reimbursement basis:</u> Type of reimbursement including pre-agreed rates for material quantities; and
 - c. <u>Reimbursement limit:</u> Cost limit of reimbursement.
- 2. Contractor responsibilities: Contractor shall:
 - a. Cooperate with Owner and assist in monitoring the Work being performed. As requested by Owner, Contractor shall identify workers assigned to the Change Order Work and areas in which they are working;
 - b. Leave access as appropriate for quantity measurement; and
 - c. Not exceed any cost limit(s) without Owner's prior written approval.
- 3. <u>Cost breakdown consistent with Fixed Price requirements:</u> Contractor shall submit costs in accordance with paragraph 7.02B and satisfy the following requirements:
 - a. <u>Unit prices must include overhead, profit, bond and insurance premiums:</u> Unit prices shall include reimbursement for all direct and indirect costs of the Work, including overhead, profit, bond, and insurance costs; and
 - b. <u>Owner verification of quantities:</u> Quantities must be supported by field measurement statements signed by Owner.

D. <u>Change Order Pricing – Time-and-Material Prices</u>

- 1. <u>Content of Owner authorization:</u> Whenever Owner authorizes Contractor to perform Work on a time-and-material basis, Owner's authorization shall clearly state:
 - a. <u>Scope:</u> Scope of Work to be performed;

- b. <u>Reimbursement basis:</u> Type of reimbursement including pre-agreed rates, if any, for material quantities or labor; and
- c. <u>Reimbursement limit:</u> Cost limit of reimbursement.
- 2. <u>Contractor responsibilities:</u> Contractor shall:
 - a. <u>Identify workers assigned:</u> Cooperate with Owner and assist in monitoring the Work being performed. As requested by Owner, identify workers assigned to the Change Order Work and areas in which they are working;
 - b. <u>Provide daily timesheets:</u> Identify on daily time sheets all labor performed in accordance with this authorization. Submit copies of daily time sheets within 2 working days for Owner's review.
 - c. <u>Allow Owner to measure quantities:</u> Leave access as appropriate for quantity measurement;
 - d. <u>Perform Work efficiently:</u> Perform all Work in accordance with this section as efficiently as possible; and
 - e. <u>Not exceed Owner's cost limit:</u> Not exceed any cost limit(s) without Owner's prior written approval.
- 3. <u>Cost breakdown consistent with Fixed Price requirements:</u> Contractor shall submit costs in accordance with paragraph 7.02B and additional verification supported by:
 - a. <u>Timesheets:</u> Labor detailed on daily time sheets; and
 - b. <u>Invoices:</u> Invoices for material.

7.03 CHANGE IN THE CONTRACT TIME

- A. <u>COP requests for Contract Time:</u> The Contract Time shall only be changed by a Change Order. Contractor shall include any request for a change in the Contract Time in its Change Order Proposal.
- B. <u>Time extension permitted if not Contractor's fault</u>: If the time of Contractor's performance is changed due to an act of Force Majeure, or due to the fault or negligence of Owner or anyone for whose acts Owner is responsible, Contractor shall be entitled to make a request for an equitable adjustment in the Contract Time in accordance with the following procedure. No adjustment in the Contract Time shall be allowed to the extent Contractor's changed time of performance is due to the fault or negligence of Contractor, or anyone for whose acts Contractor is responsible.
 - <u>Notice and record keeping for Contract Time request:</u> A request for an equitable adjustment in the Contract Time shall be based on written notice delivered within 7 Days of the occurrence of the event giving rise to the request. If Contractor believes it is entitled to adjustment of Contract Time, Contractor shall immediately notify Owner and begin to keep and maintain complete, accurate, and specific daily records. Contractor shall give Owner access to any such record and if requested, shall promptly furnish copies of such record to Owner.
 - 2. <u>Timing and content of Contractor's Notice</u>: Contractor shall not be entitled to an adjustment in the Contract Time for any events that occurred more than 7 Days before Contractor's written notice to Owner. The written notice shall set forth, at a minimum, a description of: the event giving rise to the request for an equitable adjustment in the

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Contract Time; the nature of the impacts to Contractor and its Subcontractors of any tier, if any; and to the extent possible the amount of the adjustment in Contract Time requested. Failure to properly give such written notice shall, to the extent Owner's interests are prejudiced, constitute a waiver of Contractor's right to an equitable adjustment.

- 3. <u>Contractor to provide supplemental information:</u> Within 30 Days of the occurrence of the event giving rise to the request, unless Owner agrees in writing to allow an additional period of time to ascertain more accurate data, Contractor shall supplement the written notice provided in accordance with subparagraph 7.03B.2 with additional supporting data. Such additional data shall include, at a minimum: the amount of delay claimed, itemized in accordance with the procedure set forth herein; specific facts, circumstances, and analysis that confirms not only that Contractor suffered the delay claimed, but that the delay claimed was actually a result of the act, event, or condition complained of, and that the Contract Documents provide entitlement to an equitable adjustment in Contract Time for such act, event, or condition; and supporting documentation sufficiently detailed to permit an informed analysis of the request by Owner. Failure to provide such additional information and documentation within the time allowed or within the format required shall, to the extent Owner's interests are prejudiced, constitute a waiver of Contractor's right to an equitable adjustment.
- 4. <u>Contractor to proceed with Work as directed:</u> Pending final resolution of any request in accordance with this paragraph, unless otherwise agreed in writing, Contractor shall proceed diligently with performance of the Work.
- C. <u>Contractor to demonstrate impact on critical path of schedule:</u> Any change in the Contract Time covered by a Change Order, or based on a request for an equitable adjustment in the Contract Time, shall be limited to the change in the critical path of Contractor's schedule attributable to the change of Work or event(s) giving rise to the request for equitable adjustment. Any Change Order Proposal or request for an adjustment in the Contract Time shall demonstrate the impact on the critical path of the schedule. Contractor shall be responsible for showing clearly on the Progress Schedule that the change or event: had a specific impact on the critical path, and except in case of concurrent delay, was the sole cause of such impact; and could not have been avoided by resequencing of the Work or other reasonable alternatives.
- D. <u>Cost of change in Contract Time:</u> Contractor may request compensation for the cost of a change in Contract Time in accordance with this paragraph, 7.03D, subject to the following conditions:
 - 1. <u>Must be solely fault of Owner or A/E:</u> The change in Contract Time shall solely be caused by the fault or negligence of Owner or A/E;
 - 2. <u>Procedures:</u> Contractor shall follow the procedure set forth in paragraph 7.03B;
 - 3. <u>Demonstrate impact on critical path:</u> Contractor shall establish the extent of the change in Contract Time in accordance with paragraph 7.03C; and
 - 4. <u>Limitations on daily costs:</u> The daily cost of any change in Contract Time shall be limited to the items below, less the amount of any change in the Contract Sum the Contractor may otherwise be entitled to pursuant to Section 7.02B 7f for any change in the Work that contributed to this change in Contract Time:
 - a. <u>Non-productive supervision or labor:</u> cost of nonproductive field supervision or labor extended because of delay;
 - b. <u>Weekly meetings and indirect activities:</u> cost of weekly meetings or similar indirect activities extended because of the delay;

- c. <u>Temporary facilities or equipment rental</u>: cost of temporary facilities or equipment rental extended because of the delay;
- d. <u>Insurance premiums:</u> cost of insurance extended because of the delay;
- e. <u>Overhead:</u> general and administrative overhead in an amount to be agreed upon, but not to exceed 3% of the Contract Award Amount divided by the originally specified Contract Time for each Day of the delay.

PART 8 – CLAIMS AND DISPUTE RESOLUTION

8.01 CLAIMS PROCEDURE

- A. <u>Claim is Contractor's remedy:</u> If the parties fail to reach agreement on the terms of any Change Order for Owner-directed Work as provided in Section 7.01, or on the resolution of any request for an equitable adjustment in the Contract Sum as provided in Section 7.02 or the Contract Time as provided in Section 7.03, Contractor's only remedy shall be to file a Claim with Owner as provided in this section.
- B. <u>Claim filing deadline for Contractor:</u> Contractor shall file its Claim within 120 Days from Owner's final offer made in accordance with paragraph 7.01E, or by the date of Final Acceptance, whichever occurs first.
- C. <u>Claim must cover all costs and be documented:</u> The Claim shall be deemed to cover all changes in cost and time (including direct, indirect, impact, and consequential) to which Contractor may be entitled. It shall be fully substantiated and documented. At a minimum, the Claim shall contain the following information:
 - 1. <u>Factual statement of Claim:</u> A detailed factual statement of the Claim for additional compensation and time, if any, providing all necessary dates, locations, and items of Work affected by the Claim;
 - 2. <u>Dates:</u> The date on which facts arose which gave rise to the Claim;
 - Owner and A/E employee's knowledgeable about Claim: The name of each employee of Owner or A/E knowledgeable about the Claim;
 - 4. <u>Support from Contract Documents:</u> The specific provisions of the Contract Documents which support the Claim;
 - 5. <u>Identification of other supporting information:</u> The identification of any documents and the substance of any oral communications that support the Claim;
 - 6. <u>Copies of supporting documentation</u>: Copies of any identified documents, other than the Contract Documents, that support the Claim;
 - 7. <u>Details on Claim for Contract Time:</u> If an adjustment in the Contract Time is sought: the specific days and dates for which it is sought; the specific reasons Contractor believes an extension in the Contract Time should be granted; and Contractor's analysis of its Progress Schedule to demonstrate the reason for the extension in Contract Time;
 - 8. <u>Details on Claim for adjustment of Contract Sum:</u> If an adjustment in the Contract Sum is sought, the exact amount sought and a breakdown of that amount into the categories set forth in, and in the detail as required by Section 7.02; and

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- 9. <u>Statement certifying Claim</u>: A statement certifying, under penalty of perjury, that the Claim is made in good faith, that the supporting cost and pricing data are true and accurate to the best of Contractor's knowledge and belief, that the Claim is fully supported by the accompanying data, and that the amount requested accurately reflects the adjustment in the Contract Sum or Contract Time for which Contractor believes Owner is liable.
- D. <u>Owner's response to Claim filed:</u> After Contractor has submitted a fully documented Claim that complies with all applicable provisions of Parts 7 and 8, Owner shall respond, in writing, to Contractor as follows:
 - 1. <u>Response time for Claim less than \$50,000:</u> If the Claim amount is less than \$50,000, with a decision within 60 Days from the date the Claim is received; or
 - 2. <u>Response time for Claim of \$50,000 or more:</u> If the Claim amount is \$50,000 or more, with a decision within 60 Days from the date the Claim is received, or with notice to Contractor of the date by which it will render its decision. Owner will then respond with a written decision in such additional time.
- E. <u>Owner's review of Claim and finality of decision</u>: To assist in the review of Contractor's Claim, Owner may visit the Project site, or request additional information, in order to fully evaluate the issues raised by the Claim. Contractor shall proceed with performance of the Work pending final resolution of any Claim. Owner's written decision as set forth above shall be final and conclusive as to all matters set forth in the Claim, unless Contractor follows the procedure set forth in Section 8.02.
- F. <u>Waiver of Contractor rights for failure to comply with this Section:</u> Any Claim of the Contractor against the Owner for damages, additional compensation, or additional time, shall be conclusively deemed to have been waived by the Contractor unless made in accordance with the requirements of this Section.

8.02 ARBITRATION

- A. <u>Timing of Contractor's demand for arbitration:</u> If Contractor disagrees with Owner's decision rendered in accordance with paragraph 8.01D, Contractor shall provide Owner with a written demand for arbitration. No demand for arbitration of any such Claim shall be made later than 30 Days after the date of Owner's decision on such Claim; failure to demand arbitration within said 30 Day period shall result in Owner's decision being final and binding upon Contractor and its Subcontractors.
- B. <u>Filing of Notice for arbitration:</u> Notice of the demand for arbitration shall be filed with the American Arbitration Association (AAA), with a copy provided to Owner. The parties shall negotiate or mediate under the Voluntary Construction Mediation Rules of the AAA, or mutually acceptable service, before seeking arbitration in accordance with the Construction Industry Arbitration Rules of AAA as follows:
 - 1. <u>Claims less than \$30,000:</u> Disputes involving \$30,000 or less shall be conducted in accordance with the Northwest Region Expedited Commercial Arbitration Rules; or
 - 2. <u>Claims greater than \$30,000:</u> Disputes over \$30,000 shall be conducted in accordance with the Construction Industry Arbitration Rules of the AAA, unless the parties agree to use the expedited rules.
- C. <u>Arbitration is forum for resolving Claims:</u> All Claims arising out of the Work shall be resolved by arbitration. The judgment upon the arbitration award may be entered, or review of the award may

occur, in the superior court having jurisdiction thereof. No independent legal action relating to or arising from the Work shall be maintained.

- D. <u>Owner may combine Claims into same arbitration</u>: Claims between Owner and Contractor, Contractor and its Subcontractors, Contractor and A/E, and Owner and A/E shall, upon demand by Owner, be submitted in the same arbitration or mediation.
- E. <u>Settlement outside of arbitration to be documented in Change Order:</u> If the parties resolve the Claim prior to arbitration judgment, the terms of the resolution shall be incorporated in a Change Order. The Change Order shall constitute full payment and final settlement of the Claim, including all claims for time and for direct, indirect, or consequential costs, including costs of delays, inconvenience, disruption of schedule, or loss of efficiency or productivity.

8.03 CLAIMS AUDITS

- A. <u>Owner may audit Claims:</u> All Claims filed against Owner shall be subject to audit at any time following the filing of the Claim. Failure of Contractor, or Subcontractors of any tier, to maintain and retain sufficient records to allow Owner to verify all or a portion of the Claim or to permit Owner access to the books and records of Contractor, or Subcontractors of any tier, shall constitute a waiver of the Claim and shall bar any recovery.
- B. <u>Contractor to make documents available:</u> In support of Owner audit of any Claim, Contractor shall, upon request, promptly make available to Owner the following documents:
 - 1. Daily time sheets and supervisor's daily reports;
 - 2. Collective bargaining agreements;
 - 3. Insurance, welfare, and benefits records;
 - 4. Payroll registers;
 - 5. Earnings records;
 - 6. Payroll tax forms;
 - 7. Material invoices, requisitions, and delivery confirmations;
 - 8. Material cost distribution worksheet;
 - 9. Equipment records (list of company equipment, rates, etc.);
 - 10. Vendors', rental agencies', Subcontractors', and agents' invoices;
 - 11. Contracts between Contractor and each of its Subcontractors, and all lower-tier Subcontractor contracts and supplier contracts;
 - 12. Subcontractors' and agents' payment certificates;
 - 13. Cancelled checks (payroll and vendors);
 - 14. Job cost report, including monthly totals;
 - 15. Job payroll ledger;
 - 16. Planned resource loading schedules and summaries;

- 17. General ledger;
- 18. Cash disbursements journal;
- 19. Financial statements for all years reflecting the operations on the Work. In addition, the Owner may require, if it deems it appropriate, additional financial statements for 3 years preceding execution of the Work;
- 20. Depreciation records on all company equipment whether these records are maintained by the company involved, its accountant, or others;
- 21. If a source other than depreciation records is used to develop costs for Contractor's internal purposes in establishing the actual cost of owning and operating equipment, all such other source documents;
- 22. All nonprivileged documents which relate to each and every Claim together with all documents which support the amount of any adjustment in Contract Sum or Contract Time sought by each Claim;
- 23. Work sheets or software used to prepare the Claim establishing the cost components for items of the Claim including but not limited to labor, benefits and insurance, materials, equipment, Subcontractors, all documents which establish the time periods, individuals involved, the hours for the individuals, and the rates for the individuals; and
- 24. Work sheets, software, and all other documents used by Contractor to prepare its bid.
- C. <u>Contractor to provide facilities for audit and shall cooperate:</u> The audit may be performed by employees of Owner or a representative of Owner. Contractor, and its Subcontractors, shall provide adequate facilities acceptable to Owner, for the audit during normal business hours. Contractor, and all Subcontractors, shall make a good faith effort to cooperate with Owner's auditors.

PART 9 – TERMINATION OF THE WORK

9.01 TERMINATION BY OWNER FOR CAUSE

- A. <u>7 Day Notice to Terminate for Cause:</u> Owner may, upon 7 Days written notice to Contractor and to its surety, terminate (without prejudice to any right or remedy of Owner) the Work, or any part of it, for cause upon the occurrence of any one or more of the following events:
 - 1. <u>Contractor fails to prosecute Work:</u> Contractor fails to prosecute the Work or any portion thereof with sufficient diligence to ensure Substantial Completion of the Work within the Contract Time;
 - 2. <u>Contractor bankrupt:</u> Contractor is adjudged bankrupt, makes a general assignment for the benefit of its creditors, or a receiver is appointed on account of its insolvency;
 - 3. <u>Contractor fails to correct Work:</u> Contractor fails in a material way to replace or correct Work not in conformance with the Contract Documents;
 - 4. <u>Contractor fails to supply workers or materials:</u> Contractor repeatedly fails to supply skilled workers or proper materials or equipment;
 - 5. <u>Contractor failure to pay Subcontractors or labor:</u> Contractor repeatedly fails to make prompt payment due to Subcontractors or for labor;

- 6. <u>Contractor violates laws:</u> Contractor materially disregards or fails to comply with laws, ordinances, rules, regulations, or orders of any public authority having jurisdiction; or
- 7. <u>Contractor in material breach of Contract:</u> Contractor is otherwise in material breach of any provision of the Contract Documents.
- B. <u>Owner's actions upon termination</u>: Upon termination, Owner may at its option:
 - 1. <u>Take possession of Project site:</u> Take possession of the Project site and take possession of or use all materials, equipment, tools, and construction equipment and machinery thereon owned by Contractor to maintain the orderly progress of, and to finish, the Work;
 - 2. <u>Accept assignment of Subcontracts:</u> Accept assignment of subcontracts pursuant to Section 5.20; and
 - 3. <u>Finish the Work:</u> Finish the Work by whatever other reasonable method it deems expedient.
- C. <u>Surety's role:</u> Owner's rights and duties upon termination are subject to the prior rights and duties of the surety, if any, obligated under any bond provided in accordance with the Contract Documents.
- D. <u>Contractor's required actions:</u> When Owner terminates the Work in accordance with this section, Contractor shall take the actions set forth in paragraph 9.02B, and shall not be entitled to receive further payment until the Work is accepted.
- E. <u>Contractor to pay for unfinished Work:</u> If the unpaid balance of the Contract Sum exceeds the cost of finishing the Work, including compensation for A/E's services and expenses made necessary thereby and any other extra costs or damages incurred by Owner in completing the Work, or as a result of Contractor's actions, such excess shall be paid to Contractor. If such costs exceed the unpaid balance, Contractor shall pay the difference to Owner. These obligations for payment shall survive termination.
- F. <u>Contractor and Surety still responsible for Work performed:</u> Termination of the Work in accordance with this section shall not relieve Contractor or its surety of any responsibilities for Work performed.
- G. <u>Conversion of "Termination for Cause" to "Termination for Convenience"</u>. If Owner terminates Contractor for cause and it is later determined that none of the circumstances set forth in paragraph 9.01A exist, then such termination shall be deemed a termination for convenience pursuant to Section 9.02.

9.02 TERMINATION BY OWNER FOR CONVENIENCE

- A. <u>Owner Notice of Termination for Convenience:</u> Owner may, upon written notice, terminate (without prejudice to any right or remedy of Owner) the Work, or any part of it, for the convenience of Owner.
- B. <u>Contractor response to termination Notice:</u> Unless Owner directs otherwise, after receipt of a written notice of termination for either cause or convenience, Contractor shall promptly:
 - 1. <u>Cease Work:</u> Stop performing Work on the date and as specified in the notice of termination;

- <u>No further orders or Subcontracts:</u> Place no further orders or subcontracts for materials, equipment, services or facilities, except as may be necessary for completion of such portion of the Work as is not terminated;
- 3. <u>Cancel orders and Subcontracts:</u> Cancel all orders and subcontracts, upon terms acceptable to Owner, to the extent that they relate to the performance of Work terminated;
- 4. <u>Assign orders and Subcontracts to Owner:</u> Assign to Owner all of the right, title, and interest of Contractor in all orders and subcontracts;
- 5. <u>Take action to protect the Work:</u> Take such action as may be necessary or as directed by Owner to preserve and protect the Work, Project site, and any other property related to this Project in the possession of Contractor in which Owner has an interest; and
- 6. <u>Continue performance not terminated:</u> Continue performance only to the extent not terminated
- C. <u>Terms of adjustment in Contract Sum if Contract terminated:</u> If Owner terminates the Work or any portion thereof for convenience, Contractor shall be entitled to make a request for an equitable adjustment for its reasonable direct costs incurred prior to the effective date of the termination, plus reasonable allowance for overhead and profit on Work performed prior to termination, plus the reasonable administrative costs of the termination, but shall not be entitled to any other costs or damages, whatsoever, provided however, the total sum payable upon termination shall not exceed the Contract Sum reduced by prior payments. Contractor shall be required to make its request in accordance with the provisions of Part 7.
- D. <u>Owner to determine whether to adjust Contract Time:</u> If Owner terminates the Work or any portion thereof for convenience, the Contract Time shall be adjusted as determined by Owner.

PART 10 – MISCELLANEOUS PROVISIONS

10.01 GOVERNING LAW

<u>Applicable law and venue:</u> The Contract Documents and the rights of the parties herein shall be governed by the laws of the state of Washington. Venue shall be in the county in which Owner's principal place of business is located, unless otherwise specified.

10.02 SUCCESSORS AND ASSIGNS

<u>Bound to successors; Assignment of Contract:</u> Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to the other party hereto and to partners, successors, assigns, and legal representatives of such other party in respect to covenants, agreements, and obligations contained in the Contract Documents. Neither party shall assign the Work without written consent of the other, except that Contractor may assign the Work for security purposes, to a bank or lending institution authorized to do business in the state of Washington. If either party attempts to make such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations set forth in the Contract Documents.

10.03 MEANING OF WORDS

<u>Meaning of words used in Specifications:</u> Unless otherwise stated in the Contract Documents, words which have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings. Reference to standard specifications, manuals, or codes of any technical society, organization, or association, or to the code of any governmental authority,

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whether such reference be specific or by implication, shall be to the latest standard specification, manual, or code in effect on the date for submission of bids, except as may be otherwise specifically stated. Wherever in these Drawings and Specifications an article, device, or piece of equipment is referred to in the singular manner, such reference shall apply to as many such articles as are shown on the drawings, or required to complete the installation.

10.04 RIGHTS AND REMEDIES

<u>No waiver of rights:</u> No action or failure to act by Owner or A/E shall constitute a waiver of a right or duty afforded them under the Contract Documents, nor shall action or failure to act constitute approval or an acquiescence in a breach therein, except as may be specifically agreed in writing.

10.05 CONTRACTOR REGISTRATION

<u>Contractor must be registered or licensed:</u> Pursuant to RCW 39.06, Contractor shall be registered or licensed as required by the laws of the State of Washington, including but not limited to RCW 18.27.

10.06 TIME COMPUTATIONS

<u>Computing time:</u> When computing any period of time, the day of the event from which the period of time begins shall not be counted. The last day is counted unless it falls on a weekend or legal holiday, in which event the period runs until the end of the next day that is not a weekend or holiday. When the period of time allowed is less than 7 days, intermediate Saturdays, Sundays, and legal holidays are excluded from the computation.

10.07 RECORDS RETENTION

<u>Six year records retention period:</u> The wage, payroll, and cost records of Contractor, and its Subcontractors, and all records subject to audit in accordance with Section 8.03, shall be retained for a period of not less than 6 years after the date of Final Acceptance.

10.08 THIRD-PARTY AGREEMENTS

<u>No third party relationships created:</u> The Contract Documents shall not be construed to create a contractual relationship of any kind between: A/E and Contractor; Owner and any Subcontractor; or any persons other than Owner and Contractor.

10.09 ANTITRUST ASSIGNMENT

<u>Contractor assigns overcharge amounts to Owner:</u> Owner and Contractor recognize that in actual economic practice, overcharges resulting from antitrust violations are in fact usually borne by the purchaser. Therefore, Contractor hereby assigns to Owner any and all claims for such overcharges as to goods, materials, and equipment purchased in connection with the Work performed in accordance with the Contract Documents, except as to overcharges which result from antitrust violations commencing after the Contract Sum is established and which are not passed on to Owner under a Change Order. Contractor shall put a similar clause in its Subcontracts, and require a similar clause in its sub-Subcontracts, such that all claims for such overcharges on the Work are passed to Owner by Contractor.

10.10 HEADINGS AND CAPTIONS

<u>Headings for convenience only:</u> All headings and captions used in these General Conditions are only for convenience of reference, and shall not be used in any way in connection with the meaning, effect, interpretation, construction, or enforcement of the General Conditions, and do not define the limit or describe the scope or intent of any provision of these General Conditions.

DIVISION 1 GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

A. The provisions and intent of the Contract, including the General Conditions and General Requirements, apply to this work as if specified in this section.

1.02 SCOPE

- A. The accompanying Drawings and Specifications show and describe the location and type of work to be performed under this project. Work is more specifically defined on the drawings.
 - 1. The Work under this contract is to provide, furnish and install all labor, materials and equipment required to complete the work, installed, tested, and ready for use, and as described in these documents.
 - 2. The East End Locomotive Facility Upgrades generally consists of:
 - a. The selective demolition of tracks, pavements, track pans and miscellaneous utilities and site features.
 - b. The construction of a concrete service island that will include the following:
 - (a) Direct Sanding modules (2)
 - (b) Fuel Crane
 - (c) Lube oil boom cabinet
 - (d) Non-potable water boom cabinet
 - (e) Power and compressed air hose reels
 - (f) Crew shelter
 - (g) Overhead pipe/conduit support frame
 - c. Construction of new railroad track on timber ties and railroad track on precast concrete panels.
 - d. The installation of a sand storage silo and pneumatic conveying system to the service island and associated foundations.
 - e. The installation of a 40,000 GAL protected aboveground diesel storage tank and fuel receiving meter and filter assembly and associated foundations.
 - f. The construction of freestanding pipe/conduit support frames and a pipe/conduit support bridge to carry fuel, lube oil, water, sand, compressed air and power lines across the rail yard to the service island.
 - g. Construction of compressed air system.
 - h. Construction of a storage building with roll up door.
 - i. Construction of a lubricating oil storage and pumping system.
 - j. Surface, line, and dress of existing tracks at various locations adjacent to the above mentioned improvements.

1.03 LOCATION

A. The work is located at the Tacoma Rail East End Locomotive Facility, at 2601 SR 509 N. Frontage RD, Tacoma, Washington.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

DIVISION 1 - SPECIAL PROVISIONS

SECTION 01 1010 - SUMMARY OF WORK

1.1 PROJECT DESCRIPTION

Tacoma Rail is located in the Port of Tacoma at 2601 SR509 North Frontage Road. The East Locomotive Service Facility is located on the east end of rail facilities.

This project includes procuring, delivering and installing all items described in Section 01 1000 1.02 Scope.

In all cases, the City's contract is with one (1) general contractor and it is the general contractor's responsibility to ensure all work required to provide a complete and operational facility is included in their bid. When possible, the City has attempted to reference work that should be coordinated with various trades, but it is the contractor's responsibility to coordinate and schedule the work of all subcontractors, trades, and suppliers to assure the proper and timely prosecution and completion of all items of work.

Major components of work under this contract include, but are not limited to, the following: Installation of two new service fueling stations: Procuring, assembling, delivering, placing, and connecting the tanks, waste oil holding tank, lube oil storage shed, storm facilities, underground pump out, track revisions and concrete work to support the facility.

Site work: Installing new and relocating existing power and controls to the new facility. Work described is a brief summary of the bid package; refer to the drawings and specifications for complete scope for the bid package. Work to include coordination with other contractors on site. The bid package contains the complete project and bidder shall provide all labor and materials necessary to accomplish this task.

1.2 PROJECT LOCATION

The project is located at Tacoma Rail located in the Port of Tacoma at 2601 SR509 North Frontage Road.

1.3 SITE SHOWING

The bidder will be responsible for examining the site and to have compared the site with the specifications and contract drawings contained in this specification, and be satisfied as to the facilities and difficulties attending the execution of the proposed contract (such as uncertainty of weather, floods, nature and condition of materials to be handled and all other conditions, special work conditions including work schedules, obstacles and contingencies) before the delivery of their proposal.

No allowance will be subsequently made by the City on behalf of the bidder by reason of any error or neglect on the bidder's part, for such uncertainties as aforesaid.

A pre-bid site showing will be conducted on site July 20, 2021 at 1PM prospective bidder are urged to attend. Due to the nature of this project, the bidder is responsible for examining the site prior to placing a bid. If the contractor cannot make the listed showing, they may be able to coordinate a visit to the site on their own. Failure to examine the site may be grounds to reject the bid. City shall make no adjustment to the price or provide any compensation to the contractor for impacts relating to the contractor's failure to consider the potential impacts of not only the site conditions observed, but changes in the observed conditions that could have been foreseen by the contractor.

By entering into the contract, the bidder represents that they have inspected in detail the project site and has become familiar with all the physical and local conditions affecting the project and/or the project site. Any information provided by the City to the contractor, relating to existing conditions on, under, or to the project and/or site including, but not limited to information pertaining to hazardous material abatement and other conditions affecting the project site, represents only the opinion of the City as to the location, character, or quantity of such conditions and is provided only for the convenience of the contractor. The contractor shall draw their own conclusions from such information and make such tests, review and analyses as the contractor deems necessary to understand such conditions and to prepare their proposal.

The City assumes no responsibility whatsoever with respect to the sufficiency or accuracy of such information and there is no guarantee, either expressed or implied, that the conditions indicated or otherwise found by the contractor as a result of any examination or exploration are representative of those existing throughout the work and/or project site.

The contractor shall carefully study and compare the contract documents with each other and shall at once report to the City errors, inconsistencies or omissions discovered. If the contractor performs any construction activity knowing it involves a recognized error, inconsistency or omission in the contract documents without such notice to the City, the contractor shall assume the risk and responsibility for such performance and shall bear an appropriate amount of the attributable costs for correction.

The contractor shall take field measurements and verify field conditions and shall carefully compare such field measurements and conditions and other information known to the contractor with the contract documents before commencing activities. Errors, inconsistencies or omissions discovered shall be reported to the City at once.

1.4 COMMENCEMENT, PROSECUTION AND COMPLETION

The contractor will be required to complete the contract documents and to provide surety and payment bonds within ten (10) calendar days after the award of the contract. The contractor shall begin the work to be performed in the contract within ten (10) calendar days after the date of notification to commence work. Notification to commence work may either be by letter or, if no letter is issued, by agreement at the preconstruction conference (or if no letter is issued, by the date the contract is executed by the City).

The contractor shall be required to complete work in 220 working days.

1.5 SPECIFICATION FORMAT

This specification is written and formatted for use with Public Works specifications and is numbered to be consistent with other specifications, including Construction Specifications Institute (CSI) format, as modified by the City. It is not intended to indicate what work is to be accomplished by various subcontractors on the project. In all cases, the City's contract is with one (1) general contractor and it is the general contractor's responsibility to insure all work required to provide a complete and operational facility is included in their bid.

When possible, the City has tried to reference work which should be included with various trades, but it is the contractor's responsibility to ensure all work is properly coordinated. The numbering system in the Special Provisions Section reflects standard provisions written by the

City and assigned constant numbers. Thus, gaps will appear when specific sections are not used.

References to Washington State Department of Transportation (WSDOT) Standard Specifications are from the 2020 edition.

1.6 CONTRACT WORK TIMES

Contract work times shall be Monday through Friday, <u>12:00 AM</u> to <u>11:59 PM</u>, including holidays. Work shall be done between and coordinated with Tacoma Rail Operations.

The contractor shall submit a two week look ahead schedule weekly. The plan shall show required inspections for the following week two week period. This work plan shall be given to the Engineer for approval by 11:00 AM every Friday.

Work not specifically detailed on the weekly work plan as requiring inspection or building system shutdown shall not be performed unless approved by the engineer. The contractor shall reimburse the City for all inspection of work not previously scheduled or approved by the engineer. Work requiring inspection shall be determined solely by the engineer.

Directions of the engineer and/or inspector shall be followed at all times.

1.7 QUALIFICATION OF CONTRACTORS

A. QUALIFIED CONTRACTORS

Only contractors with management, employees, and staff experienced in the type of work required by this specification, and with a record of successful completion of projects of similar scope, complexity, and overall cost will be considered. The bidder must complete the Statement of Qualifications for Rail General Contractor Submittal form attached to this specification at the time of submitting their bid. The City will be the sole judge of the bidder's ability to meet the requirements of this paragraph. Bidders past work will be judged in complexity of job, time of completion, organization, and other factors that may indicate the abilities of the contractor.

Contractor shall comply with all requirements of Federal Railroad Administration (FRA) regulations regarding railroad workplace safety included in Title 49, Part 214 and 219 (Alcohol/Drug Program) of the Code of Federal Regulations.

Tacoma Rail requires that approved railroad flagger(s) or appropriate methods to establish inaccessible track to establish the work zone occupied by the contractor's men, materials, and equipment shall be used whenever work is being conducted on or within 15 feet of an adjacent yard track or whenever Tacoma Rail makes a determination that a qualified railroad flagger is required. The Contractor will be required to notify Tacoma Rail 72 hours in advance whenever work needs to be done within railroad rights-of-way or within 15 feet of any tracks. The final decision as to the number and location of qualified railroad flagger(s), or adequacy of inaccessible track work limits that will be required for the work will be made by Tacoma Rail. Repeated instances where the railroad flaggers are scheduled and no effective work occurs will be considered when reviewing change order requests.

Tacoma Rail requires that the Contractor incorporate Tacoma Rail specific "Safety Action Plans" into its safety program, provide a copy of the "Safety Action Plan" to the Tacoma Rail Roadmaster prior to commencement of any work on Railway Property, and shall periodically audit the plans. Contractor shall adhere to and comply with Tacoma Rail "Basic Contractor

Safety and Operating Requirements" and shall contact and adhere to any other requirements from the other partner railroads.

Submit to the engineer within ten (10) calendar days following execution of the contact documents, a list of all subcontractors, including each subcontractor's address, telephone number, and contact person to be used on this project.

B. QUALIFIED SUPERINTENDENT

Contractor shall ensure that, at a minimum, its on-site Project Supervisor(s) have completed a Safety Orientation through <u>ContractorOrientation.com</u> and that each of its employees, subcontractors, agents or invitees has received the same Safety Orientation through sessions conducted by or through the Contractor Safety Officer before the individual performs any work on the Project.

1.8 SPECIFICATIONS AND DRAWINGS

The Drawings, attached to these specifications, are made a part of the contract. The Drawings are dated 03/02/2020 and include Sheets 1 through 60.

Plans and Specifications may be obtained at American Reprographics Company (ARC), 632 Broadway, Tacoma, Washington 98402, by telephoning 253-383-6363 or 1-800-337-8103, or fax to 253-274-8775, or e-mail <u>Tacoma.bidservices@e-arc.com</u>, or by going to American Reprographics Company website at <u>www.e-arc.com/location/tacoma</u>. Prospective bidders will be required to pay reproduction costs for the specifications and plans.

A maximum of six (6) set of specifications and six (6) sets of half-size reproducible drawings will be furnished to the successful bidder for construction purposes. It shall be the contractor's responsibility to provide sufficient sets of drawings for building purposes.

The contractor shall keep on the job site a full-size copy of the drawings and the specifications, and shall, at all times, give the engineer access thereto.

1.9 EVALUATION OF BIDS

The award of this contract will not be based on cost alone as other factors and features are equally important. The contract will be awarded to the lowest responsive and responsible bidder complying with the specifications; provided such bid is reasonable and it is in the best interests of the City to accept.

The City, however, reserves the right to reject any and all bids and to waive any informalities in bids received. The City reserves the right to award the contract to the lowest responsive and responsible bidder whose bid will be most advantageous to the City, price and any other factors considered.

All other elements or factors, whether or not specifically provided for in this contract, which would affect the final cost to and the benefits to be derived by the City will be considered in determining the award of the contract. In addition, the bid evaluation factors set forth in City Code Section 1.06.262 may be considered by the City. The conclusive award decision will be based on the best interests of the City. The engineer's decision as to which contractor best meets the City's need will be final.

In addition to General Provisions Section 1.08, the following factors will be used in bid evaluation:

- A. Experience of both company and superintendent completing at least five (5) projects of similar scope, complexity and overall cost.
- B. A minimum of five years (5) documented years experience in project supervision by superintendent.
- C. Proposal prices, base bid, and cost of any or all alternates listed.
- D. Review of all required submittals.
- E. Past record with the City (including satisfying safety requirements).
- F. Bidder's responsibility based on, but not limited to:
- 1. Ability, capacity, organization, technical qualifications and skill to perform the contract or produce the services required.
- 2. Contractor's construction record including references, judgment, stability, adequacy of equipment proposed to be furnished.
- 3. Whether the contract can be performed within the time specified.
- 4. Quality of performance of previous contracts or services.

1.10 LIST OF SUBCONTRACTOR'S AND CONTRACTOR'S CATEGORIES OF WORK

Every invitation to bid on a prime contract that is expected to cost one million dollars or more for the construction, alteration, or repair of any public building or public work of the state or a state agency or municipality as defined under RCW 39.04.010 or an institution of higher education as defined under RCW 28B.10.016 shall require each prime contract bidder to submit:

A. Within one hour after the published bid submittal time, the names of the subcontractors with whom the bidder, if awarded the contract, will subcontract for performance of the work of: HVAC (heating, ventilation, and air conditioning); plumbing as described in Chapter 18.106 RCW; and electrical as described in Chapter 19.28 RCW, or to name itself for the work; AND

B. Within forty-eight hours after the published bid submittal time, the names of the subcontractors with whom the bidder, if awarded the contract, will subcontract for performance of the work of structural steel installation and rebar installation.

1.11 LOCAL EMPLOYMENT AND APPRENTICESHIP TRAINING PROGRAM (LEAP)

The LEAP goal for this project is 15% Local Employment Utilization Goal and 15% Apprentice Utilization Goal.

1.12 PREVAILING WAGES

In addition to the requirements of Section 3.08(B) of the General Provisions, the contractor shall be required to post on the job site a copy of the intent form to pay prevailing wages.

As identified in the General Provisions, the contractor shall comply with the law regarding prevailing wages. These rules apply to any contractor who does business with the City, including owner/operators.

A Statement of Intent to Pay Prevailing Wages **MUST** be filed with the Washington Department of Labor & Industries upon award of contract. An Affidavit of Wages Paid **MUST** be filed with the Washington Department of Labor & Industries upon job completion.

Payments cannot be released by the City until certification of these filings are received by the engineer. Additional information regarding these submittals can be obtained by calling the Department of Labor & Industries, Prevailing Wage at 360-902-5335, or by visiting their MY L&I account.

1.13 PERFORMANCE (SURETY), PAYMENT AND RETAINAGE BONDS

A, PERFORMANCE (SURETY) AND PAYMENT BONDS

The Contractor shall provide both a Performance Bond and Payment Bond for 100-percent of the total contract award within ten (10) calendar days after award of the contract in accordance with the General Provisions. These bonds shall be required for each contact awarded under this specification. The City's forms must be used.

B. RETAINAGE BOND

A 5-percent retainage bond may be provided in lieu of the City withholding five-percent retainage. If a retainage bond is not obtained, the City will withhold 5-percent retainage until the end of the contract. If a retainage bond is provided, the City form must be used.

1.14 WORK BY CITY

There is no other work awarded by the City related to this overall project.

END OF SECTION

SECTION 01 1025 - MEASUREMENT AND PAYMENT

1.1 ADMINISTRATION

A. AUTHORITY

The City inspector or engineer in coordination with the contractor shall make all measurements and determine all quantities and amounts of work done for progress payments under the contract.

The engineer shall make an estimate of the work completed or done by the contractor, and such estimates will be made by measurement or approximation at the option of the engineer. The engineer's determination of progress payments shall be conclusive. The City will not pay for material not under City control.

Payment will be made monthly based on the schedule of values as described in this section. Percent completion will be calculated by the engineer based on schedule of values and material on hand. Material not on the project site will not be paid for. Once material is on hand, it will be considered part of the job and shall not be removed for any reason until the entire job is complete.

NOTE: All questions regarding contract status or payments (after award) should be directed to the Engineer.

B. UNIT QUANTITIES SPECIFIED

Quantities indicated in the proposal are for bidding and contract purposes only. Quantities and measurements supplied or placed in the work and verified by the engineer and contractor determine payment.

Adjustments to contract prices due to changes in quantity shall be in accordance with the latest edition of the WSDOT Standard Specifications, unless otherwise modified by this specification.

The City reserves the right to delete any bid item from the contract by notifying the contractor in writing of its intent. In the event of deleted work, the contractor's sole compensation shall be the money due the contractor for materials that had been purchased and obtained by the contractor prior to the deletion of the work.

C. CONTRACT PRICE

The lump sum and unit bid prices shall be full and complete compensation for the contract work stated, together with all appurtenances incidental thereto, including materials, equipment, tools, labor, and all the costs to the contractor for completing the contract in accordance with the plans, specifications, and instructions of the engineer.

All work not specifically described or mentioned in these specifications, but are required to be constructed to achieve complete and operable systems, structures or amenities shall be considered incidental items of work, not separately compensable, and its price included in items of work specified in the specifications.

D. NON-PAYMENT FOR REJECTED OR SURPLUS PRODUCTS

Payment will not be made for any of the following:

- 1. Products wasted or disposed of in a manner that is not acceptable
- 2. Products determined as unacceptable before or after placement
- 3. Products not completely unloaded from the transporting vehicle

- 4. Products placed beyond the lines and levels of the required work
- 5. Products remaining on hand after completion of the work
- 6. Loading, hauling and disposing of rejected products

1.2 PROPOSAL ITEMS

See Section 01 2000.

The contractor shall supply all necessary survey to construct the project. All costs for labor, equipment and materials for survey shall be included in the appropriate lump sum pay items.

1.3 SCHEDULE OF VALUES

Submit a detailed list of items to be included in the Schedule of Values within five (5) days of award of contract for approval by the engineer.

Submit a schedule of values within five (5) days after award of contract for all components of the construction. Schedule of values will be used by the engineer to calculate monthly payment for percent completion as indicated in Section 01 1025 Paragraph 1.1.

Use the specification Table of Contents as a guide to establish the format for the Schedule of Values. Provide a breakdown of each lump sum item shown in Section 01 2000 for each component of work to include pricing such as to lump sum (LS), per each (EA), linear feet (LF), ton (TON), or cubic yard (CY) prices as approved by the engineer.

- 1. FORMAT
 - A. Type Schedule on $8-1/2 \times 11$ in. bond paper.
 - B. Round amounts to nearest whole dollar; the total shall equal the contract sum.
 - C. Contractor's standard form or media-driven printout will be considered on request.
 - D. For Specification Divisions 2 through 34 of the Project Manual, follow the Table of Contents for minimum listing of schedule of values. Identify each line item by number and title of each Specification section. Complex line items may be required to be listed in component parts of the line item.
 - E. For Specification Division 1, as a minimum, include one (1) line item for each of the following: mobilization, General Conditions, bonds and insurance, punchlist correction, "record" drawings, O&M manuals, operation instructions, and demobilization.
- 2. REQUIREMENTS
 - A. Two (2) weeks prior to submission of first Application and Certificate for Payment, submit schedule of values to the engineer for review.
 - B. List installed value of each major item of Work and each subcontracted item of Work as a separate line item to serve as a basis for computing values for Progress Payments. Round off values to nearest dollar.

- C. List guarantees/warranties as separate line items for each type of Work, such as roofing, painting, etc. Show the value of each of these on the Schedule of Values.
- D. For each major subcontract, list products and operations of that subcontract as separate line items.
- E. For each line item of installed value exceeding \$20,000, show breakdown by major products or operations as separate line items.
- F. Coordinate listings with Progress Schedule.
- G. All line item listings shall each include a directly proportional amount of Contractor's overhead and profit.
- H. For items on which payments will be requested for stored products, list subvalues for cost of stored products.
- 3. Update and resubmit the Schedule of Values prior to the next application for payment or when change orders or engineering change directives result in a change in the contract sum as directed by the engineer.

1.4 FORCE ACCOUNT WORK

In certain circumstances, the contractor may be required to perform additional work. Where the work to be performed is determined to be extra and not attributed to the contractor's negligence, carelessness, or failure to install permanent controls, it shall be paid in accordance with the unit contract price or by force account.

Such additional work not covered by contract items will be paid for on a force account basis as a negotiated change order with lump sum or unit price items. There is no guarantee that there will be any force account work.

1.5 NON-PAYMENT FOR REJECTED OR SURPLUS PRODUCTS OR WORK

Payment will not be made for work rejected by the City. Products or work not meeting contract requirements shall be replaced by the contractor at no expense to the City, regardless of the impact to work, schedule or cost.

1.6 AS-BUILTS

The final retained portion of this contract shall not be released for any reasons until complete redline "AS-BUILT" plans are received and approved by the engineer. Redline "AS-BUILT" plans shall have all necessary information including make/model numbers, dimensions, and layout information necessary to properly draft changes in AutoCAD.

1.7 ALTERNATES

PART 1 - GENERAL

1.01 There are no bid alternates for this project.

END OF SECTION

SECTION 01 1040 - PROJECT COORDINATION

1.1 PROJECT ENGINEER/LEAD

The project engineer/lead shall be herein referenced as engineer in these specifications.

Construction management for this project with whom the contractor shall coordinate all their activities once the notice to commence work is issued will be Mr. Mike Slade, Construction Manager. Any changes to these specifications or plans shall be approved by this engineer prior to commencing any work.

Bidder inquiries regarding general purchasing provisions or technical specifications may be directed to Ms. Doreen Klaaskate, Senior Buyer, dklaaskate@cityoftacoma.org.

1.2 MEETINGS

A. PRE-BID EIC MEETING

Questions concerning the EIC may be answered at the pre-bid site showing.

If you cannot attend the meeting or have further questions following the meeting regarding the EIC (Equity in Contracting) program and/or the LEAP (Local Employment and Apprenticeship Program) please call the office at 253-591-5826, for instructions in filling out the EIC/LEAP forms or for questions concerning these requirements.

B. PRE-BID SITE VISIT

All bidders are responsible for assessing the site for work conditions and clarifying information to form their bids during this site visit. Please contact Tacoma Rail to obtain access to the site.

C. PRE-CONSTRUCTION MEETING

Following award of the contract, the engineer will notify the selected bidder of the time and date of the pre-construction meeting to be held at the Tacoma Municipal Building, 747 Market Street, Tacoma, Washington.

Minutes of the pre-construction meeting will be sent to the contractor and all meeting attendees. Recipients of the pre-construction meeting minutes will be required to direct any comments or changes to these minutes to the engineer within seven (7) days from the date of receipt. If no changes or comments are received within the seven (7) days, the meeting minutes will be kept by the engineer and become part of the project file.

D. COORDINATION MEETING WITH TACOMA RAIL

While this project is underway active rail activities will be ongoing. See Section 01 1040, Paragraph 1.4.

1.3 PERMITS

The City has made application to the applicable authorities for the following permits:

Site Development Permit - SDEV20-0078

The contractor shall apply for, obtain and pay for all other required permits as set forth in Section 3.02 of the General Provisions and Section 01 1200 Permits

1.4 COORDINATION WITH OTHERS

A. OPERATION OF EXISTING FACILITIES

The facilities or portions of facilities within the project limits must be kept in continuous operation throughout the construction period. No interruption will be permitted which adversely affects the degree of service provided. Provided permission is obtained by Tacoma Rail in advance, portions of the existing facilities may be taken out of service for short periods.

All construction activities shall be coordinated daily with the engineer or their designated representative. Changes to the schedule that will impact on dates shown as milestones on the schedule shall be coordinated with the engineer on a daily basis.

The contractor shall give a minimum of 72 hours' notice to the Tacoma Rail for all planned power or utility interruptions and all mechanical interruptions to occupied areas.

Tacoma Rail will be using this facility for ongoing daily operations. See Section 01 1040, Paragraph 1.12 for additional information.

The contractor shall become familiar with the ongoing operations and include all coordination required as part of the bid. The contractor shall follow all requirements of the City and Tacoma Rail and do all coordination as part of the required work.

B. SCHEDULE AND COORDINATION OF WORK

The contractor shall coordinate scheduling, submittals, and all work specified herein to assure efficient and orderly sequence of the installation of interdependent construction elements with provisions for accommodating items installed later.

C. RELATIONS WITH THE RAILROAD

Railroad Company, as used in these specifications, shall be the railroad company or companies, or railway company or companies specified in these Special Provisions. The following provisions, though referring to a single Railroad Company, shall be applicable to each of the following railroad companies or railway companies:

Tacoma Rail

Protection of Railroad Property

The Contractor shall exercise care in all operations and shall, at the Contractor's expense, protect the property of the Railroad Company and the Company's appurtenances, property in its custody, or persons lawfully upon its right of way, from damage, destruction, interference or injury caused by the Contractor's operations. The Contractor shall prosecute the work to not interfere with the Railroad Company or its appurtenances, or any of the Railroad Company's trains or facilities, and shall complete the work to a condition that shall not interfere with or menace the integrity or safe and successful operations of the Railroad Company or its appurtenances, or any of the Railroad Company's trains or facilities.

The Contractor shall not transport equipment, machinery, or materials across the Railroad Company's tracks, except at a public crossing, without the written consent of the Railroad Company.

The Contractor shall keep the right of way and ditches of the Railroad Company open and clean from any deposits or debris resulting from its operations. The Contractor shall be responsible for the cost to clean and restore ballast of the Railroad Company which is disturbed or becomes fouled with dirt or materials when such deposits or damage result from the Contractor's operations, except as provided elsewhere.

The Contractor's work shall be conducted in such a manner that there will be a minimum of interference with the operation of railroad traffic. The Railroad Company will specify what periods will be allowed the Contractor for executing any part of the work in which the Railroad Company's tracks will be obstructed or made unsafe for operation of railroad traffic.

In the event that an emergency occurs in connection with the work specified, the Railroad Company reserves the right to do any and all work that may be necessary to maintain railroad traffic. If the emergency is caused by the Contractor, the Contractor shall pay the Railroad Company for the cost of such emergency work.

Protective services to protect the Railroad Company's facilities, property, and movement of its trains or engines, including railroad flagging and other devices, may be required by the Railroad Company as a result of the Contractor's operations.

The nature and extent of protective services, personnel and other measures required will in all cases be determined by the Railroad Company. Nothing in these specifications will limit the Railroad Company's right to determine and assign the number of personnel, the classes of personnel for protective services, nor other protective measures it deems necessary.

When, in the opinion of the Railroad Company, the services of qualified railroad flaggers or security personnel are necessary for the protection of the Railroad Company's facilities by reason of the Contractor's operations, the Contractor will furnish such qualified railroad flaggers or security personnel as may be required.

The Railroad Company's contact is:

Kyle Kellem: Roadmaster, Tacoma Rail: 253-377-3554

No act of the Railroad Company in supervising or approving any work shall reduce or in any way affect the liability of the Contractor for damages, expense, or cost which may result to the Railroad Company from the construction of this Contract.

1.5 DIVISION OF WORK

A. MATERIAL FURNISHED AND INSTALLED BY CONTRACTOR

The contractor shall furnish and pay for all necessary materials (except City-furnished) and shall provide all labor, tools, equipment and superintendent, and perform all work incidental to the completion of the project as contemplated by this contract in accordance with the plans, specifications, and instructions of the engineer.

Each subcontractor shall furnish and install all materials and equipment unless otherwise specified.

Requests for use of alternate materials shall be submitted prior to bid opening in accordance with Section 01 1300, Paragraph 1.3 – "Or Equal" Clause or Substitutions.

1.6 LIMITATION OF CONTRACTOR'S WORK AREA/OR CONTRACTOR'S USE OF PREMISES

A. BARRIERS

The contractor shall furnish barriers, cones, or candle sticks with caution tape, dividing work area from area in City use.

B. WORK BY OTHERS AND WORK BY CITY

Other contractors or Tacoma Rail may be working in the project area and other buildings at the site during the time of construction. It shall be the responsibility of this contractor to collaborate and coordinate its work with Tacoma Rail and/or contractors within the project area.

C. CONTRACTOR'S USE OF PREMISES

All requests for use of areas not designated for use by the contractor shall be made in writing to the engineer for approval at least four (4) days in advance of the need. The engineer shall approve those areas for use prior to use by the contractor.

The contractor shall use the staging and work area shown in the plans.

1.7 HAZARDOUS MATERIALS

Tacoma Rail will test all excavated material prior to the project and supply the chemical analysis to assist the contractor in disposing of the material. The contractor is required to follow all local, state, and federal laws pertaining to the disturbance, removal, handling, storing, transporting, and disposal of all materials deemed hazardous by law. The contractor is to assume all soils are contaminated on the project site as described in Section 31 00 00 – Earthwork.

All work shall be performed by workers certified by Washington State Department of Labor and Industries as having successfully completed a state approved training course. All work shall be in accordance with EPA Title 40 CFR.

1.8 CONTRACT CHANGE FORMS

Section Not Used.

1.9 DIFFERING SITE CONDITION

Differing site conditions shall be administered in accordance with Sections 1.04.5, 1.04.7, and 1.09.11 of the Washington State Department of Transportation Standard Specifications except as stipulated in these Special and General Provisions. Contractor shall have no claim for additional costs or work, if it fails to submit a written RFI to the City immediately upon encountering any differing site condition, conflicts in the plans, specifications, or constructability issues.

The contractor shall promptly, and before conditions are disturbed, notify the engineer or their field representative of problems with subsurface conditions at the site, problems or conflicts in the plans or specifications or problems on constructability. A written **Request for Information (RFI)** shall be submitted by the contractor when such problems and direction are required.

The engineer shall promptly investigate the conditions, and if agreed upon with the contractor, adjustment shall be made on the appropriate details in writing to facilitate construction. No claim by the contractor under this differing site condition shall be allowed except as agreed upon in writing with the engineer.

Whenever possible, the contractor shall submit in advance and in writing for changes in the scope of work and/or contract amount. This proposal shall be either accepted or rejected in writing by the project engineer prior to work commencing. When no agreement can be reached, the City may order extra work on force account.

When time is short, the contractor shall notify the City extra work is required or the City shall notify the contractor that extra work is needed and at a minimum, the engineer shall issue a handwritten **Engineering Change Directive**. In such cases, said handwritten **Directive** will not be considered as agreement that such work is extra. Within seven (7) days, the contractor shall submit a written **Change Order Proposal** for changes in the scope of work and/or contract amount.

1.10 CONSTRUCTION PROGRESS SCHEDULES

A. FORMAT

The contractor shall prepare schedules as a horizontal bar chart with separate bar for each major portion of work or operation, identifying the first work day of each week and include holidays and times when facility will not be available to contractor for City installed work.

B. CONTENT

This schedule shall be activity-oriented showing as nearly as can be determined the starting and completion dates of each event. The schedule shall show the materials delivery, structure erection, and installation. It will include the start and completion of each major civil, structural, mechanical, communications and electrical item of work critical to the general contractor's operation.

Show complete sequence of construction, by activity, with dates for beginning and completion of each element of construction.

Identify each task by the appropriate proposal bid item number and subcontractor responsible.

As a minimum, the following tasks shall be included on the schedule:

- 1. Scope of Work identified architectural, landscape, civil, structural, mechanical, electrical, and communications.
- 2. Phases of work where required.
- 3. Milestone dates Fueling Facility system testing and shut-down dates and times for existing systems.

C. SEQUENCE SCHEDULING

Progress schedules are required to be coordinated with the City and updated bi-monthly or when changes occur. Acceptance or approval of the progress schedule does not release the contractor from the responsibility to provide the necessary resources to meet the schedule.

D. SUBMITTALS

The contractor shall submit initial schedules at the preconstruction meeting or at a minimum of within five (5) working days after the contract award. After review, if the engineer requires changes, resubmit required revised data within five (5) working days.

The contractor shall use the attached Submittal Transmittal form (electronic version is available from the engineer) for all submittals.

Within ten (10) days of the date of the contract, the contractor and the engineer will reach an agreement on all adjustments and all modifications to the submitted schedule, which are warranted. The schedule, thus modified, will become part of the contract.

The failure of the contractor to submit a schedule(s), or the inability of the contractor and the City to reach an agreement as to modifications to a schedule, shall not excuse the contractor's obligation to perform the work required by the specifications in the number of days required by the specification.
Twice a month, the City's and the contractor's site representatives will meet and perform a "Line-to-Line" review of items on the schedule, illustrating their plan for meeting the completion dates specified in this contract and the associated construction costs for each subcontractor.

The contractor shall be required to submit all color samples for the entire structure at one time. That shall include tile, grout, base, paint, fixtures, stain, etc. The contractor will make a color board for the building and submit to the engineer for approval. See Section 01 1300 Paragraph 1.2 – Submittals and Shop Drawings.

1.11 PROTECTION OF EXISTING UTILITIES AND IMPROVEMENTS

In addition to Section 3.03 "Notification of Other Governmental Agencies and Utilities When Underground Work is Involved" and Section 3.07 "Protection of Workers and Property" of the General Provisions:

The contractor shall protect from damage the utilities and all other existing improvements not provided for in the proposal or special provisions. The cost of labor, equipment and materials required to protect or replace said items shall be incorporated into the bid for this project.

The City has attempted to locate and show on the contract drawings the locations of the existing underground utilities which may conflict with portions of this work, but cannot guarantee the accuracy or the completeness of the data shown.

1.12 CITY OCCUPANCY

The City reserves the right to use or to occupy any substantially completed part of the project, and to use equipment installed under the contract prior to the date of final acceptance. Such use of occupancy shall not constitute acceptance of the work, or any part thereof.

During construction, normal operations will be ongoing at the fueling facility as stated in Section 1.4.

The Contractor shall coordinate with the Tacoma Rail while working on the project to coordinate work and access issues. The contractor will cooperate with the City to minimize conflict and to facilitate the City's operations. Occasional, shut downs of the fueling operations will be allowed but Tacoma Rail shall be notified three weeks in advance to plan for these shutdowns. No shutdowns will be allowed without Tacoma Rails written approval.

The contractor will schedule the work to accommodate this requirement.

1.13 SUPERINTENDENT

The contractor shall employ a competent superintendent who shall be present at the project site at <u>all</u> times during the entire progress of the work, except those times when the contractor is demobilized. The superintendent shall be on site even when only a subcontractor is working, unless otherwise approved by the engineer. The superintendent shall be satisfactory to the contractor, and shall have full authority to act on their behalf.

It will be the superintendent's responsibility to have a set of plans and specifications on the project site during the progress of the work. The superintendent shall mark or record on the plans all changes made during construction. Such redline "AS-BUILT" plans shall be available to the engineer at all times and shall be delivered to the engineer upon completion of the work.

The superintendent initially assigned to the project by the general contractor shall remain superintendent for the duration of the contract. If the superintendent is replaced, all work shall stop until an additional preconstruction meeting with the City is held. This work stoppage will be at the contractor's expense. The completion date shall remain unchanged, regardless of any work stoppage.

1.14 CLEAN UP

In addition to General Provisions Section 3.11 - Cleaning Up of the General Provisions

A. DAILY

The contractor and the City inspector will walk the site daily and as required to determine the clean up and restoration required.

All areas shall be left safe, clean and free of debris.

Clean up is considered incidental to the project and no payment will be allowed.

Collect waste daily and when containers are full, legally dispose of waste off site.

Clean-up of any area impacted by the construction shall be done weekly or as directed/instructed by the engineer.

SECTION 01 1200 - PERMITS AND FEES

- 1.1 RELATED DOCUMENTS:
 - A. Drawings and general provisions of Contract, including General Conditions and other Division-1 Specification sections, apply to work of this section.

1.2 PERMITS PAID FOR BY OWNER:

- A. The Owner has paid for the Site Development permit to be issued by the City of Tacoma outside of the contract. Do not include the cost of this permit in the bid. Note that the Owner has previously submitted the construction documents to the City of Tacoma for plan review. If required the Contractor will attend permit acceptance meeting with the City of Tacoma and obtain final Site Development Permit.
- B. Other permits necessary to complete the work such as electrical and plumbing, as examples, shall be the contractor's responsibility to procure.
- 1.3 PERMITS PAID FOR BY CONTRACTOR:
 - A. Contractor is responsible to acquire and pay for all other permits and fees required by all other agencies having jurisdiction.
 - B. Contractor is responsible to acquire and pay for inspections required to obtain Manufacturer Certificate from Washington State Labor and Industries for the prefabricated Guard House. Include the cost of this permit in the bid. Certify that the product meets or exceeds specified requirements.
- 1.4 PERMIT RECORDS:
 - A. Maintain notebook on site with copies of all permits and inspection reports. Include same in Maintenance and Operations Manuals furnished at conclusion of project.
- 1.5 UTILITY SERVICE CONNECTION FEES PAID FOR BY OWNER (PERMANENT):
 - A. The Owner will pay directly for fees required for all permanent service connections to utilities (natural gas, electricity, water, sewer, telecommunications). Make all final connection application(s) required, advise Owner when connection fee is ready for payment, and notify Owner of all pertinent permit payment details so that payment can be made.
- 1.6 UTILITY SERVICE CONNECTION FEES PAID FOR BY CONTRACTOR (TEMPORARY):
 - A. Pay for all utility service connection fees required by utility vendors that are required for temporary use during the course of construction.

END OF SECTION

SECTION 01 1300 - SUBMITTALS AND SHOP DRAWINGS

- 1.1 DOCUMENTS REQUIRED AT PRECONSTRUCTION CONFERENCE
 - A. Work Hazard Analysis Report as required in Paragraph 3.06(B) of the General Provisions.
 - B. Construction Schedule as required in Section 01 1040 Project Coordination.
 - C. List of Subcontractors, including each subcontractor's address, telephone number, and contact person on this project.
 - D. Name of Job Superintendent.
 - E. List of Number and Names of Workers, Equipment List, and Working Site Layout or Requirements.
 - F. List of Products.
 - G. List of Principal Suppliers and Fabricators.
 - H. Schedule Of Values See Section 01 10 25 MEASUREMENT AND PAYMENT

1.2 SUBMITTALS AND SHOP DRAWINGS DURING CONSTRUCTION

Submittals and shop drawings submitted to the City as specified herein are intended to show compliance with the contract documents. <u>Signatures</u>, corrections or comments made on submittals do not relieve the contractor from compliance with requirements of the drawings and specifications. Neither does acceptance or approval of submittals by signature add to or delete from any contract requirements resulting from these specifications regardless of the wording of the submittals. Submittals will not be reviewed or approved when the term "By Others" is used. Submittals are reviewed or approved for general conformance with the design concept of the project and general compliance with the information given in the contract documents. The contractor is responsible for confirming and correlating all quantities and dimensions, selecting fabrication processed and techniques of construction, coordinating their work with that of other contractors and agencies, and performing their work in a safe and satisfactory manner. Piece-mealing of submittals will not be accepted.

A. SUBMITTALS PROCEDURES

- 1. Submittal Requirements: Submit as specified under individual sections. Submittals not requested will not be recognized or processed.
- 2. Transmittal Form: Accompany each submittal with transmittal letter, in triplicate. Transmittal form will be supplied by the engineer.
- 3. Submittal Numbering: Sequentially number transmittal forms in order submitted. Add alphabetic suffix to original submittal number of re-submittals.
- 4. Submittal Identification: Include project, contractor, subcontractor or supplier, pertinent drawing and detail number, specification section number, manufacturer, fabrication, product, material, and, as appropriate

- 5. Contractor's Certification: Apply contractor's stamp, signed or initialed, certifying that review, verification or products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the contract documents.
- 6. Contractor shall review submittals for adequate installation interface for all work prior to submitting them to the City.
- 7. Schedule of Submittals: Deliver to engineer, promptly, to meet critical path, and lead times as required to expedite the project.
- 8. Turn-Around Time: Allow from time of receipt five (5) working days for each submittal and each re-submittal to be reviewed by the engineer.
- 9. Critical Issues: Prior to submittal, communicate with engineer reason for critical issue. Upon approval, allow five (5) working days turn-around time from time of receipt by engineer.
- 10. Coordination and Consolidation of Submittals: Submit related items, sections or trades under one (1) submittal package for each unit of work or system where possible.
- 11. Deviations on Submittals: Identify deviations, including products and systems, not conforming with contract documents.
- 12. Product and System Limitations: Indicate conditions which may be detrimental to successful performance or completion of work.
- Substitutions to Specified Items: Submit for approval in accordance with Section 01 1300 Paragraph 1.3 "Or Equal" Clause or Substitution. Do not indicate or otherwise imply substitutions to specified items, except as approved.
- 14. Job Site Office Records: Maintain one (1) copy of every submittal, regardless of status, along with a current submittal log. Ensure that the most current, architect, and engineer stamped shop drawings and product data are distributed and subsequently used in connection with the work.
- 15. Re-Submittal Requirements: Revise initial submittal as directed and re-submit. Following procedures specified for the initial submittal. Make any corrections or changes in the submittals required by the engineer. Revise and make any further resubmittals until no exceptions are taken. Identify changes on re-submittal made since previous submittal.
- 16. Other Pertinent Submittals: Provide templates, inserts, and as applicable in timely fashion to other trades.
- B. SCHEDULE OF SUBMITTALS
- 1. Within five (5) days of notice to proceed, prepare schedule of submittals for shop drawings, product data, samples, and as specified for each section. Update as requested by engineer.
- 2. List submittals sequentially by project manual table of contents section numbers and titles.
- Show submittal preparation time, field measurements and verification time, date submitted to engineer, date due back from engineer, item order dates, and delivery dates.

- 4. Identify individual delivery, long lead times, and critical ordering deadlines. Include ordering dates for each item including individual parts of major submittals.
- 5. Indicate specified time allocated for review, turn around and distribution.
- 6. Identify decision dates for selection of colors and finishes not scheduled or otherwise approved.
- 7. Within five (5) days after notice to proceed, and in accordance with the conditions of the contract, submit list of major products proposed for use with name of manufacturer, tradesman, and model number of each product.
- 8. For products specified only by reference standards, give manufacturer, tradesman, model or catalog designation and reference standards.

C. SHOP DRAWINGS

- 1. Number and Format: Submit one (1) opaque reproductions when larger than 11inches by 17-inches.
- 2. Submittal Procedure: Submit for engineer's review in accordance with submittal procedures specified in this section. After approved drawings are return, the contractor shall reproduce and distribute copies to subcontractors and other entities, as applicable. Maintain one (1) copy of each shop drawing at field office and one (1) for project record documents to be delivered to the engineer at project completion.
- 3. Maximum Sheet Size: 24-inches by 36-inches or other allowable sizes of 8-1/2-inches by 11-inches or 11-inches by 17-inches.
- 4. Identification: Reference shop drawing details same as reference on contract documents, including sheet and detail descriptions, schedules and room numbers. Indicate by whom materials, products, work, and installations are supplied, performed or installed. Do not use the expression "by others".
- 5. Presentation: Hand drafted or computer generated, delineated to present information in a clear and thorough manner. Freehand sketches are not acceptable.
- 6. Variations from Contract Documents due to Standard Shop Practices: Make transmittal outlining variation.
- 7. Engineer Changes to Submittals which affect Contract Sum or Contract Time: Do not distribute to being work related to submittal. Notify engineer immediately.
- 8. Mechanical and Electrical Utilities, Equipment and Appliance: Include electrical characteristics, connection requirements, rough-ins, location of outlets, wiring, piping diagrams, weight where significant, and as required to describe installation requirements.

D. PRODUCT DATA

- 1. Number of Copies: Submit two (2) copies to be retained by the engineer.
- 2. Submittal Procedures: Submit for engineer review in accordance with submittal procedures specified in this section. After review, distribute to subcontractors and other applicable entities. Maintain one (1) copy for project record documents to be delivered to engineer at project completion.
- 3. Identification: Mark each copy to identify specific products, models, options, tolerances, dimensions, and other pertinent data.

- 4. Manufacturer's Standard Data: Modify drawings and diagrams to delete inapplicable information. Supplement to provide pertinent information unique to project.
- 5. Mechanical and Electrical Utilities, Equipment, and Appliance: Where not shown by shop drawings, include electrical characteristics, connection requirements, rough-ins, location of outlets, wiring, piping diagrams, controls, weight where significant, and as required to describe installation requirements. Correct published product data to correlate with specific project requirements.

E. ELECTRONIC FILES OF MANUALS (FROM VENDORS):

- 1. Electronic manuals must be submitted in .PDF and compatible with the latest version of Adobe Professional.
- 2. Manuals should be scanned at 300 DPI.
- 3. Color originals should be scanned to color images if possible.
- 4. All .PDF files should be scanned at using Optical Character Recognition (OCR)
- 5. A manual must be submitted as a single .PDF file; addendums and attachments (may or may not include drawings) should not be submitted separately, or in different file formats.
- 6. Manuals that consist of multiple volumes should be submitted as individual files.
- 7. Manuals comprised of several sections or chapters should be bookmarked by the vendor.
- 8. If a vendor wished to include security settings (so that their documents are "readonly"), that is acceptable provided that the City can view and print from the file.

F. SAMPLES

- 1. Quantity or Number: Submit one (1) each to be retained by engineer, except as otherwise specified by individual specification sections. Submit additional as required by contractor for distribution.
- 2. Submittal Procedure: Submit for engineer's review in accordance with submittal procedures specified in this section. After review, distribute to applicable entities.
- 3. Size and Completeness: As specified by individual sections. When not specified, submit samples of sufficient size and completeness to clearly illustrate product.
- 4. Identification: Label each sample with project title and complete product identification, including manufacturer, model number, descriptive name, supplier, and as applicable to sample identification.
- 5. Functional Characteristics: Include parts, attachments, and components as applicable. Coordinate with interfacing work.
- 6. Aesthetic Characteristics: As required for selection of colors, finishes, patterns, and as required or requested to finalize selection process. Furnish full range of manufacturer's custom and standard selections. Where selection is specified, submit as required to show conformance to contract documents.

H. DESIGN DETAILS

All design details shall be submitted to the City by the contractor during the design phase for review and approval prior to commencing any construction. This includes designs, loads and computations on foundations, connections, columns, beams, and complete details of all structural members and structural connections. During this phase, the contractor shall be required to submit plans, calculations, and all required materials to the applicable authority to obtain all necessary permits for the project.

I. MANUFACTURER INSTRUCTIONS AND CERTIFICATES

Number: Submit one (1) copy of both the manufacturer instructions and certificates.

Content: Include manufacturer's printed instructions for delivery, storage, preparation, assembly, installation, start-up, adjusting, balancing, and finishing as specified for individual specification sections. Include special procedures, project conditions, and environmental criteria required for application or installation.

J. CODE COMPLIANCE CERTIFICATES

Submit information required as a condition of building permit issued by code authority.

1.3 "OR EQUAL" CLAUSE OR SUBSTITUTIONS

A. GENERAL

When the engineer approves a substitution, it is with the understanding that the contractor guarantees the substituted article to be equal to, or better than, the article specified. The engineer will judge the suitability, reliability, and service availability of a proposed substitute. To be considered by the engineer, the request for substitution shall be accompanied with complete physical and technical data, manufacturer's catalogue data, photographs, samples, and the address of the nearest authorized service representative, as applicable.

The decision of the engineer on "OR EQUALS" shall be final.

The requirements of General Provision 2.15 - Approved Equals also apply.

B. PRIOR TO BID OPENING

Substitution approvals will be considered prior to the bid opening if the bidder submits their request for substitution not less than ten (10) working days prior to the date set for bid opening. All substitution requests shall be submitted using the **"Substitution Request Form"** included in the bid packet and shall be sent to the individual as noted at the top of the form. Substitution requests not received by the named individual will not be evaluated and not allowed as a substitution prior to bidding. Submit all requests and product data in triplicate.

Saturday, Sunday and holidays listed in Paragraph 2.13 of the General Provisions are excluded from the calculation of five (5) days. An addendum listing such approvals may/will be issued prior to bidding.

Bidders who do not receive prior written approvals of "OR EQUAL" by <u>five (5)</u> working days prior to bid submittal must base their bids on the items specified.

B. AFTER BID OPENING

Proposed substitution and deviation requests shall be reviewed during the time of submittal review.

Substitution and deviation requests will be received and considered only when one or more of following conditions are satisfied:

- 1. The specified product or method of construction cannot be provided within the contract period and the contractor submittal is submitted within time frame allowed.
- 2. The specified product or method of construction cannot receive necessary approval by a governing authority, and the requested substitution can be approved.
- 3. The specified product or method of construction cannot be provided in a manner that is compatible with other materials.
- 4. A substantial advantage is offered to the Owner, in terms of cost, time, or other considerations of merit.
- 5. The product as specified includes the statement, "or equal" and one of the above conditions governs
- B. The engineer's decision on all substitution or deviation requests shall be final.

SECTION 01 1400 - QUALITY CONTROL

1.1 REFERENCE STANDARDS

Reference to standards, specifications, manuals or codes of any technical society, organization, or association, or to the laws or regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest Standard Specification manual, code, or laws or regulations in effect at the time of opening of bids (or on the effective date of the agreement if there were no bids), except as may be otherwise specifically stated. However, no provision of any referenced standard, specification, manual, or code (whether or not specifically incorporated by reference in the contract documents) shall be effective to change the duties and responsibilities of City, contractor, or engineer, or employees from those set forth in the contract documents.

1.2 INSPECTION, TESTING AND CERTIFICATION

A. INSPECTION

Construction inspection and testing for the City will be performed as the City may designate and as the construction situation may dictate. The City inspector will be responsible for insuring that the contractor is complying with the contract plans and specifications.

- 1. The City will prepare a construction inspection checklist to be presented to the contractor at the preconstruction meeting. The checklist will include all inspections typically required by local, city and county officials as well as other items as deemed important by the engineer.
- 2. The contractor shall be required to contact the City 24 hours in advance of all of the construction activities listed on the checklist, have the indicated activity inspected, and the City's inspector initial that the work was performed in accordance with the appropriate technical provision.
- 3. The checklist shall be posted near each structure and be available for review by the City at all times. These inspections shall be in addition to any required inspections by state or local jurisdictions. The City will prepare a suitable checklist for each building to be constructed and present same to the contractor at the preconstruction meeting.
- 4. Pre-final Inspection: Contractor shall notify the engineer in writing when all work or portions of work are complete and ready for inspection. The engineer will make a "punch list" and forward the results of same to the contractor who shall promptly correct any deficiencies noted.
- 5. Final Inspection: Contractor shall notify the engineer in writing when all punch list deficiencies have been completed. The engineer will promptly set a time for final inspection at which time the engineer and contractor shall jointly inspect the work. The contractor will promptly correct any further deficiencies noted.

B. LABORATORY SERVICES

1. Testing for quality control certification or special inspections as required by the permitting authority will be conducted by an independent laboratory which will be furnished and paid for by the City. Subsequent sampling and testing of rejected material shall be paid for by the contractor.

- 2. Failure of the material to achieve the specified density or standards will be just cause for rejecting any portion of, and/or all of the material represented by the test. All costs associated with replacement materials or any delays caused by such failure shall be borne by the contractor.
- 3. It shall be the contractor's responsibility to prepare test specimens as required for special inspection as required by the permitting authority or the engineer and the cost shall be incidental to the contract.

C. PERMIT INSPECTIONS

The contractor shall comply with the requirements of all permits. It shall be the contractor's responsibility to contact the permitting authority and schedule all required inspections. The contractor shall notify the City inspector of all scheduled inspections.

D. QUALITY ASSURANCE - CONTROL OF INSTALLATION

- 1. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship to produce Work of specified quality.
- 2. Comply with manufacturers' instructions, including each step in sequence.
- 3. Should manufacturers' instructions conflict with Contract Documents, request clarification from engineer before proceeding.
- 4. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- 5. Perform Work by persons qualified to produce required and specified quality.
- 6. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- 7. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

E. TOLERANCES

- 1. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- 2. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from engineer before proceeding.
- 3. Adjust products to appropriate dimensions; position before securing products in place.

F. MOCK-UP

- 1. Tests will be performed under provisions identified in this Section and identified in the respective product specification sections.
- 2. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
- 3. Accepted mock-ups shall be a comparison standard for the remaining Work.
- 4. Where mock-up has been accepted by engineer and is specified in product specification sections to be removed, remove mock-up and clear area when directed to do so.

G. MANUFACTURERS' FIELD SERVICES

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance of equipment, and to initiate instructions when necessary.
- B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

SECTION 01 1500 - CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

1.1 PARKING

A. PARKING

Tacoma Rail will not provide a designated parking area. The contractor is responsible for providing parking for its crews and subcontractors offsite.

1.2 LAYDOWN AREA

B. STORAGE AND LAYDOWN AREA

An area will be made available by the owner for material storage on site. This area will be made available for inspection prior to submittal of bids. This material storage area will be required to be used for storage of all construction material with lead time requirements that is required to be on hand at start of construction. The lay down area is as shown in the plans. Any modification of the storage area for the convenience of the contractor shall be at the contractor's expense and shall be pre-approved by the engineer. Contractor may use an alternate area for storage of lead time material providing it is at the contractor's expense and available to the engineer for inspection to verify availability.

1.3 SECURITY AND ACCESS

A. GENERAL

- 1. Contractor Operations: Tacoma Rail is as secure facility and following award Tacoma Rail and the contractor shall coordinate an access protocol to the site. Access shall be restricted to the immediate work area and access an route shall be identified to be used during construction. Contractor shall confine personnel to the immediate work vicinity while on site.
- 2. Emergency Site Access during Construction: Fire lanes must remain open during construction.

1.4 SAFETY

In addition to Section 3.06 "Safety" of the General Provisions, the contractor shall:

A. WORK HAZARD ANALYSIS

The contractor and their subcontractors shall thoroughly review the scope of work of the proposed project. The contractor will be responsible to indicate a work hazard analysis on the form of "Contractor's Work Hazard Analysis Report" attached with the proposal; i.e., any known or potential safety issues or phases of construction that may require specific safety procedures as identified by WISHA or OSHA regulations, and/or prudent construction practices; i.e., shoring, fall protection, scaffolding, hazardous materials, asbestos removal, etc.

This report shall be completed and submitted to the engineer before the preconstruction conference. A copy of this report will be forwarded to the City Safety Officer for review. A copy of this report shall be maintained at the work site (accessible to the supervisor).

The City will review the submitted report and may require the contractor to clarify their safety procedures submitted or detail their procedures for ensuring safe working conditions for other working conditions not listed in the original submitted report; and/or explain how the procedures meet current safety regulations. In no case, may the contractor commence work until the Job Hazard Analysis Report has been reviewed and approved by the engineer.

1.5 PROTECTION OF ADJACENT AREAS DURING CONSTRUCTION

The contractor shall take any measures, including but not limited to the ones listed below, to protect adjacent areas from the effects of construction.

Other work and barrier requirements as directed by the engineer to provide separation between the contractor's work area and ongoing GTCC operations.

The contractor shall take any measures, including but not limited to the ones listed below, to protect adjacent areas and quadrants from the effects of construction.

1.6 DUST CONTROL

The contractor shall take reasonable measures to prevent unnecessary dust. Earth surfaces subject to dusting shall be kept moist with water or by application of a chemical dust suppressant. Dusty materials in piles or in transit shall be covered when practicable to prevent blowing.

Buildings or operating facilities which may be affected adversely by dust shall be adequately protected from dust. Existing or new machinery, motors, instrument panels, or similar equipment shall be protected by suitable dust screens. Proper ventilation shall be included with dust screens.

1.7 POLLUTION CONTROL

Contractor shall prevent the pollution of drains and watercourses by sanitary wastes, sediment, debris, and other substances resulting for construction activities. No sanitary wastes will be permitted to enter any drain or watercourse other than sanitary sewers. No sediment, debris, or other substances will be permitted to enter sanitary sewers and reasonable measures will be taken to prevent such materials for entering and drain or watercourse.

The contractor shall maintain oil absorption pads in the actual job site whenever any equipment is present to immediately catch and contain any oil and/or fuel leaks.

Nothing in this specification or contract shall be deemed to warrant to the contractor the quality, quantity or usefulness of the property designated for demolition, not designated as salvage, or designated to become the property of the contractor.

END OF SECTION

SECTION 01 1600 - MATERIAL AND EQUIPMENT

1.1 QUALITY OF WORKMANSHIP AND MATERIAL

A. WORKMANSHIP

The contractor shall employ only competent, skillful, and orderly persons to do the work. If, in the engineer's opinion, a person is incompetent, disorderly or otherwise unsatisfactory, the engineer shall notify the contractor, in writing, of same. The contractor shall immediately discharge such personnel from the work and shall not again employ those person(s) on said contract again. Work shall conform to the highest industry standards.

See General Provisions, Paragraph 3.07 - Contractor - Supervision and Character of Employees for additional requirements.

B. MATERIALS

Materials shall be delivered to the project site in the manufacturer's original containers, bundles or packages unopened with the seals unbroken and the labels intact. Each type of material shall be of the same make and quality throughout. Manufactured articles, materials and equipment shall be installed in accordance with each manufacturer's written directions, unless otherwise specified.

All materials and equipment to be provided under this contract shall conform to the latest edition of the applicable codes, but in no case shall be contrary to the laws of the State of Washington and/or Federal Government.

The equipment supplied shall meet appropriate ANSI, OSHA, WISHA, and all Federal, state, and local standards for the type of equipment provided for its intended use.

Deliver, store and handle products according to manufacturer's written instructions, using means and methods that will prevent damage, deterioration, and loss, including theft.

- 1. Schedule delivery to minimize long-term storage and to prevent overcrowding construction spaces.
- 2. Deliver with labels and written instructions for handling, storing, protecting, and installing.
- 3. Inspect products at time of delivery for compliance with the contract documents and to ensure items are undamaged and properly protected.
- 4. Store heavy items in a manner that will not endanger supporting construction.
- 5. Store products subject to damage on platforms or pallets, under cover in a weather tight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required.
- 6. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- 7. Provide [bonded] off-site storage and protection when sited does not permit on-site storage or protection.
- 8. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

1.2 SALVAGEABLE AND NONSALVAGEABLE MATERIAL

A. PROPERTY OF CONTRACTOR

Demolition, not indicated for salvage, becomes property of contractor. Removed from site at contractor's expense to a legal waste site obtained by the contractor

Materials deemed to be non-salvageable by the engineer's representative shall be disposed by the contractor to a legal dump site obtain by him. All costs to dispose of non-salvageable materials shall be the contractor's responsibility.

The contractor may, if approved by the City, furnish and install new items in lieu of those specified or indicated to be salvaged and reused, in which case such removed items will become the contractor's property. Existing materials and equipment removed by the contractor shall not be reused in the work except where so specified or indicated.

PART 1 - GENERAL

1.01 PAYMENT PROCEDURES

- A. Monthly pay estimates shall clearly identify the work performed for the given time period based on the approved Schedule of Values.
 - 1. At the Pre-construction meeting, the Engineer and the Contractor shall agree upon a date each month when payment applications shall be submitted.
- B. Prior to submitting a payment application, the Contractor and Engineer shall meet each month to review the work accomplished to determine the actual quantities including labor, materials and equipment charges to be billed.
 - 1. Prior to the payment application meeting, the Contractor shall submit to the Engineer all measurement documentation as referenced in these contract documents; to include all measurement by weight, volume or field.
 - 2. For all change work being done on a force account basis, the Contractor shall submit prior to meeting with Engineer all Force Account back-up documentation as required to process the payment application where Force Account work is being billed. The Engineer and the Contractor shall review the documentation at the payment application meeting to verify quantities and review the work accomplished.
 - 3. The Contractor shall bring a copy of all documentation to the pay application meeting with the Engineer.
- C. Following the Engineers review, the Contractor shall prepare an original pay estimate, in a form approved by the Owner or with the Owner's supplied form, signed and complete with all supporting documentation attached and submit it electronically using Adobe PDF file format.
 - 1. With each payment application, the Contractor shall submit a list of all subcontractors (at all tiers) and suppliers on the Owner supplied form.
- D. An estimated cashflow statement projecting the Contractor's monthly billings on the project shall be submitted with each payment application.

1.02 PAYMENT PRICING

- A. Pricing for the various lump sum or unit prices in the Bid Form, as further specified herein, shall include all compensation to be received by the Contractor for furnishing all tools, equipment, supplies, materials and manufactured articles, and for all labor, operations, and incidentals appurtenant to the items of work being described, as necessary to complete the various items of the work in accordance with the requirements of the Contract Documents.
- B. Pricing also includes all costs of compliance with the regulations of public agencies having jurisdiction, including safety and health requirements of the Occupational Safety and Health

Administration of the U.S. Department of Labor (OSHA).

- C. No separate payment will be made for any item that is not specifically set forth in the Bid Form, and all costs therefore shall be included in the prices named in the Bid Form for the various appurtenant items of work.
- D. All other work not specifically mentioned in the measurement and payment sections identified below shall be considered incidental to the work performed and merged into the various unit and lump sum prices bid. Payment for work under one item will not be paid for under any other item.
- E. Indirect costs, such as supervision, overhead costs, profit, and compliance with general conditions, shall be allocated to each bid item as applicable for work defined in the bid item. No separate payment will be made to the Contractor for indirect costs.
- F. The Owner reserves the right to make changes should unforeseen conditions necessitate such changes. Where the work is on a unit price basis, the actual quantities occasioned by such changes shall govern.
- 1.03 LUMP SUM MEASUREMENT
 - A. Lump-sum measurement will be for the entire item, unit of Work, structure, or combination thereof, as specified and as indicated in the Contractor's submitted bid.
 - 1. If the Contractor requests progress payments for lump-sum items, such progress payments will be made in accordance with an approved schedule of values. The quantity for payment for completed work shall be an estimated percentage of the lump sum amount, agreed to between the Engineer and Contractor, payable in monthly progress payments in increments proportional to the work performed in amounts as agreed between the Engineer and the Contractor.

1.04 MEASUREMENT OF QUANTITIES FOR UNIT PRICES

- A. Measurement Standards:
 - 1. All Work to be paid for at a contract price per unit measurement, as indicated in the Contractor's submitted bid, will be measured by the Engineer in accordance with United States Standard Measures.
- B. Measurement by Weight:
 - Unless shipped by rail, material to be measured and paid for by weight shall be weighed on sealed scales regularly inspected by the Washington State Department of Agriculture's Weights and Measures Section or its designated representative. Measurement shall be furnished by and at the expense of the Contractor. All weighing, measuring, and metering devices shall be suitable for the purpose intended and shall conform to the tolerances and specifications as outlined in Washington State Department of Transportation Standard Specifications, Division 1, General Requirements, Article 1-09.2, Weighing Equipment.

- 2. Provide or utilize platform scales of sufficient size and capacity to permit the entire vehicle or combination of vehicles to rest on the scale platform while being weighed. Combination vehicles may be weighed as separate units provided they are disconnected while being weighed. Scales shall be inspected and certified as often as the Engineer may deem necessary to ascertain accuracy. Costs incurred as a result of regulating, adjusting, testing, inspecting, and certifying scales shall be borne by the Contractor.
- 3. A licensed weighmaster shall weigh all Contractor-furnished materials. The Engineer may be present to witness the weighing and to check and compile the daily record of such scale weights. However, in any case, the Engineer will require that the Contractor furnish weight slips and daily summary weigh sheets. In such cases, furnish a duplicate weight slip or a load slip for each vehicle weighed, and deliver the slip to the Engineer at the point of delivery of the material.
- 4. If the material is shipped by rail, the certified car weights will be accepted, provided only actual weight of material will be paid for and not minimum car weights used for assessing freight tariff. Car weights will not be acceptable for material to be passed through mixing plants. Material to be measured by weight shall be weighed separately for each bid item under which it is to be paid.
- 5. Trucks used to haul material being paid for by weight shall be weighed empty daily and at such additional times as the Engineer may require. Each truck shall bear a plainly legible identification mark. The Engineer may require the weight of the material be verified by weighing empty and loaded trucks on such other scales as the Engineer may designate.
- C. Measurement by Volume:
 - 1. Measurement by volume will be by the cubic dimension indicated in the Contractor's submitted bid. Method of volume measurement will be by the unit volume in place or removed as shown on the Contract Drawings or as specified.
 - 2. When material is to be measured and paid for on a volume basis and it is impractical to determine the volume by the specified method of measurement, or when requested by the Contractor in writing and accepted by the Engineer in writing, the material may be weighed in accordance with the requirements specified for weight measurement. Such weights will be converted to volume measurement for payment purposes. Factors for conversion from weight measurement to volume measurement will be determined by the Resident Engineer and shall be agreed to by the Contractor before such method of measurement of pay quantities will be accepted.
- D. Field Measurement for Payment:
 - 1. The Contractor shall take all measurements by providing equipment, workers, and survey crews as required to measure quantities in accordance with the provisions for measurement specified herein. No allowance will be made for specified tolerances.
 - 2. The Engineer will verify all quantities of Work performed by the Contractor on a unit-price basis, for progress payment purposes.

1.05 REJECTED, EXCESS, OR WASTED MATERIALS

 Quantities of material wasted or disposed of in a manner not called for under the Contract; rejected loads of material, including material rejected after it has been placed by reasons of the failure of the Contractor to conform to the provisions of the Contract; material not unloaded from the transporting vehicle; material placed outside the lines indicated on the Contract Drawings or established by the Engineer; or material remaining on hand after completion of the Work, will not be paid for, and such quantities shall not be included in the final total quantities. No additional compensation will be permitted for loading, hauling, and disposing of rejected material.

1.06 MEASUREMENT AND PAYMENT

- A. Item #1: Mobilization and Demobilization
 - 1. Payment for MOBILIZATION AND DEMOBILIZATION shall be for preparatory work and operations performed by the Contractor including, but not limited to completion and submittal and approval of the following:
 - a. All bonds and insurance certificates (General Conditions Part 2, Contract Forms)
 - b. Schedule of Values (GC 6.02)
 - c. Detailed CPM progress schedule (GC 3.02)
 - d. Demolition Management Plan (02 41 13)
 - e. Establishing Contractor's Project Manager, Superintendent, and other required specified personnel on the Work site full time.
 - f. Furnishing and installing all temporary facilities and controls as needed for the safe and proper completion of the work, including utilities, sanitary facilities, barriers and enclosures, fences, staging and entrance areas, and field offices, as specified.
 - g. Mobilization onto the site required in support of the Contractor's first 30 days of operations.
 - 2. Mobilization and Demobilization shall be paid at the lump sum price listed in the Contractor's submitted bid. Incremental payment shall be made for each location as follows:
 - a. 40% after completion of 5% of the total contract amount of other bid items have been earned.
 - b. 40% after completion of 20% of the total contract amount of other bid items have been earned.
 - c. 20% after all work on the project has been completed, including cleanup and issuance of Final Completion from the Engineer.

B. Item #2: Trench Safety Systems

- 1. Payment for all work and costs related to development of the trench safety system plan and all labor, materials, and equipment to provide protective systems, including shoring, shielding, and support systems for excavations that exceed four feet in depth.
- C. Item #3: Site Preparation and Site Demolition
 - Payment for all work and costs related to general site preparation and site demolition shall be at the contract lump sum price, which shall be full compensation for utility locates, TESC, protection or abandonment of existing monitoring wells, demolition and/or salvage of structures, utilities, pavements, track, track pans and other site improvements. Site preparation and site demolition shall also include all costs related to disposal of demolition materials and securing demolition permits, including permit fees.
- D. Item #4: Site Grading and Earthwork
 - 1. Payment for all work and costs related to site grading and earthwork shall be at the contract lump sum price, which shall be full compensation for excavation, stockpiling, fill and backfill, fine grading, compaction and related work required to prepare subgrades and finish grades on the site per the Contract Documents.
- E. Item #5: Track with Standard Ties
 - 1. Payment for all work and costs related to Track with Standard Ties shall be made at the contract unit price per track foot, which shall be full compensation for furnishing and installing track on ties, including but not limited to geotextile, ballast, rail, ties, rail fastening components, other track materials, surfacing, tamping and lining necessary and incidental to constructing track.
 - 2. This item shall be measured per track foot of installed track. A track foot is one linear foot of complete railroad track.
- F. Item #6: Track with Precast Concrete Track Panels
 - 1. Payment for all work and costs related to Track with Precast Concrete Track Panels shall be made at the contract unit price per track foot, which shall be full compensation for furnishing and installing track on concrete panels, including but not limited to rail, rail fastening components, and all other track materials necessary and incidental to constructing track with precast concrete track panels.
 - 2. This item shall be measured per track foot of installed track panel. A track foot is one linear foot of complete railroad track.
- G. Item #7: Crushed Surfacing
 - 1. Payment for all work and costs related to crushed surfacing shall be made at the contract unit price per ton, which shall be full compensation for furnishing, loading, hauling placing,

shaping, compacting, proof rolling and other incidentals related to providing crushed surfacing complete in place.

- 2. Measurement for this item shall be based on certified truck weight tickets. Weight tickets shall be presented to the inspector each day.
- H. Item #8: Service Island Concrete Pavement, Curbs and Grating
 - 1. Payment for all work and costs related to Service Island Concrete Pavement shall be made at the contract unit price per square yard, which shall be full compensation for furnishing, mixing, loading, hauling, placing, forming, finishing, painting and other incidentals related to cast-in-place concrete pavement and curbs within the Service Island, and fabricating and installing metal grating panels, complete in place as indicated on the Contract Drawings.
 - 2. Measurement for this item shall be based square yard of cast-in-place concrete pavement surface in place.
- I. Item #9: Concrete Pavement and Curbs
 - 1. Payment for all work and costs related to Concrete Pavement shall be made at the contract unit price per square yard, which shall be full compensation for furnishing, mixing, loading, hauling, placing, forming, finishing, painting and other incidentals related to cast-in-place concrete pavement, aprons, equipment pads, and curbs, complete in place as indicated on the Contract Drawings, and excluding concrete pavement and curbs within the Service Island.
 - 2. Measurement for this item shall be based square yard of concrete pavement surface in place.
- J. Item #10: Hot Mix Asphalt Pavement
 - 1. Payment for all work and costs related to hot mix asphalt pavement shall be made at the contract unit price per ton, which shall be full compensation for furnishing, loading, hauling placing, shaping, compacting, and all other incidentals related to providing asphalt concrete pavement complete in place.
 - 2. Measurement for this item shall be based on certified truck weight tickets. Weight tickets shall be presented to the inspector each day.
- K. Item #11: Fuel Tank Foundations
 - 1. Payment for all work and costs related to fuel tank foundations shall be at the contract lump sum price, which shall be full compensation for constructing tank foundations complete in place, including but not limited to furnishing, mixing, loading, hauling, placing, forming, finishing reinforced concrete.
- L. Item #12: Fuel System
 - 1. Payment for all work and costs related to fuel system shall be at the contract lump sum price, which shall be full compensation for furnishing, installing, testing and commissioning a

complete fuel receiving, storage and dispensing system including tank fill connection, meter, fuel filters, containment pans, diesel storage tank with ladder, walkway and handrails, piping, fuel crane, gauges, vents, level sensors, breathers, fuel pump and all other materials and components necessary and incidental to a complete system.

- M. Item #13: Sand Silo Foundation
 - 1. Payment for all work and costs related to sand silo foundation shall be at the contract lump sum price, which shall be full compensation for constructing silo foundation complete in place, including but not limited to furnishing, mixing, loading, hauling, placing, forming, finishing and painting reinforced concrete foundation as indicated on the Contract Drawings.
- N. Item #14: Sand System
 - Payment for all work and costs related to sand system shall be at the contract lump sum price, which shall be full compensation for furnishing, installing, testing, and commissioning a complete sand receiving, storage and dispensing system including sand silo, air receiver tank, sand piping, sanding system modules, hoses, fill wands, and all other materials and components necessary and incidental to a complete system.
- O. Item #15: Compressed Air System
 - Payment for all work and costs related to compressed air system shall be at the contract lump sum price, which shall be full compensation for furnishing, installing, testing, and commissioning a complete compressed air system including air compressor, air dryer, air receiver tank, air piping, air hoses and reels, and all other materials and components necessary and incidental to a complete system, and excluding the air receiver tank included in Item #13 – Sand System.
- P. Item #16: Lube Oil System
 - 1. Payment for all work and costs related to lube oil system shall be at the contract lump sum price, which shall be full compensation for furnishing, installing, testing, and commissioning a complete system for lubricant storage, conveyance of lubricant to the service island and dispensing lubricant into locomotives. System includes but is not limited to feed tubes, lube oil pump, filter and regulator, heater, lube oil piping, lube oil cabinet, and all other materials and components necessary and incidental to a complete system.
- Q. Item #17: Storm Drainage System
 - 1. Payment for all work and costs related to storm drainage system shall be at the contract lump sum price, which shall be full compensation for furnishing, installing, and testing a storm drainage system including trench drains, catch basins, storm drainage piping, cleanouts, roof downspouts, butterfly valve and all other work and incidentals related to providing a storm drainage system as indicated on the Contract Drawings.
- R. Item #18: Electrical System

- 1. Payment for all work and costs related to electrical system shall be at the contract lump sum price, which shall be full compensation for furnishing, installing, testing, and commissioning a complete electrical system as indicated on the Contract Drawings.
- S. Item #19: Water and Sewer Utilities
 - 1. Payment for all work and costs related to water and sewer utilities shall be at the contract lump sum price, which shall be full compensation for furnishing, installing, and testing water and sewer utilities including sanitary dumping points, sanitary sewers, sewage holding tank and anti-flotation system, water piping, backflow preventer, emergency eyewash and shower, water heater, safety signage, non-potable water cabinet, and all other work and incidentals related to providing a water and sewer utilities as indicated on the Contract Drawings.
- T. Item #20: Oil Retention System
 - Payment for all work and costs related to oil retention system shall be at the contract lump sum price, which shall be full compensation for furnishing, installing, and testing\ a complete oil retention system including ORT discharge points, waste oil holding tank, tank anti-flotation system, ORT drain line, tank vents, pumpout access points, level gauging probe and drop tube, and all other work related to the oil retention system as indicated on the Contract Drawings.
- U. Item #21: Overhead Support Structures
 - 1. Payment for all work and costs related to overhead support structures shall be at the contract lump sum price, which shall be full compensation for fabricating, finishing, furnishing, and installing pipe supports, overhead pipe bridge, and overhead support frame including foundations, roof, gutters and all other work related to support structures as indicated on the Contract Drawings.
- V. Item #22: Crew Shelter
 - 1. Payment for all work and costs related to the Crew Shelter shall be at the contract lump sum price, which shall be full compensation for fabricating, transporting, installing, finishing and other incidentals necessary for a crew shelter structure as indicated on the Contract Drawings.
- W. Item #23: Lube Oil Shed
 - 1. Payment for all work and costs related to the Lube Oil Shed shall be at the contract lump sum price, which shall be full compensation for fabricating, transporting, installing, finishing and other incidentals necessary for a Lube Oil Shed structure as indicated on the Contract Drawings.
- X. Item #24: Disposal & Haul of Contaminated Materials
 - 1. Payment for all work and costs to haul and dispose of contaminated excavation material shall be at the contract unit price per ton, which shall be full compensation for storing, protecting,

loading, hauling, disposing, providing placement material, and all other incidentals related to providing disposal of contaminated materials.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including General Conditions and General Requirements, apply to this work as if specified in this Section. Work related to this Section is described in the following sections:
 - 1. Section 02 41 13 Selective Site Demolition
 - 2. Section 31 00 00 Earthwork
 - 3. Section 31 23 19 Dewatering
 - 4. Section 31 23 33 Trenching and Backfilling
 - 5. Section 31 41 00 Shoring and Underpinning
 - 6. Section 31 63 29 Concrete Piers and Drilled Shafts
 - 7. Section 33 10 00 Water Utilities
 - 8. Section 33 30 00 Sanitary Sewer Utilities
 - 9. Section 33 40 00 Storm Drainage Utilities
 - 10. Section 34 05 17 Railroad Work

1.02 DESCRIPTION OF WORK

- A. Soils excavated on-site are anticipated to be exported to an off-site facility and must have a completed soil profile prior to export. Contractor is responsible for collecting the appropriate data that satisfies the requirements of the receiving facility.
- B. All soils excavated within the project area, as shown on the drawings, are considered regulated material requiring special handling and cannot be reused as part of the project
 - 1. Soil beyond construction excavation limits will not require excavation unless free draining product is observed or other special conditions exist; in which case the Engineer will direct the Contractor in additional excavation. Soils determined to require special handling will be hauled and disposed of at an approved disposal facility.
- C. No soil shall be removed from the site without prior notification to the Engineer. The notification shall include:
 - 1. An estimate of the number of truck-trips, the haul destination, and the period in which these trips will be made (e.g., 20 truck-trips to the Waste Management Facility over the two-week period beginning on March 1, 2012).

1.03 DEFINITIONS

- A. Regulated Material: Any chemical, physical, biological, or radiological substance that does not occur naturally in the environment, or that occurs at concentrations higher than natural background levels, and is regulated by agencies as to the disposal/recycling facility(ies) the material can and cannot go (i.e., EPA, Department of Ecology, Tacoma-Pierce County Health Department).
- B. Soil (waste) Profile: A characterization of the chemical and physical properties of soil material designated for off-site disposal, including the presence of pollutants and their concentrations as

measured by approved laboratory analytical methods. A profile is required by the receiving permitted disposal or recycling facility.

- C. Special Handling: Refers to hauling and disposal of soils that cannot be reused in place as backfill or as general fill at another (off-site) location due to the presence of pollutants in concentrations above allowable limits. Such soils must be hauled to and managed at a permitted disposal facility.
- E. Type A Regulated Soil: Soil that must be removed from the Project site and has been determined by the Engineer to contain pollutants in concentrations that exceed state or federal dangerous or hazardous designations (respectively), or other special Port-determined criteria. Type A Regulated Soil requires disposal at an approved Subtitle C hazardous waste landfill.
- F. Type B Regulated Soil: Soil that must be removed from the Project site and has been determined by the Engineer to contain pollutants in concentrations that are below dangerous or hazardous levels, but could negatively impact the quality of air, waters of the state, soils or sediments, or pose a threat to the health of humans or other living organisms, depending on where the soil is disposed. Type B Regulated Soil requires disposal an approved Subtitle D solid waste landfill.
- G. Type C Regulated Soil: Soil that must be removed from the Project site and has been determined by Engineer to contain unknown constituent(s) and/or in unknown concentration(s) and requires further analysis and characterization. Type C Regulated soil will require disposal at an approved Subtitle C hazardous waste landfill or Subtitle D solid waste landfill if additional soil characterization indicates special handling is required.
- H. Type D Soil: Soil determined by the Engineer not to require special handling with regard to this Contract. Classification of material as Type D Soil by the Port is not a certification nor does it release the Contractor of liability or obligation to meet any disposal or storage facility acceptance or testing requirements.

1.03 HEALTH AND SAFETY

A. The Contractor is required to implement all health and safety provisions as required by Specification 01 35 29 – Health, Safety and Emergency Response. These provisions include any special monitoring, personal protective equipment, or work plans to accommodate regulated soil or material special handling. Use of environmental characterization data may not be appropriate for health and safety purposes.

1.04 SUBMITTALS

- A. The Contractor shall not proceed with any excavation of any subsurface materials, prior to Owner approval of Soils Management Plan prepared by the Contractor. The Contract will provide a minimum of 14 day for the submittal to be reviewed prior to excavation. The Soils Management Plan must be approved by the Engineer prior to any excavation of subsurface materials. The Soils Management Plan must include the following:
 - 1. Identification of all soil disposal facilities anticipated to be used for soils that are determined to be Type A or Type B Regulated Soil.
 - 3. Identification of all fill sites, disposal/recycling facilities and/or end uses anticipated to be used for soil determined to be Type D Soil in accordance with paragraph 3.02 of this section.
 - 4. Contingency for delivery and placement of Type C Regulated Soil at an on-site soil

stockpile area.

- 5. Contingency for managing soil/debris encountered during excavation that may disqualify soil for disposal or recycle at the anticipated facilities.
- 6. General description of how equipment operators, safety staff and other applicable on-site personnel will identify and respond to soil containing potentially regulated material.
- 7. Contractor shall coordinate with the Engineer to facilitate handling of regulated soil in accordance with this specification.
- 8. Description of all haul routes to be used on the project.
- B. A completed soil profile prior to export to an off-site receiving facility.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 EXCAVATION/TESTING

- A. The field-testing for soil to be exported offsite will be performed by the City and will result in the following classification of material:
 - 1. Type A Regulated Soil as defined in 1.02(E) of this Section
 - 2. Type B Regulated Soil as defined in 1.02(F) of this Section
 - 3. Type C Regulated Soil as defined in 1.02(G) of this Section
 - 4. Type D Soil as defined in 1.02(H) of this Section
- B. Contractor shall give City no less than 14 days notice to sample export soil prior to disposal offsite.
- C. Laboratory turnaround times may require additional time for analytical results; therefore, Contractor should coordinate with Engineer well in advance of anticipated disposal date. Samples that are required to have "rush" analysis performed due to the Contractor's failure to disclose the anticipated disposal date shall have the difference in service fees paid by the Contractor, or the Contractor may delay the disposal until the standard analysis turnaround time is complete, at no additional cost to the City.

3.02 TRANSPORTATION AND OFF-SITE DISPOSAL OF SOILS

- A. The Contractor shall be responsible for handling, re-handling, loading, transporting, and legal off-site removal of all waste materials and excavated soils not reused on-site.
 - 1. Contractor shall ensure that transport truck gross weight meets federal and/or state Department of Transportation (DOT) requirements and the requirements of the receiving facility, whichever is more stringent.
 - 2. Contractor shall take measures to prevent debris from being spilled from trucks or tracked from the site to local streets. Contractor shall sweep streets adjacent to the site as necessary or as directed by the Engineer.
 - 3. Contractor shall ensure that any vehicle transporting materials offsite are properly labeled and placarded in accordance with federal and state DOT requirements.
- B. Type A Regulated and Type B Regulated Soil shall be hauled to an approved facility by the

Contractor for disposal.

- C. Type C Regulated Soil is of unknown origin or special circumstances. Type C Regulated Soil shall be hauled to an on-site segregated stockpile area. The Contractor shall protect the material from weather and other disturbances once stockpiled. The City will inform the Contractor of the soil profile following additional analysis of the suspect material (as needed), and the soil will be categorized as either Type A Regulated, Type B Regulated or Type D Soil and disposed of accordingly.
- D. Type D Soil shall be hauled by the Contractor to a site determined by the Contractor. If the receiving/disposal facility requires additional testing or certification of this soil, Contractor shall complete these requirements, at no additional cost to the City. The City will not certify or declare the material suitable for unrestricted use.

3.03 OTHER REQUIREMENTS

- A. Type A, Type B or Type C Regulated Soil may be, upon approval of the Engineer, temporarily stockpiled within the construction area. Contractor shall place an impervious liner beneath the soil and securely cover the stockpile with waterproof covering (e.g., plastic sheeting). Additional measures (e.g., berm, jersey barriers, silt fence, etc.) may be required to minimize soil runoff from the stockpile area. The soil shall be removed prior to completion of Work.
- B. Contractor shall provide the Engineer with all hauling receipts (or copies of receipts) from the disposal facility for all Type A, Type B or Type C Regulated Soil at least weekly.
- C. The Engineer may shut down excavation activities should unexpected regulated material be encountered during excavation.

SECTION 01 7329 - CUTTING AND PATCHING

1.1 GENERAL

A. SUBMITTALS

- 1. Submit written request in advance of cutting or alteration which affects:
 - a. Structural integrity of any element of Project.
 - b. Integrity of weather exposed or moisture resistant element.
 - c. Efficiency, maintenance, or safety of any operational element.
 - d. Visual qualities of sight exposed elements.
 - e. Work of Owner or separate contractor.

B. INCLUDE IN REQUEST

- 1. Identification of Project.
- 2. Location and description of affected Work.
- 3. Necessity for cutting or alteration.
- 4. Description of proposed Work and products to be used.
- 5. Alternatives to cutting and patching.
- 6. Effect on work of Owner or separate contractor.
- 7. Written permission of affected separate contractor.
- 8. Date and time Work will be executed.

2.1 PRODUCTS

A. MATERIALS

- 1. A. Primary Products: Those required for original installation.
- 2. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 1300 Submittals and Shop Drawings.

3.1 EXECUTION

A. EXAMINATION

- 1. Examine existing conditions prior to commencing Work, including elements subject to damage or movement during cutting and patching.
- 2. After uncovering existing Work, assess conditions affecting performance of Work.
- 3. Beginning of cutting or patching means acceptance of existing conditions.
- **B. PREPARATION**
- 1. Provide temporary supports to ensure structural integrity of the Work. Provide devices and methods to protect other portions of Project from damage.

- 2. Provide protection from elements for areas which may be exposed by uncovering work.
- 3. Maintain excavations free of water.
- C. CUTTING
- 1. Execute cutting and fitting including excavation and fill to complete the Work.
- 2. Uncover work to install improperly sequenced work.
- 3. Remove and replace defective or non-conforming work.
- 4. Remove samples of installed work for testing.
- 5. Provide openings in the Work for penetration of mechanical and electrical work.
- 6. Employ original or skilled and experienced installer to perform cutting for weather exposed and moisture-resistant elements and sight-exposed surfaces.
- 7. Cut rigid
- D. PATCHING
- 1. Execute patching to complement adjacent Work.
- 2. Fit products together to integrate with other Work.
- 3. Execute Work by methods to avoid damage to other Work, and which will provide appropriate surfaces to receive patching and finishing.
- 4. Employ original installer to perform patching for weather exposed and moistureresistant elements, and sight-exposed surfaces.
- 5. Restore Work with new products in accordance with requirements of Contract Documents.
- 6. Fit Work to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- 7. At penetrations of fire rated walls, partitions, ceiling, or floor construction completely seal voids with fire rated material to full thickness of the penetrated element.
- 8. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

SECTION 01 7700 - CONTRACT CLOSEOUT

1.1 DOCUMENTS REQUIRED UPON COMPLETION OF WORK

A. CLOSE OUT PROCEDURES

The contractor shall notify the engineer in writing when identified tasks are complete and ready for inspection. The engineer will make the inspection, forward the results of same to the contractor, who shall promptly correct any deficiencies noted.

The contractor shall notify the engineer in writing when all punch list deficiencies have been completed. The engineer will promptly set a time for final inspection, at which time the engineer and the contractor shall jointly inspect the work. The contractor will promptly correct any deficiencies noted.

It is possible that other contractors or the City will be working in the project area during the time of construction. It shall be the responsibility of this contractor to coordinate their work with all other agencies and/or contractors within the project area.

B. ADJUSTMENTING

Adjust operating products and equipment to ensure smooth and unhindered operation.

C. FINAL DOCUMENTATION

Upon completion of the work and before final payment is made, the contractor shall deliver to the engineer, in addition to such other items specified in these specifications, the following documents:

1. "AS-BUILT" Drawings

"AS-BUILT" drawings and specifications of new or revised existing work, shown in red ink, provided by the general, mechanical, electrical contractors, and all other subcontractors, including all addendum's, change orders, deviations, changes, elevations, and dimensions of their work from the construction documents, updated monthly during the construction. Monthly payments will not be made until all redlined as-builts are updated.

Two (2) copies of all shop and construction drawings used for the project, the final record drawings ("AS-BUILT" to reflect the actual installation) including one (1) reproducible set of all design drawings and AutoCAD files, if applicable.

NOTE: The final payment for this contract will not be released until "AS-BUILT" drawings are received and approved by the engineer.

- 2. Project Record Documents
 - a. Operation and Maintenance instructions arranged by system and subdivided by specification section.
 - b. Shop drawings, product data, reports, certificates, original of warranties and bonds.
- 3. Spare Parts and Maintenance Products
 - a. Provide spare parts, maintenance, and extra products in quantities specified in individual specification sections.
 - b. Deliver to Project site and place in location as directed by Owner; obtain receipt from Owner.

- 4. Warranties and Bonds
 - a. Provide duplicate notarized copies.
 - b. Execute and assemble transferable warranty documents from subcontractors, suppliers and manufacturers.
 - c. Provide Table of Contents and assemble in three D side rind binder with durable plastic cover.
 - d. Submit prior to final Application for Payment
 - e. For items of Work delayed beyond date of Substantial Completion, provide updated submittal within ten (10) days after acceptance, listing date of acceptance as start of warty period.
- 5. Re-Review Fees
 - a. Engineer will do a Substantial Completion Inspection and a Final Inspection. Re-Inspections after the Final Inspection, due to Contractor failure to correct deficient work, will require the deduction of an amount for Engineer compensation from the final payment to the Contractor.
- 6. Final Adjustment of Accounts
 - a. Submit final adjusted pay application to Engineer.
 - b. Submit all closeout documents to Engineer for review and acceptance prior to Final Pay Application.

D. FINAL CLEANUP

- 1. After all trades have completed their work, and just prior to occupancy, the general contractor shall:
- 2. Replace and remove any broken glass. Remove excess glazing compounds or seals.
- 3. Removal of all temporary facilities and contractor equipment.
- 4. Remove labels that are not permanent.
- 5. Clean the site.

a. Sweep paved areas and walkways. Remove stains, spills, and foreign deposits.

b. All surfaces disturbed shall be restored to a condition equal to that before the work began.

c. Surplus conduit material, tools, temporary structures, dirt and rubbish shall be removed and disposed of by the contractor, and the project area shall be left clean to the satisfaction of the engineer.

d. Clean up is considered incidental to the project and no measurement and payment will be allowed.

e. Obtain final inspections from authorities having jurisdiction.

TECHNICAL SPECIFICATIONS DIVISIONS 2 - 34

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including General Conditions and General Requirements, apply to this work as if specified in this Section. Work related to this Section is described in the following sections:
 - 1. Section 01 35 43.19 Export Soil Management
 - 2. Section 31 00 00 Earthwork
 - 3. Section 31 23 19 Dewatering
 - 4. Section 31 23 33 Trenching and Backfilling
 - 5. Section 31 41 00 Shoring and Underpinning

1.02 DESCRIPTION OF WORK

- A. The extent and location of the demolition work is indicated on the Drawings and in the specifications. The work includes, but is not limited to:
 - 1. The requirements for the removal, wholly or in part, and satisfactory disposal of ballast, subgrade materials, special trackwork, trackwork, pavements, retaining walls, fencing, storm drainage and utility pipelines and structures, miscellaneous site debris, and other obstructions which are designated to be demolished on the Drawings or within these Specifications.
 - 2. Payment of all costs required for disposal of items at legal disposal sites, including all permit fees and related costs.
 - 3. Salvaging items as indicated on the Drawings and in the specifications.
- B. All demolition items not identified for salvage by the Engineer shall become the property of the Contractor. Disposal of all demolition items shall be in accordance with the specifications, local, state and federal requirements.

1.03 SUBMITTALS

- A. Demolition Management Plan (DMP)
 - 1. The DMP shall provide the procedures proposed for the complete accomplishment of the demolition work and management of the demolition wastes and documentation. The procedures shall provide for safe conduct of the work, careful removal and disposition of materials specified to be salvaged or disposed, protection of property to remain undisturbed, and coordination with other work in progress. The procedures shall include a detailed description of the methods, staff, and equipment to be used for each operation, the sequence of operations, and quality control measures to ensure compliance with the Contract and regulatory requirements.
 - Submittal requirements in Section 01 35 43.19, Export Soil Management and 01 74 19 Construction Waste Management and Disposal may be included as part of DMP plan or submitted separately.
 - 3. The plan shall acknowledge that the work is to take place in an active railyard and that the contractor shall confine operations and staging to the laydown area(s) on

the plans and the limits of the track and turnout to be replaced and yield to railyard traffic at all times.

PART 2 - PRODUCTS

2.01 SALVAGE ITEMS FOR TACOMA RAIL

- A. All materials designated to be salvaged to Tacoma Rail shall be placed within Contractor Laydown area(s) as indicated on the Drawings, where Tacoma Rail staff will load and haul the materials from the site. All salvaged materials delivered to Tacoma Rail shall be stacked on Contractor supplied pallets where practical, or stored by blocking larger items on Contractor supplied dunnage in a neat and orderly manner.
 - 1. Track mats noted for salvage on the plans
 - 2. All joint bars

2.02 ITEMS TO BE REMOVED

- A. All demolition items not identified for salvage by the Engineer shall become the property of the Contractor. Disposal of all demolition items shall be in accordance with the specifications, local, state and federal requirements.
 - 1. For removal of existing ballast and native material excavated from track section, refer to Sections 01 35 43.19 and 01 74 19 for handling, testing and disposal requirements.
 - 2. For removal of timber railroad ties within removal limits, refer to Sections 01 35 43.19 and 01 74 19 for handling, testing and disposal requirements.
 - 3. For removal and demolition of rail material, see additional requirements in Section 2.03 of this specification section.

2.03 RAIL MATERIALS FOR OFFSITE RELAY OR RECYCLE

- A. All rail material designated for demolition or removal, which are not salvaged for Tacoma Rail, shall be salvaged for offsite relay or recycle by the Contractor. All salvaged material shall be stacked on Contractor supplied pallets where practical, or stored by blocking larger items on Contractor supplied dunnage in a neat and orderly manner.
- B. The following materials shall be salvaged for offsite relay or recycle:
 - 1. Salvaged rail conforming to AREMA specifications for Class I and Class II for relay rail.
 - 2. Scrap rail, including all rail removed which does not conform to AREMA specifications for Class I and Class II for relay rail.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Utility locates shall be performed prior to start of demolition. Coordinate and resolve with the Engineer to turn off or de-energize affected services before starting demolition.
- B. Verify all items for demolition, disposal, and salvage as early as practicable prior to start of the work. Notify the Engineer immediately if observed conditions differ from anticipated conditions.
- C. Pothole investigations:
 - 1. Perform pothole investigations to determine the alignment and horizontal and vertical position of utilities at the locations indicated on the Drawings.
 - 2. Potholes shall be 12-inch diameter air vacuum excavations.
 - 3. Survey utilities located by potholing and provide survey data to the Engineer within 5 days of completing pothole investigations.
 - 4. Backfill pothole excavations with Gravel Backfill for Pipe Zone Bedding.

3.02 REMOVAL OF RAIL

A. Unless otherwise noted, rail identified on the Drawings for removal shall be removed to the nearest joint at or beyond the length shown on the drawings.

3.03 DISPOSAL AND DISPOSITION OF MATERIALS

- A. Disposition of Materials
 - 1. All materials and equipment removed, and not used for relay or reinstallation within the project, shall become the property of the Contractor and shall be removed from Tacoma Rail property.
 - 2. The Contractor assumes full responsibility for the proper disposal of all demolition materials under this Contract in a manner that meets the requirements of federal, state and local regulations for protecting the health and safety of employees, the public, and for protecting the environment.
 - 3. Existing ballast, excavated base course and excavated soil to be disposed of off site in accordance with Section 01 35 43.19 Export Soil Management.
- B. Cleanup:
 - 1. Haul route and paved site areas will be swept to remove any construction debris or soil tracked out by construction equipment and vehicles.
 - 2. There shall be no debris, rubble or litter left at the site from any of the demolition operations and the site shall be clean.

PART 1 – GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in:
 - 1. Section 03 20 00 Concrete Reinforcing
 - 2. Section 03 30 00 Cast-in-Place Concrete

1.02 DESCRIPTION OF WORK

A. The Work includes furnishing all necessary material, labor, and equipment for providing the structural support and physical barriers or forms which control the shape and location of the concrete. Also included in this section are the requirements for the removal of the forms and their supports.

1.03 REFERENCE STANDARDS

- A. American Concrete Institute ACI 301-10: Specifications for Structural Concrete.
- B. American Concrete Institute ACI 318-14: Building Code Requirements for Structural Concrete and Commentary.
- C. American Concrete Institute ACI 347-04: Guide to Formwork for Concrete.

1.04 QUALITY ASSURANCE

- A. Design all forms, falsework, accessories, and shoring to meet the requirements of the concrete type, sequence of placing, schedule, and other conditions of the project and in strict accordance with project permits and the WQMPP. Use a designer having at least five (5) years of experience designing and constructing forms and falsework under similar project conditions.
- B. Before casting concrete, inspect all forms, falsework, accessories, and shoring, using workers having at least five (5) years of experience with the types of construction involved and the techniques necessary for completion of the work.

1.05 SUBMITTALS

- A. Documentation demonstrating the falsework designer's qualifications and experience as described above.
- B. Documentation demonstrating each inspection worker's qualifications in and experience at inspecting or supervising concrete work, forms, falsework, accessories, and shoring as described above.
- C. Submit form, falsework, and shoring drawings and calculations for review prior to executing the work.
 - 1. Drawings shall show details of member sizes, connections, product data, and other related elements including proposed construction joints.
 - 2. Drawings shall indicate the construction sequence, the methods for release, and the sequence of removal.

- 3. Calculations shall clearly state the material weights, lateral pressures, rates of pour, direction of pour, and working loads for form ties, friction collars, wedges, she-bolts, and accessories used in the design.
- 4. Drawings shall indicate how the formwork will be made watertight.
- 5. Drawings and calculations for forms, falsework, accessories, and shoring designs shall be stamped by a Professional Engineer registered in the state of Washington.
- D. In the event patented or prefabricated systems are used for forms or falsework, submit complete drawings, details, and calculations for review. Paper, fiberglass, micarta, asphalt-impregnated fiber, and other miscellaneous form materials shall be approved by the Engineer prior to delivery, fabrication, and construction.

PART 2 – PRODUCTS

2.01 GENERAL

- A. Materials for concrete forms may be new or used. The quality of the materials, not the age or previous usage, will be the determining factor as to their suitability.
- B. All prefabricated form details, whether they are part of a patented system or customfabricated, shall be submitted for approval by the Engineer prior to assembly or arrival on site. Forms shall be kept in a condition to produce finished work meeting the location, alignment, and surface tolerances specified.

2.02 WOOD FORMS

- A. For all exposed concrete forms, Grade B-B or B-C Plyform Plywood shall be used.
- B. For unexposed concrete forms, plywood shall be exterior type without splits or knotholes and sanded smooth. All joints in surfaces of forms used on exposed surfaces shall be vertical or horizontal. Plywood shall not be less than ½-inch thick except where curved areas require the use of ¼-inch thick material. When ¼-inch-thick material is used, it shall be backed with heavier material.
- C. Use commercial Grade No. 2 or better for all species of framing lumber. Framing lumber shall be of standard dimensions and of such quality as to meet the requirements of the applied stresses or loads.
- D. Shiplap, square-edged boards, or tongue-and-groove sheathing may be used for forming unexposed concrete surfaces.
- E. Use metal, fiberglass, or other special form linings where required.

2.03 STEEL FORMS

- A. Steel forms shall be designed and fabricated to meet the requirements of the member/members to be cast. Use only new materials for steel form construction.
- B. Forms for round elements shall consist of self-supporting metal shell or tube which will give a smooth, even surface. Forms which produce a spiral appearance or those made of wood shall not be used except as approved by the Engineer.

2.04 FORM LINERS AND COATINGS

- A. Forms shall be lined, coated, or treated with a suitable release agent or bond-breaker to ensure their timely removal with no damage to the concrete.
- B. Release agents or bond-breakers shall be non-coloring and shall not leave a film on the concrete surface that may inhibit subsequent finishing activities required to attain the prescribed finish.

2.05 FORM TIES AND ACCESSORIES

- A. Wire ties and wood spacers shall not be used.
- B. Form ties shall be pre-manufactured items with published allowable stress values from the manufacturer. Form ties shall have a premeasured, break-back, weakened area so that ties can be removed 3/4-inch below the concrete surface.
- C. Tie rods for use with she-bolts shall be set back (1-1/2 inches) from the concrete surface. Tie-rod steel shall have published allowable stress values.

PART 3 – EXECUTION

3.01 GENERAL

- A. Do not construct forms or falsework until the Engineer has reviewed the drawings and calculations. Review by the Engineer does not relieve the Contractor of the responsibility for sufficiency of the forms or falsework.
- B. Set forms and falsework to allow for structural camber plus an allowance for shrinkage and settlement. The finished concrete shall conform to the location lines and grades indicated on the drawings.
- C. Forms shall be constructed as to be rigid, unyielding, true to line, level, and sufficiently tight to prevent escape of mortar.
- D. Openings, embedded objects, and reinforcement shall be placed at the locations shown on the drawings. They shall be formed and fastened securely in position to maintain minimum cover for all reinforcement, and to leave smooth surfaces, true openings, accurate geometry, etc., after the forms are removed.
- E. Clean forms of all waste, debris, or other objects and substances deleterious to the concrete, concrete surface, or concrete element, prior to casting.

3.02 FORM INSTALLATION

- A. Prior to installation of form work, forms for exposed concrete shall be treated with a release agent, bond-breaker, or parting compound. Apply the compound at a rate recommended by the manufacturer, to provide a smooth surface free of dusting action caused by the chemical reaction of the compound. Release agents, bond-breakers, or parting compounds shall not be applied to the forms while in place over the water.
- B. Immediately remove any release agent or bond-breaker that comes in contact with reinforcement or embedded objects.
- C. Forms may be set with a slight bevel or draft for easy removal, where approved by the Engineer. Use ³/₄-inch chamfer strips on all exposed inside and outside corners.

- D. All forms shall be mortar tight.
- E. Remove all debris, waste, foreign objects from forms before assembly. Standing water in the forms shall not be permitted. Forms shall be cleaned with fresh water before assembly and prior to placing concrete.

3.03 FORM REMOVAL

- A. Forms shall remain in place for the minimum length of time indicated below, provided the ambient temperature is 40 degrees Fahrenheit or higher during that time period.
 - 1. Soffit forms: 7 days
 - 2. Side forms: 7 days
- B. When temperatures lower than 40 degrees prevail, forms shall remain in place longer and at the Engineer's direction.
 - 1. All periods where the ambient temperature is below 40 degrees Fahrenheit shall be disregarded in determining the length of time forms are to remain in place.
 - 2. The Contractor may submit for prior approval a cold-weather concreting plan in accordance with Section 03 30 00 Cast-in-Place Concrete.
 - 3. Development and incorporation of an approved cold-weather concreting plan shall be at the Contractor's expense.
- C. For elements described on the Civil Drawings (C-series) or the Electrical Drawings (Eseries) the minimum time that forms shall remain in place may be reduced under the following conditions.
 - 1. When concrete cylinder tests, according to ACI 318, indicate that a compressive strength greater than or equal to 80 percent of the specified 28-day strength has been reached.
 - 2. Additional concrete cylinder testing for the purpose of establishing the 80 percent threshold level shall be at the Contractor's expense.
- D. The removal of forms as stipulated herein shall in no case relieve the Contractor of responsibility for the performance, acceptability, or finish of the work.
- E. All form and falsework removal shall be accomplished in a manner that prevents damage to the concrete, concrete finishes, and adjacent work elements.

PART 1 – GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in:
 - 1. Section 03 10 00 Concrete Forming and Accessories
 - 2. Section 03 30 00 Cast-in-Place Concrete
 - 3. Section 05 50 00 Metal Fabrications

1.02 DESCRIPTION OF WORK

A. The work includes the requirements for manufacture, detailing, cutting, bending, transporting, handling, and placing of all concrete reinforcement and associated items required or indicated on the drawings.

1.03 REFERENCE STANDARDS

- A. American Concrete Institute ACI 301-10: Specifications for Structural Concrete for Buildings.
- B. American Concrete Institute SP-66(04): ACI Detailing Manual (including ACI 315-99).
- C. American Concrete Institute ACI 318-14: Building Code Requirements for Structural Concrete and Commentary.
- D. American Society for Testing Materials (ASTM), Standard Specifications and Standard Test Methods, designated by basic reference in this section (use the most current edition at the time of bid unless otherwise indicated).
- G. Concrete Reinforcing Steel Institute (CRSI) Manual of Standard Practice (MSP), 2009, 28th Edition.
- H. Washington State Department of Transportation (WSDOT) Standard Specifications for Road, Bridge and Municipal Construction M41-10, 2012 Edition.

1.04 QUALITY ASSURANCE

A. Provide at least one (1) qualified person who shall be present at all times during execution of this portion of work, be thoroughly familiar with the type of materials being installed, be skilled in the required methods for installation, and who shall direct all the work. Qualified personnel shall have a minimum of five (5) years of experience in placement of reinforcement for concrete and prestressed concrete structures.

1.05 SUBMITTALS

- B. Detailed shop drawings that are coordinated and checked for all concrete reinforcement prior to casting concrete.
 - 1. Do not deliver concrete reinforcement to the site prior to acceptance of the shop drawings.

- 2. The shop drawings shall include, but not be limited to, material specifications, bar lengths, bar bending schedules, order lists, splice lengths, and proposed splice locations.
- C. Mill certificates for each heat of reinforcing steel and threaded bars to be furnished, indicating specification compliance, yield strength, ultimate strength, and chemistry.
- H. Data sheets for mortar blocks and chairs used for placing reinforcement.

PART 2 – PRODUCTS

2.01 HANDLING

- A. Protect from damage all reinforcement before, during, and after installation in the work. Protect from damage the installed work and materials of other trades.
- B. All reinforcement shall be new and free from rust, grease, oil, wax, paint, soil, dirt, kinks, bends, or other defects. Store in a manner to prevent corrosion, or fouling with bond-breaking or deleterious coatings.
- C. Maintain reinforcement identification after the bundles are broken. Indicate to the Engineer what bar types and grades are stored in each location.
- D. In the event of damage, immediately make all repairs and replacements necessary as directed by the Engineer and at no additional cost to the Port.

2.02 REINFORCEMENT

- A. All reinforcing bars, except as noted below, shall be deformed billet-steel bars conforming to ASTM A615, Grade 60, deformed. Bars conforming to ASTM A706 may be substituted for ASTM A615 reinforcing bars at the Contractor's expense.
- C. Cold drawn steel wire for spirals shall conform to ASTM A1064.
- D. Welded headed studs and welded shear connectors shall conform to ASTM A108, Grades 1010 through 1020 according to ASTM A29. Head geometry shall conform to AWS D1.1, Section 7.2.
- E. Mechanical couplers, where approved, shall be as follows.
 - 1. Couplers shall develop a minimum of 125% of the minimum specified yield strength of the reinforcing bar.
 - 3. Dayton Superior D-250 Bar-Lock S/CA-Series couplers, or approved equal.
 - 4. Lenton Lock B-Series mechanical couplers by Erico Inc, or approved equal.
 - 5. HRC Series 400 High Performance Mechanical Couplers by the Headed Reinforcement Company, or approved equal.

PART 3 – EXECUTION

3.01 GENERAL

- A. Prior to installation of this section, carefully inspect the installed work of other trades and verify that such work is complete to the point where reinforcement installation may commence.
- B. Details of bending, placing, and splicing of all reinforcing steel shall conform to ACI 318 and ACI SP-66, except as modified herein.

3.02 REINFORCING STEEL BARS

- A. Order Lists: Before ordering material, furnish all order lists and bending diagrams for approval by the Engineer; reinforcement placing drawings submitted for approval shall conform to the CRSI MSP. Do not order material until such lists and bending diagrams have been approved. The approval of order lists and bending diagrams by the Engineer shall in no way relieve the Contractor of responsibility for the correctness of such lists and diagrams.
- B. General Fabrication Requirements for Reinforcing Bars: Bend all bars cold to the shapes indicated on the drawings unless otherwise approved by the Engineer. Do not field-bend bars partially embedded in concrete except as indicated on the drawings or as approved by the Engineer. Make bends and hooks in accordance with the applicable portions of the CRSI MSP.
- C. Placing and Fastening:
 - 1. Place all steel reinforcement accurately and hold firmly in the position indicated on the drawing during the placing and setting of concrete. Tie bars at all intersections.
 - 2. Minimum concrete cover to reinforcement shall be as indicated on the drawings:
 - 3. Maintain the minimum distance from the forms by means of stays, blocks, ties, hangers, or other approved supports.
 - a. Holding reinforcement from contact with the forms shall be by approved metal or plastic chairs. Metal chairs which are in contact with the exterior surface of the concrete shall be plastic-coated for the full depth of the indicated concrete cover.
 - b. Separate layers of bars by plastic chairs, by precast mortar blocks of compressive strength not less than 3750 pounds per square inch, spacing bars, or by other devices approved equal.
 - c. The minimum spacing between bars, except at lap splices, shall not be less than one bar diameter or one inch minimum, but not less than 1-1/3 times the maximum size of the coarse aggregate.
 - 4. In the event that conduits, anchor bolts, piping, inserts, sleeves, embedded objects, headed studs, or other items interfere with placing reinforcement as indicated on the drawings, or as otherwise required, immediately contact the Engineer and obtain approval of a new procedure before placing concrete.

3.03 SPLICING

- A. Furnish all reinforcement in the full lengths indicated on the drawings, except that reinforcement over forty feet in length may be spliced.
- B. Splicing of bars, except reinforcement over forty feet in length and when indicated on the drawings, will not be permitted without approval of the Engineer. When approved, splices shall be staggered with no more than fifty percent of any particular bar type being spliced at any one location. Minimum length of lap splice shall be per the schedule of minimum lap splice lengths in the drawings unless noted otherwise on the drawings. Minimum distance between spliced zones shall be one lap length plus one foot.
- C. Splicing of spiral wire shall be done in accordance with the details as shown on the drawings.

3.05 CLEANING REINFORCEMENT

A. Steel reinforcement, at the time concrete is placed around it, shall be free from loose rust or mill scale, oil, paint, and all other coatings which will destroy, impair, or reduce the bond between steel and concrete.

3.06 INSPECTION

- A. Reinforcement in any member shall be placed and inspected by qualified personnel before placement of concrete.
- B. Access for inspection by the Engineer prior to concrete placement shall be provided for all pours. Concrete placed in violation of this provision will be rejected. The Contractor shall remove the rejected concrete, place new reinforcing steel, and cast new concrete at its own expense.
- C. The Contractor shall notify the Engineer at least 48 hours in advance of any concrete pour, to allow for inspection.

PART 1 – GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in:
 - 1. Section 03 10 00 Concrete Forming and Accessories
 - 2. Section 03 20 00 Concrete Reinforcing
 - 3. Section 31 63 29 Concrete Piers and Drilled Shafts

1.02 DESCRIPTION OF WORK

A. The extent and location of the "Cast-in-Place Concrete" work is indicated on the drawings. The work includes the requirements for providing all cast-in-place concrete and associated work in conformance with these specifications and as indicated on the drawings.

1.03 REFERENCE STANDARDS

- A. American Concrete Institute ACI 301-10: Specifications for Structural Concrete.
- B. American Concrete Institute ACI 305R-10: Hot Weather Concreting.
- C. American Concrete Institute ACI 306R-10: Cold Weather Concreting.
- D. American Concrete Institute ACI 308R-01: Guide to Curing Concrete.
- E. Modification of ACI 305R, 306R, and 308R: accomplish work in accordance with these guides except as modified herein. Consider the advisory or recommended provisions to be mandatory. Interpret reference to the "Building Official," the "Structural Engineer," and the "Architect/Engineer" to mean the Engineer.
- F. American Concrete Institute ACI 318-14: Building Code Requirements for Structural Concrete and Commentary.
- G. American Society for Testing Materials (ASTM), Standard Specifications and Standard Test Methods, designated by basic reference in this section (use the most current edition at the time of bid unless otherwise indicated).
- H. Standard Specifications for Road, Bridge, and Municipal Construction, M41-10, 2012 edition, by Washington State Department of Transportation (WSDOT Standard Specifications).
- I. International Building Code (IBC) 2015, as amended and adopted by the City of Tacoma into the Tacoma Municipal Code (TMC).

1.04 QUALITY ASSURANCE

- A. All concrete work shall conform to the requirements of ACI 301, unless otherwise noted in the drawings or the specifications.
- B. Inspection and Testing: As determined by the Engineer, TPU will provide inspection and testing as required. The Contractor shall provide all necessary access and assistance in carrying out such inspections and tests at its own expense. The Contractor may obtain results of tests performed by TPU from the Engineer.

DIVISION 03 – CONCRETE SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

- C. Qualifications of Supplier: Ready-mixed concrete plants shall be approved and certified by the National Ready Mix Concrete Association (NRMCA) or qualified by WSDOT. Ready-mixed concrete shall be batched in accordance with the applicable portions of ASTM C94.
- D. Qualifications of Personnel:
 - 1. Provide at least one qualified person who shall be present at all times during execution of this portion of the work, who shall be thoroughly trained and experienced in placing the types of concrete specified, and who shall direct all work performed under this section. Qualified personnel shall have at least five (5) years experience performing the work described in this section.
 - 2. Trained and experienced journeyman concrete finishers having at least five (5) years experience shall be responsible for finishing all exposed surfaces.
- E. Building Code: All concrete shall meet the requirements of the IBC. Where provisions of pertinent codes and standards conflict with this specification, the more stringent provisions shall govern, as determined by the Engineer.

1.05 SUBMITTALS

- A. Documentation demonstrating the qualifications and experience of supervisors and directors of work, as described above.
- B. Proposed concrete design mixes, indicating all material contents per cubic yard of concrete, including certificates of specification compliance. Written evidence that the ready-mix concrete plant is approved and certified by the NRMCA and other organizations.
- C. Test certificates for compressive strength, yield, air content, and slump of the proposed concrete mix. Report strength test results in accordance with ACI 318, Section 5.3.
- D. Manufacturer's name, address, catalog number, and specifications for all proposed admixtures, concrete bonding agents, curing compounds, etc.
- E. Identify all aggregate supply pit names and locations. Submit certificates of specification compliance for materials to be used including aggregate alkali-silica reactivity (ASR).
- F. Proposed curing methods including manufacturer's data for curing membranes, evaporation retardants, accelerated cure methods, etc. Submit detailed plans for concreting in ambient temperatures below 40 degrees F. Describe the specific methods and procedures used for substrate preparation, concrete placement, curing, and protection. Provide specific references to ACI 306R and ACI 308R.
- G. Shop drawings showing pour sequences, construction joints, expansion joints, etc. Manufacturer's data for proposed pre-fabricated construction joint systems and hardware.
- H. Concrete delivery tickets for each truck delivered to the site. Submit delivery tickets to the Engineer before unloading at the site and in accordance with ASTM C94, Section 14.

PART 2 – PRODUCTS

- 2.01 CONCRETE
 - A. General:
 - 1. All concrete, unless otherwise specifically permitted by the Engineer, shall be batched and mixed at the approved Ready-Mix plant. Batching, mixing, and delivery of ready-mix concrete shall conform to ASTM C94.
 - 2. All cast-in-place concrete shall be proportioned on the basis of field experience or laboratory trial mixtures according to ACI 318, Section 5.3.
 - B. Cementitious Materials:
 - 1. All cement shall be Portland cement conforming to ASTM C150.
 - Portland cement for use in mixes without fly ash shall be Type I-II or Type II conforming to ASTM C150 except that the cement shall not contain more than 0.75 percent alkalis by weight calculated as Na₂0 plus 0.658 K₂0 and the content of Tricalcium aluminate (C₃A) shall not exceed 8 percent by weight.
 - 3. Portland cement for use in mixes with fly ash shall be Type I or Type I-II conforming to ASTM C150.
 - 4. Fly ash, if used, shall meet the requirements of ASTM C618, Type F, with the added provision that the loss on ignition shall not exceed 1 percent, and that the fly ash is stored in a separate silo from the cement. Split bins are not acceptable.
 - C. Aggregates:
 - 1. Aggregates shall conform to ASTM C33. All coarse and fine aggregate shall consist of hard, tough, durable particles free from foreign and deleterious materials, and shall be stored in such a manner as to prevent segregation, excessive breakage, and the introduction of foreign material.
 - 2. Evaluate and test fine and coarse aggregates to be used in all concrete for alkaliaggregate reactivity in accordance with ASTM C1260 or ASTM C1293. Test both coarse aggregate size groups if from different sources. Test results of the combination shall have a measured expansion equal to or less than 0.10 percent at 16 days after casting when aggregates are tested in accordance with ASTM C1260 or 0.04 percent for aggregates tested in accordance with ASTM C1293.
 - 3. Grading shall conform to WSDOT Standard Specifications paragraph 9-03.1(5) Combined Aggregate Gradation for Portland Cement Concrete. Maximum nominal aggregate size shall be ³/₄ inch, unless approved by the Engineer.
 - 4. The maximum size of coarse aggregate shall not be larger than three fourths of the minimum clear spacing between reinforcing bars, between reinforcing bars and side forms, and between reinforcing bars and top or bottom surface of the concrete.
 - D. Water used for mixing concrete shall conform to the quality requirements of paragraph 9-25.1 of the WSDOT Standard Specifications.
 - E. Admixtures: All admixtures shall be supplied by one manufacturer approved by the Engineer.

- 1. Air-entraining admixtures shall conform to ASTM C260. Dosage rates shall be in accordance with the manufacturer's recommendations to meet the air content specified herein.
- 2. Water-reducing admixtures shall conform to the requirements of ASTM C494. Dosage rates shall be in accordance with the manufacturer's recommendations.
- 3. Water reducing admixture shall be Type A, D, F, or G. The amount shall control the desired workability and water/cement ratio of the mix and shall be within the manufacturer's recommended range.

2.02 OTHER MATERIALS

A. All other materials not specifically described but required for a complete and proper installation of cast-in-place concrete shall be selected by the Contractor subject to the approval of the Engineer.

2.03 MIX PROPORTIONS AND STRENGTH

- A. The mix proportions shall produce a mixture that will readily work into all corners, sides, and angles of the forms, around reinforcement and embedded items, with no segregation, and prevent free water from collecting on the surface.
- B. The mix proportions shall be selected in accordance with ACI 318.
 - 1. Test data representing thirty recent consecutive tests for each design shall be submitted to establish the standard deviation used in Section 5.3.1.
 - The criteria for acceptance of submitted tests shall be accordance with Section 5.3.1.1. Section 5.3.1.1(b) shall be amended to read, "... 500 psi of f'c", instead of 1000 psi.
 - 3. Where 30 recent consecutive tests are not available, the standard deviation may be determined by records based on no less than 15 tests as described in Section 5.3.1.2.
 - 4. Where no previous data are available, the mix or mixes shall be overdesigned in accordance with Section 5.3.2.2.
 - 5. When consecutive test data have been established during the project the overdesign criteria may be relaxed in accordance with Section 5.5.
 - 6. Deviation from any reviewed design mix without approval of the Engineer will not be permitted.
- C. Unless otherwise indicated, concrete minimum 28-day compressive strengths are shown on the drawings.
- D. Concrete shall meet the following requirements:
 - 1. Minimum Cementitious Material
 - a. Cement without fly ash: 6.5 sacks/cy (611 lbs/cy)
 - b. Cement with fly ash: 6 sacks/cy (564 lbs/cy) and 100 lbs fly ash/cy
 - 2. Maximum Water/Cement Ratio: 0.40, computed by weight, including free moisture on aggregate. If fly ash is used, the water/cement ratio shall be calculated as the weight of water divided by the combined weight of cement and fly ash.

- 3. Air Content: 3.5 percent to 6.5 percent
- 4. Slump: Maximum 8 inches, and chosen to enhance workability without violating the maximum water/cement ratio requirement.

PART 3 – EXECUTION

3.01 PREPARATORY WORK

- A. General:
 - All concrete work shall be coordinated and performed in strict accordance with the permit requirements and the WQMPP. This specification section does not include all required protection measures, mitigation measures, and BMPs associated with this project. The Contractor shall pay particular attention to the conditions of issued permits and the WQMPP, and applicable regulations and authorizations associated with this project. All protection measures, mitigation measures, and BMPs included in these documents shall be implemented by the Contractor.
 - 2. Prior to casting, inspect the installed work of all other trades and verify it is complete to the point where this installation may commence.
 - 3. Verify that all items to be embedded in concrete are in place, properly oriented, located, and secured.
 - 4. Verify that concrete may be placed to the lines and elevations indicated on the drawings with all required clearances for reinforcement.
 - 5. All areas in which concrete is to be placed shall be thoroughly cleaned to remove wood debris, sawdust, tie wire cuttings, and all other deleterious material.
 - 6. Tie wire ends shall be bent back so they do not encroach into the specified clear cover of the concrete.
 - 7. Concrete forms which have not been treated with oils, waxes, or other bond breakers shall be thoroughly wet prior to placing concrete.
 - 8. Clean and roughen existing concrete or concrete from previous pours to provide a bondable surface.
 - 9. All transporting and handling equipment shall be cleaned of all hardened concrete and other debris.
- B. Notification: Notify the Engineer at least 48 hours in advance of any concrete pour. Notify the Engineer when inspection by the Contractor is complete. In the event of discrepancy, immediately notify the Engineer. Do not proceed with installation until all discrepancies have been fully resolved.

3.02 TRANSPORTING AND PLACING CONCRETE

- A. Placement:
 - 1. Concrete that does not reach its final position in the forms within 1-1/2 hours after the addition of cement shall not be used. During hot weather, this time limit shall be reduced in accordance with ACI 305R.

- 2. Place concrete as soon as possible after mixing. Concrete which has developed initial set or partially hardened shall not be re-tempered or remixed.
- 3. The method and manner of placing concrete shall not allow segregation of the aggregates or displacement of reinforcement and embedded objects.
- 4. When using a concrete pumps as the placing system, the pump priming slurry shall be discarded before placement into the forms. Initial acceptance testing may be delayed until the pump priming slurry has been eliminated. No pump shall be used that allows free water to flow past the piston. Aluminum conduits or tremies shall not be used for pumping or placing concrete.
- 5. Place concrete in continuous horizontal layers, or lifts, not exceeding 18 inches and compact so that there will be no line of separation between layers. Carefully fill each part of the forms by depositing concrete directly in its final destination.
- 6. When concrete must be dropped more than five feet into the forms, it shall be deposited through a sheet metal or other approved conduit. Approved conduit shall also be used to place concrete in sloping forms or in other locations, as directed by the Engineer, to prevent concrete from sliding around reinforcing or other embedded objects.
- 7. The methods of depositing and compacting concrete shall produce compact, dense, impervious concrete with the required surface finishes and no segregation. Remove defective concrete as directed by the Engineer at no additional cost to the Port.
- B. Hot/Cold Weather Placement: Do not place concrete on frozen ground or against frosted reinforcing steel or forms. Do not mix or place concrete while the atmospheric temperature is below 40° F. If air temperature exceeds 90°F, provide water spray or other approved methods to cool contact surfaces to less than 90°F. Hot and coldweather concrete placement shall follow the respective recommendations in ACI 305R and ACI 306R.
- C. Underwater Placement: Concrete shall not be placed in the water. See Section 31 63 29 Concrete Piers and Drilled Shafts for concrete placement below groundwater level for pole foundations.
- D. Consolidation of Concrete:
 - 1. Provide suitable internal vibrators for use in compacting all concrete. The vibrators shall be of the type designed to be placed directly in the concrete, and their frequency of vibration shall not be less than 7,000 impulses per minute when in actual operation.
 - 2. Vibration shall be such that the concrete becomes uniformly plastic. Insert vibrators to a depth sufficient to vibrate the bottom of each layer effectively, but do not penetrate partially hardened concrete. Do not apply the vibrators directly to steel which extends into partially hardened concrete. The intervals between points of insertion shall be not less than 2 feet, nor more than 3 feet.
 - 3. Do not continue vibration in any one spot such that pools of cement or cement and sand are formed. In vibrating and finishing top surfaces which are exposed to weather or wear, avoid drawing water or laitance to the surface. In relatively high

lifts, the top layer shall be comparatively shallow and the concrete mix shall be as stiff as can be effectively vibrated into place and properly finished.

- 4. Do not use vibrators to transport or move concrete inside the form.
- 5. A sufficient number of vibrators shall be supplied to effectively vibrate all of the concrete placed. Hand-tamping or rodding shall be required wherever necessary to secure a smooth and dense concrete on the outside surfaces.
- E. Concrete trucks shall not be washed out onsite unless contained within a concrete wash-out area that complies with the requirements of the latest version of the Department of Ecology Stormwater Management Manual for Western Washington.
- F. Any delivered load of concrete that is rejected shall be completely disposed of offsite.

3.03 CONSTRUCTION JOINTS

- A. Joints and stoppages, except as specifically shown on the drawings, shall conform to ACI 318, Chapter 16. Wire mesh or similar materials shall not be used.
- B. Submit for the Engineer's approval all requests for additional, deleted, or relocated construction joints. Changes as a result of such requests shall be at the Contractor's expense.
- C. Thoroughly clean and roughen all joint surfaces and remove loose concrete, gravel, sediment, laitance, and all other deleterious substances.
- D. Thoroughly wet and condition all joint surfaces to a saturated surface dry (SSD) condition for a minimum twelve hour period immediately prior to placing fresh concrete.
- E. Horizontal surfaces of construction joints shall have a clean roughened surface but need not have a bonding agent or neat cement paste applied.
- F. Unless otherwise noted, joints requiring roughened surfaces shall have grooves ½-inch to 1-inch wide, ¼-inch to ½-inch deep, which are spaced at twice the width of the groove.
- G. Where a roughened surface is not required, provide shear keys with a positive mechanical bond using formed depressions covering one third to one half of the joint area and approximately 1-1/2 inches deep.

3.04 CURING CONCRETE

- A. Follow ACI 308R.
- B. Concrete shall be maintained above 40° F and in a moist condition for at least the first seven days (168 hours) after placement.
- C. Do not use curing compounds on surfaces to receive additional concrete.
- D. Where permitted, apply an ASTM C309, Type 1, Class A or B curing compound to the fresh concrete immediately after finishing the concrete and as soon as the visible bleed water has evaporated or as directed by the Engineer. Apply according to the manufacturer's recommendations. The rate of coverage shall be at least one gallon per 100 square feet and be sufficient to effectively obscure the original color of the concrete.

- E. Apply the curing compound in two applications to ensure full coverage of the concrete, with the second coat applied in a direction perpendicular to that of the first application.
- F. Do not apply curing compound to construction joint surfaces, reinforcing steel, or embedments in the concrete. Curing compound on construction joints, reinforcing steel, or embedments shall be completely removed before the following concrete pour.
- G. Supply backup spray equipment and sufficient workers to properly apply the curing compound.
- H. Within 12 hours following the application of the curing compound, the top surfaces shall be covered with cotton mats, an approved vapor proof curing paper, or white polyethylene sheeting. If the covering used is cotton mats, it shall be kept continuously wet day and night for the period of time specified above, and if curing paper or plastic film is used, it shall be left in place for the same length of time.
- I. Curing paper and white polyethylene sheeting shall be kept tightly in place by taping and weighting joints, or other methods for the prescribed length of time.
- J. Membrane curing compounds which leave a waxy film on the concrete shall not be used.
- K. After the concrete has cured for the required time, the top surfaces shall be swept clean.
- L. All concrete shall be protected from damage and accelerated drying. No fire or excessive heat shall be permitted near the concrete at any time.
- M. In lieu of curing compounds the Contractor may use wet burlap or other wet cure methods as approved by the Engineer.
- N. Only wet cure methods shall be used on concrete surfaces against which additional concrete will be cast.
- O. Wet cure methods shall be continuous for the prescribed duration of the curing period.

3.05 FINISHING CONCRETE

- A. Finish: All permanently exposed surfaces, unless specifically noted otherwise, shall be free from local bulging and all ridges or lips shall be removed to leave a smooth, flat surface. Patching mortar, if used, shall be of the same color as the surrounding concrete. White Portland cement shall be added to the patching mortar for color matching. A test section, approved by the Engineer, shall be completed prior to production work.
- B. Protect finished surfaces from damage, stains and abrasion. Surfaces or edges damaged during construction shall be repaired at the Contractor's expense.
- C. Defects:
 - 1. Surface defects include honeycomb, rock pockets, spalls, chips, air bubbles, voids, pinholes, bug holes, and indentations greater than or equal to 1/4 inch in depth, or greater than or equal to 1/2 inch in width, length, or diameter. These defects shall be chipped out to reveal sound concrete and then shall be patched according to Section 03 60 00 Grouting.

- 2. Surface cracks greater than or equal to 0.007 inches in width. These cracks shall be patched according to Section 03 60 00 Grouting.
- 3. Surface irregularities include embedded objects, embedded debris, lift lines, sand lines, bleed lines, segregation, form pop-outs, fins, form leakage, texture irregularities, stains and other discolorations that cannot be removed by water blast cleaning. These defects shall be repaired as specified in this Section unless otherwise directed by the Engineer.
- D. Vertical Surfaces and Walls:
 - 1. Immediately after removal of forms or form linings, inspect the concrete surfaces for defects and irregularities.
 - 2. All defects, defective concrete, and tie rod holes shall be repaired immediately after the forms are removed unless otherwise directed by the Engineer. Exposed tie wires shall be removed (chipped out) and the resulting holes patched. The repair mortar shall be BASF EMACO N 350 CI or an epoxy mortar approved by the Engineer applied according to the manufacturer's instructions by experienced personnel qualified by the manufacturer of the repair material.
 - 3. All vertical surfaces, against which concrete will be cast, are construction joints, and shall be thoroughly cleaned and roughened to an amplitude of 1/4 inch. Roughening shall be accomplished using methods in accordance with the construction permits and approved by the Engineer, to expose sound concrete without undercutting around the edges of the larger aggregate particles or cracking the concrete to remain.
- E. Horizontal Surfaces:
 - 1. All horizontal surfaces that will carry additional concrete are construction joints and shall be thoroughly cleaned and roughened to an amplitude of 1/4 inch. Roughening shall be accomplished using methods in accordance with the construction permits and approved by the Engineer, to expose sound concrete without undercutting around the edges of the larger aggregate particles or cracking the concrete to remain.
 - 2. Exposed horizontal surfaces that will not receive additional concrete shall have a smooth wood float finish except for walking working surfaces which shall have a light broom finish. The broom stria shall be 1/16 inch to 1/8 inch.

3.06 TESTING

- A. Testing of concrete will be performed by an accredited testing agency retained by TPU. Methods of sampling, testing, evaluation, and acceptance will conform to ACI 301. The Contractor shall assist TPU with access to collect samples.
- B. Testing as described above will be at TPU's discretion and in no way relieves the Contractor of any obligations.
- C. The Contractor shall perform its own tests and institute a quality assurance program to assure the specified quality of materials and work are provided.
- D. Tests performed by TPU will be done at no cost to the Contractor, except as noted below.

- 1. Additional testing and inspection required because of changes in materials, proportions, and procedures requested by the Contractor.
- 2. Additional testing of materials or concrete when either fails to meet the specification requirements when tested in accordance with the ACI standards outlined and the appropriate ASTM standards contained therein.

PART 1 – GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in the following sections:
 - 1. Section 03 30 00 Cast-in-Place Concrete
 - 2. Section 05 50 00 Metal Fabrications

1.02 DESCRIPTION OF WORK

A. The work includes furnishing of all necessary material, labor, and equipment for grouting and doweling as shown on the drawings and described in the specifications.

1.03 REFERENCE STANDARDS

A. American Society for Testing Materials (ASTM), Standard Specifications and Standard Test Methods, designated by basic reference in this section (use the most current edition at the time of bid unless otherwise indicated)

1.04 QUALITY ASSURANCE

- A. TPU will provide testing and inspection services as required. The Contractor shall provide all necessary assistance in testing of materials and provide access for testing and inspection at its own expense.
- B. Provide at least one person who shall be present at all times during execution of the work, who shall direct all work performed, and who has at least five (5) years experience with the materials and the methods of installation necessary to meet the performance specifications.

1.05 SUBMITTALS

- A. Documentation that the supervisor's directing the work and that the dowel installers have the qualifications and experience as described above.
- B. For each application, manufacturer's name, address, catalog cuts, and specifications for grout, epoxies, adhesives, admixtures, and proprietary products.
- C. Manufacturer's test certificates for grout compressive strength and non-shrink properties of proposed cementitious grout. Indicate the working time, fluid consistency, flow rate, volume change characteristics, and manufacturer's recommended installation temperatures.

PART 2 – PRODUCTS

2.01 NON-SHRINK CEMENTITIOUS GROUT

- A. Locations: supporting metal fabrications and all other locations not specified.
- B. Requirements:

- 1. Meet ASTM C1107 for hydraulic-cement non-shrink grout.
- 2. Plastic height change of 0% to +4% according to ASTM C827.
- 3. Hardened height change of 0% to +0.3% according to ASTM C1090.
- 4. Fluid consistency at 25 to 30 seconds according to ASTM C939.
- 5. Minimum working time of 30 minutes.
- 6. Minimum compressive strength of 10,000 psi @ 28 days when prepared in fluid consistency according to ASTM C109.
- 7. Shall not contain powdered aluminum.
- C. Suppliers, or approved equal:
 - 1. Euclid Chemical Co., Hi-Flow Grout, Cleveland, OH.
 - 2. Masterflow 928, by BASF Construction Chemicals LLC, Shakopee, MN.
 - 3. SikaGrout 328, by Sika Corporation, Lyndhurst, NJ.
 - 4. Sure-Grip High Performance Grout, by Dayton Superior Corp., Dayton, OH.

2.02 REPAIR MORTAR

- A. Typical locations: demolition surfaces, damaged concrete, locations determined by the Engineer.
- B. Shrinkage-compensated mortar EMACO N 350 CI manufactured by BASF Construction Chemicals LLC, or approved equal.
- 2.03 EPOXY GROUT
 - A. Typical Locations: overhead repairs on new concrete elements, damaged concrete, and locations determined by the Engineer.
 - B. Five Star High Performance (HP) precision epoxy grout, or approved equal.

2.04 DRILLED-IN AND BONDED DOWEL ADHESIVE

- A. Store adhesive at temperatures and in locations indicated in the manufacturer's literature. Do not use and dispose of adhesives with expired shelf lives.
- B. Meet ASTM C881, Type IV, Grade 2 or 3. Overhead applications shall meet Grade 3. Temperature Class A, B, or C shall match, or be endorsed by the manufacturer, the surface temperature of the concrete to which the bonding system is applied.
- C. Suppliers, or approved equal:
 - 1. Hilti HIT-RE 500, or Hilti HIT-RE 500 SD adhesive, by Hilti Inc., Tulsa, OK.
 - 2. SET-XP adhesive, by Simpson Strong-Tie Co., Dublin, CA.

PART 3 – EXECUTION

3.01 GENERAL

- A. Products shall be stored, mixed, placed, and cured in accordance with the manufacturer's published specifications. Surface shall be prepared in accordance with manufacturer's published specifications unless otherwise indicate herein. In case of a discrepancy the more strict requirements, as determined by the Engineer, shall apply.
- B. Concrete surfaces shall be thoroughly cleaned and wetted before placing grout. Steel members to be embedded and grouted shall be set level at proper elevation with the use of steel shims or leveling screws before grout placement begins.

PART 1 – GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in:
 - 1. Section 03 20 00 Concrete Reinforcing
 - 2. Section 03 30 00 Cast-in-Place Concrete
 - 3. Section 03 60 00 Grouting
 - 4. Section 09 96 00 High Performance Coatings

1.02 DESCRIPTION OF WORK

A. All metal fabrications are indicated on the Drawings and in the specifications. The work shall consist of furnishing all materials, labor, and equipment for fabricating and/or repairing and erecting metal fabrications, in accordance with the Drawings, notes, and this specification.

1.03 REFERENCE STANDARDS

- A. American Institute of Steel Construction (AISC), Specification for Structural Steel Buildings, 2010.
- B. American Institute of Steel Construction (AISC), Code of Standard Practice for Steel Buildings and Bridges, 2010.
- C. American Society for Testing Materials (ASTM), Standard Specifications and Standard Test Methods, designated by basic reference in this section (use the most current edition at the time of bid unless otherwise indicated).
- D. American Welding Society (AWS) D1.1 2010, Structural Welding Code Steel.
- E. American Welding Society (AWS) A2.4 2012, Standard Symbols for Welding, Brazing, and Nondestructive Examination.
- F. Society for Protective Coatings (SSPC), Surface Preparation Specifications.
- G. Washington Association of Building Officials (WABO) Standard No. 27-13, WABO Welder and Welding Operator Performance Qualification Standard for Structural Steel, Sheet Steel, and Reinforcing Steel.
- H. International Building Code (IBC), 2015

1.04 QUALITY ASSURANCE

- A. Demonstrate that the fabricator has a minimum of five (5) years of experience fabricating and working similar metals and configurations, including cutting, bending, forming, welding, and finishing.
- B. Welders shall be currently certified by the Washington Association of Building Officials (WABO) for structural welding.

- C. Welding procedures, operations, welders, and tackers shall be qualified in accordance with AWS D1.1.
- D. Nondestructive testing (NDT) and inspection of all shop and field welds will be performed in accordance with AWS D1.1 by an independent testing agency retained by TPU. Welds failing to comply shall be repaired or replaced at the Contractor's expense.

1.05 SUBMITTALS

- A. Detailed and coordinated shop drawings indicating all shop and erection details, including cuts, copes, connections, holes, fasteners, material specifications, welds, surface preparations, and finishes.
- B. Welder qualifications and certifications.
- C. Weld Procedure Specifications (WPS's) proposed for use on the project. Submit supporting Procedure Qualification Records (PQR's) for all WPS's not prequalified by AWS.
- D. Mill certificates for each heat number of structural and miscellaneous steel.
- E. Product Test Reports: For the following:

1. Bolts, nuts, and washers including mechanical properties and chemical analysis.

- 1.06 DELIVERY, STORAGE, AND HANDLING
 - A. Protection: Use all means necessary to protect miscellaneous metal materials before, during and after installation and to protect the installed work of other trades. Make no marks on architectural exposed metals during fabrication or erection.
 - B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the City.
- 1.07 WARRANTY
 - A. Installers Warranty: One year from the date of Substantial Completion for labor and materials on installed finish systems.

PART 2 – PRODUCTS

2.01 GENERAL

- A. All products shall be new, free from oxidation, corrosion, and defects, and shall be of the specified quality.
- B. Protect all materials and fabrications before, during, and after installation from damage. Protect the installed work of other trades from damage.
- C. Protect coatings from damage by use of padded slings and straps.
- D. In the event of damage, immediately make all repairs and replacements as per the manufacturer's written recommendations and as approved by the Engineer at no additional cost to TPU.

2.02 STRUCTURAL STEEL

- A. Wide flange sections: ASTM A992
- B. Plates and bars: ASTM A572, Grade 50, unless noted otherwise.
- C. Angles and channels: ASTM A36.
- D. HSS sections: ASTM 500, Grade B.
- E. Pipe: ASTM A53, Grade B, ASTM A106, Grade B or C.

2.03 BOLTS, NUTS, AND WASHERS

- A. Anchor bolts or anchor rods: ASTM F1554, Grade 55, headed, unless noted otherwise.
- B. Economy bolts, hex head bolts, and other bolts not specified as high-strength: ASTM A307, Grade A.
- C. Nuts and washers for economy bolts, hex head bolts, and other bolts not specified as high-strength: ASTM A563, suitable for grade of bolt, ASTM F844, wide series, maximum thickness, respectively.
- D. High-Strength bolts, nuts, and washers: ASTM A325-X, Type 3, ASTM A563-DH, hotdip zinc coated, and ASTM F436, hot-dip zinc coated, respectively.

2.04 OTHER MATERIALS

- A. Drilled-in expansion anchors AISI Type 316 stainless steel: Simpson Strong-Tie Wedge-All anchor, Hilti Kwik-Bolt 3 expansion anchor, or approved equal.
- B. Welded headed studs and shear stud connectors: See Section 03 20 00 Concrete Reinforcing.
- C. Traffic Bollards: ASTM A53 Grade B
- D. All other materials not specifically described but required shall be proposed by the Contractor, new, free of corrosion, and subject to the approval of the Engineer.
- 2.05 WELDING:
 - A. Welding electrodes for carbon steel shall be 70 ksi low hydrogen.
- 2.06 FABRICATION:
 - A. All miscellaneous metal shall be fabricated in accordance with the approved shop drawings.
 - B. Insofar as practicable, shop-prefabricate all items complete and ready for installation.
 - C. Unless otherwise indicated on the drawings, weld all shop connections. All joints shall be tightly fitting, securely fastened, square, plumb, straight and true.
 - D. Drill or punch all holes required for the attachment of work of other trades and for bolted connections. Burned holes are not acceptable.

PART 3 – EXECUTION

3.01 PREPARATORY REVIEW

- A. Prior to all work of this section, inspect the installed work of all other trades affecting this work and verify that all such work is complete to the point where this installation may commence.
- B. Coordinate and furnish placement drawings, templates, instructions, and directions for installation of embedded anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items.
- C. Verify that the work can be fabricated and installed in accordance with the Drawings, specifications, and reference standards. Immediately report discrepancies to the Engineer and do not proceed with fabrication or installation until discrepancies are resolved and direction is provided.

3.02 FABRICATION

- A. All structural steel shall be fabricated in accordance with the approved shop drawings and reference standards.
- B. Shop-fabricate and preassemble all items complete for installation to the extent practicable to minimize field assembly. Disassemble units only as necessary for shipping and handling limitations.
- C. Weld all shop connections unless otherwise directed on the Drawings. All joints shall be tightly fitting, securely fastened, square, plumb, straight, and true.
- D. Drill or punch all holes required for attachments and bolted connections including those of other trades. Burned holes are not acceptable.
- E. Welding of all metal fabrications shall conform to AWS D1.1.
- F. Install and erect all miscellaneous metal and metal fabrications in accordance with the design drawings, shop drawings, and reference standards.

3.03 ERECTION:

A. Erect and install all miscellaneous metal items in strict accordance with the drawings, the approved shop drawings and the reference standards, aligning straight, plumb and level within a tolerance of 1 in 200.

3.04 PROTECTIVE COATINGS

- A. Galvanizing:
 - 1. All miscellaneous metal, metal fabrications, and fasteners, except as noted in this specification, shall be hot-dip galvanized in conformance with ASTM A123, A 143, A 153, A 384, and A 385, as applicable.
 - All miscellaneous metal, metal fabrications, and fasteners that have a galvanized or hot-dip zinc coating, except as noted in this specification, shall be further coated (painted). Galvanized components to receive further coating shall be cleaned, prepared, primed, and coated with additional coatings over the galvanized coating as specified in Section 09 96 00 – High Performance Coatings.

- 3. Identify proposed drain holes or vent holes required to produce galvanized coatings to the specified standards. Clearly locate these holes on the shop drawings.
- 4. Galvanize items, to the extent practicable, immediately after fabrication is complete.
- 5. Damaged galvanizing, including damage due to welding and erection, shall be restored in accordance with ASTM A780, annex A3. Zinc-rich paints and cold spray materials are not acceptable. Surface preparation and application shall be according to the manufacturer's specifications.
- B. All Metal fabrications and associated hardware shall be galvanized and coated as specified in Section 09 96 00 High Performance Coatings.

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in:
 - 1. Section 13 34 23 Pre-Engineered Metal Buildings
- 1.02 SUMMARY
 - A. The location of the "Snow Guard" work is indicated on the drawings. The work includes the requirements for providing and installing snow guards, as well as associated work, in conformance with these specifications and as indicated on the drawings.
 - B. Section Includes:
 - 1. Snow guards for standing seam metal roofs.
 - 2. Non-penetrating attachment system.

1.03 SYSTEM DESCRIPTION

- A. Attachment system to provide attachment to standing seam metal roofs:
 - 1. With only minor dimpling of panel seams.
 - 2. Without penetrations through roof seams or panels.
 - 3. Without use of sealers or adhesives.
 - 4. Without voiding roof warranty.
- B. Loading: Design snow guard system to resist minimum in-service vector load of 42 pounds per linear foot of eave.
- C. Factor of safety: Utilize a factor of safety 2 to determine allowable loads from ultimate tested clamp tensile load values.

1.04 REFERENCE STANDARDS

- A. Aluminum Association (AA) Aluminum Standards and Data, 2003 Edition.
- B. ASTM International (ASTM):
 - 1. A581/A581M-95b(2004) Standard Specification for Free-Machining Stainless Steel Wire and Wire Rods.
 - 2. A582-05 Standard Specification for Free-Machining Stainless Steel Bars.
 - 3. B85-03 Standard Specification for Aluminum-Alloy Die Castings.
 - 4. B221-04a Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 - 5. E527-83(2003) Standard Practice for Numbering Metals and Alloys.

1.05 SUBMITTALS

A. Submittals for Review:

- 1. Shop Drawings: Show locations of snow guards on roof and attachment spacing.
- 2. Product Data: Include product description and installation instructions.
- 3. Samples:
 - a. Clamp samples.
 - b. Cross member samples including coupler and other hardware.
- B. Quality Control Submittals:
 - 1. Test results: Results of product load testing, issued by a recognized independent testing laboratory, showing load-to-failure value of attachment.
- C. Sustainable Design Submittals:
 - 1. Regionally manufactured products: Certify location of material manufacturer and distance from manufacturer to project site.
- D. Closeout Submittals:
 - 1. Certification: Installer's certification that snow guard system was installed in accordance with manufacturer's instructions and approved Shop Drawings.

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. Contract Documents are based on LMCurbSnowGuard two rod by LMCurbs, 1-800-284-1412. 827 Fisher Rd. Longview, TX. 75604. <u>www.lmcurbs.com</u>. Substitution for an approved equal product is acceptable.
- B. Potential product sources

1.	LMCurb 827 Fisher Rd. Longview, TX 75604 Phone: (800) 284-1412	Fax: (903) 759-3598
2.	S-5! Metal Roof Innovations, LTD. 500 W. Highway St. Iowa Park, TX 76367-2802 Phone: (888) 825-3432	Fax: (719) 495-0045
3.	PMC Industries, Inc. 87 Spring Ln. Plainville, CT 06062 USA Phone: (860) 406-7410	Fax: (860) 351-0689

2.02 COMPONENTS

- A. Clamps:
 - 1. Manufactured from 6061-T6 aluminum extrusions conforming to ASTM B221 or aluminum castings conforming to ASTM B85 and to AA Aluminum Standards and Data.

- 2. Clamp model: LMClamp or approved equal.
- 3. Set screws: 300 Series stainless steel, 18-8 alloy, 3/8 inch diameter, with round nose point.
- 4. Attachment bolts: 300 Series stainless steel, 18-8 alloy, 10 mm diameter, flanged head.
- B. Snow Straps: Lower / Upper:
 - 1. Manufactured from 6061-T6 alloy and temper aluminum extrusions conforming to ASTM B221 and AA Aluminum Standards and Data.
- C. Stop Collar:
 - 1. Manufactured from Type 303 stainless steel conforming to ASTM A581/A581M or ASTM A582.
- D. Cross Members:
 - 1. Manufactured from 6061-T6 alloy and temper aluminum extrusions conforming to ASTM B221 and AA Aluminum Standards and Data.
 - 2. Provide coupler ensuring alignment and structural continuity at end joints.
- E. SnoClips: Aluminum, with rubber foot, minimum 3 inches wide.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Prior to beginning installation, verify that:
 - 1. Panel seaming is complete.
 - 2. Panel attachment is sufficient to withstand loads applied by snow guard system.
 - 3. Installation will not impede roof drainage.

3.02 PREPARATION

- A. Clean areas to receive attachments; remove loose and foreign matter that could interfere with installation or performance.
- 3.03 INSTALLATION
 - A. Install system in accordance with manufacturer's instructions and approved Shop Drawings.
 - B. Place clamps at maximum 24 inches on center or as required by in-service loads.
 - C. Place clamps in straight, aligned rows.
 - D. Install set screws into clamps.
 - E. Tighten set screws to manufacturer's recommended torque.
 - F. Use stainless steel stop collars at each end of each assembly, and at a frequency and spacing of one for each 48 feet of assembly.

- G. Slide on one SnoClip per panel between panel seams.
- H. Install cross members through holes in Snow Straps.
- I. Install couplers at cross member end joints.
- J. Tighten set screws against cross members at all stop collar locations.
- K. Do not cantilever cross members more than 3 inches beyond last clamp at ends.

PART 1 – GENERAL

- 1.01 RELATED WORK SPECIFIED ELSEWHERE
 - A. The provisions and intent of the Contract, including the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in:
 - 1. Section 01 13 00 Submittals and Shop Drawings
 - 2. Section 05 55 00 Metal Fabrications
- 1.02 DESCRIPTION OF WORK
 - A. The work includes furnishing all materials, labor, equipment, and accessories for preparing and providing the required finished painting and protective coatings on the fabrications and items identified on the drawings and in the specifications. See Section 05 50 00 for list of project components to receive high performance coating.
- 1.03 REFERENCE STANDARDS
 - A. Society for Protective Coatings (SSPC), SSPC Painting Manual, Volume I, 4th Edition, "Good Painting Practice".
 - B. SSPC Painting Manual, Volume II, 2008 Edition, "Systems and Specifications".
 - C. SSPC, "The Fundamentals of Cleaning and Coating Concrete".
 - D. SSPC, "Procedure for Determining Conformance to Dry Coating Thickness Requirements", SSPC-PA2.
- 1.04 QUALITY ASSURANCE
 - A. Coating application shall be by qualified and experienced personnel having demonstrated at least five (5) years of experience in coating applications for marine structures.
 - B. Conform to all manufacturers' specifications and recommendations for achieving published results with each product, application, and condition. If manufacturers' specifications or recommendations differ from those in these specifications, report the discrepancy to the Engineer and obtain further direction before proceeding.
 - C. The Engineer may inspect coating preparation, application, or touchup at its discretion. Provide access to the Engineer for these inspections and at no additional cost to TPU.

1.05 SUBMITTALS

- A. A complete list of products and product descriptions proposed for use as coating systems.
 - 1. Provide manufacturer product data and accessories, including specifications, physical characteristics, and performance data.

- 2. Manufacturer instructions and directions for application of the coating systems.
- 3. Manufacturer instructions and procedures for use in performing field repairs and touch-ups to the coating systems.
- 4. Use the same manufacturer's products for all coats unless otherwise approved by the Engineer.
- B. Documentation that key personnel of the coating applicator have at least the minimum experience and certifications described above and below. Demonstrate consistent experience applying the proposed coating systems under similar conditions. List information by individual and include the following.
 - 1. Position or responsibility
 - 2. Employer (if other than the Contractor)
 - 3. Name of facility owner
 - 4. Mailing address and telephone number of facility owner
 - 5. Name of contact reference in facility owner's organization
 - 6. Location, size, and description of structure
 - 7. Dates work was performed
 - 8. Description of work performed on structure
- C. Samples of all paints and finishes proposed for use.
- D. Schedule of coating operations with dates and items listed.
- E. Measurement reports of dry paint thickness on metal surfaces according to SSPC-PA2.

1.06 PRODUCT HANDLING

- A. Deliver paint and associated materials in undamaged and unopened containers bearing labels of the manufacturer, which indicate the contents and directions for use, storage, and handling. Store materials in a location where the ambient temperature and humidity is not outside the ranges recommended by the manufacturer.
- B. Prevent fire. Open containers of inflammable materials only as needed. Keep rubbing cloths, oily rags, etc., in tightly closed metal containers, or remove from the job site daily. Benzene, gasoline, or distillates shall not be stored on the job site.
- C. Do not damage the coating materials before, during, or after installation and prevent damage to the installed work and materials of other trades.
- D. In the event of damage, immediately make all repairs and replacements as directed by the Engineer according to the manufacturer's recommendations and procedures at no additional cost to TPU.

PART 2 – PRODUCTS

2.01 COATING SYSTEMS

- A. Manufacturers who have provided acceptable coating systems for past marine projects include the following. This does not imply that products from any manufacturer listed below will be acceptable.
 - 1. Carboline Protective Coatings (1-206-243-6494)
 - 2. International Marine Coatings of AkzoNobel (1-206-763-8003),
 - 3. Sherwin Williams Co Industrial and Marine Coatings (1-360-931-4645)
 - 4. Tnemec Company (1-206-762-5755)
 - 5. Wasser High-Tech Coatings (1-253-218-2222)
 - 6. Fields Company LLC (1-253-627-4098)
- B. Coating systems selected for each type of finish surface shall be products of a single manufacturer. Coating materials shall be suitable for corrosion protection in an aggressive marine environment.
- C. Materials not specifically noted but required for the work, such as thinners, or other materials, shall be products of the approved paint manufacturer or compatible products accepted by the coating manufacturer.
- D. Paint products for coating systems shall be mixed according to the manufacturer's directions. Do not deviate except with written approval of the Engineer.
- 2.02 SUBSTITUTIONS
 - A. Manufacturer-specific coating systems are referenced in this specification. The manufacturer's product identification numbers indicate the product type, quality, and performance required for a specific application. Bids shall be based upon the manufacturer-specific coating systems referenced herein.
 - B. Submit in writing a request to the Engineer for review and approval prior to material procurement and in accordance with Section 01 13 00 Submittals and Shop Drawings. Substantiating technical data and documentation are required as described above for all submittals.
 - C. Proposed coating system substitutions will be reviewed and evaluated, subject to the approval of the Engineer, based on equivalency to the coating systems referenced in this herein. Substitute coating system data and documentation that does not demonstrate equivalency will not be approved.
 - D. Approved substitutions shall be at no additional cost to TPU.
- 2.03 COLOR SCHEDULE
 - A. OSHA safety yellow: traffic bollards, and traffic bollard guardrails; above ground vent pipes; precast and cast-in-place concrete as indicated on the Drawings.
 - B. Standard gray: All other items scheduled for painting.

2.04 COATING SCHEDULE

- A. Galvanized metal surfaces that are indicated in Section 05 50 00 Metal Fabrications to be coated (painted) shall be coated as follows:
 - 1. Solvent cleaned to remove contaminants using a biodegradable, water soluble, cleaner in conformance with SSPC-SP1.
 - 2. Solvent cleaned galvanized surfaces shall receive a light, sweeping abrasive sand blast to create a toothed surface profile in accordance with SSPC-SP7.
 - 3. Primer: Intergard 345 epoxy primer by International Marine Coatings of AkzoNobel, applied to a minimum dry film thickness of 5 mils on all surfaces.
 - 4. Top coat: Intergard 345 epoxy primer by International Marine Coatings of AkzoNobel, applied to a minimum dry film thickness of 5 mils on all surfaces.

PART 3 – EXECUTION

3.01 GENERAL

- A. Apply paints and coatings in accordance with the manufacturer's recommendations for each application. Adhere to the manufacturer's provisions, directions, and procedures for the following.
 - 1. Surface preparation
 - 2. Ambient temperature and humidity monitoring
 - 3. Mixing techniques
 - 4. Method of product application
 - 5. Minimum and maximum thickness per coat to achieve total thickness
 - 6. Minimum time between coats
- B. Use clean equipment and brushes. Spread materials evenly without runs, drips, sags, laps, brush marks, variations in color, texture, or sheen, and without "holidays".
- C. Vary color or sheens between coats and apply all coats to uniform thicknesses. Refinish any work determined defective or damaged, and repair all defective or damaged work at no additional cost to TPU. Leave finished surfaces clean, completely covered, and uniform in appearance.

3.02 APPLICATION

- A. The location, lettering size, and style of the surface regulatory markings shall be as indicated on the drawings and in the specifications.
- B. Number of coats as specified herein.

- C. Thickness of coats: Use ample undiluted materials; apply in uniform thickness over entire areas; do not exceed manufacturer's recommended spreading rate per gallon.
- D. Tint prime coats if necessary to obtain uniform finish coats.
- E. Portions of components which shall be embedded in concrete shall not be coated.
- F. Bolts, nuts, washers, and other fasteners shall be coated after installation.
- 3.03 TOUCHUP PAINTING
 - A. Paint film damaged due to field welding, field bolting, or other Contractor activities shall be immediately restored to its original thickness after thorough cleaning and necessary surface preparation according to the written manufacturer's recommendations.
 - B. Touchup painting shall be at the Contractor's expense.
- 3.04 INSPECTION
 - A. The Contractor shall perform measurements of dry paint thickness on all metal surfaces by means of magnetic gages as described in SSPC-PA2.
 - B. Copies of the measurement reports shall be provided to the Engineer prior to delivery.
 - C. The Engineer will perform verification testing/inspection at TPU's expense. The Contractor shall make arrangements for these tests/inspections at all facilities performing coating applications and give the Engineer a notice at least 14 days in advance of each coating operation.
PART 1- GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including General Conditions and General Requirements, apply to this work as if specified in this Section. Work related to this Section is described in the following sections:
 - 1. Section 05 50 00 Metal Fabrications
 - 2. Section 09 96 00 High Performance Coatings
 - 3. Section 13 34 23 Pre-Engineered Metal Buildings
- 1.02 DESCRIPTION OF WORK
 - A. The work of this section shall include all labor, materials, equipment, and appliances required to complete the louver work as indicated on the Drawings and as specified herein.
- 1.03 QUALITY ASSURANCE
 - A. Provide louvers manufactured by a firm with not less than 5 years of successful experience in the production of this type of work as listed herein.
 - B. Provide louvers as herein specified.
 - C. References:
 - 1. AAMA 605.2 Voluntary Standard for High-Performance Coatings on Architectural Extrusion and Panels
 - 2. AMCA Standard 500 Air Movement and Control Association
 - D. Comply with specific performance requirements and unit performance ratings determined in compliance with *AMCA Standard 500*.

1.04 SUBMITTALS

- A. Submit shop drawings for the fabrication and installation of louvers. Include details of each type, elevations, conditions at openings, tolerances, details of construction, location, and installation requirements. Show anchorage and accessory items.
- B. <u>Certification</u>: Where performance requirements are included, provide *AMCA* Certified Rating Seal indicating that louvers comply with requirements.

PART 2 - PRODUCTS

- 2.01 THROUGH-WALL LOUVERS
 - A. Location: Louvers to be provided for the Service Shed.
 - B. Approved Products: The following products are approved, subject to the specified requirements:
 - 1. *Ruskin*, Grandview, Missouri
 - 2. Construction Specialties, Inc., San Marcos, California
 - 3. *Airolite Company*, Marietta, Ohio
 - C. General: Conform to SMACNA ASSM, Plates 137 and 138 Figure C.
 - D. Materials: ASTM A526 galvanized to G90 zinc coating.
 - E. Metal Gages: 606375 extruded aluminum, .081-inch nominal wall thickness.
 - F. Frame: ASSM, Plate 138 (Figure A1).
 - G. Blades: ASSM, Plate 138 (Figure D).
 - H. Air Performance and Water Penetration: Louvers shall bear AMCA certified ratings seals for air performance and water-penetration ratings. Manufacturer shall submit AMCA licensed test data on a 3-foot high by 4-foot wide louver, showing that it provides a minimum of 5.12 square feet of free area and 450 FPM free air velocity at a pressure drop not exceeding 0.05 W.G, and test data on a 18-inch high by 30-inch wide louver showing that it provides a minimum of 1.09 square feet of free area and 460 FPM free-air velocity at a pressure drop not exceeding 0.05 W.G. Water penetration shall not exceed 0.01 ounce per square foot of free area at an airflow of 500 FPM free-area velocity when tested for 15 minutes per AMCA Standard 500.
 - I. Screens shall be ¹/₂-inch mesh, 0.041 diameter galvanized steel wire in galvanized steel frame.
 - J. Louver panel thickness shall be 4 inches deep with face dimensions as required to fit openings.
 - K. Finish shall be shop coat of primer, zinc chromate alkyd type, for field painting.
 - L. Louvers shall be designed to resist wind loading in accordance with live loads as indicated on the Drawings and in the Specifications, but in no case less than a uniform load of 25 pounds per square foot acting perpendicular to the plane of the louver assembly. Design for maximum deflection of L/180 the span.

M. Anchorage systems shall be designed to resist live loads as indicated on the Drawings and as specified.

2.02 FABRICATION

- A. Louvers: Manufacturer's standard fabrication for types specified.
- B. Accessories: Fabricate sill extension, flashings, wall anchors, structural supplementary subframing and accessories, as required for complete system.
- C. Shop fabricate units to maximum extent possible, and disassemble as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation.
 - 1. Fabricate frames, including integral sill, to suit adjacent construction with tolerances for installation.
 - 2. Provide sill extensions and loose sills of same finish and materials as louvers.
- D. Join frame members and louver blades by welding, maintaining equal blade spacing including separation between frame head and sill and uniform appearance.
- E. Shop miter and weld blades into prefabricated units to align with straight sections, include concealed bracing.

PART 3 - EXECUTION

3.01 SITE CONDITIONS

- A. Inspection:
 - 1. Prior to installation of the work of this section, carefully inspect the installed work of all other trades, and verify that all such work is complete to the point where this installation may properly commence.
 - 2. Take site dimensions affecting this work prior to fabrication.
 - 3. Ensure openings affecting this work are properly prepared and flashings are correctly located to divert moisture to exterior. Install sealant in accordance with manufacturer's instructions.
 - 4. Protect adjacent surfaces, finishes, and materials from damage during installation of louvers.
- B. Discrepancies: Do not proceed with installation in areas of discrepancies until all such discrepancies have been resolved.

3.02 INSTALLATION

- A. Install louvers in openings, properly aligned and level.
- B. Secure louver rigid with concealed fasteners of noncorrosive metals to suit materials being encountered.
- C. Coordinate installation method with application of adjacent backing, structural elements, and mechanical work.
- D. Set and tie into flashing to ensure diversion of moisture to exterior.
- E. Hinge screens for access.

3.03 CLEANING

When installation is complete, touch up all scuffs and abrasions in accordance with the manufacturer's recommendations.

END OF SECTION 10200

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including General Conditions and General Requirements, apply to this work as if specified in this Section. Work related to this Section is described in the following sections:
 - 1. Division 03 Concrete
 - 2. Division 05 Metals
 - 3. Section 11 05 00 Common Work Results for Equipment
 - 4. Section 22 05 00 Common Work Results for Plumbing
 - 5. Section 22 05 23 General Duty Valves for Plumbing Pipes
 - 6. Section 22 05 53 Identification for Plumbing Piping and Equipment
 - 7. Division 26 Electrical

1.02 SECTION INCLUDES

- A. Requirements for sand storage silo, boom-supported sand dispensing hoses/fill wands, and compressed air system (including but not limited to Equipment ID: 111129-01, 111129-03, 111129-04, 111129-05, 111129-06, 111129-08, 111129-09):
 - 1. Design, fabrication, installation and testing of:
 - a. A dense phase low velocity pneumatic sand conveying system (sanding system) to refill sand boxes of various types of locomotives at fixed locations indicated on drawings, including piping, hose support booms, hoses, fill wands with auto-shutoff feature, and dust trapping equipment.
 - b. A sand storage silo and reinforced concrete foundation pad (foundation pad by General Contractor)
 - c. Master and local control panels, control and power wiring, conduit, anchor bolts, accessories, spare parts, training, and related materials required for a complete installation.
 - d. Truckload delivery of sand for testing, training, and initial operations.
 - e. Compressed air system to supply air to the sanding system, air-operated MEO pump (specified in 22 70 13) and air hose reel.

2. The intent of this Specification is for a complete, Code-compliant, and operational installation. It is the responsibility of the Contractor to apportion and coordinate the Work required, including work related to piping, wiring and concrete. Work not included in the Contractor's purchase order or contract with the equipment system supplier ("manufacturer") shall be the responsibility of the Contractor.

1.03 STANDARDS AND REGULATIONS

- A. Standards and regulations shall be in accordance with Section 11 05 00, Common Work Results for Equipment, as supplemented and/or modified by the requirements listed below in this section.
- B. AWS American Welding Society:
- C. AWS D1.1, Structural Welding Code—Steel.
- D. ISO International Organization for Standardization:
 - 1. ISO 9001-2000 series.
- E. NEMA National Electrical Manufacturers Association.
 - 1. Work shall conform to the following codes:
 - 2. NEC (NFPA 70) National Electrical Code.
 - 3. IEEE C2 National Electrical Safety Code.
 - 4. UL Underwriters Laboratories, Inc.
- F. Electrical Apparatus Safety: Electrical apparatus shall be UL listed and bear the ULI label.
- G. Flame and Smoke Rating Requirements: Comply with Washington Building Code.
- H. Paints and Coatings: Not containing chromate or lead.
- I. Dust and Other Emissions: Compliant with OSHA and Washington State regulations.

1.04 SUBMITTALS

- A. Submittals shall be provided in accordance with Section 11 05 00, Common Work Results for Equipment, as supplemented and/or modified by this section.
- B. Calculations, for the design of the equipment including required supports, attachments, wiring and control diagrams. Provide the following data for design (under this or other specification sections) of the sand silo foundation:

- 1. Weights and loading diagram for the sand silo (including static load of silo, sand, and transfer equipment), including anchorage points and manufacturer's recommendations.
- 2. It is the Contractor's responsibility to ensure that this data is submitted in a timely manner, so as not to delay the work of other suppliers and subcontractors.
- 3. The data will be reviewed "for information only" by the Engineer, and it is the Contractor's responsibility to furnish it to his other suppliers and subcontractors as needed.
- C. Verification of the pre-designed foundation of the sand silo. Submit either:
 - 1. A confirmation letter affirming the adequacy of the pre-designed foundation, or
 - 2. If otherwise a revised structural design calculations or details from the approved Sand Silo manufacturer/supplier. No work on the sand silo foundation shall commence in the absence of either of these two conditions.
- D. Information obtained from manufacturer, to be submitted to the Engineer within 30 calendar days after Contract Award:
 - 1. A list of operating systems supplied by the proposed manufacturer of similar type, function, application, and capacity, and still in operation. Minimum number: five (5).
 - 2. Name of contact person at each installation submitted above, who is familiar with the operation and maintenance of all equipment provided by the manufacturer.
 - 3. Detailed information on location(s) where fabrication, assembly, and testing operations are to be performed for the equipment to be furnished as part of this contract. This refers to the sand silo and the sand transporter.
- E. Product Data: Technical documentation defining sanding system and compressed air system design, testing, and operational criteria, type and grade of each material to be utilized, machining tolerances, and types of finish.
 - 1. Submit manufacturer's recommended installation procedures which, when reviewed by the Engineer, shall be the basis for accepting or rejecting installation procedures used on the work.
 - 2. Installation details, including platform and foundation requirements.
 - 3. Performance and operating characteristics.
 - 4. Typed operating narrative.
 - 5. Electrical power requirements.
 - 6. Catalog cuts of all purchased components.

- a. In cases where there are multiple models, variants, or options for a component, the Submittal shall be annotated – by arrows, clouding or other means -- to clearly indicate only the model / options to be furnished under this Contract.
- 7. Submit Product Data together with the Shop Drawings.
 - a. Incomplete submittals will be rejected, with no basis for a delay claim.
 - b. It is understood that the manufacturer may need to order long-lead components before Shop Drawings are complete, so catalog cuts for longlead equipment may be submitted on a case-by-case basis with prior approval of the Engineer.
- F. Shop Drawings: Dimensioned shop drawings showing fabrication details, materials, tolerances, component clearance diagrams, wiring diagrams, system logic diagrams, layout, and finish.
 - 1. Isometric drawing(s) to show complete piping arrangement for sand and compressed air piping.
 - 2. General arrangement drawings showing sand system (sand storage silo, sand pump assemblies including hose boom, fill wands, and dust control equipment), and compressed air system (compressor, dryer, receiver tank).
 - 3. Schematic and interconnecting wiring diagrams of all electrical equipment. Interconnection diagrams shall show what electrical equipment is located in each control enclosure. All electrical equipment and components shall be identified.
- G. Record Documents:
 - 1. Operation and Maintenance Manuals: Complete set of the operating and maintenance instructions for equipment, including lubrication instructions, motor replacements, and spare parts, and related drawings and diagrams for review, in accordance with Section 11 05 00, Common Work Results for Equipment.
 - 2. Upon approval, deliver final sets of the manual in accordance with Section 11 05 00, Common Work Results for Equipment, two CD-ROMs of the material in PDF format, and one set of full size drawings and diagrams.
 - 3. Spare Parts Recommendations:
 - a. Recommendations for spare parts inventory including types and quantities considered normal for routine maintenance of the equipment for one year.
 - b. Recommendations for spare parts inventory including types and quantities considered critical and for which extended acquisition time would create excessive downtime

- c. Within 30 days Tacoma Rail will determine parts and quantities to be furnished. For Bid purposes, include a separate line item with an assumed amount of \$3,000. Final cost to be negotiated as part of the Change Order process.
- d. After approval, deliver approved parts lists as adjuncts of the operation and maintenance manuals.
- H. Bind manual, catalogues, and lists in heavy 3 ringed binders, and deliver to Engineer prior to request for final acceptance. Indicate the name and telephone number of manufacturer(s), local representative(s), and nearest source(s) of service and parts, inside the front cover of each manual. All documents shall comply with Specification Section 11 05 00, Common Work Results for Equipment. Also include electronic versions of all material found in the hardcopy binders.
- I. Testing and Training:
 - 1. Acceptance (field) testing procedures, submitted to Engineer for approval a minimum of two weeks before the acceptance test can be scheduled.
 - 2. Proposed training program, submitted to Engineer in duplicate for approval a minimum of 30 calendar days before the scheduled start of training.

1.05 QUALITY CONTROL

- A. Quality control shall be done in accordance with Section 11 05 00, Common Work Results for Equipment, as supplemented and/or modified by this section.
- B. Qualifications of Manufacturer's Representative:
 - 1. Engage the services of a manufacturer's field service representative to supervise installation of equipment, to conduct acceptance testing, and to train Tacoma Rail's personnel in the proper operation and maintenance of the equipment
 - 2. The field service representative shall be a qualified supervisor employed by the manufacturer, having a minimum of 5 years' documented training and experience in the installation of equipment being furnished. The representative shall work with Contractor's specialists and shall be present at the site for 100 percent of the installation work of the equipment being furnished.
- C. Qualifications of Installers:
 - 1. If the installer is other than the manufacturer, the installation shall be carried out by a firm having minimum 5 years' documented experience in the installation of specified products and components, and performing the work under the direction of a supervisor approved by equipment manufacturer.
 - 2. The installation shall be carried out under the direction of a qualified manufacturer's field service representative to supervise installation of equipment, to conduct acceptance testing, and to train Tacoma Rail's personnel in the proper

operation and maintenance of the equipment, and who shall be present at the site and who will work with Tacoma Rail's contractors and direct the installation work. The field service representative shall be a qualified supervisor employed by the manufacturer, having a minimum of 5 years' documented training and experience in the installation of equipment being furnished.

- 3. The installer shall employ an adequate number of specialists who are skilled workmen and who are thoroughly trained and experienced in the methods and requirements necessary for the proper execution of the work under this section.
- D. Registration of Designer(s):
 - 1. Shop drawings and design calculations that pertain to the equipment to be provided under the work of this section shall be reviewed and sealed by a professional engineer.
 - 2. Professional engineer shall have a minimum of 5 years' documented experience in providing engineering services of the kind indicated herein, including familiarity with seismic design requirements and Building Code for project location.
- E. Design and manufacture the system for a minimum 30-year life span given that scheduled maintenance will be performed in accordance with the manufacturer's instructions.
- F. Welding: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1, Structural Welding Code—Steel.
 - 2. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
- G. Warranty:
 - 1. Submit warranty signed by Contractor and installer and executed by manufacturer for equipment, materials, and workmanship against defects agreeing to repair or replace equipment and materials and correct workmanship.
 - a. Warranty Period: Minimum one (1) year from the date of Final Acceptance or the manufacturer's standard warranty period, whichever is greater. If the manufacturer's standard warranty period is less than that required herein, e.g. one year from shipping date, then the Contractor shall provide any necessary coverage to maintain the full warranty period specified herein.
 - b. Extend warranty to include specific products performing as a system.
 - 2. This warranty shall be in writing, on Contractor's and/or supplier's letterhead, and shall be included in the operations and maintenance manual(s).
 - a. Even if previously submitted separately, a copy of the warranty shall be included in the submittal of the O&M Manual(s).

1.06 DELIVERABLES

- A. All material shall be furnished in accordance with Section 11 05 00, Common Work Results for Equipment, as supplemented and/or modified by the requirements of this section.
- B. Approved maintenance and operation manuals.
- C. Documentation of training program, including all training materials, completion certificates, and electronic recording of instruction.
- D. Owner-approved spare parts. Contractor to obtain written receipt from Owner for delivery.
- E. One gallon of matching touch-up paint for each color utilized.

1.07 VERIFICATION OF DIMENSIONS

- A. All work shall be performed in accordance with Section 11 05 00, Common Work Results for Equipment, as supplemented and/or modified by the requirements of this section.
- B. Coordinate and verify with equipment manufacturer dimensions, loads, clearances, and utility requirements relating to fabrication of the equipment and building construction.
- C. Foundation: Coordinate installation and furnish anchor bolts, support plates, and incidental items embedded in foundation, along with applicable drawings and instructions approved by Engineer minimum 30 days prior to pouring of concrete for equipment foundation.

1.08 OPERATIONS AND MAINTENANCE MANUALS

A. Manuals shall be submitted in accordance with Section 11 05 00, Common Work Results for Equipment, as supplemented and/or modified by the requirements of this section.

1.09 TRAINING PROGRAM

- A. Training program shall be in accordance with Section 11 05 00, Common Work Results for Equipment, as supplemented and/or modified by the requirements of this section.
- B. Following installation, and at Tacoma Rail's convenience, conduct training program for Tacoma Rail's personnel. Schedule training period for a mutually agreed-upon number of consecutive days of 8 hours each day.
- C. Training shall include a written test as well as hands-on demonstration by student. Provide each person attending training sessions with a written training manual.

- D. Following completion of training, provide Tacoma Rail with:
 - 1. A letter attesting to the names of persons receiving instruction and the dates instruction took place.
 - 2. Certificate of completion for each person receiving instruction.
 - 3. Minimum of 2 copies of training materials (excluding operation and maintenance and parts manuals).
 - 4. Minimum of 2 copies of audiovisual recording of the training sessions.

1.10 GENERAL DESIGN AND FABRICATION REQUIREMENTS

A. This work shall be in accordance with Section 11 05 00, Common Work Results for Equipment, as supplemented and/or modified by the requirements of this section.

1.11 NOISE AND VIBRATION ISOLATION

A. All work shall be performed in accordance with Section 11 05 00, Common Work Results for Equipment, as supplemented and/or modified by the requirements of this section.

1.12 SHOP PAINTING

- A. All work shall be performed in accordance with Section 11 05 00, Common Work Results for Equipment, as supplemented and/or modified by the requirements of this section.
- B. Color Code Bands: Apply color-coded safety bands to piping, control conduits, and controls.
- C. Stainless Steel: Do not paint.

1.13 INSPECTION

A. Inspection shall be performed in accordance with Section 11 05 00, Common Work Results for Equipment, as supplemented and/or modified by the requirements of this section.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with requirements, provide equipment and products of the following, or equal approved as a substitution:
 - 1. Dynamic Air (<u>www.dynamicair.com</u>)

2.02 GENERAL REQUIREMENTS

- A. General equipment requirements shall be in accordance with Section 11 05 00, Common Work Results for Equipment, as supplemented and/or modified by the requirements of this section.
- B. Provide a complete sand distribution system to refill sand boxes of locomotives at fixed locations indicated on the Drawings. The system components include but are not limited to:
 - 1. Sand storage silo, silo foundation pad, and anchor bolts
 - 2. Sand Transporter (aka Distri-Sand or Conveyor) and anchor bolts
 - 3. Valves
 - 4. Sand dispensing apparatus, complete with flexible sand delivery hose assemblies. Each assembly shall include aluminum fill wand with auto-shutoff feature and dust trapping equipment.
 - 5. Hose support booms.
 - 6. Sand piping, compressed air piping, boosters, pressure relief valve(s).
 - 7. Master Control Panel (at the silo), all power and control wiring and conduit, and local control panels (at dispensers) if required by manufacturer's system. If electrical disconnect, power wiring and conduit to breaker, and piping to air compressor are not included in the manufacturer's scope, they shall be furnished and installed by the Contractor.
- C. Description of System Operation:
 - 1. Receiving Sand from Bulk Truck
 - a. Off-loading of sand will be done using the "on-board" blower of the delivery truck. Automatic level sensors in/on the sand silo, with exterior indicator lights on a weather tight control panel, will provide a visual indication of sand level in the silo, including a "Low Level" (or "Refill Required") level light, which indicates sufficient capacity to receive an entire truckload delivery.
 - b. When delivery commences, the control system will automatically initiate the vent filter, to filter the air from the blower on the truck as it discharges the sand, and also to accommodate (vent) the large surge of air generated when the trailer empties. When silo filling is complete, the driver unhooks the hose and departs. The control system will then automatically operate the filter for an additional 15 minutes in an unloaded condition to clean the cartridges.
 - 2. Conveying and Dispensing of Sand to Locomotives

- a. The sand transporter will be located at the base of the sand silo, protected from the elements and accessible for maintenance. The transporter will take sand from the silo and, by means of compressed air, convey it to the sand dispensing apparatus via sand piping. Boosters (or injectors) will periodically and automatically inject compressed air into the sand piping to assist in conveying the sand.
- b. At the sand dispensing point, the operator will remove the sanding wand from the holster located on the side of the dispenser, and hang the wand on the locomotive railing. The operator will then ascend the locomotive ladder to reach the sand box opening. The sand box cover hatch is opened and the sanding wand is placed into the sand box opening. The operator climbs down and starts the sanding operation by means of the local control panel mounted on the dispenser. The local control panel will also have controls for "Purge and Stop" and "Emergency Stop." Indicator lights on the dispenser will give visual indication of the dispenser/system status.
- c. Auto-shutdown feature: During sanding, the sand flow is monitored by pressure controls for automatic shutdown on detection of a full sandbox. When the sand level in the locomotive sandbox fills and covers the end of the sanding nozzle, the sand flow is obstructed, creating a higher pressure to trigger the shutdown of the system. A brief automatic purge is initiated to clear sand from the wand to prevent spillage when the wand is disconnected from the locomotive, and to clear some of the sand from the hose to reduce weight. After the purge is complete, the system will automatically open a vent valve to relieve any residual pressure in the dispenser tank. The dispenser will also automatically transmit a single to the Master Control Panel requesting a refill of sand from the silo, by means of the transporter and piping.
- d. When the sanding operation is complete, the wand is removed from the sand box, the box cover closed, and the wand is replaced in the holster.
- D. Place sanding equipment in accordance with general arrangement indicated. Modify as required and as approved by Engineer to suit specific equipment. Modify layout dimensions to improve operating efficiency or to minimize potential obstructions in path of personnel and vehicles. Obtain approval of Engineer prior to finalizing modifications.
- E. Where products and manufacturers are listed, make submittals for proposed comparable products and substitutions in accordance with the Contract Specifications.
- F. Fabricate sand system to permit components to be easily removed by 1 or 2 people or to weigh not more than 100 pounds. If component cannot comply with this requirement, include provisions for material handling (e.g., lifting eyes).
- G. Provide metallic hinges and latches and protect from corrosion by inherent material properties or by auxiliary protective platings or coatings.

H. Protect joints, connections, and contacts between dissimilar metals against galvanic action.

2.03 DESIGN CRITERIA

- A. Design sanding system equipment, including storage silos, distribution tanks, transfer piping, sand pump nozzle assemblies and hoses, to convey sand having the following material characteristics:
 - 1. Material: Sand.
 - 2. Bulk Density: 100 lb./cu. ft.
 - 3. Temperature: 70 Deg. F
 - 4. Moisture (maximum): Nil.
 - 5. Abrasiveness: High.
 - 6. Classification: 3.
 - 7. Gravity Flow: Good.
 - 8. Particle Size: 50 Mesh
 - a. Sieve Size: Percent Passing:
 - b. No. 10: 100
 - c. No. 20: 95 100
 - d. No. 30: 40 100
 - e. No. 50: 10 30
 - f. No. 80: 0 5
 - g. No. 100: 0
- B. System Rates:
 - 1. Flow Rate (at Fill Wand): 3,600 Lb/Hr
 - 2. Sand transfer speed: Not to exceed 5 feet per second, to minimize abrasion of sand piping.
- C. Performance:
 - 1. Perform sand fill operations of locomotive sand boxes without sand dust emission.

- a. Provide manufacturer's standard dust capture system, applicable for rigid fill wand, to capture sand dust at the fill point during sanding operations.
- 2. System design shall permit up to four (4) fill wands to be in use simultaneously (only two wands are required for the initial installation).
- 3. System shall be capable of safely shutting down with transfer piping full of material and then being restarted without blockage, damage, or disconnection of transfer lines.
- 4. System shall be capable of transporting sand at required flow rates to from the silo to the furthest located sand dispenser approximately 165 feet not including vertical travel and bends. Size piping, transporter/conveyor unit and other components accordingly.
- D. Equipment Configuration:
 - 1. Locate and configure each sand dispenser to interface with fill point of locomotive sand box, located approximately 10 feet above top of rail (ATOR) at the "F" end and 14.5 feet ATOR at the "B" end. Verify applicable vehicle dimensions and capacities prior to delivery.
 - 2. Provide sand system with compressed air from the compressed air system specified herein.
 - 3. At each hose station, provide an aluminum fill wand with a 90-degree bend at the end, of sufficient length and diameter for placement in a sand fill point located at center line of track.
 - 4. At each hose station, provide a manually rotatable hose support mast and boom (jib type) to assist in supporting the weight of the hose and placing the wand over the fill point. Mount to Locomotive Shed structural column. End of boom shall not extend past 5'-6" from track centerline.
 - 5. Locate sand fill apparatus, equipped with fill hoses, fill wands, and dust trapping mechanisms, as indicated on drawings.
 - 6. System manufacturer shall verify that diameter of wands is compatible with diameter of sand box fill openings, and that hose length is sufficient to reach the various sand box fill openings.
- E. Piping Support Bridge:
 - 1. Provide necessary hardware to hang or support piping. Provide supports at minimum 10 feet on center and at bends.
- F. Piping:
 - 1. Sand Transfer Piping: Provide Schedule 80 steel sand piping between storage silo and sand dispensing pumps.

- 2. Compressed Air Piping: ASTM A53 Grade B, Black.
- 3. Design transfer piping, particularly bends and connections, to be resistant to abrasion due to passage of sand.
- 4. Design system capable of shutting down with transfer piping full of material and capable of restarting conveyance without disconnecting transfer lines.
- 5. If piping and jib boom supports are excluded from system supplier's scope of work, then they shall be furnished by the General Contractor.
- G. Transporter:
 - 1. Provide one (or more, if required to meet design performance) transporter for pumping sand from the silo to the fill wands.
 - 2. Provide sand level monitoring and isolation valves to permit transporter servicing without having to empty sand from the silo or transfer piping.
- H. Sand Silo:
 - 1. Capacity: Minimum 1,500 cubic feet of sand, capable of receiving one full truckload of sand from Owner's local supplier, with approximately 20% reserve.
 - 2. Dimensions: Maximum diameter of 10 ft, or maximum width/depth of 10 ft.
 - 3. Provide enclosed equipment area at base of silo for sand transporter, with interior lighting and 120 VAC convenience outlet.
 - 4. Provide reinforced concrete foundation pad designed and installed to accommodate fully-loaded silo.
 - 5. If components requiring access for maintenance/repair (such as filter or dehumidifier) are located on the roof of the silo, provide an OSHA-compliant access ladder with safety cage and OSHA-compliant safety railing at top of silo.
 - 6. Provide self-cleaning dust collection for venting convey air as delivery truck offloads, and associated controls and indicators.
 - 7. Provide pressure relief valve.
 - 8. Provide detectors (sensors) for high and low levels of sand, and local indicators for same. Indicators shall be readily visible to ground-level operator at truck-to-silo fill point.
 - 9. Provide automatic dehumidifier for sand silo.
 - 10. Include truck-to-silo fill point:

- a. Silo designed to accept pneumatic delivery from bulk truck, by means of "semi-dense" phase pneumatic conveying
- b. 4" Schedule 80 pipe to receiver at top of silo
- c. Provide 4" hose adapter with male quick disconnect (cam-lock) and dust cap with chain.
- 11. Provide lift lugs on silo top and base skid for lifting off of delivery truck and setting into position
- 12. Alarms:
 - a. Provide both an indicator light and an alarm horn that will alert the driver so that sand transfer can be stopped, for the following conditions:
 - 1) Sand at High level.
 - 2) If any fault occurs (such as failure of the dust filter/air vent system) while sand is being conveyed into the silo.
 - b. Indicator light for "Low Level" (or "Refill Required"), with modem and capability for Low Level indication to be transmitted to via modem to a mobile telephone (text message) or PC.
- I. Sand Fill Station:
 - 1. Auto Stop: During filling operation, fill wand assembly shall automatically stop filling when detecting locomotive sandbox is full. Design wand to purge sand remaining in hose and wand, or close securely, to prevent spillage of sand when wand is removed from locomotive sandbox.
 - 2. Equip each with the following:
 - a. Filling hose with aluminum filling wand suitable for sand fill inlets on Tacoma Rail's locomotives. Support hose from a platform-mounted hose support boom (jib assembly), with hinged design to allow the beam to swing toward the track.
 - b. Provide system, local or centralized, to trap dust during the filling operation.
 - 3. Hose Assembly:
 - a. Provide 2-inch diameter flexible industrial-grade hose with aluminum fill wand.
 - b. Hoses shall be weatherproof and UV and heat resistant.

- J. Master Control Panel (MCP):
 - 1. Provide automated control of transfer and distribution, as well as monitoring of sand usage and silo high and low sand levels.
 - 2. Locate at the sand storage silo.
 - 3. Provide all necessary control wiring and conduit, in accordance with approved shop drawings.
 - 4. Provide weatherproof electrical panels, cabinets, and components for outdoor applications.
- K. Required Controls:
 - 1. NEMA 4 local control panel with Start/Stop push button (to activate the dispenser after the fill wand has been placed, and deactivate after auto shutoff), Emergency Stop (mushroom head), and indicator lights for "Sanding in Operation," "Purge Complete" and "Fault."
 - 2. Purge & Stop: If while sanding, the operator would like to stop the operation before the sand box is filled, the "Purge & Stop" push button is pressed. The system will go through a brief purge cycle, and when complete, the "Purge Complete" light will be an illuminated indicating it is safe to remove the sanding wand from the sandbox. The wand can now be removed and replaced in the holster.
 - 3. Fault / Emergency Stop: In the event that a fault occurs, such as loss of convey air pressure, an audible and visual alarm will be activated to alert the operator. An emergency stop button allows for stopping the system if needed. Once the fault is corrected and the alarm reset button has been pressed, the operator presses the "Start" button and the system will reinitiate automatic operation.

2.04 COMPRESSED AIR SYSTEM

- A. Air Compressor, to include the following capacities and features:
 - 1. Minimum 444 acfm airflow at 125 psig
 - 2. 125 hp, 460/3/60, TEFC, high efficiency electric motor
 - 3. Stand-alone controls package in NEMA 4 enclosure, factory-mounted
 - 4. Full weather enclosure with acoustical damping
 - 5. Direct drive
 - 6. Differential pressure oil system with oil cooler
 - 7. ASME-coded air/oil separator with oil level guard and oil filter

- 8. Aftercooler with high efficiency moisture separator
- 9. Manual and automatic drains
- 10. Cold weather kit
- 11. Inlet filter with service indicator
- 12. Starter cubicle with wye-delta starter and control voltage reduction transformer a LOAD / NO LOAD capacity control
- 13. Comprehensive system of monitoring, controlling, and regulating compressor operation
- 14. Multi-stage, 3 micron high dust inlet filter
- 15. Factory fill of 8,000-hour oil
- B. Air Dryer, Regenerative (Heatless Twin Tower Desiccant type), to include:
 - 1. Minus 40°F line pressure dew point
 - 2. ASME-coded desiccant vessels
 - 3. 10 minute cycle, fully automatic operation
 - 4. Color-change dew point Indicator
 - 5. NEMA 4 electrical construction
 - 6. Fail safe operation; continuous flow in case of power failure
 - 7. Non-lubricated flow control valves
 - 8. Pressure gauges on each desiccant vessel
 - 9. High-efficiency pre and after-filters to 1 micron including coalesced liquid
 - 10. Gradual re-pressurization for longer desiccant life
 - 11. Relief valve on outlet manifold
 - 12. Full charge of desiccant
 - 13. Heavy duty angle and channel support base
 - 14. Interconnect piping to Air Receiver Tank, and electrical connection to power source
 - 15. Energy Management System.

- C. Air Receiver (Storage) Tank, 1060-gallon capacity, vertical:
 - 1. ASME-coded pressure vessel
 - 2. Factory painted
 - 3. Pressure gauge
 - 4. Relief valve
- D. All interconnecting piping, valves, gauges, supports, including connections to sand silo, MEO air-operated pump, and air hose reel, with isolation valve and pressure regulator for each connection.
 - 1. All interconnecting piping shall be above-grade, and comply with requirements of Section 22 15 13 General Service Compressed Air Piping.
 - 2. Piping, valves, gauges, and supports, if excluded from system supplier's scope of work, shall be furnished by the General Contractor.
 - 3. Provide filter/regulator/lubricator for air hose reel. Set pressure regulator to 90 psi.
 - 4. Provide manufactured pipe markers, arrows for direction of flow, and other necessary pipe markings in accordance ASME A13.1 and Section 22 05 53 Identification for Plumbing Piping and Equipment.
- E. If additional filtration, drying or regulation of compressed air is required, provide necessary equipment.

2.05 ELECTRICAL POWER

- A. Equipment's electrical requirements shall be in accordance with Section 11 05 00 -Common Work Results for Equipment, as supplemented and/or modified by the requirements of this section, and in accordance with Division 26.
- B. Provide 120V, single phase, 60 Hz to disconnect switch at Master Control Panel (MCP) at silo.
- C. Provide power and control conduit and wiring to distribute power from disconnect switch to system as required by manufacturer's approved design.

2.06 FINISHING

A. Non-Stainless and Non-Galvanized Steel: Finish equipment, piping, enclosures, structural steel, conduits, electrical cabinets, plates, and other items except wear surfaces, with two coats of primer and one finish coat of machinery enamel in color selected by Engineer.

- B. Prepare surfaces in compliance with paint manufacturer's recommendations ensuring that surfaces are free of rust, scale, dirt, grease, and oil before painting.
- C. Provide 1 gallon of touch-up paint for each color used to permit retouching marred surfaces. Perform required touch-ups prior to acceptance of the equipment. Match touch up-paint to factory coat.
- D. Color Code Bands: Apply color coded safety bands to piping, control conduits, and controls.
- E. Stainless Steel: Do not paint.
- 2.07 GASKETS AND FASTENERS
 - A. Gaskets and Fasteners requirements shall be in accordance with Section 11 05 00 -Common Work Results for Equipment, as supplemented and/or modified by the requirements of this section.
- 2.08 HOLES, OPENINGS, AND INSERTS
 - A. This work shall be done in accordance with Section 11 05 00 Common Work Results for Equipment, as supplemented and/or modified by the requirements of this section.
- 2.09 CONCRETE FOUNDATIONS
 - A. This work shall be done in accordance with Section 11 05 00 Common Work Results for Equipment, as supplemented and/or modified by the requirements of this section.
- 2.10 MOTORS AND DRIVES
 - A. The work for motors and drives shall be in accordance with Section 11 05 00 -Common Work Results for Equipment, as supplemented and/or modified by the requirements of this section.

PART 3 - EXECUTION

3.01 PREPARATION

- A. All work shall be performed in accordance with Section 11 05 00 Common Work Results for Equipment, as supplemented and/or modified by the requirements of this section.
- B. Verify and coordinate actual dimensions of building, service and inspection platforms, and routings between them, relating to fabrication of system and notify Engineer of discrepancies prior to ordering equipment and material, and starting fabrication or installation.

- C. Foundation: Coordinate installation and furnish anchor bolts, support plates, and incidental items embedded in pit walls or foundation, along with applicable drawings and instructions approved by Engineer minimum 30 days prior to pouring of concrete for equipment foundation.
- D. Verify that dimensions and utility supplies are satisfactory for placement of equipment.
- E. Verify that surfaces receiving metal fabrications are sound, square, and true. Correct any surface defects that would impair operability or shorten the life of any component of equipment.
- F. Examine conditions for compliance with requirements for installation tolerances, clearances, and other conditions affecting performance of equipment.
- G. Proceed with installation after unsatisfactory conditions have been corrected.
- H. Coordinate and verify proper relation of all work to the site and to the work of all trades.

3.02 FABRICATION

- A. All work shall be performed in accordance with Section 11 05 00 Common Work Results for Equipment, as supplemented and/or modified by the requirements of this section.
- 3.03 DELIVERY, STORAGE, AND HANDLING
 - A. All work shall be performed in accordance with Section 11 05 00 Common Work Results for Equipment, as supplemented and/or modified by the requirements of this section.
 - B. Special precautions shall be taken to prevent damage to electrical components such as motors, controls and conductors.
 - C. All materials shall be delivered to the site with their original manufacturer's markings and identification intact. Reject materials that are damaged, improperly identified or not in conformance with reviewed shop drawings and catalog cuts. Tacoma Rail (or its designated site representative) reserves the right to also reject such materials.

3.04 INSTALLATION

- A. All work shall be performed in accordance with Section 11 05 00, -Common Work Results for Equipment, as supplemented and/or modified by the requirements of this section.
- B. Coordinate and verify that required utility connection points are in place.
- C. Install and connect Master Control Panel to power sources.

- D. Install and connect power conduit and wiring from disconnect switches to sanding system pumps and controls.
- E. Install and connect compressed air piping/equipment from capped line (related work) to sand silo and sanding equipment.
- F. Field Touch Up-Painting: Re-touch surfaces where the shop coat has been damaged, using the same film thickness as the original shop coat.

3.05 SETTING AND ALIGNING EQUIPMENT

- A. All work shall be performed in accordance with Section 11 05 00 Common Work Results for Equipment, as supplemented and/or modified by the requirements of this section.
- 3.06 CLEANING AND PROTECTION
 - A. All work shall be performed in accordance with Section 11 05 00, Common Work Results for Equipment, as supplemented and/or modified by the requirements of this section.
- 3.07 FIELD PAINTING
 - A. All work shall be performed in accordance with Section 11 05 00 Common Work Results for Equipment, as supplemented and/or modified by the requirements of this section.
- 3.08 EQUIPMENT TEST AND CHECKOUT
 - A. All work shall be performed in accordance with Section 11 05 00 Common Work Results for Equipment, as supplemented and/or modified by the requirements of this section.
 - B. After approval of the site test procedure notify the Engineer at least two weeks in advance of making the site test.
 - C. Provide material and manpower required for the program.
 - D. Provide initial delivery of sand (approximately 30 tons) to fill silo. Verify low level and high level sensors during this process.
 - E. Owner will provide rail vehicles and components.
 - F. Test all pump locations.
 - 1. Verify auto refill, auto stop, and dust control features
 - 2. Verify function of amber indicator light on each pump
 - 3. Verify safe shut-down and restart of sanding system with full transfer piping.

- G. During testing, verify operation of safety and annunciation devices.
- H. Top off sand level prior to final acceptance.
- I. Submit test results to Engineer.
- J.In the determination of Engineer, should sanding system fail to function properly, make modifications and adjustments and replace impaired parts required for operation. Perform additional tests as necessary to verify equipment is operating properly.

3.09 START-UP AND INSTRUCTIONS

- A. All work shall be performed in accordance with Section 11 05 00 Common Work Results for Equipment, as supplemented and/or modified by the requirements of this section.
- B. Prior to installation, submit for review a program to train Owner's personnel to operate and maintain equipment. Provide materials required for the program.
- C. Following installation and at Owner's convenience, conduct training program for Owner's personnel. Schedule training period for a mutually agreed-upon number of consecutive days of 8 hours each day. All training shall include a written test as well as hands-on demonstration by student. Provide each person attending training sessions with a written training manual.
- D. Following completion of training, provide Owner with:
 - 1. A letter attesting to the names of persons receiving instruction and the dates instruction took place.
 - 2. Certificate of completion for each person receiving instruction.
 - 3. Minimum of 2 copies of training materials (excluding operation and maintenance and parts manuals).
 - 4. Minimum of 2 copies of training materials (excluding operation and maintenance and parts manuals).

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the contract, including general conditions and general requirements, apply to this work as if specified in this section. Work related to this section is described in the following sections:
 - 1. Section 05 50 00 Metal Fabrications
 - 2. Section 11 05 00 Common Work Results for Equipment
 - 3. Section 22 05 00 Common Work Results for Plumbing
 - 4. Section 22 05 23 General Duty Valves for Plumbing Pipes
 - 5. Section 22 05 53 Identification for Plumbing Piping and Equipment

1.02 SUMMARY

- A. This Section includes complete general service fluid storage, distribution, and dispensing system, with the entire system to be furnished, installed and tested by a single firm, who shall be responsible for warranty service. (Including but not limited to Equipment ID: 111153-01, 111153-02, 111153-03, 111153-04, 111129-01, 111129-03, 111129-07).
- B. System includes but is not limited to:
 - 1. Air-operated pump (LP-1) for transfer of Main Engine Oil (MEO) to boom oil cabinet located on the service island.
 - 2. All interconnecting piping from storage to dispensing, pipe labeling, fittings and accessories for a complete Code-compliant installation. Include pipe painting and labeling.
 - 3. Boom oil cabinet with electric start/stop, electric hose rewind and oil heater.
 - 4. Spill containment pallet for owner-furnished 275-gallon totes of lubricant. Quantity = 2.
 - 5. Valves, gauges, hangers, vents and vent pipes (including through roof, where required by code), and other accessories required for a complete installation.
 - 6. Cleaning (air purging), flushing, and pressure testing of all lines prior to start-up and training.
 - 7. Acceptance testing, training, and equipment documentation (certifications, test results, training materials, and O&M manuals).

- 8. Spare Parts.
- 1.03 NOT USED
- 1.04 NOT USED
- 1.05 SUBMITTALS
 - A. Product Data: Technical data (including catalog cuts) and manufacturer's written installation instructions for each component.
 - B. Shop Drawings: Five sets of dimensioned shop drawings indicating tolerances, clearances, and dimensions.
 - 1. Boom oil cabinet.
 - 2. Arrangement drawing and flow diagram schematic for lubrication oil system, indicating all required pumps, valves, vents, sensors, mounting locations, pipe sizes and material.
 - C. Record Documents:
 - Operation and Maintenance Manuals: One complete set in electronic form of operating and maintenance instructions, including maintenance instructions, motor replacements, and spare parts, and related drawings and diagrams for review, in accordance with Section 11 00 05, Common Work Results for Equipment. Upon approval submit final copies in accordance with Section 11 00 05.
 - a. Submit data required for proper operation and maintenance. For operating type procedures, ensure that nomenclature for control positions, test points and indicating devices having panel nomenclature is written exactly as it appears on equipment panel, placard, or structure (e.g., "Set master switch to 'OFF'").
 - 2. Parts Catalog: Include with operation and maintenance manuals.
 - a. Enumerate and describe each component and related parts, including identifying numbers and commercial equivalents where applicable.
 - b. Include cutaway and exploded view drawings for identification of parts
 - 3. Spare Parts:
 - a. For inventory including types and quantities considered normal for routine maintenance of the equipment for one year.

- b. For inventory including types and quantities considered critical and for which extended acquisition time (greater than 72 hours) would create excessive downtime.
- c. Submit approved parts lists as adjuncts of the operation and maintenance manuals.
- 4. Training Manual: Two hard copies of the training manual and an electronic version on a CD or DVD of the training manual.
- D. Testing Data: Field testing procedures and data.
- E. Certifications: Certification that proposed equipment meets or exceeds specified requirements and is appropriate to intended application.

1.06 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Applicable provisions of State of Washington and local authority building, safety, and environmental codes.
 - 2. Comply with Federal and State toxicity and air quality regulations and with Federal requirements on content of lead, mercury, and other heavy metals. Do not use solvents in paint products that contribute to air pollution.
 - 3. UL Ratings and FM ratings for each component or item of equipment.
- B. Manufacturer Qualifications: Firms experienced in the manufacture of lubrication oil and other service fluid storage and distribution equipment with characteristics and capacities required, whose products have been in satisfactory use in similar service (i.e., industrial/railroad applications) for not less than 10 years.
- C. Installer Qualifications: Experienced installer having minimum 10 years' documented experience in the design, installation, and service of similar equipment.
 - a. Provide, as a minimum, the following information for no fewer than three large-scale projects executed within the last five years that remain in satisfactory operation:
 - 1) Client, project name and location, year completed, and summary description of work.
 - 2) Client Contact Information: Names, addresses, titles, and phone numbers of the engineers or technicians who operate the system.
 - 3) Drawings and photographs, if available.

- 4) Projects for which the firm provided, or currently provides, extended warranty of preventive maintenance service, remote system monitoring, or an emergency repair service contract. Experience of this type is preferred but not mandatory.
- 5) Evidence of required current Washington state contractor's licenses, and evidence of general liability insurance.
- 6) Any other data the firm deems useful in establishing competence.
- 2. Requirements for system installer include the following:
 - a. The firm shall have experience in design and construction of service fluid (including but not limited to lubrication oils and greases, engine coolants, and waste oil) distribution systems for industrial, railroad, or commercial facilities similar to the required system for this project. This experience shall encompass the following key design elements:
 - 1) Multiple storage tanks and totes.
 - 2) Distribution / dispensing at rates up to 20 gpm.
 - 3) Central alarm and monitoring systems.
 - 4) Indoor and outdoor piping and hose reel applications, with pipe runs in excess of 50 ft.
 - 5) Installation in the state of Washington.
 - b. The firm shall have design capability and demonstrate understanding of Federal, State of Washington, and local code requirements including NFPA, UL, ASTM, and API standards and guidelines relating to venting, thermal protection, and seismic zone 4 anchoring.
 - c. The firm (or its installation partner) shall hold current Washington state contractor's licenses in all required categories to complete the work.
 - d. The firm shall provide evidence of general liability insurance.
- 3. Employ an adequate number of specialists who are skilled workman and who are thoroughly experienced and trained in the methods and requirements necessary for the proper execution of the work under this section.
- D. Professional Engineer Qualifications: Professional Engineer, legally qualified and licensed to practice in the State of Washington or California, and experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for seismic installations of above-ground tanks similar to those indicated herein in material, design, and extent.

- E. Installer's Representative: Installation of the equipment in this section shall be carried out under the direction of a qualified supervisor employed by the system installer who is thoroughly experienced and trained in pertinent trades and who shall be present at the site to direct the work. Representative shall also conduct acceptance testing, provide start up services, and train Owner's personnel in operation and maintenance of equipment.
- F. Standard Components: Provide standard, commercially available components, including motors, pumps, and electrical devices, manufactured by companies regularly engaged in the manufacture of the components.
- G. Single Source Responsibility: Provide an integrated, internally compatible system using products manufactured by a single manufacturer to the greatest extent possible, including accessories and appurtenances. The design shall provide for interchangeability of items of pumps, valves, subassemblies, and sensors.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Pack system components to protect against damage during transportation, unloading, setting in place, and assembly.
- B. Deliver to site with original manufacturer's markings and identification intact. Tacoma Rail reserves the right to reject materials that are damaged, improperly identified, or not in conformance with reviewed shop drawings and catalog cuts. Deliver to site in sealed containers and protect against intrusion of moisture or foreign matter. Unload, move, and store system components in location designated.
- C. Store at site as required to prevent misalignment or distortion. Take precautions to prevent damage to electrical components such as motors, controls, and conductors.

1.08 WARRANTY

- A. Submit written warranty signed by Contractor and installer and executed by manufacturer, warranting components, equipment, and workmanship. Warranty shall contain provisions to repair or replace defects in equipment, components, or workmanship.
 - 1. Warranty Period (Hose Reels and Control Handles/Nozzles): Three years from date of Final Acceptance. Contractor's responsibility is for first year only of warranty period.
 - 2. Warranty Period (Other Than Reels): One year from date of Final Acceptance.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Manufacturers: Subject to compliance with requirements, provide products complete with required accessories from one of the following, or equal approved as a substitution:
 - 1. Storage Totes and Integral Racks:
 - a. By Owner.
 - 2. Air-Operated Pumps, Hose Reels, and Dispensing Nozzles:
 - a. ARO
 - b. Balcrank Products, Inc.
 - c. Graco Inc.
 - d. Hannay Reels.
 - e. Coxreels.
 - f. Morrison.
 - 3. Portable Oil Dispensers:
 - a. Snyder
- B. Piping:
 - Double wall High density polyethylene pipe (HDPE) shall be manufactured in accordance with the specifications set-forth in ASTM F2619 and API 15LE "Standard Specification for Polyethylene (PE) line pipe" for fuel and oil transmission. HDPE pipe and fittings should be made from PE4710 resin conforming to ASTM D2513 with the cell classification of 445574C/E conforming to ASTM D3350 and listed with the Plastic Pipe Institute's (PPI) TR4. Pipe shall be carbon black in color, and shall include sufficient markings to demonstrate compliance to industry standards and to provide identification and traceability to a specific lot/batch of raw materials. Pipe shall be furnished in laying lengths of not less than 50 feet.
 - 2. HDPE pipe joints shall be made by butt heat fusion in accordance with ASTM F2620 "Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings" and associated specifications for fuel/oil pipe.

- a. Manufacturers: Subject to compliance with requirements, provide the indicated product, a comparable product by one of the following, or equal approved as a comparable product:
 - 1) U.S. Hose Corporation.
 - 2) Flex-Hose Co., Inc.
 - 3) Flexicraft Industries.
 - 4) Hyspan Precision Products, Inc.
 - 5) Metraflex Company.
 - 6) Unaflex Inc.
 - 7) Franklin Fueling Systems
- 3. Provide manufactured pipe markers, arrows for direction of flow, and other necessary pipe markings in accordance ASME A13.1 and section 22 05 33 "Identification for Plumbing Piping and Equipment".
- C. Air-Operated Main Engine Oil (MEO) Pump (LP-1): Wall-mounted, self-priming, airoperated double diaphragm pump.
 - 1. Flow: 120 gpm for distance up to 160 feet.
 - 2. Mounting: Provide bracket for mounting on wall.
 - 3. Ratio: 1:1
 - 4. Inlet Air Pressure Range: 10 psi to 120 psi.
 - 5. Air Inlet: 3/4 inch NPTF.
 - 6. Fluid Outlet: 1-1/2 inch NPTF.
 - 7. Fluid Inlet: 1-1/2 inch NPTF.
 - 8. Maximum Air Consumption (SCFM per gallon, at 100 psi Air): 140
 - 9. Gallons per cycle: 1.35
 - 10. Basis of Design: ARO Model 666250-144-C; see above for other manufacturers.

- D. Air Inlet Pump Accessories: For each pump specified, provide the following accessories:
 - 1. Air filter/water separator.
 - 2. Air line oiler.
 - 3. Air shut off valve.
 - 4. Air pressure regulator with gauge.
- E. Fluid Outlet Pump Accessories: For each pump specified, provide the following accessories:
 - 1. Fluid shut off valve.
 - 2. Dispense hose.
 - 3. Suction tube.
 - 4. Bung adapter (suitable for change-out totes).
 - 5. Low level cut off.
 - 6. Swivel.
 - 7. Metered control valve.
- F. Pump: Pump shall start/stop electrically at the lube oil boom cabinet.
 - 1. Fluid Level Monitoring: Not used.
 - 2. Storage Tote:
 - a. By Owner. 275 gallon
- G. Alarm and Monitoring System: Not used.
- H. Accessories and Related Items:
 - 1. Provide required accessories and related items including suction piping, shut off valves, check valves, pump, flexible hydraulic hose, distribution piping and fittings, control handles, compressed air overrun controls, compressed air filters, compressed air regulators, pressure gauges, final connections to components of equipment, and controls.
 - 2. Accessories and related items shall be those manufactured by or specifically recommended by the manufacturer of the primary equipment.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Examine areas and conditions under which the lubrication system is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.
- B. Verify that all necessary sources of electrical power, compressed air, and water are available at the applicable proximity to the equipment.

3.02 PREPARATION

A. Determine and verify pipe sizes and materials; component locations, types, and quantities; mounting requirements and hardware; equipment selection; and design parameters, necessary to provide a complete operable system.

3.03 INSTALLATION AND PRESSURE TESTING

- A. Comply with each manufacturer's installation instructions.
- B. Unless otherwise specified, any materials described, shown, reasonably implied, or obviously part of the system and necessary to its complete installation and correct operation shall be furnished and installed, without extra charge to Tacoma Rail. The drawings and specifications are intended to supplement one another, and any item set forth in either shall be recognized as having been fully set forth in both.
- C. Pressure test pipes with air for 8 hours without more than 1 percent loss in pressure as follows:
 - 1. As required for HDPE PE 100 double wall pipe.
 - 2. If pressure loss exceeds 1 percent, adjust, repair or replace fittings, joints and/or piping as necessary. Retest piping.

3.04 CLEANING AND FLUSHING OF LINES

- A. Clean all product lines, including waste oil line, as follows:
 - 1. Blow out the piping with compressed air at the recommended pressure to remove dust, metal shavings and other debris. Inject air at various points along the line to the extent possible, beginning at the outlet of the pump connection and proceeding downstream to the cabinet.
 - 2. CAUTION: Do not blow the air through the boom cabinet they shall be disconnected from the pipe outlet before the cleaning.
- B. Flush out all product lines, excluding waste oil line, with applicable "sacrificial" product as follows:

- 1. Pump applicable "sacrificial" service fluid through the piping), minimum 20 gallons. Cease flushing based on a careful visual examination of the product at discharge, observed in a clean colorless glass container.
- 2. CAUTION: Do not pump the "sacrificial" product through the hose reel or the control handle they shall be disconnected from the pipe outlet before the flushing process commences. Oils and other service fluids dispensed during the flushing process shall be disposed of via a licensed recycling facility, and not placed back into the storage tank.

3.05 ADJUSTMENT

- A. Tests and Adjustments: Supply services of authorized factory representative of manufacturer for start up and adjustment of pumps, sensors, meters, gauges and controls.
- B. Submit written report to Tacoma Rail certifying that operating controls, meters, gauges, and sensors are properly installed, calibrated, and adjusted.
- 3.06 START-UP AND TRAINING
 - A. Start-Up Service: Under the direction of the manufacturer's authorized representative, provide start-up of equipment and system. Allow minimum of 2 consecutive days for initial start-up of system, training, and instruction of the field operators.
 - B. Instruct operating personnel in operation and maintenance of system at start up.
 - 1. Provide 2 CD or DVD videos and 2 written training manuals detailing the data contained in the training sessions.
 - 2. Provide each person attending training sessions with a written training manual. Submit a letter addressed to Tacoma Rail attesting to the names of persons receiving instruction and the dates instruction took place.
 - C. Start-Up Materials:
 - 1. Fill tote for testing, start-up, and training, and top off for final acceptance.
 - 2. Tacoma Rail is responsible for delivery of other oil lubrication products necessary for testing, start-up, and training. Contractor is to include required delivery dates in testing schedule and notify Tacoma Rail in writing 14 business days in advance of date(s).
 - 3. Remove from the site, and properly dispose of, oil lubricants utilized in testing, start-up, and training that are not dispensed into a locomotive or other receptacle for which Tacoma Rail accepts disposal liability.

4. Replace lubricants spilled or otherwise lost due to malfunction or improper design or installation of tanks, pumps, or any other system component during testing, start-up, and training.

3.07 TESTING

- A. Upon completion of installation of equipment and after system has been energized with normal power source, test equipment to demonstrate compliance with requirements. When possible, field correct malfunctioning components, then retest to demonstrate compliance. Replace components that cannot be corrected.
- B. Follow-on Inspection and Testing:
 - 1. Conduct two complete follow-on inspections of the equipment:
 - a. Conduct first inspection at six months after date of final acceptance of the installation. At this time a complete realignment and/or adjustment of all critical equipment elements shall be made. Test all equipment functions for proper operation. Make a written report to Tacoma Rail of all findings, maintenance and operating recommendations, and any items in need of repair or modification.
 - b. Conduct second inspection at twelve months after date of Final Acceptance of the installation. Test all equipment functions for proper operation. Make a written report to Tacoma Rail of all findings, maintenance and operating recommendations, and any items in need of repair or modification.
 - 2. Follow-on inspection and testing shall be conducted by an authorized factory service technician, with assistance by Contractor as required.

END OF SECTION
PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including General Conditions and General Requirements, apply to this work as if specified in this Section. Work related to this Section is described in the following sections:
 - 1. Section 03 30 00 Cast-in-Place Concrete
 - 2. Division 10 Louvers
 - 3. Division 11 Equipment
 - 4. Division 22 Plumbing
 - 5. Division 26 Electrical

1.02 SUMMARY

- A. The work of this section shall include all labor, materials, equipment, and appliances required to provide a complete pre-engineered metal buildings as indicated on the Drawings and as specified herein.
- B. The following is a partial list of work included in this section, but shall not be limited to the following:
 - 1. Anchor bolt design.
 - 2. Pre-engineered metal building and components as shown on the Drawings.
- C. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
 - 1. <u>American Institute of Steel Construction (AISC) Publication</u>: Steel Construction Manual, Current Edition.
 - 2. <u>American Iron and Steel Institute (AISI) Publication</u>: Cold-Formed Steel Design Manual, 1986 Edition, Including Addendum No. 1.
 - 3. <u>Metal Building Manufacturers Association (MBMA) Publication</u>: *Recommended Design Practices Manual, 1974 Edition.*
 - 4. <u>International Conference of Building Officials</u>: *International Building Code, 2012 Edition.*
 - 5. <u>ASCE</u> 7-10 Minimum Design Loads for Buildings & Other Structures.

- D. Description of Buildings:
 - 1. Crew Shelter: Prefabricated steel structure with glazing and shelf as indicated on the Drawings, approximately 4'-6" feet wide x 12'-0" feet long x 8'-4" feet height overall.
 - Service Shed: Rigid clear span, solid-member, structural-framing system without interior columns and with portal frames or diagonal rod bracing. Secondary frame system of manufacturer's purlins and girts. Reference plate height of approximately 11 feet. Roof purlins shall be designed to a minimum depth of 9½ inches. Roof slope shall be 1 inch per foot.
 - 3. Service Island Overhead Support Frame Roof: Metal roof decking similar to that provided for the crew shelter shall be provided for the overhead support frame structure located on the service island.

1.03 SUBMITTALS

- A. Erection Instructions and Diagrams: Submit instructions and diagrams as necessary to erect the building and install all components for approval containing, but not limited to the following:
 - 1. Structural framing;
 - 2. Structural connections;
 - 3. Anchor bolt layouts and sizes;
 - 4. Roofing and siding connections;
 - 5. Joint sealing and caulking;
 - 6. Flashing and trim;
 - 7. Window and door installation details, including dimensions and hardware;
 - 8. Gutters and downspouts;
 - 9. Accessory installation details;
 - 10. All details and instructions necessary for complete assembly; and
 - 11. Shop drawings necessary to supplement the instructions, and drawings as required for the proper erection and installation of the building and components.
- B. Certificates of Conformance or Compliance: Submit certificates from the manufacturer attesting that materials conform to the requirements of these specifications and reference documents.

- C. Colors: For each building, submit not less than 8 different samples of manufacturer's standard colors for selection by the Engineer.
- D. Metal Building Design Calculations: Submit 4 copies for approval of the engineering design calculations and stress diagrams of the following components: rigid frames, purlins, girts, end frame, columns, bracing, eave brackets, end wall brackets, and footing reactions. Verify the loads and reactions are suitable for the foundation shown on the drawings.
- E. Letter of Design Certification: For each of the buildings, signed and sealed by licensed professional engineer in the State of Washington responsible for their preparation.
 - 1. Include the following:
 - a. Name and location of Project.
 - b. Order number.
 - c. Name of manufacturer.
 - d. Name of Contractor.
 - e. Building dimensions including width, length, height, and roof slope.
 - f. Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard.
 - g. Governing building code and year of edition.
 - h. Design Loads: Include dead load, roof live load, collateral loads, roof snow load, deflection, wind loads/speeds and exposure, seismic design category or effective peak velocity-related acceleration/peak acceleration, and auxiliary loads.
 - i. Load Combinations: Indicate that loads were applied acting simultaneously with concentrated loads, according to governing building code.
 - j. Building-Use Category: Indicate category of building use and its effect on load importance factors.
 - k. AISC Certification, IAS Accredited: Include statement that metal building system and components were designed and produced in an AISC-Certified Facility by an AISC-Certified Manufacturer.
- F. Material Test Reports: For each of the following products:
 - 1. Structural steel including chemical and physical properties.
 - 2. Bolts, nuts, and washers including mechanical properties and chemical analysis.

- 3. Tension-control, high-strength, bolt-nut-washer assemblies.
- 4. Shop primers.
- 5. Non-shrink grout.
- G. Delivery and Storage: Deliver, store, and handle prefabricated components, panels, and other manufactured items in such a manner that they will not be damaged or deformed. Stack materials stored onsite before erection on platforms or pallets, and cover with tarpaulins or other suitable weather-tight covering. Store all metal sheets or panels so that water that might have accumulated during transit or storage will drain off. Do not store the sheets or panels in contact with materials that might cause staining. Upon arrival on the jobsite, inspect the sheets or panels. If found wet, remove the moisture, restack the sheets or panels, and protect them until used.
- H. Design Requirements: *MBMA Recommended Design Practices Manual*, except as specified otherwise herein.
 - Normal Design Loads: As indicated. Apply the vertical live loads, in addition to the applicable dead loads on the horizontal projection of the roof structure. Proportion the wind load on the building, and apply as horizontal and uplift velocity pressures. Do not exceed the maximum deflection in roofing or roof panels 1/180 of their spans, and in siding or wall panels, 1/90 of their spans.
 - a. Snow Load: 25 PSF
 - b. Wind Load: Basic Wind Speed = 100 MPH Exposure C, MWFRS (Directional Procedure) per ASCE 7-10.
 - c. Seismic Zone: See structural notes on Drawings for site specific seismic design parameters.
 - d. Dead Load: Determined by building manufacturer
 - 2. <u>Auxiliary Loads</u>: Piping, ducts, mechanical equipment hangers, and light fixtures constitute the auxiliary loads for this structure. All members and systems shall be designed to accommodate these loads in addition to the standard (distributed) loads. In addition to the loads shown, all purlins shall be designed for a single concentrated load of 200 pounds located anywhere along the span.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer and member of MBMA.
 - 1. AISC Certification AIS Accredited: An AISC-Certified Manufacturer that designs and produces metal building systems and components in an AISC-Certified Facility.

- B. Engineering Responsibility: Contractor or building manufacturer shall be responsible for preparation of Shop Drawings and comprehensive engineering analysis by a licensed professional engineer in the State of Washington responsible for their preparation.
- C. Erector Qualifications: An experienced erector who specializes in erecting and installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer. Erector shall have completed a minimum of 10 projects with similar systems and of similar size.
- D. Source Limitations: Obtain metal building system components, including primary and secondary framing and metal panel assemblies, from single source from single manufacturer.
- E. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code Steel."
 - 2. AWS D1.3, "Structural Welding Code Sheet Steel."
- F. Structural Steel: Comply with AISC 360, "Specification for Structural Steel Buildings," for design requirements and allowable stresses.
- G. Cold-Formed Steel: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" for design requirements and allowable stresses.
- H. Surface-Burning Characteristics: Provide vapor-retarder-facing materials with the following surface-burning characteristics as determined by testing identical products per ASTM E84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. Flame-Spread Index: 25 or less, unless otherwise indicated.
 - 2. Smoke-Developed Index: 50 or less, unless otherwise indicated.
- I. Pre-installation Conference: Conduct conference at Project site.
 - 1. Retain subparagraphs below if additional requirements are necessary; include information about conference.
 - 2. Review methods and procedures related to metal building systems including, but not limited to, the following:
 - a. Condition of foundations and other preparatory work performed by other trades.
 - b. Structural foundation load confirmation procedures.
 - c. Construction schedule. Verify availability of materials and erector's personnel, equipment, and facilities needed to make progress and avoid delays.

- d. Required tests, inspections, and certifications.
- e. Unfavorable weather and forecasted weather conditions.
- 3. Review methods and procedures related to metal roof panel assemblies including, but not limited to, the following:
 - a. Compliance with requirements for purlin and rafter conditions, including flatness and attachment to structural members.
 - b. Structural limitations of purlins and rafters during and after roofing.
 - c. Flashings, special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect metal roof panels.
 - d. Temporary protection requirements for metal roof panel assembly during and after installation.
 - e. Roof observation and repair after metal roof panel installation.
 - f. Ability of roofing system to carry future PV panel array.
- J. Review methods and procedures related to priming and finish painting of all primary structural components.

1.05 COORDINATION

- A. Coordinate sizes and locations of concrete foundations and casting of anchor-bolt inserts into foundation walls and footings. Concrete, reinforcement, and formwork requirements are specified in Section 03 30 00 Cast-in-Place Concrete.
- B. Coordinate metal panel assemblies with rain drainage work, flashing, trim, and construction of supports and other adjoining work to provide a leak proof, secure, and noncorrosive installation.
- C. Coordinate application of primers and finish coatings to ensure quality application is achieved under suitable conditions.
- D. Coordinate all work necessary to secure required permits for the metal buildings. Contractor shall be responsible for submitting shop drawings to the local permitting authority for plan review of and permits for all work associated with the pre-engineered metal building systems.
- 1.06 WARRANTY

- A. Special Warranty on Metal Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 years from date of Substantial Completion.
- B. Special Weathertightness Warranty for Standing-Seam Metal Roof Panels:
 - 1. Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that leak or otherwise fail to remain weathertight within specified warranty period.
 - 6. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 METAL BUILDING SYSTEMS PERFORMANCE

- A. Delegated Design: Design metal building system, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Metal building systems shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to procedures in MBMA's "Metal Building Systems Manual."
 - 1. Base Roof Dead and Live Loads: As indicated on Drawings. Contractor to coordinate between all trades.
 - 2. Deflection Limits: Design metal building system assemblies to withstand design loads with deflections no greater than the following:
 - a. Purlins and Rafters: Vertical deflection of L/360 of the span under live load, and L/240 of the span under total load.
 - b. Metal Roof Panels: Vertical deflection of L/240 of the span.

- c. Design secondary-framing system to accommodate deflection of primary framing and construction tolerances, and to maintain clearances at openings.
- 3. Drift Limits: Engineer building structure to withstand design loads with drift limits no greater than the following:
 - a. Lateral Drift: Maximum of H/200 of the building height.
- 4. Metal panel assemblies shall withstand the effects of gravity loads and loads and stresses within limits and under conditions indicated according to ASTM E 1592.
- C. Seismic Performance: Metal building systems shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 and as required by the Structural Drawings.
- D. Thermal Movements: Allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- E. Air Infiltration for Metal Roof Panels: Air leakage through assembly of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) of roof area when tested according to ASTM E 1680 at negative test-pressure difference of 1.57 lbf/sq. ft. (75 Pa).
- F. Water Penetration for Metal Roof Panels: No water penetration when tested according to ASTM E 1646 at test-pressure difference of 2.86 lbf/sq. ft. (137 Pa).
- G. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for Class 90.

2.02 MATERIALS

- A. General: *MBMA Recommended Design Practices Manual*, except as specified otherwise herein. Roof and wall coverings, accessories, and flashing shall be of such design and installed so that they will be completely weather tight, and free of abrasions, loose fasteners, and deformations. Furnish in writing 1-year warranties providing for repairs to roof and wall coverings, accessories, and flashing. Correct all leaks occurring within 1 year from the date of acceptance by the Owner.
- 2.03 STEEL FRAMING
 - A. Service Shed:

- 1. Primary Framing: Manufacturer's standard primary-framing system, designed to withstand required loads and specified requirements. Primary framing includes transverse and lean-to frames; rafter, rake, and canopy beams; sidewall, intermediate, end-wall, and corner columns; and wind bracing, and other primary framing members as indicated.
 - a. General: Provide frames with attachment plates, bearing plates, and splice members. Factory drill for field-bolted assembly. Provide frame span and spacing indicated on architectural and structural drawings. See architectural and structural drawings for maximum allowable frame sizes.
 - b. Rigid Clear-Span Frames: I-shaped frame sections fabricated from shop-welded, built-up steel plates or structural-steel shapes. Interior columns are only permitted if shown on architectural and structural drawings. See architectural and structural drawings for maximum allowable frame sizes.
 - c. Exterior Column Type: Tapered or Parallel. See Drawings for maximum allowable frame sizes, column bracing requirements, and maximum allowable slope of column taper.
 - d. Rafter (Beam) Type: Parallel.
- 2. Secondary Framing: Manufacturer's standard secondary framing, including purlins, girts, eave struts, flange bracing, base members, gable angles, clips, headers, jambs, and other miscellaneous structural members. Unless otherwise indicated, fabricate framing from either cold-formed, structural-steel sheet or roll-formed, zinc-coated (galvanized), to comply with the following:
 - a. Purlins: C- or Z-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes; minimum 2-1/2-inch- (64-mm-) wide flanges.
 - b. Depth: As indicated.
 - c. Eave Struts: Unequal-flange, C-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes; to provide adequate backup for metal panels.
 - d. Flange Bracing: Minimum 2-by-2-by-1/8-inch (51-by-51-by-3-mm) structuralsteel angles or 1-inch- (25-mm-) diameter, cold-formed structural tubing to stiffen primary-frame flanges.
 - e. Sag Bracing: Minimum 1-by-1-by-1/8-inch (25-by-25-by-3-mm) structural-steel angles.
 - f. Base or Sill Angles: Minimum 3-by-2-inch (76-by-51-mm) zinc-coated (galvanized) steel sheet.

- g. Purlin Clips: Manufacturer's standard clips fabricated from steel sheet. Provide galvanized clips where clips are connected to galvanized framing members.
- h. Secondary End-Wall Framing: Manufacturer's standard sections fabricated structural-steel sheet.
- i. Miscellaneous Structural Members: Manufacturer's standard sections fabricated from cold-formed, structural-steel sheet; built-up steel plates; or zinc-coated (galvanized) steel sheet; designed to withstand required loads.
- 3. Bracing: Provide adjustable wind bracing as follows:
 - a. Rods: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50 (345); or ASTM A 529/A 529M, Grade 50 (345); minimum 1/2-inch- (13-mm-) diameter steel; threaded full length or threaded a minimum of 6 inches (152 mm) at each end.
 - b. Cable: Cable bracing shall not be permitted unless specifically approved by the structural engineer of record.
 - c. Angles: Fabricated from structural-steel shapes to match primary framing, of size required to withstand design loads.
 - d. Rigid Portal Frames: Fabricated from shop-welded, built-up steel plates or structural-steel shapes to match primary framing; of size required to withstand design loads. See Drawings for portal frame column and beam size restrictions
 - e. Fixed-Base Columns: Fabricated from shop-welded, built-up steel plates or structural-steel shapes to match primary framing; of size required to withstand design loads. Fixed base columns shall only be permitted where indicated on the Drawings.
 - f. Diaphragm Action of Metal Panels: Design metal building to resist wind forces through diaphragm action of metal panels.
 - g. Bracing: Provide wind bracing using any method specified above, at manufacturer's option.
- 4. Bolts: Provide plain-finish bolts for structural-framing components that are primed or finish painted. Provide hot-dip galvanized bolts for structural-framing components that are galvanized.
- 5. Materials:
 - a. W-Shapes: ASTM A 992/A 992M; ASTM A 572/A 572M, Grade 50 or 55 (345 or 380); or ASTM A 529/A 529M, Grade 50 or 55 (345 or 380).

- b. Channels, Angles, M-Shapes, and S-Shapes: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50 or 55 (345 or 380); or ASTM A 529/A 529M, Grade 50 or 55 (345 or 380).
- c. Plate and Bar: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50 or 55 (345 or 380); or ASTM A 529/A 529M, Grade 50 or 55 (345 or 380).
- d. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.
- e. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B or C, structural tubing.
- f. Structural-Steel Sheet: Hot-rolled, ASTM A 1011/A 1011M, Structural Steel (SS), Grades 30 through 55 (205 through 380), or High-Strength Low-Alloy Steel (HSLAS), Grades 45 through 70 (310 through 480); or cold-rolled, ASTM A 1008/A 1008M, Structural Steel (SS), Grades 25 through 80 (170 through 550), or High-Strength Low-Alloy Steel (HSLAS), Grades 45 through 70 (310 through 480).
- g. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grades 33 through 80 (230 through 550), or High-Strength Low-Alloy Steel (HSLAS), Grades 50 through 80 (340 through 550); with G60 (Z180) coating designation; mill phosphatized.
- Non-High-Strength Bolts, Nuts, and Washers: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6), carbon-steel, hex-head bolts; ASTM A 563 (ASTM A 563M) carbon-steel hex nuts; and ASTM F 844 plain (flat) steel washers.
 - 1) Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C
- High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy-hex steel structural bolts; ASTM A 563 (ASTM A 563M) heavy-hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M) hardened carbon-steel washers.
 - 1) Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C
- j. High-Strength Bolts, Nuts, and Washers: ASTM A 490 (ASTM A 490M), Type 1, heavy-hex steel structural bolts; ASTM A 563 (ASTM A 563M) heavy-hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M) hardened carbon-steel washers, plain.
- k. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy-hex-head steel structural bolts with spline ends.
 - 1) Finish: Mechanically deposited zinc coating, ASTM B 695, Class 50

- I. Unheaded Anchor Rods: ASTM F 1554, Grade 36 and as indicated on structural drawings.
 - 1) Configuration: Straight.
 - 2) Nuts: ASTM A 563 (ASTM A 563M) heavy-hex carbon steel.
 - 3) Plate Washers: ASTM A 36/A 36M carbon steel.
 - 4) Washers: ASTM F 436 (ASTM F 436M) hardened carbon steel.
 - 5) Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C
- m. Headed Anchor Rods: ASTM F 1554, Grade 36 and as indicated on Drawings.
 - 1) Configuration: Straight.
 - 2) Nuts: ASTM A 563 (ASTM A 563M) heavy-hex carbon steel.
 - 3) Plate Washers: ASTM A 36/A 36M carbon steel.
 - 4) Washers: ASTM F 436 (ASTM F 436M) hardened carbon steel.
 - 5) Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C
- 6. Finish: Factory Primed. Apply specified primer immediately after cleaning and pretreating.
 - a. Primer by Metal Building Manufacturer (in their shop): Shop prime with manufacturer's standard red oxide primer. SSPC-Paint 15, Type I, red oxide. For certain elements, as described below, this primer is for shipping purposes only.
 - b. Primer in Local Shop: Ship metal building components, specified herein to be primed and painted, to a local shop (or to site of adequate facilities are provided) for stripping, preparation and priming. All non-galvanized, ferrous metal components, generally including but not limited to "Primary Framing Components", "Canopy Framing", "End-Wall Framing", and "Bracing" are to be locally stripped, prepared, and primed using the primer specified in Section 09 96 00 High Performance Coatings, or approved substitute.
 - c. Apply primer to primary framing to a minimum dry film thickness of 1 mil (0.025 mm).
 - 1) Prime secondary framing formed from G-30 galvanized steel sheet with a paintable acrylic protective coating.

B. Crew Shelter: Constructed of 3 inch x 3 inch x 0,120 A-360 structural steel tube frame, and 16 gauge steel wall and window framing.

2.04 ROOF:

- A. Service Shed: Factory-formed, field-machine-seamed metal roof panels designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and engaging opposite edge of adjacent panels.
 - 1. Material: Aluminum-zinc alloy-coated steel sheet, 22 gauge nominal thickness, ASTM A 792/A 792M, Class AZ50 coating designation, Grade 40 (Class AZM150 coating designation, Grade 275); structural quality.
 - a. Exterior Finish: Fluoropolymer.
 - b. Color: The Owner reserves the right to change colors and select from the manufacturer's full range of available colors.
 - 2. Clips: Manufacturer's standard, floating type to accommodate thermal movement; fabricated from aluminum-zinc alloy-coated steel or stainless steel sheet.
 - 3. Joint Type: Mechanically seamed, double folded.
 - 4. Panel Coverage: 24 inches
 - 5. Panel Height: 3 inches
 - 6. Uplift Rating: UL 90.
- B. Roof Panel Accessories: Provide components required for a complete metal roof panel assembly including copings, fasciae, corner units, ridge closures, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.
 - 1. Closures: Provide closures at eaves and ridges, fabricated of same material as metal roof panels.
 - 2. Clips: Manufacturer's standard, formed from stainless-steel sheet, designed to withstand negative-load requirements.
 - 3. Cleats: Manufacturer's standard, mechanically seamed cleats formed from stainless-steel sheet or nylon-coated aluminum sheet.
 - 4. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.

- 5. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefinfoam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- 6. Thermal Spacer Blocks: Where metal panels attach directly to purlins, provide thermal spacer blocks of thickness required to provide 1-inch (25-mm) standoff; fabricated from extruded polystyrene.
- C. Flashing and Trim: Formed from aluminum-zinc alloy-coated steel sheet prepainted with coil coating of same gauge of material as the metal roofing; finished to match adjacent metal panels. Provide flashing and trim under this section as noted in sub-paragraphs C.1 and C.2.
 - 1. Roof-Related Flashing and Trim: Provide, under this section, all eaves, rakes, corners, roof openings, fasciae, ridges, and other miscellaneous flashing for a complete, weathertight installation from the eaves to the ridge of all metal buildings.
 - 2. Opening Trim: Formed from aluminum-zinc alloy-coated steel sheet prepainted with coil coating of same gauge of material as the metal roofing. Trim head and jamb of door openings, and head, jamb, and sill of other openings. All Other Flashing, Trim, Soffits: Provide all other flashing, trim, and soffit panels, not otherwise included under roof-related flashing and trim.
- D. Gutters: Formed from 22 gauge nominal-thickness, metallic-coated steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating; finished to match roof fascia and rake trim. Match profile of gable trim, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch- (2438-mm-) long sections, sized according to SMACNA's "Architectural Sheet Metal Manual."
 - 1. Gutter Supports: Fabricated from same material and finish as gutters.
 - 2. Strainers: Bronze, copper, or aluminum wire ball type at outlets.
- E. Down Spouts: As specified in Section 05 50 00 Metal Fabrications.
- F. Pipe Flashing: Premolded, EPDM pipe collar with flexible aluminum ring bonded to base.
- G. Bird Control Devices:
 - 1. Provide "Nixalite" (1-800-624-1189) Bird Netting, Bird Spikes, or equivalent product.
 - a. Material: 6-ply high density polyethylene (HDPE)
 - b. Size: ³/₄ inch x ³/₄ inch square mesh
 - c. Color: Black

- d. Location: Crew Shelter and Service Shed.
- H. Crew Shelter: Barrel or shed roof, material in accordance with Article 2.04.A of this Section with 4 inch tall steel fascia, 3 inch overhang on all sides, gutter system including drain channel and downspout. Roof, fascia and gutter system colors shall be matching, color selection shall be in accordance with Article 1.02.D of this Section.
- I. Service Island Overhead Support Frame Roof: Shed roof, material in accordance with Article 2.04.A of this Section, accessories in accordance with Article 2.04.B of this section, and gutter system in accordance with Article 2.04D of this Section. Roof, fascia, and gutter system colors shall be matching, color selection shall be in accordance with Article 1.02.D of this Section. Flashing and trim shall be provided in accordance with Article 2.04.C of this Section, down spouts in accordance with Article 2.04.E of this Section, and bird control devices in accordance with Article 2.04.G of this Section.

2.05 EXTERIOR WALL PANELS

A. Exterior wall panels shall be manufactured to provide 42-inch wide net coverage and be 2½-inches thick with an R-Value of 20.8 min. The panels shall be 24-gauge metal exterior skins and 26-gauge metal interior skins, bonded to a rigid polyurethane foam insulation core. Panels shall be of maximum length to minimize end laps. The panel sheets shall be connected to the supporting structure at each panel joint with concealed galvanized steel clips. Include all sealants as required by the panel manufacturer for a complete watertight joint.

2.06 FASTENERS

A. Fasteners for attachment to structural supports and fasteners for attachment to adjoining sheets or panels shall be as approved and in accordance with the manufacturer's recommendations. Unless specified otherwise herein, the fasteners shall be either self-tapping screws, bolts and nuts, self-locking rivets, self-locking bolts, end-welded studs, bolted or riveted studs, or step rivets held by aluminum straps. Other types of fasteners of the building manufacturer's standard type may be used if prior approval of the Engineer is obtained. Design the fastening system to withstand the design loads according to the IBC & ASCE 7-10 for cladding systems as indicated prior herein. Fasteners shall be stainless steel, cadmium plated steel, or aluminum. All fasteners, with the exception of those having integral hex washer heads and those having aluminum drive caps, shall have composite-metal and neoprene washers. Heads of screws or bolts exposed on exterior face of factory-finished wall coverings shall be nylon headed to match color of coverings.

2.07 METAL PANEL SEALANTS

A. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene-compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape of manufacturer's standard size.

B. Joint Sealant: ASTM C 920; one-part elastomeric polyurethane or polysulfide; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended by metal building system manufacturer.

2.08 METAL DOORS AND FRAMES

- A. Exterior hollow metal doors shall be 1-3/4 inch doors, not less than thickness indicated; fabricated with smooth surfaces, in compliance with ANSI/SDI A250.8. Doors shall be seamless design, face sheets shall be 16 Gauge A60 hot-dipped Galvannealed or galvanized steel conforming to ASTM A924 and A653.
- B. Door shall have 22 gage steel vertical stiffeners placed no more than 6" apart and welded to both face sheets no more than 5" on center along their length. Fiberglass batting insulation shall fill the spaces between vertical stiffeners. The top and bottom door edges shall be closed with 16 gage steel channels welded to both face sheets.
- C. Steel doors shall be factory finished with one coat of oven-cured neutral color primer paint. Primer coat shall conform with ANSI A250.10. Two coats finish paint shall be applied in the field, Contractor shall coordinate color selection with Engineer.

2.09 ROLL UP DOOR

- A. Roll-up door shall be wall mounted, springless heavy duty service door, Overhead Door model 610S or approved equal.
- B. Door curtain shall be interlocking roll-formed slats, flat profile type F-265 fabricated of 20 gauge stainless steel. Endlocks shall be attached to each end of alternate slats to prevent lateral movement.
- C. Door hood shall be 24 gauge galvanized steel with intermediate supports and shall be finished with rust-inhibitive, roll coating process, including 0.2 mils thick baked-on prime paint, and 0.6 mils thick baked-on polyester top coat. Top coat color to be selected by the Engineer from manufacturers standard range of colors.
- D. Stainless steel door curtain shall be finished with No. 4 stain finish.
- E. Counterbalance: Helical torsion spring type housed in a steel tube or pipe barrel, supporting the curtain with deflection limited to 0.03 inch per foot of span. Counterbalance is adjustable by means of an adjusting tension wheel.
- F. Door shall include vinyl bottom seal and guide weatherseal.
- G. Door guides shall be fabricated from structural steel angles.
- H. Brackets for support of counterbalance, curtain and hood shall be galvanized steel

- I. Finish for brackets, bottom bar, headplate and guides shall be powder coat finish, powder coat color shall be selected by the Engineer to match color finishes of the building.
- J. Door operation shall be chain hoist with chain keeper locks.

2.10 WINDOWS

A. Window glazing shall be ¼-inch tempered, solar control, Low E glass, Solarban 70XL or approved equal. Glazing shall be installed with a 16 gauge steel frame with removable window stops. All glazing edges shall be sealed with a concealed gasket system.

2.11 CLOSURE STRIPS

A. Formed and approved compressed rubber, synthetic rubber, bituminous impregnated materials, or metal of the same respective type as the roof and wall panels, and as standard with the manufacturer. Molded closure strips shall be free of open voids and shall not absorb or retain water. Closure strips shall be formed to match the corrugations or configurations of the roofing or siding being used, and shall be provided where necessary to provide weather tight construction.

2.12 JOINT SEALING

A. Seal all side and end laps with *Type II*, *Class B*, ribbon-form sealant conforming to *Federal Spec. TT-C-1796*. Do not use bituminous-type materials. Minimum size of ribbons shall be 3/32 by ½-inch for rectangular areas and ¼-inch diameter for circular areas. Seal all joints at accessories and flashing in a manner similar to the sealing of sheets and panels.

2.13 SOURCE QUALITY CONTROL

- A. Testing Agency: Owner may engage a qualified testing agency to evaluate product.
- B. Special Inspector: Owner may engage a qualified special inspector to perform the following tests and inspections and to submit reports. Special inspector will verify that manufacturer maintains detailed fabrication and quality-control procedures and will review the completeness and adequacy of those procedures to perform the Work.
 - 1. Special inspections may be waived by the owner if fabrication is performed by manufacturer registered and approved by authorities having jurisdiction to perform such Work without special inspection.
 - a. After fabrication, submit copy of certificate of compliance to authorities having jurisdiction, certifying that Work was performed according to Contract requirements.
- C. Testing: Test and inspect shop connections for metal buildings according to the following:

- Bolted Connections: Shop-bolted connections shall be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- 2. Welded Connections: In addition to visual inspection, shop-welded connections shall be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at inspector's option:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - c. Ultrasonic Inspection: ASTM E 164.
 - d. Radiographic Inspection: ASTM E 94.
- D. Product will be considered defective if it does not pass tests and inspections.

2.14 FABRICATION

- A. General: Design components and field connections required for erection to permit easy assembly.
 - 1. Mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and instruction manuals.
 - 2. Fabricate structural framing to produce clean, smooth cuts and bends. Punch holes of proper size, shape, and location. Members shall be free of cracks, tears, and ruptures.
- B. Tolerances: Comply with MBMA's "Metal Building Systems Manual" for fabrication and erection tolerances.
- C. Primary Framing: Shop fabricate framing components to indicated size and section, with baseplates, bearing plates, stiffeners, and other items required for erection welded into place. Cut, form, punch, drill, and weld framing for bolted field assembly.
 - 1. Make shop connections by welding or by using high-strength bolts.
 - 2. Join flanges to webs of built-up members by a continuous, submerged arc-welding process.
 - 3. Brace compression flange of primary framing with steel angles or cold-formed structural tubing between frame web and purlin web or girt web, so flange compressive strength is within allowable limits for any combination of loadings.

- 4. Weld clips to frames for attaching secondary framing.
- 5. Shop Priming: Prepare surfaces for shop priming according to SSPC-SP 2. Shop prime primary framing with specified primer after fabrication.
- 6. Primary Framing Components: Provide Manufacturer's standard structural primary framing system, designed to withstand required loads and other specified requirements including profiles. Primary framing includes transverse and lean-to frames; rafter, rake, and canopy beams; sidewall, intermediate, end-wall, and corner columns; and wind bracing.
 - a. General: Provide frames with attachment plates, bearing plates, and splice members. Factory drill for field-bolted assembly. Provide frame span and spacing indicated.
- 7. Primary Framing Preparation: All primary framing members shall be prepared in the shop for shop priming as follows. When the primary framing members arrive at the local priming shop, the manufacturer's shop primer shall be stripped and then prepared for local final priming as follows:
 - a. Shop Preparation: Prepare uncoated surfaces for shop priming according to SSPC-SP3 Powertool Cleaning for bents (rafters), and SSPC SP-6 Commercial Blast Cleaning for vertical leg members (columns).
- 8. Primary Framing Priming and Finish: When the primary framing members arrive at the local priming facility, the manufacturer's shop primer shall be stripped and then prepared for local final priming. Prepare, prime and finish primary steel framing with same procedures and systems as specified in Section 05 50 00 Metal Fabrication and Section 09 96 00 High-Performance Coatings.
- D. Secondary Framing: Shop fabricate framing components to indicated size and section by roll-forming or break-forming, with baseplates, bearing plates, stiffeners, and other plates required for erection welded into place. Cut, form, punch, drill, and weld secondary framing for bolted field connections to primary framing.
 - Secondary Framing Components: Manufacturer's standard secondary framing members, including purlins, girts, eave struts, flange bracing, base members, gable angles, clips, headers, jambs, and other miscellaneous structural members. Fabricate framing from cold-formed, structural-steel sheet or roll-formed, metalliccoated steel sheet pre-painted with coil coating, unless otherwise indicated, to comply with the following:
 - Purlins: C- or Z-shaped sections; fabricated from minimum 0.0598-inch- (1.5-mm-) thick steel sheet, built-up steel plates, or structural-steel shapes; minimum 2-1/2-inch- (64-mm-) wide flanges

- 1) Depth: Determined by metal building manufacturer's design, unless indicated otherwise on the Drawings.
- 2) Finish: Galvanized at all buildings.
- b. Flange Bracing: Minimum 2-by-2-by-1/8-inch (51-by-51-by-3-mm) structuralsteel angles or 1-inch (25-mm) diameter, cold-formed structural tubing to stiffen primary frame flanges.
- c. Sag Bracing: Minimum 1-by-1-by-1/8-inch (25-by-25-by-3-mm) structural-steel angles.
- d. Base or Sill Angles: Minimum 3-by-2-by-0.0598-inch (76-by-51-by-1.5-mm) zinc-coated (galvanized) steel sheet.
- e. Purlin and Girt Clips: Minimum 0.0598-inch- (1.5-mm-) thick, steel sheet. Provide galvanized clips where clips are connected to galvanized framing members.
- f. Secondary End-Wall Framing: Manufacturer's standard sections fabricated from minimum 0.0598-inch- (1.5-mm-) thick, zinc-coated (galvanized) steel sheet.
- g. Framing for Openings: Channel shapes; fabricated from minimum 0.0598-inch-(1.5-mm-) thick, cold-formed, structural-steel sheet or structural-steel shapes. Frame head and jamb of door openings, and head, jamb, and sill of other openings.
- h. Miscellaneous Structural Members: Manufacturer's standard sections fabricated from cold-formed, structural-steel sheet; built-up steel plates; or zinc-coated (galvanized) steel sheet; designed to withstand required loads.
- 2. Make shop connections by welding or by using non-high-strength bolts.
- Shop Priming: Prepare uncoated surfaces for shop priming according to SSPC-SP
 Shop prime uncoated secondary framing with specified primer after fabrication.
- E. Bracing: Provide adjustable wind bracing as follows:
 - 1. Rods: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50 (345); or ASTM A 529/A 529M, Grade 50 (345); minimum 1/2-inch- (13-mm-) diameter steel; threaded full length or threaded a minimum of 6 inches (152 mm) at each end.
 - a. Priming and Finish: Same as specified for Primary Framing Components.
 - 2. Cable: ASTM A 475, 1/4-inch- (6-mm-) diameter, extra-high-strength grade, Class B zinc-coated, 7-strand steel; with threaded end anchors.

- 3. Angles: Fabricated from structural-steel shapes to match primary framing, of size required to withstand design loads.
 - a. Priming and Finish: Same as specified for Primary Framing Components.
- 4. Rigid Portal Frames: Fabricate from shop-welded, built-up steel plates or structuralsteel shapes to match primary framing; of size required to withstand design loads. Coordinate rigid portal frame member sizes with Drawings.
 - a. Priming and Finish: Same as specified for Primary Framing Components.
- 5. Fixed-Base Columns: Not permitted unless specifically shown on the Drawings.
- 6. Bracing: Provide wind bracing using any method specified above, at manufacturer's option. Alternate bracing methods shall be submitted for review and approval by the structural engineer of record.
 - a. Priming and Finish: Match Primary framing if hot rolled, or Secondary framing if gauge sections.
- F. Bolts: Provide plain finish bolts for structural-framing components that are primed or finish painted. Provide hot-dipped galvanized bolts for structural-framing components that are galvanized or at exterior conditions where exposed to the weather.
- G. Metal Panels: Fabricate and finish metal panels at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.
 - 1. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of metal panel.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with erector present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Before erection proceeds, survey elevations and locations of concrete- and masonrybearing surfaces and locations of anchor rods, bearing plates, and other embedments to receive structural framing, with erector present, for compliance with requirements and metal building system manufacturer's tolerances.
 - 1. Engage licensed land surveyor to perform surveying.

C. Proceed with erection only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Transport metal building components specified herein to be locally prepared and primed to a local shop. Clean and prepare surfaces to be primed and painted as required herein. Prime members and transport back to site for erection after painting according to high-performance coating manufacturer's written instructions for each particular substrate condition.
- B. Provide temporary shores, guys, braces, and other supports during erection to keep structural framing secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural framing, connections, and bracing are in place unless otherwise indicated.

3.03 ERECTION OF STRUCTURAL FRAMING

- A. Erect metal building system according to manufacturer's written erection instructions and erection drawings.
- B. Do not field cut, drill, or alter structural members without written approval from metal building system manufacturer's professional engineer.
- C. Set structural framing accurately in locations and to elevations indicated, according to AISC specifications referenced in this Section. Maintain structural stability of frame during erection.
- D. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before placing grout.
 - 3. Promptly place non-shrink cementitious grout solidly between bearing surfaces and platesso no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with Specification Section 03 60 00 Grouting as well as manufacturer's written installation instructions for shrinkage-resistant grouts.
- E. Align and adjust structural framing before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with framing. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure.

- 2. Make allowances for difference between temperature at time of erection and mean temperature when structure will be completed and in service.
- F. Secondary Framing: Erect framing level, plumb, rigid, secure, and true to line. Field bolt secondary framing to clips attached to primary framing.
 - 1. Provide rake or gable purlins with tight-fitting closure channels and fasciae.
 - 2. Locate and space wall girts to suit openings such as doors and windows.
 - 3. Provide supplemental framing at entire perimeter of openings, including doors, windows, louvers, ventilators, and other penetrations of roof and walls.
- G. Bracing: Install bracing in roof and sidewalls where indicated on erection drawings.
 - 1. Tighten rod bracing immediately to avoid sag. Re-tighten bracing prior to final project acceptance.
 - 2. Locate interior end-bay bracing only where indicated.
- H. Framing for Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work. Securely attach to structural framing.
- I. Erection Tolerances: Maintain erection tolerances of structural framing within AISC 303.
- 3.04 PAINTING OF BUILDING SYSTEM COMPONENTS
 - A. See Section 09 96 00 High-Performance Coatings.

3.05 METAL ROOF PANEL INSTALLATION

- A. General: Provide metal roof panels of full length from eave to ridge unless otherwise indicated or restricted by shipping limitations.
 - 1. Install ridge caps as metal roof panel work proceeds.
 - 2. Flash and seal metal roof panels with weather closures at eaves and rakes. Fasten with self-tapping screws.
- B. Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint, at location and spacing and with fasteners recommended by manufacturer.
 - 1. Install clips to supports with self-drilling or self-tapping fasteners.

- 2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
- 3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.
- 4. Seamed Joint: Crimp standing seams with manufacturer-approved motorized seamer tool so that clip, metal roof panel, and factory-applied sealant are completely engaged.
- 5. Rigidly fasten eave end of metal roof panels and allow ridge end free movement due to thermal expansion and contraction. Predrill panels for fasteners.
- 6. Provide metal closures at peaks, rake edges and each side of ridge caps.
- C. Metal Fascia Panels: Align bottom of metal panels and fasten with blind rivets, bolts, or selfdrilling or self-tapping screws. Flash and seal metal panels with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.
- D. Metal Roof Panel Installation Tolerances: Shim and align metal roof panels within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.06 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
 - 1. Install components required for a complete metal roof panel assembly, including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
 - 2. Install components for a complete metal wall panel assembly, including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
 - 3. Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by manufacturer.
- B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

- 1. Install exposed flashing and trim that is without excessive oil-canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
- 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (600 mm) of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).
- C. Gutters: Join sections with riveted-and-soldered or lapped-and-sealed joints. Attach gutters to eave with gutter hangers spaced as required for gutter size, but not more than 36 inches (914 mm) o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.
- D. Downspouts: As specified in Section 05 50 00 Metal Fabrications.
- E. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to panel as recommended by manufacturer.
- 3.07 FIELD QUALITY CONTROL
 - A. Special Inspections: Owner may engage a qualified special inspector to perform the following special inspections in accordance with IBC chapter 17:
 - 1. Fabrication Inspection.
 - 2. Steel construction.
 - B. Testing Agency: Owner may engage a qualified testing agency to perform tests and inspections.
 - C. Tests and Inspections:
 - High-Strength, Field-Bolted Connections: Connections shall be tested and inspected during installation according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
 - 2. Welded Connections: In addition to visual inspection, field-welded connections shall be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at inspector's option:
 - a. Liquid Penetrant Inspection: ASTM E 165.

- b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
- c. Ultrasonic Inspection: ASTM E 164.
- d. Radiographic Inspection: ASTM E 94.
- D. Product will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.
- F. The Contractor and the Fabricator shall allow access for the Inspector and coordinate visits with the Inspector.
- 3.08 CLEANING AND INSPECTION
 - A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
 - B. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
 - C. Touchup Painting: Cleaning and touchup painting are specified in Section 09 96 00 High-Performance Coatings.
 - D. Metal Panels: Remove temporary protective coverings and strippable films, if any, as metal panels are installed. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
 - 1. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Piping materials and installation instructions common to most piping systems.
 - 2. Transition fittings.
 - 3. Dielectric fittings.
 - 4. Mechanical sleeve seals.
 - 5. Sleeves.
 - 6. Escutcheons.
 - 7. Grout.
 - 8. Equipment installation requirements common to equipment sections.
 - 9. Painting and finishing.
 - 10. Concrete bases.
 - 11. Supports and anchorage.
 - 12. Training requirements.
- B. The requirements of this section apply to all sections in Division 22.

1.02 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for plastic materials:
 - 1. ABS: Acrylonitrile-butadiene-styrene plastic.
 - 2. CPVC: Chlorinated polyvinyl chloride plastic.
 - 3. PE: Polyethylene plastic.
 - 4. PVC: Polyvinyl chloride plastic.
- G. The following are industry abbreviations for rubber materials:
 - 1. EPDM: Ethylene-propylene-diene terpolymer rubber.
 - 2. NBR: Acrylonitrile-butadiene rubber.

1.03 SUBMITTALS

- A. Product Data: Manufacturer's technical data and installation instructions for transition fittings, dielectric fittings, mechanical sleeve seals, escutcheons, and welding certificates.
- B. Shop Drawings: Submit detailed fabrication drawings for metal and wood supports and anchorage for mechanical materials and equipment.
- C. Coordination Drawings: Prepare coordination drawings to a 1/4 inch equals 1 foot scale or larger. Detail major elements, components, and systems of plumbing equipment and materials in relationship with other systems, installations, and building components. Show space requirements for installation and access. Show where sequence and coordination of installations are important to the efficient flow of the work. Include the following:
 - 1. Proposed locations of piping, equipment, and materials. Include the following:
 - a. Planned piping layout, including valve and specialty locations and valve stem movement.
 - b. Clearances for installing and maintaining insulation.

- c. Clearances for servicing and maintaining equipment, including space for equipment disassembly required for periodic maintenance.
- d. Equipment service connections and support details.
- e. Exterior wall and foundation penetrations.
- f. Fire rated wall and floor penetrations.
- g. Sizes and location of required concrete pads and bases.
- 2. Scheduling, sequencing, movement, and positioning of large equipment into the building during construction.
- 3. Floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.
- 4. Reflected ceiling plans to coordinate and integrate installations, air outlets and inlets, light fixtures, communication systems components, sprinklers, and other ceiling mounted items.
- D. Samples: Submit samples of color, lettering style, and other graphic representation required for each identification material and device.
- E. Certificates: Submit copies of required certificates, certifications, and reports.

1.05 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Steel Support Welding: Qualify processes and operators according to AWS D1.1, Structural Welding Code--Steel.
 - 2. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, Welding and Brazing Qualifications.
 - a. Comply with provisions in ASME B31 Series, Code for Pressure Piping.
 - b. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
 - 3. Welding: Perform welding in accordance with Factory Mutual Hot Water Permit conditions.
 - 4. ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

- B. Equipment Selection: Should equipment of greater or larger power, dimensions, capacities, and ratings be proposed by Contractor, written approval of Engineer is required prior to ordering equipment. Submit written request for a substitution and indicate provisions for connecting plumbing and electrical services and upgrading and increasing circuit breakers, conduit, motors, bases, and equipment spaces at no additional cost.
 - 1. Where minimum energy ratings or efficiencies of the equipment are specified, provide equipment that meets design requirements and commissioning requirements.
- C. Electrical Characteristics for Plumbing Equipment: Should equipment of higher electrical characteristics be proposed by Contractor, written approval of Engineer is required prior to ordering equipment. Submit written request for a substitution and indicate provisions for connecting and modifying electrical services, circuit breakers, and conduit sizes.
 - 1. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.
- 1.06 DELIVERY, STORAGE, AND HANDLING
 - A. Deliver pipes and tubes with factory applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
 - B. Protect stored pipes and tubes from moisture and dirt. Elevate above grade. When stored inside, do not exceed structural capacity of the floor.
 - C. Protect flanges, fittings, and piping specialties from moisture and dirt.

1.07 COORDINATION

- A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for plumbing installations.
- B. Coordinate installation of required supporting devices and set sleeves in poured in place concrete and other structural components as they are constructed.
- C. Coordinate requirements for access panels and doors for plumbing items requiring access that are concealed behind finished surfaces.
- D. Coordinate plumbing equipment installation with other building components.
 - 1. Arrange for chases, slots, and openings in building structure during progress of construction, to allow for plumbing installations.

- E Sequence, coordinate, and integrate installations of plumbing materials and equipment for efficient flow of work. Coordinate installation of large equipment requiring positioning prior to closing in the building.
- F. Coordinate connection of plumbing systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
- G. Coordinate installation of identifying devices after completion of covering and painting, where devices are applied to surfaces. Install identifying devices prior to installation of acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

- 2.01 GENERAL
- 2.02 MATERIALS
 - A. Pipe, Tube, Fittings: Refer to individual piping sections for requirements for pipe, tube, and fitting materials and joining methods.
 - 1. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.
 - B Joining Materials:
 - 1. Pipe Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - a. ASME B16.21, nonmetallic, flat, asbestos free, 1/8 inch maximum thickness unless thickness or specific material is indicated.
 - 1) Full Face Type: For flat face, Class 125, cast iron and cast bronze flanges.
 - 2) Narrow Face Type: For raised face, Class 250, cast iron and steel flanges.
 - b. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full face or ring type, unless otherwise indicated.
 - 2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
 - 3. Solder Filler Metals: ASTM B32, lead-free alloys. Include water flushable flux according to ASTM B813.

- 4. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.
- 5. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- 6. Solvent Cements for Joining Plastic Piping:
 - a. ABS Piping: ASTM D2235.
 - b. CPVC Piping: ASTM F493.

c.PVC Piping: ASTM D2564. Include primer according to ASTM F 656.

- d. PVC to ABS Piping Transition: ASTM D3138.
- 7. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.
- 8. Flanged, Ductile Iron Pipe Gasket, Bolts, and Nuts: AWWA C110, rubber gasket, carbon steel bolts and nuts.
- 9. Copper Tubing:
 - a. Solder for Copper Pipe, 4 inch and smaller: No lead for copper pipes above ground.
 - b. Sil-Fos silver alloy for pipe underground and for piping above ground having a continuous street main pressure of 100 psi or more.
 - c. Wire solder only; paste mixed solder not permitted.
 - d. Flux: As recommended by manufacturer of solder.
- C. Transition Fittings:
 - 1. AWWA Transition Couplings: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.
 - a. Underground Piping NPS 1-1/2 and Smaller: Manufactured fitting or coupling.
 - b. Underground Piping NPS 2 and Larger: AWWA C219, metal sleeve type coupling.

- c. Aboveground Pressure Piping: Pipe fitting.
- d. Manufacturers: Subject to compliance with requirements, provide products of one of the following, or equal approved as a comparable product:
 - 1) Cascade Waterworks Mfg. Co.
 - 2) Ford Meter Box Company, Incorporated.
 - 3) JCM Industries.
 - 4) Smith-Blair, Inc.
 - 5) Viking Johnson.
- 2. Couplings: Iron body sleeve assembly, fabricated to match outside diameters of plain-end, pressure pipes.
 - a. Sleeve: ASTM A126, Class B, gray iron.
 - b. Followers: ASTM A47, Grade 32510 or ASTM A536 ductile iron.
 - c. Gaskets: Rubber.
 - d. Bolts and Nuts: AWWA C111.
 - e. Finish: Enamel paint.
- 3. Plastic to Metal Transition Fittings: PVC or CPVC and PVC one piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent cement joint end.
 - a. Manufacturers: Subject to compliance with requirements, provide products of one of the following, or equal approved as a comparable product:
 - 1) Charlotte Pipe and Foundry.
 - 2) Eslon Thermoplastics.
 - 3) JCM Industries.
 - 4) Smith-Blair, a Sensus company.

- 4. Plastic to Metal Transition Adaptors: One piece fitting with manufacturer's SDR 11 equivalent dimensions; one end with threaded brass insert, and one solvent cement joint end.
 - a. Manufacturers: Subject to compliance with requirements, provide products of one of the following, or equal approved as a comparable product:
 - 1) Charlotte Pipe and Foundry.
 - 2) Thompson Plastics, Inc.
 - 3) JCM Industries.
 - 4) Smith-Blair, a Sensus company.
- 5. Plastic to Metal Transition Unions: MSS SP-107, PVC or CPVC and PVC four part union, include brass end, solvent cement joint end, rubber O-ring, and union nut.
 - a. Manufacturers: Subject to compliance with requirements, provide products of one of the following, or equal approved as a comparable product:
 - 1) NIBCO INC.
 - 2) Chemtrol brand, NIBCO, Inc.
- 6. Flexible Transition Couplings for Underground Nonpressure Drainage Piping: ASTM C 1173 with elastomeric sleeve, ends same size as piping to be joined, and corrosion resistant metal band on each end.
 - a. Manufacturers: Subject to compliance with requirements, provide products of one of the following, or equal approved as a comparable product:
 - 1) Cascade Waterworks Mfg. Co.
 - 2) Fernco, Inc
 - 3) Mission Rubber Company, div. MCP Industries, Inc.
- D. Dielectric Fittings: Assembly or fitting having insulating material isolating joined dissimilar metals, to prevent galvanic action and stop corrosion.
 - 1. Fitting: Combination of copper alloy and ferrous; threaded, solder, plain, and weld neck end types and matching piping system materials.

- 2. Insulating Material: Suitable for system fluid, pressure, and temperature.
- 3. Dielectric Unions: Factory fabricated, union assembly, for 250 psig minimum working pressure at 180 deg F temperature.
 - a. Manufacturers: Subject to compliance with requirements, provide products of one of the following, or equal approved as a comparable product:
 - 1) Capitol Manufacturing Co., member Phoenix Forge Group.
 - 2) Central Plastics Company.
 - 3) Hart Industries, International, Inc.
 - 4) Watts Water Technologies, Inc.
 - 5) Wilkins Water Control Products, div. Zurn Industries.
- 4. Dielectric Flanges: Factory fabricated, companion flange assembly, for 150 or 300 psig minimum pressure to suit system pressures.
 - a. Manufacturers: Subject to compliance with requirements, provide products of one of the following, or equal approved as a comparable product:
 - 1) Capitol Manufacturing Co., member Phoenix Forge Group
 - 2) Central Plastics Company.
 - 3) Watts Water Technologies, Inc.
- 5. Dielectric Flange Insulation Kits: Field assembled, companion flange assembly, full face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
 - a. Separate companion flanges and steel bolts and nuts shall have 150 psig or 300 psig minimum working pressure where required to suit system pressures.
 - b. Manufacturers: Subject to compliance with requirements, provide products of one of the following, or equal approved as a comparable product:
 - 1) Advance Products & Systems, Inc.

- 2) Calpico, Inc.
- 3) Central Plastics Company.
- 4) Pipeline Seal and Insulator, Inc.
- 6. Dielectric Couplings: Non-Galvanized steel coupling, having inert and noncorrosive, thermoplastic lining, with threaded ends and 300 psig minimum working pressure at 225 deg F temperature.
- 7. Dielectric Nipples: Electroplated steel nipple, having inert and noncorrosive, thermoplastic lining, with combination of plain, threaded, or grooved end types and 300 psig working pressure at 225 deg F temperature.
 - a. Manufacturers: Subject to compliance with requirements, provide products of one of the following, or equal approved as a comparable product:
 - 1) Perfection Corporation, subsidiary of American Motor Company
 - 2) Precision Plumbing Products, Inc.
 - 3) Sioux Chief Manufacturing Co., Inc.
 - 4) Victaulic Company.
- E. Mechanical Sleeve Seals: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
 - 1. Sealing Elements: EPDM or NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 - 2. Pressure Plates: Carbon steel; include two for each sealing element.
 - 3. Connecting Bolts and Nuts: Carbon steel with corrosion resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.
 - 4. Manufacturers: Subject to compliance with requirements, provide products of one of the following, or equal approved as a comparable product:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Metraflex Company.
d. Pipeline Seal and Insulator, Inc.

F. Sleeves:

- 1. Non-galvanized Steel Sheet: 0.0239 inch minimum thickness; round tube closed with welded longitudinal joint.
- 2. Steel Pipe: ASTM A53, Type E, Grade B, Black, Schedule 40, plain ends.
- 3. Cast Iron: Cast or fabricated wall pipe equivalent to ductile iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
 - a. Cast Iron Sleeve Fittings: Commercially made, sleeve having integral clamping flange, with clamping ring, bolts, and nuts for membrane flashing.
 - 1) Underdeck Clamp: Clamping ring with set screws.
- 4. Stack Sleeve Fittings: Manufactured, cast iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
 - a. Underdeck Clamp: Clamping ring with set screws.
- 5. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.
- 6. PVC Pipe: ASTM D1785, Schedule 40.
- 7. Molded PE: Reusable, PE, tapered cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.
- 8. Steel Sheet Metal: 0.020 inch minimum thickness (aka 24 gauge) or heavier, non-galvanized sheet metal, round tube closed with welded longitudinal joint.
- 9. Wall Penetration Systems: Wall sleeve assembly, consisting of housing, gaskets, and pipe sleeve, with one mechanical joint end conforming to AWWA C110 and 1 plain pipe sleeve end.
 - a. Penetrating Pipe Deflection: 5 percent without leakage.
 - b. Housing: Ductile iron casting having waterstop and anchor ring, with ductile iron gland, steel studs and nuts, and rubber gasket conforming to AWWA C111, of housing and gasket size as required to fit penetrating pipe.
 - c. Pipe Sleeve: AWWA C151, ductile iron pipe.

- d. Housing to Sleeve Gasket: Rubber or neoprene, push on type, of manufacturer's design.
- G. Escutcheons: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
 - 1. One Piece, Deep Pattern Type: Deep drawn, box shaped brass with polished chrome plated finish.
 - 2. One Piece, Cast Brass Type: Set screw; Finish: Polished chrome plated.
 - 3. One Piece, Stamped Steel Type: Set screw; Finish: Chrome plated finish.
 - 4. One Piece, Floor Plate Type: Cast iron floor plate.
 - 5. Inside Diameter: Closely fit around pipe, tube, and insulation of insulated piping.
 - 6. Outside Diameter: Completely cover opening.
- H. Grout: ASTM C1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout; premixed and factory packaged.
 - 1. Characteristics: Post hardening, volume adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
 - 2. Design Mix: 5000 psi minimum 28 day compressive strength.
 - 3. Subject to compliance with requirements, provide products of one of the following, or equal approved as a comparable product:
 - a. Masterflow 928, BASF Building Systems.
 - b. Hi-Flow Grout, Euclid Chemical Company.
- I. Protective Wrapping for Underground Pipe and Fittings:
 - 1. Copper Pipe, Cast Iron Soil Pipe, and Ductile Pipe and Fittings: Factory applied 10 mil thick polethylene pipe encasement complying with AWWA C105, Class C.

- 2. Steel Pipe and Fittings: Standard pipe protection, X-Tru-Coat, 20 mil thick or Scotchkote 6233 fusion bonded epoxy powder coating, 12 mil thick.
- J. Steel Casing Pipe at Railroad Track Crossing: Schedule 40 steel pipe, type of connection, and vent piping complying with Tacoma Rail and Class 1 freight railroad requirements and specifications.
 - 1. Casing Size: Minimum diameter two inches greater than carrier pipe diameter.
- K. Sand and Trench Backfill Materials: Refer to SSPWC.
- L. Concrete Materials: Refer to Section 03 30 00, Cast-in-Place Concrete.
- M. Expansion Loops: Provide products of one of the following, or equal approved as a comparable product:
 - 1. Adsco Manufacturing.
 - 2. Advanced Thermal Systems.
 - 3. Metraflex Company.

PART 3 - EXECUTION

3.01 PIPING SYSTEMS COMMON REQUIREMENTS

- A. Install piping according to requirements for piping systems.
- B. General Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- C. Install components having pressure rating equal to or greater than system operating pressure.
- D. Install piping and components:
 - 1. In concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
 - 2. Indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

- 3. Exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, except where indicated.
- 4. Tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.
- 5. Piping to allow application of insulation plus 1 inch clearance around insulation.
- 6. Above accessible ceilings to allow sufficient space for ceiling panel removal.
- 7. To permit valve servicing.
- 8. At indicated slopes.
- 9. Free of sags and bends.
- 10. To allow application of insulation.
- E. Install fittings for changes in direction and branch connections.
- F. Locate groups of pipes parallel to each other, spaced to permit valve servicing.
- G. Install couplings according to manufacturer's printed instructions.
- H. Select system components with pressure rating equal to or greater than system operating pressure.
- I. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
 - 1. Piping with Fitting or Sleeve Protruding from Wall: One piece, deep pattern type.
 - 2. Chrome Plated Piping: One piece, cast brass type with polished chrome plated finish.
 - 3. Insulated Piping: Cast brass or stamped steel, with concealed hinge, spring clips, and chrome plated finish; one piece, stamped steel type with spring clips.
 - 4. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One piece, stamped steel type.
 - 5. Bare Piping at Ceiling Penetrations in Finished Spaces: One piece, cast brass type with polished chrome plated finish.

- 6. Bare Piping in Unfinished Service Spaces: One piece, cast brass type with rough brass finish.
- 7. Bare Piping in Equipment Rooms: One piece, cast brass type.
- 8. Bare Piping at Floor Penetrations in Equipment Rooms: One piece, floor plate type.
- 9. Uninsulated Piping Wall Escutcheons: Cast brass or stamped steel, with set screw.
- 10. Uninsulated Piping Floor Plates in Utility Areas: Cast iron floor plates.
- 11. Piping in Utility Areas: Cast brass or stamped steel, with set-screw or spring clips.
- J. Sleeves are not required for core drilled holes.
- K. Permanent sleeves are not required for holes formed by removable PE sleeves.
- L. Install sleeves for pipes passing through concrete and masonry walls, gypsum board partitions, and concrete floor and roof slabs.
 - 1. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
 - 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
 - 3. Install sleeves that are large enough to provide 1/4 inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
 - a. Steel Pipe Sleeves: For pipes smaller than NPS 6.
 - b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum board partitions.
- M. Aboveground, Exterior Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1 inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
 - 1. Install steel pipe for sleeves smaller than 6 inches in diameter.

- Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- N. Fire Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials.
- O. Verify final equipment locations for roughing in. Refer to equipment specifications for roughing in requirements.

3.02 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to requirements for piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B813, water flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B828 or CDA's Copper Tube Handbook using lead free solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's Brazing Handbook, Pipe and Tube chapter, using copper phosphorus brazing filler metal complying with AWS A5.8.
- F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
 - 3. Note internal length of threads in fittings or valve ends, and proximity of internal seat or wall to determine how far pipe should be threaded into joint.
 - 4. Align threads at point of assembly.
 - 5. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.

- G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators.
- H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- I. Piping Connections: Make connections according to requirements:
 - 1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
 - 2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
 - 3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
 - 4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.
- J. Protective Wrapping for Underground Metal Pipe and Fittings: Protected piping with factory applied wrapping.
 - 1. Underground copper pipe, cast iron soil pipe, and ductile iron pipe and fittings factory-encased in 8 mil thick polyethylene conforming to AWWA C105, Class C.
 - 2. Underground steel pipe and fittings factory-coated with standard pipe protection.

3.03 EQUIPMENT INSTALLATION COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install plumbing equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.

3.04 PAINTING

A. Damage and Touchup: Repair marred and damaged factory painted finishes with materials and procedures to match original factory finish.

3.09 TRAINING PROGRAM

- A. General Requirements: Contractor is responsible for training as outlined in this section.
 - 1. Maintenance management classes shall take place prior to occupancy of the facility.
 - 2. Mechanics' training shall commence only after installation of equipment is complete at the facility.
 - 3. Conduct training at location selected by owner.
 - 4. Hours for training shall be between 7:00 a.m. and 3:00 p.m. unless specifically permitted otherwise.
- B. Ensure that training instructors are not only familiar with technical information, but also able to utilize proper methods of instruction, training aids, audiovisuals, etc., to ensure effective presentations.
- C. Provide all training aids, audiovisual equipment, and visual aids for the conduct of these courses.
- D. Training materials will become property of owner at conclusion of training.
- E. Submission and Approval of Training Plans:
 - 1. Meet with owner not later than three weeks prior to the start of formal training. At that time, submit lesson plans and an outline of the training program and demonstrate any training aids involved. Also present handouts for approval and provide copies later in a ratio of one per student. Provide a complete set of prints and schematics for each location.
 - 2. Submit written plans for meeting specified training requirements for approval and then coordinate and schedule all training involved.
- F. Outline specific objectives for each of the required courses.
 - 1. The course shall include sessions in safety and machine operation, as well as a comprehensive seminar teaching basic skills and knowledge of each operation. The course shall include both classroom and practical exercise sessions and shall provide the mechanic with the basic knowledge necessary to utilize all training materials. Provide a detailed schedule outlining the length and content of each of these sessions in accordance with the guidelines established.
 - 2. The training program shall include familiarization with equipment operation and performance and detailed instruction in operation, maintenance, and test procedures. Training duration shall be as specified in specification sections.

- G. Training related to plumbing systems shall include, but not be limited to, the following:
 - 1. A written test, as well as a hands-on demonstration of competence by the student.
 - 2. Troubleshooting instruction.
 - 3. Troubleshooting guides and protocols.
 - 4. Maintainability demonstration for each system.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the contract, including general conditions and general requirements, apply to this work as if specified in this section. Work related to this section is described in the following sections:
 - 1. Section 11 11 29 Sand Distribution Equipment
 - 2. Section 11 11 53 Lube Oil Distribution Equipment
 - 3. Section 22 05 00 Common Work Results for Plumbing
 - 4. Section 22 05 53 Identification for Plumbing, Piping and Equipment
 - 5. Section 22 15 13 General Service Compressed Air Piping
 - 6. Section 22 70 13 Fuel Oil System

1.02 SUMMARY

- A. Section Includes:
 - 1. Bronze angle valves.
 - 2. Copper alloy ball valves.
 - 3. Bronze check valves.
 - 4. Bronze gate valves.
 - 5. Bronze globe valves
 - 6. Iron single-flange butterfly valves
 - 7. Iron swing check valves.
 - 8. Iron gate valves

1.02 DEFINITIONS

- A. The following are standard abbreviations for valves:
 - 1. CWP: Cold working pressure.

- 2. EPDM: Ethylene-propylene-diene terpolymer rubber.
- 3. NBR: Acrylonitrile-butadiene rubber.
- 4. PTFE: Polytetrafluoroethylene plastic.
- 5. TFE: Tetrafluoroethylene plastic.
- 6. HDPE: High Density Polyethylene
- 1.03 SUBMITTALS
 - A. Product Data: For each type of valve indicated. Include body, seating, and trim materials; valve design; pressure and temperature classifications; end connections; arrangement; dimensions; and required clearances. Include list indicating valve and its application. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.
- 1.04 QUALITY ASSURANCE
 - A. ASME Compliance: ASME B31.1 for power piping valves and ASME B31.9 for building services piping valves.
 - 1. Exceptions: Domestic hot- and cold-water piping valves unless referenced.
 - B. NSF Compliance: NSF 61 for valve materials for potable-water service.
- 1.05 DELIVERY, STORAGE AND HANDLING
 - A. Prepare valves for shipping as follows:
 - 1. Protect internal parts against rust and corrosion.
 - 2. Protect threads, flange faces, grooves, and weld ends.
 - 3. Set angle, gate, and globe valves closed to prevent rattling.
 - 4. Set ball and plug valves open to minimize exposure of functional surfaces.
 - 5. Set butterfly valves closed or slightly open.
 - 6. Block check valves in either closed or open position.
 - B. Use the following precautions during storage:

- 1. Maintain valve end protection.
- 2. Store valves indoors and maintain at higher than ambient dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use hand wheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.01 GENERAL

A. Drawings and general provisions of the contract apply to this section.

2.02 VALVES

- A. Bronze Valves: NPS 2 and smaller with threaded ends, unless otherwise indicated.
- B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- C. Valve Sizes: Same as upstream pipe, unless otherwise indicated.
- D. Extended Valve Stems: On insulated valves.
- E. Valve Flanges: ASME B16.1 for cast-iron valves, ASME B16.5 for steel valves, and ASME B16.24 for bronze valves.
- F. Valve Grooved Ends: AWWA C606.
 - 1. Solder Joint: With sockets according to ASME B16.18.
 - a. Caution: Use solder with melting point below 840 deg F for angle, check, gate, and globe valves; below 421 deg F for ball valves.
 - 2. Threaded: With threads according to ASME B1.20.1.
- G. Valve Bypass and Drain Connections: MSS SP-45.

2.03 BRONZE ANGLE VALVES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or equivalent as approved by the Engineer.
 - Type 1, Bronze Angle Valves with Metal Disc:
 a. Cincinnati Valve Co., div. Lunkenheimer Valves.

- b. Stockham brand, Crane Valve Group, Crane Company.
- c. Hammond Valve.
- d. Milwaukee Valve Company.
- e. Nibco Inc.
- f. Red-White Valve Corp.
- Type 2, Bronze Angle Valves with Nonmetallic Disc: a. American Valve, Inc.
 - b. Cincinnati Valve Co., div. Lunkenheimer Valves.
 - c. Crane brand, Crane Valve Group, Crane Company.
 - d. Jenkins brand, Crane Valve Group, Crane Company.
 - e. Stockham brand, Crane Valve Group, Crane Company.
 - f. Grinnell Corporation.
 - g. Hammond Valve.
 - h. Nibco Inc.
 - i. William Powell Co.
- 3. Type 3, Bronze Angle Valves with Metal Disc and Renewable Seat:
 - a. Cincinnati Valve Co.
 - b. Crane brand, Crane Valve Group, Crane Company.
 - c. Crane Co.; Crane Valve Group; Jenkins Valves.
 - d. Crane Co.; Crane Valve Group; Stockham Div.
 - e. Grinnell Corporation.
 - f. Milwaukee Valve Company.
 - g. NIBCO INC.

- 4. Bronze Angle Valves, General: MSS SP-80, with ferrous alloy handwheel.
- 5. Type 1, Class 125, Bronze Angle Valves: Bronze body with bronze disc.
- 6. Type 1, Class 150, Bronze Angle Valves: Bronze body with bronze disc.
- 7. Type 1, Class 200, Bronze Angle Valves: Bronze body with bronze disc.
- 8. Type 2, Class 125, Bronze Angle Valves: Bronze body with disc.
- 9. Type 2, Class 150, Bronze Angle Valves: Bronze body with disc.
- 10. Type 2, Class 200, Bronze Angle Valves: Bronze body with PTFE or TFE disc
- 11. Type 3, Class 125, Bronze Angle Valves: Bronze body with bronze disc and renewable seat.
- 12. Type 3, Class 125, Bronze Angle Valves: Bronze body with bronze disc and renewable seat.
- 13. Type 3, Class 150, Bronze Angle Valves: Bronze body with bronze disc and renewable seat.
- 14. Type 3, Class 200, Bronze Angle Valves: Bronze body with bronze disc and renewable seat.

2.04 COPPER ALLOY BALL VALVES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or equivalent as approved by the Engineer.
 - 1. One Piece, Copper Alloy Ball Valves: a. American Valve, Inc.
 - b. Apollo brand, Conbraco Industries, Inc.
 - c. Jenkins brand, Crane Valve Group, Crane Company.
 - d. Stockham brand, Crane Valve Group, Crane Company.
 - e. DynaQuip Controls.
 - f. Grinnell Corporation.
 - g. Jamesbury brand, Metso Automation.

- h. Kitz Corporation of America.
- i. Legend Valve.
- j. Nibco Inc.
- k. Watts Water Technologies, Inc.
- 2. Copper Alloy Ball Valves, General: MSS SP-110.
- 3. One Piece, Copper Alloy Ball Valves: Brass or bronze body with chrome plated bronze ball, PTFE or TFE seats, and 400 psig minimum CWP rating.
- 4. Ferrous Alloy Butterfly Valves: Flanged end type with one piece stem.

2.05 BRONZE CHECK VALVES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or equivalent as approved by the Engineer.
 - 1. Type 1, Bronze, Horizontal Lift Check Valves with Metal Disc:
 - a. Cincinnati Valve Co.
 - b. Crane brand, Crane Valve Group, Crane Company.
 - c. Stockham brand, Crane Valve Group, Crane Company.
 - d. Red-White Valve Corp.
 - e. Walworth Co.
 - 2. Type 1, Bronze, Vertical Lift Check Valves with Metal Disc:
 - a. Cincinnati Valve Co.
 - b. Crane brand, Crane Valve Group, Crane Company.
 - c. Jenkins brand, Crane Valve Group, Crane Company.
 - d. Red-White Valve Corp.
 - 3. Bronze Check Valves, General: MSS SP-80.

- 4. Type 1, Class 125, Bronze, Horizontal Lift Check Valves: Bronze body with bronze disc and seat.
- 5. Type 1, Class 125, Bronze, Vertical Lift Check Valves: Bronze body with bronze disc and seat.
- 6. Type 1, Class 150, Bronze, Horizontal Lift Check Valves: Bronze body with bronze disc and seat.
- 7. Type 1, Class 150, Bronze, Vertical Lift Check Valves: Bronze body with bronze disc and seat.

2.06 BRONZE GATE VALVES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or equivalent as approved by the Engineer.
 - 1. Type 1, Bronze, Nonrising-Stem Gate Valves:
 - a. American Valve, Inc.
 - b. Cincinnati Valve Co.
 - c. Crane brand, Crane Valve Group, Crane Company.
 - d. Jenkins brand, Crane Valve Group, Crane Company.
 - e. Stockham brand, Crane Valve Group, Crane Company.
 - f. Grinnell Corporation.
 - g. Hammond Valve.
 - h. Kitz Corporation of America.
 - i. Legend Valve.
 - j. Milwaukee Valve Company.
 - k. Nibco Inc.
 - I. William Powell Co.
 - m. Red-White Valve Corp.

- n. Walworth Co.
- o. Watts Water Technologies.
- 2. Type 2, Bronze, Rising-Stem, Solid-Wedge Gate Valves:
 - a. American Valve, Inc.
 - b. Cincinnati Valve Co.
 - c. Crane brand, Crane Valve Group, Crane Company.
 - d. Jenkins brand, Crane Valve Group, Crane Company.
 - e. Stockham brand, Crane Valve Group, Crane Company.
 - f. Grinnell Corporation.
 - g. Hammond Valve.
 - h. Kitz Corporation of America.
 - i. Milwaukee Valve Company.
 - j. Nibco Inc.
 - k. William Powell Co.
 - I. Red-White Valve Corp.
 - m. Walworth Co.
- 3. Type 3, Bronze, Rising-Stem, Split-Wedge Gate Valves:
 - a. Cincinnati Valve Co.
 - b. Jenkins brand, Crane Valve Group, Crane Company.
 - c. Grinnell Corporation.
 - d. Nibco Inc.
- B. Bronze Gate Valves, General: MSS SP-80, with ferrous-alloy handwheel.

- C. Type 1, Class 125, Bronze Gate Valves: Bronze body with nonrising stem and bronze solid wedge and union ring bonnet.
- D. Type 1, Class 150, Bronze Gate Valves: Bronze body with nonrising stem and bronze solid wedge and union ring bonnet.
- E. Type 1, Class 200, Bronze Gate Valves: Bronze body with nonrising stem and bronze solid wedge and union ring bonnet.

2.07 BRONZE GLOBE VALVES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or equivalent as approved by the Engineer.
 - 1. Type 1, Bronze Globe Valves with Metal Disc:
 - a. Cincinnati Valve Co.
 - b. Crane brand, Crane Valve Group, Crane Company.
 - c. Jenkins brand, Crane Valve Group, Crane Company.
 - d. Stockham brand, Crane Valve Group, Crane Company.
 - e. Grinnell Corporation.
 - f. Hammond Valve.
 - g. Kitz Corporation of America.
 - h. Legend Valve.
 - i. Milwaukee Valve Company.
 - j. Nibco Inc.
 - k. William Powell Co.
 - I. Red-White Valve Corp.
 - 2. Walworth Co.
 - 3. Type 2, Bronze Globe Valves with Nonmetallic Disc:
 - a. Cincinnati Valve Co.

- b. Crane brand, Crane Valve Group, Crane Company.
- c. Jenkins brand, Crane Valve Group, Crane Company.
- d. Stockham brand, Crane Valve Group, Crane Company.
- e. Grinnell Corporation.
- f. Hammond Valve.
- g. Kitz Corporation of America.
- h. Kennedy Valve, Inc., div. McWane, Inc.
- i. Milwaukee Valve Company.
- j. Nibco Inc.
- k. William Powell Co.
- I. Red-White Valve Corp.
- m. Walworth Co.
- 4. Type 3, Bronze Globe Valves with Renewable Seat and Metal Disc:
 - a. Cincinnati Valve Co.
 - b. Crane brand, Crane Valve Group, Crane Company.
 - c. Jenkins brand, Crane Valve Group, Crane Company.
 - d. Stockham brand, Crane Valve Group, Crane Company.
 - e. Grinnell Corporation.
 - f. Hammond Valve.
 - g. Milwaukee Valve Company.
 - h. Nibco Inc.
 - i. Walworth Co.
- 5. Bronze Globe Valves, General: MSS SP-80, with ferrous-alloy handwheel.

- 6. Type 1, Class 125, Bronze Globe Valves: Bronze body with bronze disc and union ring bonnet.
- 7. Type 1, Class 150, Bronze Globe Valves: Bronze body with bronze disc and union ring bonnet.
- 8. Type 1, Class 200, Bronze Globe Valves: Bronze body with bronze disc and union ring bonnet.

2.08 IRON SINGLE-FLANGE BUTTERFLY VALVE

- A. 200 CWP, Iron, Single-Flange Butterfly Valves with EPDM Seat and Aluminum-Bronze Disc:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or equivalent as approved by the Engineer.
 - a. Hammond Valve.
 - b. Milwaukee Valve Company.
 - c. NIBCO INC.
 - d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - 2. Description:
 - a. Standard: MSS SP-67, Type I.
 - b. CWP Rating: 200 psig.
 - c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
 - d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
 - e. Seat: EPDM.
 - f. Stem: One- or two-piece stainless steel.
 - g. Disc: Aluminum bronze.
- B. 200 CWP, Iron, Single-Flange Butterfly Valves with NBR Seat and Aluminum-Bronze Disc:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or equivalent as approved by the Engineer.
 - a. Hammond Valve.
 - b. Milwaukee Valve Company.
 - c. NIBCO INC.
 - d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - e. Viega
- 2. Description:
 - a. Standard: MSS SP-67, Type I.
 - b. CWP Rating: 200 psig.
 - c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
 - d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
 - e. Seat: NBR.
 - f. Stem: One- or two-piece stainless steel.
 - g. Disc: Aluminum bronze.

2.09 IRON GATE VALVES

- A. Class 125, NRS, Iron Gate Valves:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or equivalent as approved by the Engineer.
 - a. Hammond Valve.
 - b. Milwaukee Valve Company.
 - c. NIBCO INC.
 - 2. Description

- a. Standard: MSS SP-70, Type I.
- b. CWP Rating: 200 psig.
- c. Body Material: ASTM A 126, gray iron with bolted bonnet.
- d. Ends: Flanged.
- e. Trim: Bronze.
- f. Disc: Solid wedge.
- g. Packing and Gasket: Asbestos free.
- B. Class 125, OS&Y, Iron Gate Valves:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or equivalent as approved by the Engineer.
 - a. Hammond Valve.
 - b. Milwaukee Valve Company.
 - c. NIBCO INC.
 - d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - 2. Description:
 - a. Standard: MSS SP-70, Type I.
 - b. CWP Rating: 200 psig.
 - c. Body Material: ASTM A 126, gray iron with bolted bonnet.
 - d. Ends: Flanged.
 - e. Trim: Bronze.
 - f. Disc: Solid wedge.
 - g. Packing and Gasket: Asbestos free.
- C. Class 250, OS&Y, Iron Gate Valves:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or equivalent as approved by the Engineer.
 - a. Hammond Valve.
 - b. Milwaukee Valve Company.
 - c. NIBCO INC.
 - d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
- 2. Description:
 - a. Standard: MSS SP-70, Type I.
 - b. CWP Rating: 500 psig.
 - c. Body Material: ASTM A 126, gray iron with bolted bonnet.
 - d. Ends: Flanged.
 - e. Trim: Bronze.
 - f. Disc: Solid wedge.
 - g. Packing and Gasket: Asbestos free.

PART 3 - EXECUTION

- 3.01 EXAMINATION
 - A. Examine piping system for compliance with requirements for installation tolerances and other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.
 - B. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
 - C. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
 - D. Examine threads on valve and mating pipe for form and cleanliness.

- E. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- F. Do not attempt to repair defective valves; replace with new valves.

3.02 VALVE APPLICATIONS

- A. Refer to piping sections for specific valve applications. If valve applications are not indicated, use the following:
 - 1. Shutoff Service: Ball, butterfly, gate, or plug valves.
 - 2. Throttling Service: Angle, ball, butterfly, or globe valves.
 - 3. Pump Discharge: Spring-loaded, lift-disc check valves.
- B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.
- C. Low-Pressure, Compressed-Air Piping: Use the following types of valves:
 - 1. Ball Valves, NPS 2 (DN 50) and Smaller: One or two piece, 400 psig CWP rating, copper alloy.
 - 2. Equipment Isolation Ball Valves, NPS 2 and Smaller: Safety exhaust, bronze.
 - 3. Lift Check Valves, NPS 2 and Smaller: Type 2, Class 125, horizontal or vertical, bronze.
 - 4. Swing Check Valves, NPS 2 and Smaller: Type 4, Class 125, bronze.
 - 5. Spring Loaded, Lift Disc Check Valves, NPS 2 and Smaller: Type IV, Class 125 minimum.
 - 6. Gate Valves, NPS 2 and Smaller: Type 2, Class 125, bronze.
 - 7. Globe Valves, NPS 2 and Smaller: Type 2, Class 125, bronze.
- D. Domestic Water Piping: Use the following types of valves:
 - 1. Angle Valves, NPS 2 and Smaller: Type 2, Class 125, bronze.
 - 2. Ball Valves, NPS 2 and Smaller: One or two piece, 400 psig CWP rating, copper alloy.

- 3. Lift Check Valves, NPS 2 and Smaller: Type 2, Class 125, horizontal or vertical, bronze.
- 4. Swing Check Valves, NPS 2 and Smaller: Type 4, Class 125, bronze.
- 5. Spring Loaded, Lift Disc Check Valves, NPS 2 and Smaller: Type IV, Class 125 minimum.
- 6. Gate Valves, NPS 2 and Smaller: Type 1, Class 125, bronze.
- 7. Globe Valves, NPS 2 and Smaller: Type 2, Class 125, bronze.
- E. Heating Water Piping: Use the following types of valves:
 - 1. Angle Valves, NPS 2 and Smaller: Type 2, Class 125, bronze.
 - 2. Ball Valves, NPS 2 and Smaller: One or two piece, 400-psig CWP rating, copper alloy.
 - 3. Lift Check Valves, NPS 2 and Smaller: Type 2, Class 125 horizontal or vertical, bronze.
 - 4. Swing Check Valves, NPS 2 and Smaller: Type 4, Class 125 bronze.
 - 5. Spring Loaded, Lift Disc Check Valves, NPS 2 and Smaller: Type IV, Class 125 minimum.
 - 6. Gate Valves, NPS 2 and Smaller: Type 2, Class 125, bronze.
 - 7. Globe Valves, NPS 2 and Smaller: Type 2, Class 125, bronze.
 - 8. Plug Valves, NPS 2 and Larger: Class 125 nonlubricated type, cast iron.

3.03 VALVE INSTALLATION

- A. Piping installation requirements are specified in other Division 23 sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- C. Locate valves for easy access and provide separate support where necessary.
- D. Install valves in horizontal piping with stem at or above center of pipe.
- E. Install valves in position to allow full stem movement.

- F. Install check valves for proper direction of flow and as follows:
 - 1. Swing Check Valves: In horizontal position with hinge pin level.
 - 2. Dual Plate Check Valves: In horizontal or vertical position, between flanges.
 - 3. Lift Check Valves: With stem upright and plumb.

3.04 JOINT CONSTRUCTION

- A. Grooved Joints: Assemble joints with keyed coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.
- B. Soldered Joints: Use ASTM B813, water flushable, lead free flux; ASTM B32, lead free alloy solder; and ASTM B828 procedure, unless otherwise indicated.

3.05 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Heat tracing for above ground water piping. Furnish, install, and test.

1.02 SUBMITTALS

- A. Product Data.
- B. Manufacturer's Installation and Maintenance Instructions.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Self regulating low temperature type, wrapped around pipes, UL listed and labeled, suitable for indoor and outdoor applications.
- B. Provide 1 inch fiberglass insulation with protective external aluminum jacket.
- C. Power: 120 volt single phase, coordinate with electrical power supply
- D. Maintenance Temperature: Adjustable,
 - 1. Water line: 40 deg F, +/- 5 percent.
- E. Provide system as follows:
 - 1. Water
 - a. Provide necessary number of circuits (minimum two) for length of piping.
 - b. Cable Output Rate: 5 watts per linear foot, +/- 5 percent.
 - c. Minimum ambient temperature: 20 deg F.
 - d. Basis of Design: Tyco Thermal Controls, Subject to compliance with requirements, provide the indicated product, a comparable product by one of the following, or equal approved as a substitution:
 - (1) Tyco Thermal Controls.
 - (2) Chromolox Precision Heat and Control.

(3) Raychem

- 2. Provide the following:
 - a. Temperature control, thermostat-based.
 - b. Single entry power connection.
 - c. High profile end seal kit.
 - d. Glass tape.
 - e. Permanent labeling "Electric Traced" marking at 10 feet on center.
 - f. Pipe straps.
 - g. Any other necessary parts and accessories for a complete installation.
- 3. Locate temperature controls and circuit breakers in the maintenance shed.
- 4. Water piping above ground: similar to those specified above but set to above freezing point to prevent the water in the pipe from being frozen.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Plumbing identification, including but not limited to:
 - a. Equipment nameplates.
 - b. Pipe markers.
 - c. Valve tags.
 - d. Warning tags.
 - e. Accessories required for a complete installation.

1.02 SUBMITTALS

- A. Product Data: Technical data and installation instructions.
- B. List of wording, symbols, letter size, and color coding.
- C. Valve numbering scheme.

1.03 QUALITY ASSURANCE

- A. ASME Compliance: Comply with ASME A13.1, Scheme for the Identification of Piping Systems, for letter size, length of color field, colors, and viewing angles of identification devices for piping.
- 1.04 COORDINATION
 - A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
 - B. Coordinate installation of identifying devices with location of access panels and doors.
 - C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

- 2.01 IDENTIFICATION DEVICES
 - A. Equipment Nameplates: Metal, with data engraved or stamped, for permanent attachment on equipment.
 - 1. Data:
 - a. Manufacturer, product name, model number, and serial number.

- b. Capacity, operating and power characteristics, and essential data.
- c. Labels of tested compliances.
- 2. Location: Accessible and visible.
- 3. Fasteners: As required to mount on equipment.
- B. Equipment Signs: ASTM D709, Type I, cellulose, paper base, phenolic resin laminated engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine subcore, unless otherwise indicated. Fabricate in sizes required for message. Provide holes for mechanical fastening.
 - 1. Data: Instructions for operation of equipment and for safety procedures.
 - 2. Engraving: Manufacturer's standard letter style, of sizes and with terms to match equipment identification.
 - 3. Thickness: 1/16 inch for units up to 20 sq. in. or 8 inches in length, and 1/8 inch for larger units.
 - 4. Fasteners: Self tapping, stainless steel screws or contact type, permanent adhesive.
- C. Manufacturer's Identification: Nameplate, name, or trademark permanently affixed to each piece of equipment. Where equipment is located in a finished occupied area, conceal nameplate in an accessible place. Nameplate of the contractor or distributor in lieu of the manufacturer's nameplate is not acceptable.
- D. Stencils: Standard stencils, prepared for required applications with letter sizes conforming to recommendations of ASME A13.1 for piping and similar applications, but not less than 1-1/4 inches high letters for ductwork and not less than 3/4 inch high letters for access door signs and similar operational instructions.
 - 1. Material: Fiberboard.
 - 2. Material: Brass.
 - 3. Stencil Paint: Standard exterior type stenciling enamel; black, except as otherwise indicated; either brushing grade or pressurized spray can form and grade.
 - 4. Identification Paint: Standard identification enamel of colors indicated for piping systems, comply with ASME A13.1 for colors.
- E. Plastic Equipment Markers: Laminated plastic, color coded equipment markers. Comply with color code:
 - 1. Blue: Equipment and components that do not meet any of above criteria.
 - 2. For hazardous equipment, use colors and designs recommended by ASME A13.1.

- 3. Nomenclature: Include following, matching terminology on schedules as closely as possible:
 - a. Name and plan number.
 - b. Equipment service.
 - c. Design capacity.
 - d. Other design parameters such as pressure drop, entering and leaving conditions, and rpm.
- 4. Size: Approximately 2-1/2 by 4 inches for control devices, dampers, and valves; and 4-1/2 by 6 inches for equipment.
- F. Lettering and Graphics: Coordinate names, abbreviations, and other designations used in plumbing identification, with corresponding designations indicated. Use numbers, lettering, and wording indicated for proper identification and operation/maintenance of plumbing systems and equipment.

2.02 PIPING IDENTIFICATION DEVICES

- A. Manufactured Pipe Markers: Preprinted, color coded, with lettering indicating service, and showing direction of flow.
 - 1. Colors: Comply with ASME A13.1, unless otherwise indicated.
 - 2. Lettering: Use piping system terms indicated and abbreviate only as necessary for each application length.
 - 3. Pipes with OD, Including Insulation, Less Than 6 Inches: Full band pipe markers extending 360 degrees around pipe at each location.
 - 4. Pipes with OD, Including Insulation, 6 Inches and Larger: Either full band or strip type pipe markers at least three times letter height and of length required for label.
 - 5. Arrows: Integral with piping system service lettering to accommodate both directions; or as separate unit on each pipe marker to indicate direction of flow.
 - 6. Plastic Tags: Self extinguishing UL approved plastic snap-on color coded markers encircling pipe with overlap. Do not use adhesive.
 - a. Stencil mark and tag pipes complying with Schedule. Legibly apply stencil lettering near valve and branch connection and at maximum 40 foot intervals on straight runs of pipe. Indicate flow arrows for piping at each lettering. Adjacent to legend, stencil size of pipe.
 - 7. Stencil and Valve Tag Schedule:

Service	Designation	Stencil Color	Designation
Cold Water	Cold Water	Green	CW
Hot Water	Hot Water	Green	HW - Deg F
Sanitary Sewer	San. Sewer	Green	
Industrial Waste	IW	Green	
Fuel Oil	Fuel oil supply and Return	Green	FOS, FOR
Air	Air	Green	Air

- B. Self Adhesive Pipe Markers: Plastic with pressure sensitive, permanent type, self adhesive back.
- C. Plastic Tape: Continuously printed, vinyl tape at least 3 mils thick with pressure sensitive, permanent type, self adhesive back.
 - 1. Width for Markers on Pipes with OD, Including Insulation, Less Than 6 Inches: 3/4 inch minimum.
 - 2. Width for Markers on Pipes with OD, Including Insulation, 6 Inches or Larger: 1-1/2 inches minimum.
- 2.03 VALVE TAGS
 - A. Valve Tags: Stamped or engraved with 1/4 inch letters for piping system abbreviation and 1/2 inch numbers, with numbering scheme approved by Engineer. Provide 5/32 inch hole for fastener.
 - 1. Material: 0.032 inch thick brass.
 - 2. Valve Tag Fasteners: Brass S hook.
- 2.04 WARNING TAGS
 - A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags; of plasticized card stock with matte finish suitable for writing.
 - 1. Size: 3 by 5-1/4 inches minimum.
 - 2. Fasteners: Brass grommet and wire.
 - 3. Nomenclature: Large size primary caption such as Danger, Caution, or Do Not Operate.
 - 4. Color: Yellow background with black lettering.

PART 3 - EXECUTION

3.01 APPLICATIONS

A. Products specified are for applications referenced in other sections. If more than single type material, device, or label is specified for listed applications, selection is installer's option.

3.02 EQUIPMENT IDENTIFICATION

- A. Install and permanently fasten equipment nameplates on each major item of mechanical equipment that does not have nameplate or has nameplate that is damaged or located where not easily visible. Locate nameplates where accessible and visible.
- B. Equipment: Install engraved plastic laminate equipment signs or markers with screws or permanent adhesive on or near each major item of mechanical equipment. Locate signs where accessible and visible.
 - 1. Letter Size: Minimum 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering 2/3 to 3/4 the size of principal lettering.
 - 2. Data: Distinguish among multiple units, indicate operational requirements, indicate safety and emergency precautions, warn of hazards and improper operations, and identify units.
- C. Adjusting: Relocate identifying devices which become visually blocked.

3.03 PIPING IDENTIFICATION

- A. Install manufactured pipe markers indicating service on each piping system. Install with flow indication arrows showing direction of flow. Locate pipe markers and color bands where piping is exposed in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior nonconcealed locations.
 - 1. Pipes with OD, Including Insulation, Less Than 6 Inches: Self adhesive pipe markers. Use color coded, self adhesive plastic tape, 1-1/2 inches wide, lapped at least 1-1/2 inches at both ends of pipe marker, and covering full circumference of pipe.
 - 2. Pipes with OD, Including Insulation, 6 Inches and Larger: Self adhesive pipe markers. Use color coded, self adhesive plastic tape, at least 1-1/2 inches wide, lapped at least 3 inches at both ends of pipe marker, and covering full circumference of pipe.
 - 3. Stenciled Markers: Complying with ASME A13.1.
 - 4. Plastic markers, with application systems. Install on pipe insulation segment where required for hot noninsulated pipes.

- 5. Locate pipe markers wherever piping is exposed in finished spaces, machine rooms, accessible maintenance spaces (shafts, tunnels, plenums) and exterior nonconcealed locations.
 - a. Near each valve and control device.
 - b. Near each branch, excluding short take offs for fixtures and terminal units. Mark each pipe at branch, where flow pattern is not obvious.
 - c. Near locations where pipes pass through walls, floors, ceilings, or enter nonaccessible enclosures.
 - d. At access doors, manholes, and similar access points that permit view of concealed piping.
 - e. Near major equipment items and other points of origination and termination.
 - f. Spaced at a maximum of 20 feet intervals along each run. Reduce intervals to 10 feet in congested areas of piping and equipment. Intervals are to comply with City of Tacoma Fire Department requirements.
 - g. On piping above removable acoustical ceilings, except omit intermediately spaced markers.

3.04 VALVE TAG INSTALLATION

- A. Install tags on valves and control devices in piping systems, except check valves; valves within factory fabricated equipment units; plumbing fixture supply stops; shutoff valves; faucets; convenience and lawn watering hose connections; and roughing in connections of end use fixtures and units.
 - 1. Valve Tag Size and Shape:
 - a. Cold Water: 1-1/2 inches round.
 - b. Hot Water: 1-1/2 inches round.
 - c. Fire Protection: 1-1/2 inches round.
 - d. Gas: 1-1/2 inches round.
 - e. Steam: 1-1/2 inches round.
- B. Mount valve schedule on wall in accessible location in each major equipment room.
- 3.05 WARNING-TAG INSTALLATION
 - A. Write required message on, and attach warning tags to, equipment and other items where required.

3.06 ADJUSTING

A. Relocate plumbing identification materials and devices that have become visually blocked by other work.

3.07 CLEANING

A. Clean faces of plumbing identification and glass frames of valve schedules.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the contract, including general conditions and general requirements, apply to this work as if specified in this section. Work related to this section is described in the following sections:
 - 1. Section 11 11 29 Common Work Results for Equipment
 - 2. Section 22 05 00 Common Work Results for Plumbing
 - 3. Section 22 05 53 Identification for Plumbing, Piping and Equipment

1.02 SUMMARY

- A. Section Includes:
 - 1. Piping and related specialties for general-service compressed air systems operating at 200 psig or less.

1.03 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Compressed air piping and support and installation shall withstand effects of seismic events determined according to Washington State Building Code and local City Code.

1.04 SUBMITTALS

- A. Product Data, for the following:
 - a. Dielectric fittings.
 - b. Flexible pipe connectors.
 - c. Safety valves.
 - d. Automatic drain valves.
 - e. Quick couplings.
- B. Shop Drawings: In accordance with Section 22 05 00 Common Work Results for Plumbing, Part 1.03 B.
- C. Coordination Drawings: In accordance with Section 22 05 00 Common Work Results for Plumbing, Part 1.03 C.
- a. Brazing certificates.
- D. Qualification Data, for installers.
- E. Field quality-control test reports.
- F. Operation and Maintenance Data: For general-service compressed air piping specialties to include in emergency, operation, and maintenance manuals.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications:
 - a. Extruded-Tee Outlet Procedure: Qualify operators according to training provided by T-DRILL Industries Inc., for making branch outlets.
- B. Brazing: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, Welding and Brazing Qualifications, or to AWS B2.2, Standard for Brazing Procedure and Performance Qualification.
- C. ASME Compliance: Comply with ASME B31.1, Power Piping, for high-pressure compressed air piping.

PART 2 - PRODUCTS

2.01 GENERAL

a. Where products and manufacturers are listed, make submittals for proposed comparable products and substitutions.

2.02 PIPES, TUBES, AND FITTINGS

- a. Schedule 40 Steel Pipe: ASTM A53, Type E or S, Grade B, black with ends threaded according to ASME B1.20.1.
- b. Steel Nipples: ASTM A733, made of ASTM A53 or ASTM A106, Schedule 40, seamless steel pipe. Include ends matching joining method.
- c. Malleable-Iron Fittings: ASME B16.3, Class 150 or 300, threaded.
- d. Malleable-Iron Unions: ASME B16.39, Class 150 or 300, threaded.
- e. Steel Flanges: ASME B16.5, Class 150 or 300, carbon steel, threaded.
- f. Steel Flanges: ASME B16.5, Class 150 or 300, carbon steel.

- B. Grooved-End Fittings and Couplings:
 - 1. Subject to compliance with requirements, provide products by one of the following, or equal approved as a comparable product:
 - a. Anvil International, Inc.
 - b. Star Pipe Products; Star Fittings Div.
 - c. Victaulic Company.
 - d. Ward Manufacturing, Inc.
 - 2. Grooved-End Fittings: ASTM A47, malleable-iron castings or ASTM A536, ductile-iron casting; with grooves according to AWWA C606 and dimensions matching steel pipe.
 - Couplings: AWWA C606 or UL 213, for steel-pipe dimensions and rated for 300psig minimum working pressure. Include ferrous housing sections, gasket suitable for compressed air, and bolts and nuts. Provide EDPM gaskets for oilfree compressed air. Provide NBR gaskets if compressed air contains oil or oil vapor.
- C. Copper Tube: ASTM B88, Type M seamless, drawn-temper, water tube.
 - 1. Wrought-Copper Fittings: ASME B16.22, solder-joint pressure type or MSS SP-73, wrought copper with dimensions for brazed joints.
 - 2. Cast-Copper-Alloy Flanges: ASME B16.24, Class 150 or 300.
 - 3. Copper Unions: ASME B16.22 or MSS SP-123.
 - 4. Extruded-Tee Outlets: Procedure for making branch outlets in copper tube according to ASTM F2014.
 - 5. Manufacturers: Subject to compliance with requirements, provide procedure according to one of the following:
 - a. T-DRILL Industries Inc.
 - b. Or equal.
- D. Transition Couplings for Metal Piping: Metal coupling or other manufactured fitting same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

2.03 JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: Suitable for compressed air piping system contents.
 - 1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
- B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- D. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated.

2.04 VALVES

A. Metal Ball, Butterfly, Check, Gate, and Globe Valves: Comply with requirements in Section 22 05 23, General Duty Valves for Plumbing Piping.

2.05 DIELECTRIC FITTINGS

- A. General Requirements for Dielectric Fittings: Combination fitting of copper alloy and ferrous materials with insulating material; suitable for system fluid, pressure, and temperature. Include threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Dielectric Unions: Factory-fabricated union assembly, for 250-psig minimum working pressure at 180 deg F.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or equal approved as a comparable product:
 - a. Capitol Manufacturing Company.
 - b. Central Plastics Company.
 - c. EPCO Sales, Inc.
 - d. Hart Industries International, Inc.
 - e. Watts Water Technologies, Inc.; Water Products Div.
 - f. Zurn Plumbing Products Group; Wilkins Div.

2.06 FLEXIBLE PIPE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or equal approved as a comparable product:
 - 1. Flex-Hose Co., Inc.
 - 2. Flexicraft Industries.
 - 3. Hyspan Precision Products, Inc.
 - 4. Mercer Rubber Co.
 - 5. Metraflex, Inc.
 - 6. Proco Products, Inc.
 - 7. Unaflex, Inc.
 - 8. Universal Metal Hose; a Hyspan Company
- B. Stainless-Steel-Hose Flexible Pipe Connectors: Corrugated-stainless-steel tubing with stainless-steel wire-braid covering and ends welded to inner tubing.
 - 1. Working-Pressure Rating: 200 psig minimum.
 - 2. End Connections, NPS 2 and Smaller: Threaded steel pipe nipple.
 - 3. End Connections, NPS 2-1/2 and Larger: Flanged steel nipple.

2.07 ESCUTCHEONS

- A. General Requirements: Manufactured wall and ceiling escutcheons and floor plates, with ID to closely fit around pipe and tube and OD that completely covers opening.
- B. One-Piece, Deep-Pattern Escutcheons: Deep-drawn, box-shaped brass with polished chrome-plated finish.
- C. One-Piece, Cast-Brass Escutcheons: With set screw.
 - 1. Finish: Polished chrome-plated.
- D. Split-Casting, Cast-Brass Escutcheons: With concealed hinge and set screw.
 - 1. Finish: Polished chrome-plated.
- E. One-Piece, Stamped-Steel Escutcheons: With set screw or spring clips and chromeplated finish.

- F. Split-Plate, Stamped-Steel Escutcheons: With concealed hinge, set screw or spring clips, and chrome-plated finish.
- G. One-Piece, Floor-Plate Escutcheons: Cast iron.
- H. Split-Casting, Floor-Plate Escutcheons: Cast brass with concealed hinge and set screw.

2.08 SPECIALTIES

- A. Safety Valves: ASME Boiler and Pressure Vessel Code: Section VIII, Pressure Vessels, construction; National Board certified, labeled, and factory sealed; constructed of bronze body with poppet-type safety valve for compressed air service.
 - 1. Pressure Settings: Higher than discharge pressure and same or lower than receiver pressure rating.
- B. Automatic Drain Valves: Stainless-steel body and internal parts, rated for 200-psig minimum working pressure, capable of automatic discharge of collected condensate.

2.09 QUICK COUPLINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or equal approved as a comparable product:
 - 1. Aeroquip Corporation; Eaton Corp.
 - 2. Bowes Manufacturing Inc.
 - 3. Foster Manufacturing, Inc.
 - 4. Milton Industries, Inc.
 - 5. Parker Hannifin Corp.; Fluid Connectors Group; Quick Coupling Div.
 - 6. Rectus Corp.
 - 7. Schrader-Bridgeport; Amflo Div.
 - 8. Schrader-Bridgeport/Standard Thomson.
 - 9. Snap-Tite, Inc.; Quick Disconnect & Valve Division.
 - 10. TOMCO Products Inc.
 - 11. Tuthill Corporation; Hansen Coupling Div.

- B. General Requirements for Quick Couplings: Assembly with locking-mechanism feature for quick connection and disconnection of compressed air hose.
- C. Valveless Quick Couplings: Straight-through brass body with stainless-steel or nickel-plated-steel operating parts.
 - 1. Socket End: With O-ring or gasket seal, without valve, and with barbed inlet for attaching hose.
 - 2. Plug End: With barbed outlet for attaching hose.

PART 3 - EXECUTION

- 3.01 PIPING APPLICATIONS
 - A. Compressed Air Piping: Use the following piping materials:
 - 1. NPS 2 to NPS 5: Schedule 40, black-steel pipe; threaded, malleable-iron fittings; and threaded joints.
 - B. Drain Piping: Use the following piping materials:
 - C. NPS 2 and Smaller: Type M copper tube; wrought-copper fittings; and brazed or soldered joints.

3.02 VALVE APPLICATIONS

- A. High-Pressure Compressed Air: Valve types specified for medium-pressure compressed air.
- B. Equipment Isolation NPS 2 and Smaller: Safety-exhaust, copper-alloy ball valve with exhaust vent and pressure rating at least as great as piping system operating pressure.
- C. Lift Check Valves, NPS 2 and Smaller: Type 2, Class 125, horizontal or vertical, bronze.
- D. Swing Check Valves, NPS 2 and Smaller: Type 4, Class 125, bronze.
- E. Spring Loaded, Lift Disc Check Valves, NPS 2 and Smaller: Type IV, Class 125 minimum.
- F. Gate Valves, NPS 2 and Smaller: Type 2, Class 125, bronze.
- G. Globe Valves, NPS 2 and Smaller: Type 2, Class 125, bronze.

3.03 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of compressed air piping. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, air compressor sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.
- C. Install piping adjacent to equipment and machines to allow service and maintenance.
- D. Install air and drain piping with 1 percent slope downward in direction of flow.
- E. Install nipples, flanges, unions, transition and special fittings, and valves with pressure ratings same as or higher than system pressure rating, unless otherwise indicated.
- F. Equipment and Specialty Flanged Connections:
 - 1. Use steel companion flange with gasket for connection to steel pipe.
 - 2. Use cast-copper-alloy companion flange with gasket and brazed or soldered joint for connection to copper tube. Do not use soldered joints for connection to air compressors or to equipment or machines producing shock or vibration.
- G. Flanged joints may be used instead of specified joint for any piping or tubing system.
- H. Extended-tee outlets with brazed branch connection may be used for copper tubing, within extruded-tee connection diameter to run tube diameter ratio for tube type, according to Extruded Tee Connections Sizes and Wall Thickness for Copper Tube (Inches) Table in ASTM F2014.
- I. Install eccentric reducers where compressed air piping is reduced in direction of flow, with bottoms of both pipes and reducer fitting flush.
- J.Install branch connections to compressed air mains from top of main. Provide drain leg and drain trap at end of each main and branch and at low points.
- K. Install thermometer and pressure gauge on discharge piping from each air compressor and on each receiver.
- L. Install piping to permit valve servicing.
- M. Install piping free of sags and bends.
- N. Install fittings for changes in direction and branch connections.

O. Install seismic restraints on piping. Seismic restraint devices are specified in the section "HANGER AND SUPPORT INSTALLATION" below.

3.04 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- D. Brazed Joints for Copper Tubing: Join according to AWS's Brazing Handbook, "Pipe and Tube" chapter.
- E. Soldered Joints: Apply ASTM B813, water-flushable flux, unless otherwise indicated, to tube end. Join according to ASTM B828 or CDA's Copper Tube Handbook.
- F. Extruded-Tee Outlets for Copper Tubing: Form branches according to ASTM F2014, with tools recommended by procedure manufacturer, and using operators qualified according to "Quality Assurance" in Part 1.
- G. Flanged Joints: Use asbestos-free, nonmetallic gasket suitable for compressed air. Join flanges with gasket and bolts according to ASME B31.9 for bolting procedure.
- H. Grooved Joints: Assemble couplings with housing, gasket, lubricant, and bolts. Join according to AWWA C606 for grooved joints. Do not apply lubricant to prelubricated gaskets.
- I. Dissimilar Metal Piping Material Joints: Use dielectric fittings.

3.05 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.

- D. Install valves in position to allow full stem movement.
- E. Install check valves for proper direction of flow and as follows:
 - 1. Swing Check Valves: In horizontal position with hinge pin level.
 - 2. Dual Plate Check Valves: In horizontal or vertical position, between flanges.
 - 3. Lift Check Valves: With stem upright and plumb.
- F. Install shutoff valves and unions or flanged joints at compressed air piping to air compressors.
- G. Install shutoff valve at inlet to each automatic drain valve, filter, lubricator, and pressure regulator.
- H. Install check valves to maintain correct direction of compressed air flow to and from compressed air piping specialties and equipment.

3.06 DIELECTRIC FITTING INSTALLATION

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. NPS 2 and Smaller: Use dielectric unions.
- C. NPS 2-1/2 to NPS 4: Use dielectric flanges.

3.07 FLEXIBLE PIPE CONNECTOR INSTALLATION

- A. Install flexible pipe connectors in discharge piping and in inlet air piping from remote air-inlet filter of each air compressor.
- B. Install bronze-hose flexible pipe connectors in copper compressed air tubing.
- C. Install stainless-steel-hose flexible pipe connectors in steel compressed air piping.

3.08 SPECIALTY INSTALLATION

- A. Install safety valves on receivers in quantity and size to relieve at least the capacity of connected air compressors.
- B. Install air-main pressure regulators in compressed air piping at or near air compressors.
- C. Install air-line pressure regulators in branch piping to equipment and tools.
- D. Install automatic drain valves on aftercoolers, receivers, and dryers. Discharge condensate onto nearest floor drain.

- E. Install coalescing filters in compressed air piping at or near air compressors and upstream from mechanical filters.
- F. Install mechanical filters in compressed air piping at or near air compressors and downstream from coalescing filters.
- G. Install air-line lubricators in branch piping to machine tools. Mount on wall at locations indicated.
- H. Install quick couplings at piping terminals for hose connections.
- I. Install hose assemblies at hose connections.

3.09 CONNECTIONS

- A. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment and machine.
- B. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment and machine.

3.10 ESCUTCHEON INSTALLATION

- A. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
 - 1. New Piping:
 - a. Piping with Fitting or Sleeve Protruding from Wall: One piece, deep pattern.
 - b. Bare Piping at Wall Penetrations in Finished Spaces: One piece, cast brass with polished chrome-plated finish.
 - c. Bare Piping in Unfinished Service Spaces: One piece, cast brass with polished chrome-plated finish.
 - d. Bare Piping in Equipment Rooms: One piece, stamped steel with set screw or spring clips.

3.11 HANGER AND SUPPORT INSTALLATION

- A. Install seismic restraints according to applicable codes and regulations and as approved by authorities having jurisdiction, unless more stringent requirements are indicated.
- B. Vertical Piping: MSS Type 8 or 42, clamps.
- C. Individual, Straight, Horizontal Piping Runs:

- 1. 100 Feet or Less: MSS Type 1, adjustable, steel clevis hangers.
- 2. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
- D. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
- E. Base of Vertical Piping: MSS Type 52, spring hangers.
- F. Support horizontal piping within 12 inches of each fitting and coupling.
- G. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.
- H. Install hangers for Schedule 40, steel piping with the following maximum horizontal spacing and minimum rod diameters unless otherwise noted in drawings:
 - 1. NPS 1/4 to NPS 1/2: 96 inches with 3/8-inch rod.
 - 2. NPS 3/4 to NPS 1-1/4: 84 inches with 3/8-inch rod.
 - 3. NPS 1-1/2: 12 feet with 3/8-inch rod.
 - 4. NPS 2: 13 feet with 3/8-inch rod.
 - 5. NPS 2-1/2: 14 feet with 1/2-inch rod.

I. Install supports for vertical, Schedule 40, steel piping every 15 feet.

- J. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1/4: 60 inches with 3/8-inch rod.
 - 2. NPS 3/8 and NPS 1/2: 72 inches with 3/8-inch rod.
 - 3. NPS 3/4: 84 inches with 3/8-inch rod.
 - 4. NPS 1: 96 inches with 3/8-inch rod.
 - 5. NPS 1-1/4: 108 inches with 3/8-inch rod.
 - 6. NPS 1-1/2: 10 feet with 3/8-inch rod.
 - 7. NPS 2: 11 feet with 3/8-inch rod.
- K. Install supports for vertical copper tubing every 10 feet.

3.12 LABELING AND IDENTIFICATION

A. Install identifying labels, colors and devices for general-service compressed air piping, valves, and specialties in compliance with the requirements of ASME A13.1 and section 22 05 53 "Identification for Plumbing Piping and Equipment".

3.13 FIELD QUALITY CONTROL

- A. Perform field tests and inspections.
- B. Tests and Inspections:
 - Piping Leak Tests for Metal Compressed Air Piping: Test new and modified parts of existing piping. Cap and fill general-service compressed air piping with oil-free dry air or gaseous nitrogen to pressure of 50 psig above system operating pressure, but not less than 150 psig. Isolate test source and let stand for 200 hours to equalize temperature. Refill system, if required, to test pressure; hold for two hours with no drop in pressure.
 - 2. Repair leaks and retest until no leaks exist.
 - 3. Prepare test reports.

END OF SECTION

PART 1 - GENERAL

- 1.01 RELATED WORK SPECIFIED ELSEWHERE
 - A. The provisions and intent of the contract, including general conditions and general requirements, apply to this work as if specified in this section. Work related to this section is described in the following sections:
 - 1. Section 22 05 00 Common Work results for Plumbing
 - 2. Section 22 45 33 Emergency Plumbing Units

1.02 SUMMARY

- A. Section Includes:
 - 1. Domestic water heater systems:
 - a. Tankless, electric water heaters.
 - b. Accessories.

1.03 SUBMITTALS

- A. Product Data: For each type and size of water heater. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.
- B. Shop Drawings: Detail water heater assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 1. Wiring Diagrams: Power, signal, and control wiring. Differentiate between manufacturer installed and field installed wiring.
- C. Product Certificates: Signed by manufacturers of water heaters certifying that products furnished comply with requirements.
- D. Maintenance Data: For water heaters to include in maintenance manuals specified.

1.04 QUALITY ASSURANCE

- A. Source Limitations: Obtain same type of water heaters through one source from single manufacturer.
- B. Product Options: Drawings indicate size, profiles, and dimensional requirements of water heaters and are based on specific units indicated. Other manufacturers' products complying with requirements may be considered.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction, and marked for intended use.

- D. ASME Compliance: Fabricate and label water heater hot water storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Pressure Vessels, Division 1.
- E. ASHRAE Standards: Comply with performance efficiencies prescribed for the following
 - 1. ASHRAE 90.1, Energy Standard of New Buildings Except Low-Rise Residential Buildings for commercial water heaters.
- 1.05 WARRANTY
 - A. Warranty: written warranty, executed by manufacturer agreeing to repair or replace components of water heaters that fail in materials or workmanship within specified warranty period.
 - 1. Failures include heating elements.
 - B. Warranty period: from date of final acceptance:
 - 1. Heating elements: 5 years.
 - 2. All others: 1 year.

PART 2 - PRODUCTS

- 2.01 MANUFACTURERS
 - A. Manufacturers: subject to compliance with requirements, provide products by one of the following, or equal approved as a comparable product:
 - 1. Tankless, electric water heaters (ewh -1):
 - a. Eemax, inc.
 - b. Hubbell heaters.

2.02 TANKLESS, ELECTRIC WATER HEATERS

- A. Unit shall be suitable for emergency shower and eyewash comply with ul 499 and ansi z358.1 and can be installed in the weather with temperature below freezing point. Factory set outlet temperature at 75° f (adjustable)
- B. Construction: without hot water storage.
 - 1. Working Pressure Rating: 125 psig minimum.
 - 2. Tapings: ASME B1.20.1, pipe thread.
 - 3. Interior Finish: Materials complying with NSF 61, barrier materials for potable-water tank linings.
 - 4. Jacket: Aluminum or steel, with enameled finish.

- C. Heating System: Electric resistance type.
 - 1. Temperature Control: Adjustable thermostat.
 - 2. Safety Control: Automatic, factory installed high temperature limit cutoff device with auto reset
- D. Mounting: Bracket or device for wall mounting.

2.03 WATER HEATER ACCESSORIES

- A. Combination temperature and pressure relief valves: asme rated and stamped and complying with asme ptc 25.3. Include relieving capacity at least as great as heat input and include pressure setting less than water heater working pressure rating. Select relief valve with sensing element that extends into tank.
 - 1. Option: separate temperature and pressure relief valves are acceptable instead of combination relief valve.
 - 2. Exception: Omit combination temperature and pressure relief valve for tankless water heater, and furnish pressure relief valve for installation in piping.
- B. Pressure Relief Valves: ASME rated and stamped and complying with ASME PTC 25.3. Include pressure setting less than heat exchanger working pressure rating.
- C. Vacuum Relief Valves: Comply with ASME PTC 25.3. Furnish for installation in piping.
 - 1. Exception: Omit if water heater has integral vacuum relieving device.
- D. Water Regulators: ASSE 1003, water pressure reducing valve. Set at 25 psig maximum outlet pressure.
- E. Shock Absorbers: ASSE 1010 or PDI WH 201, Size A water hammer arrester.
- F. Water Heater Mounting Brackets: Water heater manufacturer's factory fabricated, steel bracket for wall mounting and capable of supporting water heater and water or Nema 4/4x and recommended by manufacturer.

PART 3 - EXECUTION

3.01 WATER HEATER INSTALLATION

- A. Install water heaters on wall brackets or in nema 4/4x enclosure, level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so that controls and devices needing service are accessible.
- B. Install pressure relief valves in water piping for water heaters without storage. Extend relief valve outlet with water piping in continuous downward pitch and discharge onto closest floor drain.

- C. Install vacuum relief valves in cold water inlet piping.
- D. Install water heater drain piping as indirect waste to spill into open drains or over floor drains. Install hose end drain valves at low points in water piping for water heaters that do not have tank drains.
- E. Fill water heaters with water.

3.02 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to machine to allow service and maintenance.
- C. Connect hot and cold water piping with shutoff valves and unions. Connect hot water circulating piping with shutoff valve, check valve, and union.
- D. Make connections with dielectric fittings where piping is made of dissimilar metal.
- E. Electrical connections: power wiring and disconnect switches are specified in division 26. Arrange wiring to allow unit service.
- F. Ground equipment.
 - 1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in ul 486a and ul 486b.

3.03 FIELD QUALITY CONTROL

- A. Engage factory authorized service representative to perform startup service.
- B. In addition to manufacturer's written installation and startup checks, perform the following:
 - 1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 2. Verify that piping system tests are complete.
 - 3. Check for piping connection leaks.
 - 4. Check for clear relief valve inlets, outlets, and drain piping.
 - 5. Test operation of safety controls, relief valves, and devices.
 - 6. Energize electric circuits.
 - 7. Adjust operating controls.
 - 8. Adjust hot water outlet temperature settings. Do not set above 140 deg F unless piping system application requires higher temperature.

9. Balance water flow through manifolds of multiple unit installations.

3.04 DEMONSTRATION

- A. Engage factory authorized service representative to train Tacoma Rail maintenance personnel to adjust, operate, and maintain water heaters.
 - 1. Train Tacoma Rail's maintenance personnel on procedures for starting and stopping, troubleshooting, servicing, and maintaining equipment.
 - 2. Review data in maintenance manuals.
- B. Schedule training with Tacoma Rail, through Engineer, with at least 7 days' advance notice.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including General Conditions and General Requirements, apply to this work as if specified in this Section. Work related to this Section is described in the following sections:
 - 1. Section 22 33 13 Instantaneous Electric Water Heater

1.02 SUMMARY

- A. Section Includes:
 - 1. Combination emergency eye/face wash and shower unit.

1.03 DEFINITIONS

- A. Plumbed Emergency Plumbing Fixture: Fixture with fixed, potable water supply.
- B. Tepid: Approximately 85 deg F temperature.
 - 1. Allowable Variation: Plus or minus 5 deg F.

1.04 SUBMITTALS

- A. Product Data: Include flow rates and capacities; shipping, installed, and operating weights; furnished specialties; and accessories for each product indicated.
- B. Shop Drawings: Diagram power, signal, and control wiring and differentiate between manufacturers installed and field installed wiring.
- C. Product Certificates: Submit certificates of performance testing.
- D. Maintenance Data: For emergency plumbing fixtures to include in maintenance manuals.

1.05 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

- 2. ANSI Standard: Comply with ANSI Z358.1, Emergency Eyewash and Shower Equipment.
- 3. Comply with State of Washington Building Code.
- 4. Comply with ADA Standards for Accessible Design, 28 CFR Part 36, Appendix A.
- 5. NSF Standard: Comply with NSF 61, Drinking Water System Components--Health Effects, for fixture materials that will be in contact with potable water.
- 6. Suitable to be installed in the weather with temperature below freezing point in Tacoma

1.06 COORDINATION

A. Coordinate roughing in and final plumbing fixture locations, and verify that fixtures can be installed to comply with original design and referenced standards.

PART 2 - PRODUCTS

2.01 COMBINATION UNITS

- A. Combination Units, EWS-1: Plumbed, accessible, freestanding type with emergency shower and eye/face wash, and barrier free equipment.
 - 1. Basis of Design: Bradley Corporation, Model No. S19-310, frost proof unit suitable for area subject to freezing, with heat trace, bottom water supply and indicator lights
 - 2. Subject to compliance with requirements, provide the indicated product, a comparable product by one of the following, or equal approved as a comparable product:
 - a. Encon Safety Products.
 - b. Guardian Equipment Co.
 - c. Haws Corporation.
 - d. Speakman Co.
 - 3. Unit shall be designed and made for areas subject to freezing. Shower valve shall operate by pull rod with large triangular handle. Eyewash valve shall

operate by large, highly visible push handle. Shower shall provide washdown with a more even spray pattern

- 4. Shower head: Shall be impact-resistant plastic, minimum diameter 3 inches. Showerhead shall include integrated 22 GPM flow control.
- 5. Sprayhead assembly: Chrome-plated brass sprayhead with twin, soft flow, eyewash head and protective sprayhead cover.
- 6. Eyewash: Eyewash spray assembly shall deliver 5.1 GPM evenly across the eyes and face. Eyewash shall be covered by dust cover fabricated from impact resistant plastic which activates the eyewash spray when the cover is lifted.
- 7. Piping and fittings:
 - a. Unit Drain: Bottom.
 - b. Shower Supply: NPT 1-1/4, bottom supply
 - c. Shower and Eyewash Valves: Chrome plated brass stay open ball valves, $\frac{1}{2}$ inch NPT for eye wash and 1 inch NPT for shower.
- 8. Unit shall be encased in a protective outer shall made from safety yellow ABS plastic with removable sections for repair and maintenance.
- 9. Unit shall be furnished with a thermostatic mixing valve satisfying the requirements for ANSI/SEA Z358.1 for tepid water.
- 10. Heat trace shall be factory installed and shall be powered from 120VAC and shall be self regulated from +32 degrees Fahrenheit to -50 degrees Fahrenheit.
- 11. Shower Capacity: Deliver potable water at rate not less than 22 gpm for at least 15 minutes.
- 12. Indicator Lights: Unit shall include indicator lights rated for use in general areas, indicator lights shall signal green for power to the unit and amber for active heat trace.
- 13. Unit shall be provided with a freeze protection valve supplied by the manufacturer of the emergency shower eye/face wash unit.

2.02 SOURCE QUALITY CONTROL

A. Certify performance of plumbed and self contained emergency plumbing fixtures by independent testing agency acceptable to authorities having jurisdiction.

PART 3 - EXECUTION

3.01 EXAMINATION

a.

B. Examine roughing in for water and waste piping systems to verify actual locations of piping connections before plumbed emergency plumbing fixture installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 EMERGENCY PLUMBING FIXTURE INSTALLATION

- A. Assemble emergency plumbing fixture piping, fittings, control valves, and other components according to manufacturer's written instructions.
- B. Install fixtures level and plumb.
- C. Fasten fixtures to substrate. Utilize manufacturer provided fastening templates to layout anchor bolts and fasteners.
- D. Install shutoff valves in water supply piping to fixtures. Use ball, gate, or globe valve if specific type valve is not indicated. Install valves chained or locked in open position if permitted. Install valves in locations where they can easily be reached for operation.
 - 1. Exception: Omit shutoff valves on valved supplies to group of plumbing fixtures that includes emergency plumbing fixture.
 - 2. Exception: Omit shutoff valves on supplies to emergency equipment if prohibited by authorities having jurisdiction.
- E. Install dielectric fitting in supply piping to fixture if piping and fixture connections are made of different metals. Refer to Section 22 05 00, Common Work Results for Plumbing, for dielectric fittings.

3.03 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect cold water supply piping to plumb emergency plumbing fixtures not having water tempering equipment.
- C. Connect output from instantaneous water heater to emergency plumbing fixtures. Verify water supply temperature to be 750 F or above but not to exceed 850 F.

D. Ground Equipment: Tighten electrical connectors and terminals according to manufacturer's published torque tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.04 FIELD QUALITY CONTROL

- A. Mechanical Component Testing: After plumbing connections have been made, test for compliance with requirements. Verify ability to achieve indicated capacities and temperatures.
- B. Repair or replace malfunctioning units. Retest as specified above after repairs or replacements are made.
- C. Report test results in writing.

3.05 ADJUSTING

- A. Adjust or replace fixture flow regulators for proper flow.
- B. Adjust equipment temperature settings.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including General Conditions and General Requirements, apply to this work as if specified in this Section. Work related to this Section is described in the following sections:
 - 1. Section 03 30 00 Cast-in-Place Concrete
 - 2. Section 22 70 16 Fuel Oil Storage Tanks
 - 3. Section 22 70 19 Fuel Oil Management and Inventory System
 - 4. Section 22 05 00 Common Work Results for Plumbing
 - 5. Section 22 05 23 General Duty Valves for Plumbing Pipes
 - 6. Section 22 05 53 Identification for Plumbing Piping and Equipment
 - 7. Section 26 05 00 Common Work Results for Electrical

1.02 SUMMARY

- A. Section Includes:
 - 1. Complete design and construction of diesel fuel storage, distribution, and dispensing system, including but not limited to the following:
 - a. Aboveground fuel oil storage tanks and appurtenances.
 - b. Spill containment unit.
 - c. Fuel oil dispensing pumps.
 - d. Fuel oil pumpdown pump.
 - e. Fuel oil filters.
 - f. Fuel cranes (dispensers).
 - g. Fuel oil receiving meter.
 - h. Fuel oil piping, valves, and fittings.
 - i. Thermal-pressure relief / bypass valves.
 - j. Automatic air vents.

- k. Pressure relief / safety valves.
- I. Check valves.
- m. Butterfly valves.
- n. Ball valves.
- o. Pressure gauges.
- p. Vent caps.
- q. Emergency Vent caps.
- r. Fuel management system and inventory system.
- s. Miscellaneous devices and equipment required for proper operation of the fuel oil system.
- 2. Provide calculations, specifications, and final detailed design drawings. Submit for plan check and pull permits from the City of Tacoma Building and Safety Department, Fire Department, Environmental Health Department, and other agencies having jurisdiction. The fuel oil system shown on the Drawings depicts the system concept, which shall be followed. Equipment sizes shown are the minimum required. Increase sizes as needed and provide additional equipment and devices for a complete, properly working system without additional cost to the owner. Provide required equipment, devices, piping, and power for a complete working fuel oil system as intended.
- B. Two portions of the fuel oil system are addressed in other specification sections. The aboveground storage tank is addressed in Section 22 70 16, Fuel Oil Storage Tanks, and the fuel monitoring and inventory system is addressed in Section 22 70 19, Fuel Oil Management and Inventory System. The work of those sections is part of the fuel oil system.

1.03 SYSTEM DESCRIPTION

- A. The fuel oil system shall be designed and installed to dispense diesel fuel for locomotives at the maintenance shed as follows:
 - 1. Aboveground Storage Tanks: Install one 40,000 gallon aboveground storage tank to store diesel fuel for fuel supply to locomotives. The tank shall be located and supported on a concrete pad above the flood level and be anchored down to avoid floating or flooded away.

- 2. Fuel Oil Dispensing Pumps: Provide one high flow submersible pump (P-1) to deliver diesel fuel to one fuel cranes located on plan. The pump shall be capable of delivering 250 gpm nominal diesel fuel to one fuel crane. Prepare for one future additional submersible pump at same capacity as the first fuel pump for delivery fuel oil to the future fuel crane.
 - a. Pump P-1 shall serve fuel crane FC-1
 - b. Provide fitting for future Pump P-2 and one more additional fitting for one more additional future pump or other device.
 - c. A thermal-pressure relief / bypass valve at the end of run will relieve any pressure or expansion due to thermal effect internal to the fuel crane.
- 3. Fuel Oil Pump-Down Pump: Install a fuel oil pump-down pump to pump fuel from Filter and all strainers before servicing.
- 4. Fuel Oil Filter: Install one fuel oil filter, F-1 at the upstream of receiving meter and air eliminator in accordance with the fuel flow diagram on the Drawings.
- 5. Fuel Cranes (Dispensers): Install one fuel crane at the center of the service island as indicated on the drawings. The fuel crane shall be capable of dispensing 250 gpm.
- 6. Basket Strainers: Install a basket strainer at the inlet side of the meter.
- 7. Receiving Meter: Provide a receiving meter with air eliminator between the fuel connection to the hose from the delivery truck and the storage tank to keep track of the amount of fuel delivered from the truck to the storage tank. Provide a prover loop at the meter to verify and for local calibrating the accuracy of the meter and calibrating the meter without removal of meter.
- 8. Leak Detection, Monitoring, and Fuel Inventory System: Install system to detect leaks between the inner and outer shells of the aboveground storage tank and a tank probe for fuel inventory in the tank.
- 9. Fuel Management System: Install a fuel management system at the fuel cranes to keep track of fuel dispensed to each locomotive by each train operator, and also fuel received from the fuel truck for fuel inventory. See Section 22 70 19, Fuel Oil Management and Inventory System.

1.04 SUBMITTALS

A. Fuel Oil System: Submit complete design drawings, specifications, and shop drawings indicating system layout, pipe sizes, location of supports, elevations, and equipment mounting details, including system calculations for Engineer's review and approval. Provide piping and instrument diagram for the system including a

complete bill of materials / equipment list. Provide complete design and conformance with all codes. The fuel oil system shall be designed by or under the supervision of professional engineers licensed in the state of Washington, who shall sign and stamp their discipline drawings. After approval by Engineer, submit design package to local authorities for plan check, approval and pulling permit.

- B. Electrical System: Submit drawings and specifications that include the proposed conduit layout and wiring diagrams for equipment covered in this Section that requires electrical connections. Indicate conduit size and material, number and size of wires, location of wiring in classified areas, and location of intrinsically safe circuits and conduits. Electrical system design shall include a separate power distribution panel for the fuel system if more than 4 electrical circuits are required. Provide a one-line power diagram. Provide an electrical equipment list.
- C. Product Data: Submit manufacturer's catalog cut sheets for all equipment, pumps, filters, valves, piping, and fittings, including data for capacity, dimensions, materials, etc., demonstrating compliance with all codes and regulations applicable for installation in the State of Washington and the City of Tacoma.
- D. Control System: Submit detailed sequence of operation and control diagram and manufacturer's catalog cut sheets for the control system, devices, wiring. See Section 22 70 19, Fuel Oil Management and Inventory System.
- E. Calculations: Submit calculations for pump selection, pipe sizes, and pipe support requirements.
- F. Equipment Data: Submit manufacturer's information for all equipment.
- G. Permit Applications: Submit copies of all permit applications.
- H. Schedule: Submit a design and installation schedule.
- I. Commissioning: Submit a detailed commissioning plan as part of the submittal package. Pre-commissioning activities such as checking rotation of pumps shall be distinguished from actual commissioning (fuel movement) activities.
- J. Training: Submit a detailed objective-oriented, module-based training plan. For each module, provide an outline of learning objectives, including a description of specific skills and knowledge that each trainee is expected to master. Modules shall

include: Basis of System Design, Regulatory Requirements, Equipment Function, Emergency Operation of System, Maintenance of System, Troubleshooting of Typical Problems, and Repair. All training is to be videotaped for Tacoma Rail in format selected by Tacoma Rail.

- K. Labeling and Signage: Provide a detailed plan locating all signs and placards and detailing their text, colors, and letter sizes. Plan shall include No Smoking and hazardous materials placards and phenolic labels for cabinets, valves, sumps, and pumps.
- L. Welding Procedure: Submit proposed welding procedure specification in accordance with Section IX of ASME Code, Appendix II, QA-10 Recommended Forms Q-1 of Welding Procedure Qualification Test and of Appendices A, B, and D to Section 6 of ANSI Code for Pressure Piping.
- M. Welder Qualifications: As described in "Quality Assurance" article.
- N. Certification: As described in "Final Inspection, Training, and Documentation" article.

1.05 REFERENCE STANDARDS

- A. Design and construction shall conform to all applicable codes, including the following codes and standards.
- B. NFPA National Fire Protection Association:
 - 1. NFPA 1 National Fire Code.
 - 2. NFPA 30 Flammable and Combustible Liquids Code.
 - 3. NFPA 30A Code for Motor Fuel Dispensing Facilities and Repair Garages.
- C. Code Washington Codes:
 - 1. Washington State Building Code.
 - 2. Washington State Amendments to the International Existing Building Code
 - 3. International Fire Code
- D. Tacoma Fire Department:

- 1. Permit application #2000.1, Aboveground Tank Installation Commercial.
- E. ASME American Society of Mechanical Engineers and ANSI American National Standards Institute:
 - 1. ASME/ANSI B1.1 Unified Inch Screw Threads, UN and UNR Thread Form.
 - 2. ASME/ANSI B16.21 Nonmetallic Flat Gaskets for Pipes Flanges.
 - 3. ASME/ANSI B16.39 Malleable Iron Threaded Pipe Unions.
 - 4. ASME/ANSI B18.2.1 Square and Hex Bolts and Screws, Inch Series.
 - 5. ASME/ANSI B18.2.2 Square and Hex Nuts.
 - 6. ASME/ANSI B31.4 Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids.
- F. API American Petroleum Institute:
 - 1. API 599 Metal Plug Valves Flanged, Threaded and Welding End.
 - 2. API 600 Bolted Bonnet Steel Gate Valves for Petroleum and National Gas Industries Modified National Adoption.
 - 3. API 650 Welded Steel Tanks for Oil Storage.
 - 4. API 2000 Venting Atmospheric and Low Pressure Storage Tanks: Nonrefrigerated and Refrigerated.
- G. ASTM ASTM International:
 - 1. ASTM A53 Standard Specification for Polyethylene Gas Pressure Pipe, Tubing and Fittings.
 - 2. ASTM A307 (A307M) Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- H. UL Underwriters Laboratories Inc.:
 - 1. UL 142 Steel Aboveground Tanks for Flammable and Combustible Liquids.
 - 2. UL 2085 Protected Aboveground Tanks for Flammable and Combustible Liquids.

1.06 QUALITY ASSURANCE

- A. Fuel oil system installer shall be approved or qualified by Engineer.
 - 1. Requirements for fuel oil system installer include the following:
 - a. The firm shall have experience in design and construction of automatic fuel oil distribution systems for industrial, railroad, or commercial automobile facilities similar to the required system for this project. This experience shall encompass the following key design elements:
 - (1) Aboveground pumping system using submersible pump
 - (2) Distribution / dispensing at a rate of 50 gpm or greater.
 - (3) Storage tank size of 12,000 gallon capacity.
 - (4) Aboveground fuel piping.
 - (5) Fuel management system
 - (6) Installation of aboveground storage tanks.
 - (7) Installation in the state of Washington.
 - b. The firm shall have design capability and demonstrate understanding of Federal, State of Washington, City of Tacoma and local code requirements including NFPA, UL, ASTM, and API standards and guidelines relating to aboveground storage tanks, fuel oil distribution, and fueling systems, including leak detection and monitoring systems, tank inventory systems, and fuel management systems. If a subconsultant will be used for design, submit the subconsultant's qualifications for review as part of the qualifications package.
 - c. The firm shall provide information for no fewer than three projects executed within the last five years that remain in satisfactory operation. Provide the following:
 - (1) Client, project name and location, year completed, and summary description of work, including whether construction only or design-build.
 - (2) Client Contact Information: Names, addresses, titles, and phone numbers of the engineers or technicians who operate the fuel oil system.
 - (3) Drawings and photographs, if available.
 - (4) Projects for which the firm provided, or currently provides, extended warranty of preventive maintenance service, remote system monitoring, or an emergency repair service contract. Experience of this type is preferred but not mandatory.
 - (5) Any other data the firm deems useful in establishing competence.
 - d. The firm shall hold current Washington State contractor's licenses in all required categories including A, B, C, and HAZ.
 - e. The firm shall provide evidence of general liability and pollution liability insurance.

- f. The firm's design work for this project shall be conducted under the supervision of the Washington State-licensed professional engineer.
- B. Manufacturers shall be firms regularly engaged in manufacture of fuel oil storage and dispensing with characteristics and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.
- C. Installation of the equipment in this section shall be carried out under the direction of a qualified supervisor employed by the manufacturer who is thoroughly experienced and trained in pertinent trades and who shall be present at the site to direct the work.
- D. Employ an adequate number of specialists who are skilled workman and who are thoroughly experienced and trained in the methods and requirements necessary for the proper execution of the work under this section.
- E. Provide equipment whose performance under specified conditions is guaranteed by the manufacturer.
- F. Equipment and components shall be suitably packed or crated to prevent damage during shipping and handling. Equipment and components shall be carefully stored and handled at the site to avoid damage or distortion, and shall be adequately protected against damage from weather or other causes.
- G. Verify and coordinate with the manufacturer all dimensions of the structures that relate to fabrication of the fuel dispensing system and notify the Engineer of any discrepancy before ordering materials and equipment and also before performing fabrication or installation work.
- H. Surfaces to receive metal fabrications shall be sound, square, and true. Examine surfaces prior to installation of the fabrications and correct defects which might impair the operability or shorten the life of any component.
- Qualification of Welders: Welders performing work under this contract shall be certified and qualified in accordance with tests prescribed by the National Certified Welding Bureau (NCWB) or by other approved test procedures using methodology and procedures covered in the ASME Boiler and Pressure Vessel Code, Section IX, Qualification Standard for Welding and Brazing Procedures, Welders, Braziers, and Welding and Brazing Operators.
 - 1. Submit names, identification, and welder's assigned number, letter, or symbol.

- 2. The assigned identification symbol shall be used to identify the work of each welder and shall be indelibly stamped immediately upon completion of each weld.
- 3. Welders shall be tested and certified for all positions.
- 4. If requested, submit identifying stenciled test coupons made by each operator.
- 5. If requested, any or all welders shall retake welding certification tests at no additional expense to Owner.
 - a. When so requested, a welder shall not be permitted to work as a welder on this project until he has been recertified in accordance with NCWB.
 - b. Submit recertification after the welder has taken and passed the required tests.
- 6. Where piping 1-1/2 inches and smaller is to be butt or socket welded, submit three samples of test weld for approval.
- J. Checklist: Provide an installation checklist certifying that installation has been completed in accordance with the manufacturer's recommendations.

1.07 REGULATORY REQUIREMENTS

- A. Submit to and comply with requirements of EPA and state and local authorities having jurisdiction. Comply with requirements for plan check, permitting, and registration of fuel storage tanks, accessories, and appurtenances.
- B. Submit documentation, plan check, and permits to owner demonstrating that the fuel oil system has been submitted to the City of Tacoma Fire Department, Building Department, County Environmental Health Department for review and approval, that plan check was approved, and that related permits have been issued.

1.08 WARRANTY

- A. Warranty shall comply the following:
 - 1. Manufacturer, installer, and Contractor warrant that the work performed, and all materials and equipment, are free from defects in design, material, workmanship, and operation for a period of one year from the date of Substantial Completion or, if different, date of acceptance by owner.
 - 2. Contractor shall remedy any such defect at his own expense.

- 3. Contractor shall furnish written warranties required by the respective sections of the specifications for the time periods stipulated therein. Warranties shall be in writing, on manufacturer / installer / Contractor letterhead, and shall be included in the operation and maintenance manuals.
- 4. Major equipment components (as required by respective sections of the specifications), specifically those manufactured by other than the primary equipment manufacturer, shall be covered by their own respective warranties, which shall not be less than the manufacturer's / installer's / Contractor's standard warranty.
- 5. Nothing in project requirements, conditions, or specifications, including owner's right to a complete inspection, shall constitute a disclaimer to or limit, negate, exclude, or modify any warranty created hereunder.
- 6. Mechanical and electrical components, including but not limited to cranes, hoses, nozzle assemblies, pumps, valves, sensors, gauges, and meters, shall be warranted by the manufacturer for a period of not less than one year from Substantial Completion. Warranty service shall include labor and materials to replace any parts or controls which fail in service as the result of a defect in material or manufacture.

1.09 PROJECT RECORD DOCUMENTS

A. Record and submit drawings showing actual locations of piping system, storage tanks, wiring, conduit runs, sizes and capacity, and system components. Include printouts of final PLC ladder logic diagrams. Diagrams shall have all descriptions in English. Include printouts of Excel spreadsheets detailing all welds. Include copies of all acceptance documents and completed pre-commissioning and commissioning plans.

1.10 OPERATION AND MAINTENANCE MANUALS

- A. Operational Data: Include installation instructions and exploded assembly views.
- B. Maintenance Data: Include maintenance and inspection data, replacement part numbers, availability, and service depot location and telephone number.

PART 2 - PRODUCTS

- 2.01 ABOVEGROUND FUEL OIL STORAGE TANKS
 - A. Refer to Section 22 70 16, Fuel Oil Storage Tanks.

2.02 FUEL OIL DISPENSING PUMPS

- A. Pump shall be high capacity submersible pump suitable for delivery 250 gpm of diesel fuel. Pump shall be two stage centrifugal pump driven by a premium motor to provide high head. Pump HP shall be 5 HP or larger capable to deliver the required flow at the required head. Unit shall be with 6" diameter riser pipe to mount the pump to the tank. Unit shall be complete with complete control system including dry run protection, extended pump run detection, over/under voltage, voltage load unbalance, phase loss, locked rotor, open circuit, etc. Voltage shall be 230 volts as specified on the drawing. For any other voltage, contractor shall be responsible to provide transformer as needed. Pump shall be UL listed and meet the requirements of UL 79.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or equal approved as a comparable product
 - 1. FE Petro
 - 2. Red Jacket

2.03 FUEL OIL PUMP-DOWN PUMP

- A. Design: Positive displacement rotary pump with sliding vane design for best combined characteristics of sustained high level performance.
- B. Construction:
 - 1. Pump Casing, Heads, and Relief Valve Cover: Ductile iron, ASTM 536, 18 percent, that will withstand sudden thermal shock and stress.
 - 2. Discs, Bearing Covers, and Liner: Cast iron, ASTM A48.
 - 3. Maintainability: Fitted with replaceable casing liners and end discs to allow easy rebuilding of pump without removing pump from piping.
 - 4. Mounting: Base mounted.
 - 5. Products:
 - a. Basis of Design: Sliding-Vane Rotary Pump
 - b. Manufacturers: Subject to compliance with requirements, provide the indicated product, or equal approved as a substitution:
 - (1) Blackmer

2.04 FUEL OIL FILTERS

- A. Filter Capacity: Designed to filter not less than 350 gpm of diesel fuel.
- B. Features:
 - 1. Fabricated to highest standards.
 - 2. Manufactured to ASME pressure vessel specifications.
 - 3. Automatic air vent.
 - 4. Pressure relief valve / safety valve.
 - 5. Separate inlet and outlet gauges.
 - 6. Designed for easy filter change.
 - 7. Filter element same as locomotive filter.
 - 8. Equipped with drain-back capability to reduce fuel loss.
- C. Products:
 - 1. Basis of Design: Snyder Equipment Company, Inc.
 - 2. Manufacturers: Subject to compliance with requirements, provide the indicated product, a comparable product by one of the following, or equal approved as a substitution:
 - a. Snyder Equipment Company, Inc.
 - b. Velcon Filters, Inc.

2.05 FUEL CRANES (DISPENSERS)

- A. Capacity: Capable of delivering nominal 250 gpm diesel fuel to locomotive including all required fittings.
- B. Interface: Including meters, prover loop, controls, and accessories to interface with fuel management system.
- C. Accessories: Impact valve and other accessories as required by state and local regulatory agencies for fuel oil system.

- D. Fuel Dispensing Nozzle: Equipped with splash guards and pressure-activated shutoff feature to prevent overfilling of fuel tank.
- E. Products:
 - 1. Basis of Design: Snyder Equipment Company, Inc.
 - 2. Manufacturers: Subject to compliance with requirements, provide the indicated product, or equal approved as a substitution:
 - a. Snyder Equipment Company, Inc.

2.06 FUEL OIL RECEIVING METER

- A. The receiving meter assembly shall register fuel delivery to the storage tank and total amount of fuel for any period. It shall also interface with the fuel inventory or fuel management system. Provide an additional remote display in the location designed by owner.
- B. The receiving meter assembly shall include the air eliminator tank, prover loop, and all accessories, valves, and piping.
- 2.07 PIPING
 - A. Double wall High density polyethylene pipe (HDPE) shall be manufactured in accordance with the specifications set-forth in ASTM F2619 and API 15LE "Standard Specification for Polyethylene (PE) line pipe" for diesel fuel transmission. HDPE pipe and fittings should be made from PE4710 resin conforming to ASTM D2513 with the cell classification of 445574C/E conforming to ASTM D3350 and listed with the Plastic Pipe Institute's (PPI) TR4. Pipe shall be carbon black in color, and shall include sufficient markings to demonstrate compliance to industry standards and to provide identification and traceability to a specific lot/batch of raw materials. Pipe shall be furnished in laying lengths of not less than 50 feet.
 - B. HDPE pipe joints shall be made by butt heat fusion in accordance with ASTM F2620 "Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings" and associated specifications for fuel pipe.
 - 1. Manufacturers: Subject to compliance with requirements, provide the indicated product, a comparable product by one of the following, or equal approved as a comparable product:
 - a. U.S. Hose Corporation.

- b. Flex-Hose Co., Inc.
- c. Flexicraft Industries.
- d. Hyspan Precision Products, Inc.
- e. Metraflex Company.
- f. Unaflex Inc.
- g. Franklin Fueling Systems
- C. Provide manufactured pipe markers, arrows for direction of flow, and other necessary pipe markings in accordance with ASME A13.1 and section 22 05 53 "Identification for Plumbing Piping and Equipment".

2.08 BUCKET STRAINERS

A. Bucket Strainer: Basket type strainer with 150 lb. flanges; inlet and outlet on the same centerline; cast steel body; 40 by 40 mesh ASTM 300 series stainless steel baskets; with free area four times the pipe cross-section.

2.09 LEAK DETECTION AND MONITORING SYSTEM

- A. Leak detection and monitoring system shall meet State of Washington aboveground storage tank requirements.
 - 1. Basis of Design: Veeder-Root Company.
 - 2. Subject to compliance with requirements, provide the indicated product, or equal approved as a substitution:
 - a. Veeder-Root Company.

2.10 FUEL MANAGEMENT SYSTEM

- A. General:
 - 1. The system shall be designed to offer a wide variety of operational modes and to provide maximum versatility without special programming or engineering changes.
 - 2. The system shall be easy and inexpensive to expand to adapt to the changing needs of the facility.
- 3. The system shall be easy to install. It shall have a wireless option for connecting the fuel island equipment with the inside equipment to greatly reduce the installation cost.
- 4. The system shall be of modular design, making it inexpensive to maintain.
- 5. The system shall be capable of operating as a complete fuel management system. It shall also be capable of working with the meter installed including the tank inventory system.
- 6. The system shall be configurable and programmable using a Windows based software utility.
- 7. The system shall be able to control multiple brands of dispensers with either mechanical or electronic registers.
- 8. The system's operating software shall be stored in flash memory providing the ability to load upgrades remotely without requiring a person to be present at the site.
- 9. The system shall have the ability to interface with a variety of data processing equipment.
- B. System Overview:
 - 1. The system shall meet the following minimum requirements:
 - a. The system shall control the fuel crane (dispensing equipment) and provide accurate accounting of fuel dispensed.
 - b. Access to the system shall be by keypad. The train operator must punch his identification number or password and the train number.
 - c. At a minimum, the system shall be capable of recording and printing out the following information:
 - (1) Train operator identification number.
 - (2) Train number.
 - (3) Fuel dispensed to train.
 - (4) Accumulated fuel dispensed to train to date and over any period.
 - (5) Total fuel dispensed today.
 - (6) Today fuel dispensed to date and over any period.
 - (7) Interface with the fuel oil tank receiving meter to record and print out the amount received from the fuel truck and total fuel amount received.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine areas and condition under which the fuel oil system is to be installed. Do not proceed with work until any unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install fuel oil system where indicated in accordance with manufacturer's written instructions and with recognized industry practices to ensure that the equipment complies with requirements and serves intended purposes.
- B. Coordinate with other work, including other trades that have work in close proximity to the fuel oil system improvements.
- C. Where Drawings indicate schematically the sizes and locations of piping, set piping up and down and offset it to meet field conditions and accomplish coordination between trades without additional cost to owner. Piping shall conform to applicable standards of current specifications of ASTM.
- D. Furnish and install pipe, fittings, valves, hangers, supports, anchors and accessories specified, indicated on drawings, or required to ensure proper operation of piping systems. Maintain piping at proper level to ensure satisfactory operation, venting, and drainage. Arrange piping for maximum accessibility for maintenance and repair; locate valves for easy access and operation; and run piping so as to avoid reducing headroom or passage clearance.
- E. Pipe shall be new and of material and weight specified under applicable services. Each length of pipe shall bear maker's name and brand.
- F. Clean pipe, fittings, valves, and appurtenances of grease, dirt, and scale before installation. Keep temporary pipe openings closed during performance of the work.
- G. Provide piping required to make apparatus connected, complete, and ready for regular and safe operation. Unless otherwise noted, connect apparatus and equipment in accordance with manufacturer's standard details, as approved. Furnish accessory piping, including but not limited to vent, drain, and relief piping, when equipment is provided with connection for such piping.

- H. Cut pipe accurately to measurements established at project site. Work into place without springing or forcing.
- I. Support piping independently at equipment so that equipment is not stressed by piping weight or expansion.
- J. Provide shutoff valves where indicated and where required for isolation and for individual equipment units at inlet and outlet, to permit unit removal for repairs without interference with remainder of system.
 - 1. Pressure Testing:
 - a. Suction Piping up to Pump Inlets:
 - (1) Test fuel oil piping before connecting to fuel tank.
 - (2) Prior to testing, provide a written safety procedure for testing.
 - (3) Cap pipe ends connected to tanks or other apparatus unable to withstand test pressure. Isolate weak elements from high pressure test.
 - (4) Pressurize system to required pressure for HDPE PE100 and hold for 24 hours. Admit a small quantity of CO2 as a tracer gas.
 - (5) During pressure test:
 - a) Pound joints with a rubber mallet.
 - b) Listen for leaks.
 - c) Soap joints and examine for bubbles.
 - d) Sniff joints with an electronic halogen detector. Effectively zero halogen shall be detected.
 - (6) If leaks are found repair and retest.

3.03 FINAL INSPECTION, TRAINING, AND DOCUMENTATION

- A. The fuel oil system shall be installed by the manufacturer or its authorized installer in accordance with the reviewed shop drawings and manufacturer's instructions.
- B. After installation is complete, demonstrate to the satisfaction of owner and Engineer the proper operation of the equipment before turnover.
 - 1. Upon completion of installation of equipment and after unit has been energized with normal power source, test equipment to demonstrate compliance with requirements. Field-correct malfunctioning components, then retest to demonstrate compliance. Replace components that cannot be satisfactorily corrected.
 - 2. Submit written report to owner certifying that all operating controls, gauges, meters, and sensors have been properly installed, calibrated, and adjusted.

- C. Train no fewer than 6 people in proper operation of the fuel oil system, including the computer operated management system.
 - 1. Provide training for not less than two 8-hour days.
 - 2. Provide two VHS format videotapes, CDs, or DVDs, and two written training manuals, conveying the essential information contained in the training sessions.
 - 3. Provide all persons attending training sessions with written training manuals. Furnish a letter to owner attesting to the names of persons receiving instruction and the dates instruction took place.
- D. Provide 6 sets of operating and maintenance manuals and spare parts lists. Also provide 6 sets of the computer program documentation. Of the 6 sets, 2 shall be electronic format (e.g. PDF) on CD-ROM in a sturdy case.

3.04 CLEANOUT OF OIL PIPING

- A. Seal pipe ends with polyethylene caps at the factory and at project site storage. Before fusing clean piping as recommended per the ASTM D2513-18A and the manufacturers recommendations.
- B. Purge the entire piping system before connecting the meters.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including General Conditions and General Requirements, apply to this work as if specified in this Section. Work related to this Section is described in the following sections:
 - 1. Section 03 30 00 Cast-in-Place Concrete, for concrete and anchor bolts
 - 2. Section 22 70 13 Fuel Oil System
 - 3. Section 22 70 19 Fuel Oil Management and Inventory System
 - 4. Section 22 05 00 Common Work Results for Plumbing

1.02 SUMMARY

- A. Section Includes:
 - 1. Fuel oil storage tank, as part of the fuel oil system specified in Section 22 70 13, Fuel Oil System.
- B. Related Sections:
 - 1. Section 03 30 00, Cast-in-Place Concrete, for concrete and anchor bolts.
 - 2. Section 22 70 13, Fuel Oil System.
 - 3. Section 22 70 19, Fuel Oil Management and Inventory System.
 - 4. Section 22 05 00, Common Work Results for Plumbing.

1.03 SYSTEM DESCRIPTION

A. Contractor's Responsibility: Design, furnish, and install aboveground diesel fuel oil storage tank systems as indicated, complete with sump and all required appurtenances, tested and ready for use.

1.04 SUBMITTALS

- A. Product Data: For tank system and all components.
- B. Shop Drawings: Submit a minimum of 6 copies of shop drawings for tank. Show fittings and accessories with locations and specific dimensions.

- C. Calculations: Complete calculations indicating conformance with specified design criteria, signed by a registered professional structural engineer licensed in the State of Washington.
- D. Certificates:
 - 1. Manufacturer's certification that tank complies with indicated standards and with requirements.
 - 2. Contractor's certification that tanks as installed comply with requirements.
- E. Qualifications: For manufacturer and installer.
- F. Installation Instructions: Manufacturer's current instructions.
- G. Warranty: Copy of manufacturer's standard warranty.

1.05 REFERENCE STANDARDS

- A. UL Underwriters Laboratories Inc.:
 - 1. UL 142 Standard for Steel Aboveground Tanks for Flammable and Combustible Liquids.
 - 2. UL 2085 Standard for Protected Aboveground Tanks for Flammable and Combustible Liquids.
- B. NFPA National Fire Protection Association:
 - 1. NFPA 1 Uniform Fire Code.
 - 2. NFPA 30 Flammable and Combustible Liquids Code.
 - 3. NFPA 30A Code for Motor Fuel Dispensing Facilities and Repair Garages.
- C. Code Washington Codes:
 - 1. Washington State Building Code.
 - 2. Washington State Amendments to the International Existing building Code
 - 3. International Fire Code
- D. Tacoma Fire Department:
 - 1. Permit application #2000.1, Aboveground Tank Installation Commercial.
- E. PEI Petroleum Equipment Institute:

- 1. PEI RP200 Recommended Practices for Installation of Aboveground Storage Systems for Motor Vehicle Fueling.
- F. ASTM ASTM International:
 - 1. ASTM A36 Standard Specification for Carbon Structural Steel.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm regularly engaged in design and manufacture of products indicated, with minimum 10 years' experience in design and fabrication of products similar in nature and complexity to those specified in industrial applications.
- B. Installer Qualifications: A firm employing adequate numbers of skilled and qualified personnel who are trained in and completely familiar with the methods, materials, and specified requirements necessary for the proper execution of the work of this section.
- C. Single Source Responsibility: Obtain fuel oil storage tanks and related components and accessories from one source and from a single manufacturer.
- D. Tank shall bear UL 2085 label.

1.07 WARRANTY

- A. Special Warranty: Manufacturer's guarantee of products, materials, and workmanship. Guarantee shall contain provisions ensuring complete and satisfactory repair or replacement of all defects in equipment, materials, or workmanship which develop within warranty term.
 - 1. Defects in Materials and Workmanship: One year from date of Final Acceptance.
 - 2. Failure Due to External Corrosion: 30 years from date of Final Acceptance.
 - 3. Failure Due to Internal Corrosion: 30 years from date of Final Acceptance.

1.08 OPERATION AND MAINTENANCE DATA

PART 2 - PRODUCTS

2.01 FUEL OIL STORAGE TANK

- A. Tank shall be insulated secondary contained aboveground storage tank.
- A. Materials:
 - 1. General: Use only new material.

- 2. Tank Wall Thickness: Comply with UL 142.
- 3. Annular Space Insulation: Listed under UL 1085; 3 inch minimum thickness.
- B. Dimensions (Cylindrical):
 - 1. Capacity, Nominal: 40,000 gallons.
 - 2. Outer Diameter, Nominal: 144 inches.
 - 3. Inner Diameter, Nominal: 138 inches.
 - 4. Length of Inner Tank: 51 feet 6 inches.
 - 5. Length of Outer Tank: 52 feet 1 inches.
- C. Loading Conditions:
 - 1. Internal Load: Cylindrical tank shall withstand an air pressure test of 3 to 5 psi.
 - 2. Tank shall be designed to support accessory equipment such as ladders, pumps, floating suction, etc., when installed according to manufacturer's instructions and limitations.
 - 3. Provide suitably designed and located lifting lugs which have a 2:1 safety factor.
- D. Storage Requirements:
 - 1. Specific Gravity of Liquids Stored: Up to 1.0.
 - 2. Pressure: Atmospheric.
 - a. Provide openings for both inner and outer tanks of sufficient size to meet normal and emergency venting requirements under UL 142, NFPA standards, and code.
 - 3. Temperature: Ambient.

2.02 ACCESSORIES

- A. Certification Plate: UL label "Insulated Secondary Containment Aboveground Tank for Flammable Liquids."
- B. Fittings:
 - 1. Threaded/NPT:

- a. Of material and construction consistent with UL requirements.
- b. Protected using threaded plugs or suitable closure caps.
- c. Size and number as needed to complete the work.
- 2. Flanged Nozzles:
 - a. Of material and construction consistent with UL requirements.
 - b. Protected using suitable closure caps.
 - c. Size and number as needed to complete the work.
- C. Manways:
 - 1. Construction, Bolting, and Gaskets: Comply with UL 142.
- D. Steel Tank Supports:
 - 1. Design: Per UL listing.
 - 2. Able to support weight of tank filled to capacity.
- E. Leak Detection Monitoring Port: For space between primary and secondary tank.
- F. Ground Level Containment Unit: UL listed; complete with hand pump; capacity 20 gallons of spilled fuel.
- G. Drop Tube: Equipped with overfill prevention valve.
 - Aluminum automatic valve designed for aboveground tanks. Removable through the extractor fitting on the tanks. Locate valve near the top of the tank in the fill pipe. On aboveground pressure- filled tanks, provide single stage valve, rated for fill flow and pressure, which stops flow completely at 95 percent of tank capacity. Valve shall include method for draining fluid trapped above the valve into the tank.
- H. Anchor Straps:
 - 1. Flat anchor straps of carbon steel or other approved anchoring material as recommended by tank manufacturer; number, size, and location as indicated on drawings.
 - 2. Place suitable dielectric material between steel strap and tank at time of installation.
- I. Lifting Lugs:

- 1. Specially designed lifting lugs or temporary lifting plugs, capable of sustaining tank weight with a 2:1 safety factor.
- 2. Provide kit of preformed caps for lifting lugs, with glass matting and resin for sealing exposed metal.
- J. Interface with fuel oil tank receiving meter to record and print out amount received from fuel truck and total fuel amount received.
- K. Other devices required under applicable standards and code to complete the installation.

PART 3 - EXECUTION

3.01 DELIVERY, STORAGE, AND HANDLING

A. Protect products from damage during delivery, storage, and handling. Exercise care in unloading, storing, and installation to prevent damage to tanks and appurtenances.

3.02 EXAMINATION

A. Verify that the installation will fit in the space allotted with all required clearances and with proper relationship to related Work.

3.03 INSTALLATION

- A. Coordinate installation with other elements of fuel oil system.
- B. Install tanks in accordance with manufacturer's installation instructions, referenced standards, CFC, NFPA, local ordinances, other applicable codes, and specifications including Section 22 05 00, Common Work Results for Plumbing.

3.04 CLEANING

A. Clean tanks in accordance with manufacturer's instructions. Tanks shall be clean inside and out and free of deleterious material or substances.

3.05 TESTING AND ADJUSTING

- A. Deliver tanks to project site with a vacuum of not less than 5.3 inches Hg on the interstitial space. If the minimum vacuum is maintained for one hour, the inner tank and outer tank may be considered properly tested.
 - 1. Caution: Do not test the interstice by applying positive pressure.
- B. Test tank in accordance with manufacturer's recommendations and code requirements.

C. Perform installation precision test using factory mounted testing unit to monitor vacuum between primary tank and outer FRP secondary containment. Comply with manufacturer's instructions to meet EPA requirements for tightness testing of empty underground storage tanks in dry excavations.

3.06 TRAINING

A. Provide training of Owner's personnel in accordance with Section 22 70 13, Fuel Oil System.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including General Conditions and General Requirements, apply to this work as if specified in this Section. Work related to this Section is described in the following sections:
 - 1. Section 03 30 00 Cast-in-Place Concrete
 - 2. Section 22 05 00 Common Work Results for Plumbing
 - 3. Section 22 70 13 Fuel Oil System
 - 4. Section 22 70 16 Fuel Oil Storage Tank
 - 5. Section 26 05 00 Common Work Results for Electrical

1.02 SUMMARY

A. Fuel oil management and fuel inventory system as part of the Fuel Oil System specified in Section 22 70 13.

1.03 SYSTEM DESCRIPTION

- A. This specification establishes the minimum performance and design requirements for an automated fuel management and fuel inventory system that will control and record fuel delivered to the storage tank and the dispensing of fuel to locomotives. The vendor shall provide a stand-alone system, capable of unattended operation for 7 days a week, 24 hours a day. Fuel products shall be limited to equipment and operators with authorized keys. Dial-up of the island key reader(s) shall be by voice grade telephone or direct connected to the service island unit with user-friendly software loaded on a remotely located PC. The fuel management system (automated data collection system) shall reliably read all keys or smart cards and have the ability to lock out any key or smart card.
- B. Contractor shall design, furnish, and install a complete fuel management and fuel inventory system to meet owner's and code requirements, approved to be installed and operated at the project site in the City of Tacoma, State of Washington.
- C. This section provides minimum guidelines only. It is the Contractor's responsibility to design and provide a complete, functional, and operable system including equipment and devices needed, whether or not mentioned in these specifications.

1.04 SUBMITTALS

A. Product Data: For system components, from manufacturer.

- B. Shop Drawings: Complete system diagram including interfacing and operational sequences.
- C. Installer Qualifications: Certified by manufacturer.
- D. Certification: Of Contractor and manufacturer that system complies with codes and requirements.
- E. Manufacturer's installation instructions.
- F. Warranty: Copy of manufacturer's standard warranty.
- G. Operation and maintenance manual.

1.05 REFERENCE STANDARDS

- A. The system shall meet all applicable standards and regulatory agency requirements including, but not limited to, the standards and requirements of the following.
- B. Code Washington Codes:
 - 1. Washington State Building Code.
 - 2. Washington State Amendments to the International Existing Building Code.
 - 3. International Fire Code.
- C. Tacoma Fire Department:
 - 1. Permit application #2000.1, Aboveground Tank Installation Commercial.
- D. ANSI American National Standards Institute.
- E. API American Petroleum Institute.
- F. ASTM ASTM International.
- G. EPA Environmental Protection Agency.
- H. NFPA 70, National Electrical Code.
- I. NFPA National Fire Protection Association.
- J. UL Underwriters Laboratories, Inc.: UL 1238, Standard for Control Equipment for Use with Flammable Liquid Dispensing Devices.

K. FCC – Federal Communications Commission: 47 CFR Part 15, Radio Frequency Devices, Class A.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design: Fuelmaster. Subject to compliance with requirements, provide products of the indicated manufacturer, or equal approved as a substitution.
- 2.02 SYSTEM COMPONENTS
 - A. The fuel management (automated data collection) system shall, as a minimum, consist of the items described below.
 - B. Read/write keys shall be used to activate the system by insertion into a key reader and shall be unique to each vehicle, user, supervisor, or tanker truck. Keys shall attach to vehicle key rings. Keys shall be capable of being written to 100,000 times, and vehicle keys shall contain the previous transaction mileage and range for reasonability check. Quantity and product restrictions shall also be encoded on keys. Keys must have gold plated contacts and pins. Keys cannot require a turning or twisting motion to activate the system.
 - C. A key reader device, located on the service island, shall turn fuel dispensers on and off, monitor fuel dispensed, recognize authorized keys, and interface with dispensers and tank level monitoring systems. The island fuel management unit shall have a 64-bit processor operating at 250 MHz or faster and a socket modem to permit upgrade of modem. Modem shall be at least 48 kbps. The receptacle for reading keys must be covered to prevent sand, water and snow from causing system problems. The fuel island equipment shall have flash memory so that firmware can be updated without having to replace chips. The unit shall have at least 8 MB of non-volatile SRAM.
 - D. A PC (IBM compatible) with a printer as part of the PC system shall serve as the central controller. The PC must operate on Windows, version to be confirmed with Tacoma Rail.
 - E. A key encoder shall interface with the central controller USB port to permit transferring data onto keys.
 - F. Software shall be installed on the IBM compatible PC, permitting the encoding and re-encoding of keys; manipulation of transaction data for printing reports on vehicles, users, products, etc.; downloading of transactions; uploading of authorized user/vehicle lists; and transfer and storage of data. The fuel management system software must permit the use of a file server and workstations. Transaction data shall be transferable to any program accepting a flat ASCII file.

G. Tanker truck (mobile) key readers that perform identically to service island key readers in controlling and monitoring fuel must be available.

2.03 SYSTEM CONFIGURATION

- A. The equipment and software shall be capable of operating in different system access configurations listed below.
 - 1. Operator key.
 - 2. Tanker truck driver or vehicle key.
 - 3. Keypad only (no keys or cards required).
- B. Vehicle Keys: Data on vehicle keys shall be as follows:
 - 1. Key identification number.
 - 2. Vehicle owner number.
 - 3. Vehicle license number.
 - 4. Site signature.
- C. Driver and operator keys, if used in lieu of having the operator enter an ID number of the key reader keypad, shall be encoded with the following information:
 - 1. Key identification number.
 - 2. Driver or operator identification number.
 - 3. Site signature.
- D. Supervisor keys shall allow the on-site supervisor special access to the site's key reader. This access shall allow the supervisor to:
 - 1. Change the key reader's configuration, to include time/date, product codes, hose (fuel crane) numbers, pulser divide rate, no pulse time out, key timer setting, pump finish timer, message duration setting, zero-quantity shutdown, and pump handle switch control.
 - 2. Issue fuel.
 - 3. Activate semi-manual mode of fuel issue.

- 4. Initiate on-site reports generation.
- 5. Enter fuel drops and corrections to fuel drops.
- 6. Perform diagnostic testing of system components.

2.04 SYSTEM CAPABILITY

- A. Each island key reader shall have the ability to simultaneously control up to 2 hoses (fuel cranes) or up to 2 units.
- B. The system must have the capability to interface with certain electronic dispensers (fuel cranes) via a serial connection.
- C. Each master and each key reader shall store a minimum of 4,000 transactions. The system shall be capable of performing as a gate opener using switch closure. Also, the system shall provide the option of providing a less expensive gate opener which is not a complete key reader unit.

2.05 OPERATOR INPUT AT SERVICE ISLAND

A. The system shall include a key reader with a liquid crystal display (LCD) using light emitting diodes (LED) with back light, that is a minimum of 2 lines by 40 characters. The fuel management unit must also include an alphanumeric keypad. The operator shall be prompted by the LCD to input information, which shall be recorded as part of the transaction record, for each transaction in accordance with the system configuration described above. The operator will insert his/her key into the service island key reader, and upon cue from the system prompts will enter his/her ID number. Alpha characters may be used for non-verified identification.

2.06 DATA MANAGEMENT AND REPORTING

- A. Each service island key reader may be downloaded by the central controller operator at his/her convenience, or at a time of day programmable by the central controller operator. When automatically downloading, the system shall dial each site in sequence and generate a report of all transactions for individual sites once each 24hour period. The system must be capable of unattended dialing and downloading, thus permitting downloading when sites are not in use and when phone rates are less. The software shall operate on an IBM compatible PC using Windows, version to be confirmed with Tacoma Rail.
- B. The system shall provide the following information at the central controller as a transaction record:
 - 1. A unique transaction number.
 - 2. User identification number.

- 3. Locomotive odometer or hour reading.
- 4. Locomotive number.
- 5. Number of units (gallons, quarts, cubic feet, therms, etc.) dispensed to tenths, hundredths, etc.
- 6. Date and time, including seconds.
- 7. Hose (fuel crane) number.
- 8. Key type.
- C. The system shall be capable of totaling monthly fuel costs by organization number, locomotive ID number, and user number.
- D. The system shall keep a declining balance inventory of fuel remaining in storage. The inventory report shall give a summary of the remaining fuel in each storage tank monitored. It must also note when fuel should be purchased.
- E. The system shall allow the operator to compile summary reports for all transactions by site, organization, date, vehicle, etc.
- F. All locomotives due for preventive maintenance shall be printed as an exception report on the central controller's printer, provided the PM option is used.
- G. All locomotives that have an out of range odometer reading shall be printed as an exception report on the central controller's printer.
- H. The central controller shall be capable of displaying reports on the central controller monitor before the reports are printed. When reports are displayed on the monitor, the user shall be capable of scrolling up and down to view any page of the report.

2.07 STORAGE

A. In the event of a power failure to the island key reader equipment located at the pump, the system shall have the capability to store all data collected up to the time of the power failure for a minimum period of three months. The equipment at each fueling site must have the ability to operate if the central processor is down, limited only by the key reader's internal storage capacity. There shall be a method to access dispenser transaction information should there be data transmission problems. The main board, with memory, shall be removable and must be capable of being installed in an operating unit and downloaded; or, if the central controller is inoperable, another central controller shall be capable of downloading data. Support for recovering data from the system shall also be provided by the factory when required.

2.08 REQUIRED FEATURES

- A. Upgradeable to Fully Automated FRO/TAG System: The fuel management system must be capable of a future upgrade to a fully automated system, requiring no human intervention for the system to operate. RF/TAG technology is the preferred method for an autonomous, passive system.
- B. On-Site Transaction Printer: An on-site transaction printer shall be provided for each site. An on-line journal printer, driven by the key reader, and located at the self-service fueling station, shall print (record) each transaction as it occurs. This shall allow the remote site operators to maintain a hard copy record of transactions, as well as the capability to print the site configuration and total fuel dispensed by fuel crane number and product code.
- C. True Manual Override: The system shall permit manual override of the fuel management system should any problem occur. The override must be a complete, total by-pass of the fuel management system. Thus any requirement that parts of the fuel management system shall be operational for the manual override to function, for example, emitting fiber optic signals, etc. is unacceptable.
- D. Semi-Manual Mode: The system shall have the capability to record fuel dispensed in emergency situations when there is a need for vehicles without keys to be refueled or to streamline refueling operations, and yet accountability is still desired. With this option, individual key readers may be put into the semi-manual mode with a supervisor's key. When in this mode, fuel can be dispensed by any pump as if the key reader was not functioning, but the key reader will record all transactions as semi-manual transactions.
- E. Self-Diagnostic Capability: The island key reader shall permit diagnostic testing of boards, LCD, and keypad using the supervisor's key.
- F. No-Twist Key: The key used to activate the system shall not require a turning or twisting motion. Information must be read from the key by merely inserting the key straight into a key receptacle.
- G. Capability to Record Oil: The system shall have the capability to have drivers record whether or not they checked their oil and the amount of oil added, using the keypad on the island key reader. This information shall be downloaded into the system software and permit the tracking of oil usage.
- H. Toll Free Support: The vendor shall provide toll free support during the warranty or extended maintenance period for the hardware and software. Additionally, a means of dialing the vendor's product support technicians directly from the island key reader is required.
- I. Extended Maintenance Agreements: The vendor shall offer extended maintenance agreements on an annual basis for the life of the system (minimum 10 years).

- J. Surge Protection: The system shall have surge (lightning) protection on the AC power line and on the telephone line. Surge protection shall be designed specifically for the voltage and current requirements of fuel management systems.
- K. Modifiable Prompts: The system shall allow customization of the initial entry prompt, user ID prompt, and vehicle ID prompt.
- L. Laptop Computer Support: The system shall have the appropriate interfaces available to permit the operator to connect a laptop computer to the island key reader to download transactions and upload vehicle and personnel lists, as well as providing local diagnostic capabilities.

2.09 DESIGN

- A. The equipment shall be designed in a modular manner to permit replacement of components by non-technical personnel. It shall be designed for operation by non-technical personnel with limited computer experience.
- B. Operability: The equipment shall be simple to operate and supplied with operating instructions. The computer and data collection/download interface shall require a minimum of operating instructions and require little or no prior computer operating experience.
- C. Maintainability: Suitable clearance and access shall be provided to all maintainable points. The system shall be of modular construction and have circuit boards/components that are replaceable by the user. If the island key reader is accessed by a modem, the unit shall have the capability of the user plugging in a telephone and talking directly to factory technicians who can assist in diagnostics and repair while working on the key reader.
- D. Environment: The vehicle operator interface with the equipment will be outdoors and exposed to the elements. Thus, the fuel island unit must have an operating range of -60 degrees F to +140 degrees F and withstand rain, snow, and blowing sand. The system shall have been tested by an independent environmental testing organization to provide independent affirmation of environmental limits.
- E. Services: This equipment shall be designed to operate from 120 volt AC, 60 Hz single phase power.
- F. Safety: The equipment shall be provided with all necessary safety devices and guards to protect the operator. All primary operator control buttons, switches, etc. shall be grouped and mounted in a location affording the operator convenient access to the controls. Essential safety operating instructions shall identify safety and health hazards associated with the equipment and the procedures and practices necessary for safe operations. Placards shall be provided to warn operator or maintenance personnel of hazardous areas which could cause injury. Installation manuals and maintenance manuals shall include all necessary safety and hazardous conditions warnings.

2.10 TRAINING

A. The supplier shall provide on-site training of personnel in the functions of operation, maintenance, and repair as they apply to each specific item of equipment. Supervisors and operators at each refueling site shall be provided training in the operation of the island fuel management units. Training on software may be conducted on-site or via a remotely located computer on line with the central controller (PC) operator.

2.11 MAINTENANCE AND SPARE PARTS

- A. Spare Parts: The manufacturer shall agree to sell spare parts for the operating life of the equipment, estimated to be 10 years. The vendor shall provide documentation that supports the assertion that spare parts will be available for 10 years minimum.
- B. Maintenance Agreement: The manufacturer shall agree to provide system maintenance on a yearly renewable contract for the life of the system. The manufacturer, under a maintenance agreement, shall be responsible for providing all repair parts and telephonic assistance. The procuring agency may or may not accept the terms of the maintenance agreement and may or may not renew the maintenance contract on an annual basis.

2.12 WARRANTY

A. The manufacturer shall warrant parts for the equipment for a period of one year. Read/write keys shall be warranted for five years. All replacement parts shall be provided by the manufacturer for this one year period, except those required by acts of nature (i.e., flood, lightning, etc.). All telephonic support labor for diagnostics and assistance shall also be provided.

PART 3 - EXECUTION

Not Used

END OF SECTION

PART 1 - GENERAL

1.01 GENERAL

A. Conform to the General Conditions, Supplementary Conditions, and related work in other Divisions for all work in Division 26. See Division 1 for sequence of work.

1.02 WORK INCLUDED

- A. It is the intention of this division of the specifications and the accompanying drawings to describe and provide for the furnishing, installing, testing and placing in satisfactory and successful operation all equipment, materials, devices and necessary appurtenances to provide a complete electrical system, together with such other miscellaneous installations and equipment hereinafter specified and/or shown in the plans. The work shall include all materials, appliances and apparatus not specifically mentioned herein or noted on the plans, but which are necessary to make a complete working installation of all electrical systems shown on the plans or described herein. Equipment and devices furnished and installed under other divisions of this specification (or by the Owner) shall be connected under this division. The drawings and specifications are complementary and what is called for in either is binding as if called for in both.
- B. By submitting a bid, the Contractor is acknowledging that he has made a thorough examination of the Contract Documents, existing site and building conditions, and has determined that these documents do sufficiently describe the scope of construction work required under this Contract.
- 1.03 SCOPE OF BASIC BID
 - A. Included in Division 26 work is all work and related items necessary to provide all electrical installations except as specifically excluded. In general, this includes all labor, equipment, tools, etc., to complete the electrical work.

1.04 RELATED WORK

- A. Temporary Power and Lighting
- B. Mechanical Control Wiring See Division 23
- C. Cutting and Patching See Division 1
- D. Trenching, backfill and asphalt work See Division 2
- 1.05 STANDARDS AND REGULATIONS
 - A. The work shall comply with the latest edition of the applicable Standards and Codes of the following:
 - ASTM American Society for Testing and Materials
 - NBFU National Board of Fire Underwriters
 - NEC National Electrical Code
 - --- State Electrical Code
 - NESC National Electrical Safety Code
 - NEMA National Electrical Manufacturers Association
 - NFPA National Fire Protection Association

- U.L. Underwriters Laboratories Inc.
- IPCEA Insulated Power Cable Engineers Associated
- CBM Certified Ballasts Manufacturers
- --- Federal, State and Local Building Codes
- ETL Electrical Testing Laboratories
- B. If any conflict occurs between Government adopted Code Rules and this specification, the codes are to govern. Nothing in these drawings and specifications shall be construed to permit work not conforming to governing codes. Also, this shall not be construed as relieving the Contractor from complying with any requirements of the plans and specifications which may be in excess of, but not in conflict with, requirements of the Governing Codes.

1.06 PERMITS & FEES

- A. The Contractor shall obtain and pay for all licenses, permits and inspections required by laws, ordinances and rules governing work specified herein. The Contractor shall arrange for inspection of work by the inspectors and shall give the inspectors all necessary assistance in their work of inspection.
- B. The Contractor shall consult with and follow the requirements of the local fire, power, telephone, and television utilities serving the area and shall coordinate his work with them.
- C. Utility connection and hook-up charges for power, telephone and television shall be paid by the Owner directly to the utility. The Electrical Contractor is required to provide any and all coordination necessary to support the utility connection, file for application of service (or assist the Owner in filing for application of service) and coordinate dates for service with the utilities.

1.07 DEFINITIONS

- A. When "Provide" is used, it shall be interpreted as "furnishing and installing complete in operating condition".
- B. When "Drawings" is used, it shall be interpreted as "all Contract Drawings for all Disciplines".
- C. When "Contractors" is used, it shall be interpreted as the Electrical Contractor.

1.08 INTENT OF DRAWINGS

- A. The electrical drawings are intended to serve as working drawings for general layout. The equipment layout is diagrammatic and unless specifically dimensioned or detailed, does not indicate all fittings, hardware or appurtenances required for a complete operating installation.
- B. Anything shown on the drawings but not covered in the specifications, or anything covered in the specifications but not shown on the drawings, shall be as if covered in both. In case of conflict between the drawings and specifications, the Engineer will select the method to be used. The Contractor shall be responsible for verifying all measurements before proceeding with the work.

- C. Wiring diagrams are not intended to indicate the exact course of raceways or exact location of outlets. Raceway and outlet locations are approximately correct and are subject to revision as may be necessary or desirable at the time of installation. Precise location in every case shall be subject to the Engineer's approval.
- D. The contractor shall review the manufacturer provided installation instructions for each piece of equipment prior to rough-in. Any conflict between the drawings, specifications and installation instructions shall be brought to the Engineer's attention immediately. The contractor will not be paid for any reinstallation required due to failing to comply with manufacturer's recommendations or requirements unless specifically directed by the engineer, in writing, after the conflict has been identified.

1.09 PROTECTION

- A. The Contractor shall store and guard all equipment before installation and shall protect same, and replace any equipment that has been damaged prior to final acceptance. See Division 1 for detailed requirements.
- 1.10 HOUSEKEEPING
 - A. All electrical materials shall be kept stored in an orderly fashion protected from heat, cold, and the weather.
 - B. All marred surfaces shall be refinished and painted after installation.
 - C. All debris shall be removed from premises during work, as directed, and at completion of job.

1.11 TEMPORARY USE

- A. Temporary or interim use of any and all portions of the electrical system shall be under the supervision of the Electrical Contractor.
- B. Temporary power and lighting for use during construction shall be provided per the requirements of the Division 1 specifications.
- 1.12 AS-BUILT DRAWINGS
 - A. The Contractor shall maintain, in addition to any reference drawings, an as-built set of prints, on which all deviations from the original design shall be drafted in a neat, legible manner with red colored pencil. This red lined set shall identify all drawing revisions including addenda items, change orders, and Contractor revisions. The Contractor is responsible to revise panel schedules and load calculations as required.
 - B. Drawings shall show locations of all concealed raceway runs larger than 1", giving the number of conductors and size of raceway. Underground ducts shall be shown with cross section elevations. All pipe, raceway, manholes or lines of other trades shall be included.
 - C. The Contractor shall update all references to specific products to indicate products actually installed on project. This shall include, but not be limited to, lighting fixtures, lighting controls, etc.

D. Upon completion of the Division 26 work, the Contractor shall deliver the red lined drawings and one set of neatly drafted as-built drawings on electronic media in AutoCAD R-2013 format and full-size pdf to the Engineer for transmittal through the Engineer to the Owner.

1.13 WARRANTY

A. Provide a written warranty that the Division 26 work is free from mechanical and electrical defects. Contractor shall replace and repair, to the satisfaction of the Engineer, any parts of the installation which may fail within a period of 12 months after the certificate of final acceptance, provided that such failure is due to defects in material or workmanship, or failure to follow the specifications and drawings.

1.14 INSTRUCTIONS AND MANUALS

- A. A preliminary, complete copy, except for the bound cover, shall be submitted 60 days prior to completion of the project for checking and review. Five (5) bound, corrected copies shall be delivered to the Owner 20 days prior to scheduled instruction periods as specified under Section 1.16 "Instruction Periods" after review of the preliminary copy. Obtain a receipt for the manuals and forward a copy of the receipt to the Engineer with the completed form.
- B. Manuals shall contain shop drawings, wiring diagrams, operating and maintenance instructions, replacement parts lists, and equipment nameplate data for all equipment and systems installed under the project. Signal equipment submittals shall contain step-by-step circuit description information designed to acquaint maintenance personnel with equipment operation in each mode of operation. Manuals shall contain original brochures supplied by manufacturers. Xerox copies of originals will not be accepted.
- C. Each type of device provided shall be identified in the O & M Manual using the same identification as shown on the drawings and specifications. The information included must be the exact equipment installed not the complete "line" of the Manufacturer. Where sheets show the equipment installed and other equipment, the installed equipment shall be neatly and clearly identified on such sheets. Parts lists shall give full ordering information assigned by the original parts manufacturer. Relabeled and/or renumbered parts information as reassigned by equipment supplier is not acceptable. The following information shall be provided for each device:
 - 1. Manufacturer's name, address and phone number.
 - 2. Local supplier's name, address and phone number.
 - 3. Complete parts lists including quantities and manufacturer's part numbers.
 - 4. Installation instructions.
 - 5. Recommended maintenance items including maintenance procedure and recommended interval of maintenance listed in hours of operation, calendar unity or other similar time unit.

- D. The O & M Manual shall be assembled in a loose leaf, 3-ring, hard cover binder and electronically on compact disc. The information contained in the manuals shall be grouped in an orderly arrangement by specification index. The manuals shall have a typewritten index and divider sheets between categories with identifying tabs. The covers shall be imprinted with the name of the job, Owner, Electrical Engineer, Division 26 Contractor, and year of completion. The back edge shall be imprinted with the name of the job, Owner, and year of completion. As a minimum, the following selection shall be broken out:
 - 1. Light Fixtures
 - 2. Panelboards, Switchgear, and Transformers
 - 3. Motor Controls
- E. Wiring Diagrams for each system shall be complete for the specific system installed under the Contract. "Typical" Line Diagrams will not be acceptable unless properly marked to indicate the exact field installation.

1.15 WORK NOT INCLUDED

- A. Indicated motors, controls, and equipment as described in other divisions shall be furnished by other trades, but shall be moved, set and wired to electrical controls and power supply by the Electrical Contractor.
- B. Work to be included under this Contract shall be defined on drawings and in these specifications. Any details beyond these limits are meant only to give installation clarity to that portion which is a part of this Contract.

1.16 COMPLETION OF WORK

- A. Upon completion of the Division 26 work, the Contractor shall deliver to the Engineer a completion letter stating that he has fulfilled all the requirements of his Contract for Division 26 work as set forth in the drawings and specifications and that all items in pre-final inspection lists submitted by the Engineer have been satisfactorily completed.
- B. Arrange for and obtain all required inspections and certificates pertaining to the Division 26 work and deliver the certificates to the Engineer in triplicate.
- C. Prior to or at the time of final inspection, the Contractor shall, as outlined in detail in the specifications, complete the delivery of all the following items:
 - Completion Letter
 Certificate of Final Inspection, in triplicate form. Electrical Inspector
 Warranty to Owner
 Warranty to Owner
 Warked Set, Electronic Media Set on CD in AutoCAD R-2013 Format
 In triplicate form. COMPLETION OF WORK 26 00 00 – 1.17
 Warranty to Owner
 CONDITIONS 26 00 00– 1.13
 GENERAL AS-BUILT DRAWINGS 26 00 00– 1.12

5.	Motor Current Readings	GENERAL, TESTS
		26 05 19-3.03(D)
6.	Phase Current Readings	GENERAL, TESTS
		26 05 19 – 3.03 (E)
7.	OHMIC Test Readings	GENERAL, TESTS
		26 05 19 – 3.03 (B)
8.	Ground Fault Settings	
9.	Panelboard and Special Equipment Shop Drawings and Final Approved List of Materials Installed	MATERIALS, GENERAL
		26 00 00-2.03
10.	Certificate of Feeders Torque Results	WIRES AND CABLES
		26 05 19
11.	* Receipt from person to whom delivered the following: Fuses for Switches, Spare Keys for Panelboards, receptacles switches, plugs, etc.	FUSES – 26 28 13
		PANELBOARDS – 26 24 16
		SWITCHES & RECEPTACLES – 26 27 26
12	. Wiring diagrams, Maintenance Manuals, Operation Instructions, and Brochures (5 sets minimum)	GENERAL, INSTRUCTIONS & MANUALS – 26 00 00– 1.14

* Secure delivery instructions from Engineer for delivery to Owner.

1.17 SHOP DRAWING SUBMITTALS

- A. The Contractor shall submit to the Engineer no later than 30 days after the award of the Contract, a minimum of seven (7) copies, each bound under separate cover, with index, detailed shop drawings, to include:
 - 1. Manufacturer's Catalog Data.
 - 2. Complete Physical and Technical Data.
 - 3. Wiring Diagrams.
 - 4. Detailed Reference (written or highlighted) noting compliance with the appropriate specification section and applicable item numbers within that section.
 - 5. Other Descriptive Data as required by the Engineer.

- B. The Contractor shall submit to the Engineer electronic shop drawings in PDF format. Electronic Shop Drawings that are submitted without following the format as outlined below will be returned for corrections without any further review.
 - 1. A separate PDF file shall be submitted for each Division including All submittal items for that Division as outlined below:

a. Division 26 – Electrical

- 2. The contractor shall provide either a digital or hardware method of transporting the electronic submittal to the Engineer. Files larger than 10Megabytes shall not be sent via email and shall be transferred via an FTP or similar file transfer protocol, PC compatible CD or PC compatible Thumb Drive. Divisions shall not be broken up into separate files for transfer via email.
- 3. Each Specification PDF shall be submitted with the following format and salient attributes:
 - a. Cover page including:
 - i. Project Title as indicated on the plans
 - ii. Project Location including Address, City, State, Country
 - iii. Prime Contractor name, phone number, and email address
 - iv. Sub-Contractor name, phone number, and email address
 - v. Specification Division Number and Title
 - b. Index Page outlining each specification section included in the submittal. This list shall be linked to a corresponding Specification Section Divider for each section. This link shall enable the reviewer to jump to a specification section by clicking the item in the list.
 - c. Specification Section Divider: Shop Drawings shall be divided by specification section and each section shall begin with a Divider Page outlining the Specification Number, Title, and a list of Submittal Items for the section. In the upper right-hand corner of the divider page, a Link shall be provided returning the reviewer to the Index Page.
 - d. Each Submittal Item listed on the Specification Section Divider shall be linked to the specific item being submitted. Each Submittal Item shall be hi-lighted Yellow with a Note Reference to the specific paragraph giving the submittal requirements.
 - e. Each page of the submittal shall be numbered in the Bottom Right corner of the page. Page numbering shall be Roman Numerals for all pages before the First Specification Section. Each Specification Section page shall be numbered with the Specification Section number, a dash, and the page number in the Specification Section.
 - f. Specification items shall be specifically hi-lighted as they apply to the project rather than hi-lighting an entire product family. Items that do not apply to this project shall be crossed out with a Red X.
 - g. The PDF file shall not be protected to prevent printing, selecting of text within the document, or extracting of pages from the document.

- C. Shop drawings shall be submitted complete, at one time and each item indexed with dividers and separated per specification section and shall be, but not limited to the items of equipment listed below:
 - 1. All panelboards, showing breaker arrangement with circuit numbers, relays, and panel skirts.
 - 2. Motor starters and controls designating where items are intended to be used and equipment being controlled.
 - 3. Transformers (Dry Type)
 - 4. Disconnect Switches
 - 5. Fuses
 - 6. Lighting Fixtures (Complete)
 - 7. Wiring Devices
 - 8. Back Boxes
 - 9. Coverplates
 - 10. Raceways and Connectors
 - 11. Copper Wire
 - 12. **All Specialty Systems not listed above**
 - 13. Any other items requested by Engineer.
- D. Within 10 working days after the date of the letter rejecting any items of equipment, lighting fixtures, or materials as not in accordance with the specifications, Contractor shall submit a new list of items he proposes to furnish and install in place of those items rejected. If the Contractor fails to submit this new list within the above specified time, or if any items on this second list are rejected as not being in accordance with these specifications, the Engineer may select the items which the Contractor shall furnish and install without change in Contract price or time of completion.
- E. The acceptance of a manufacturer's name or product by the Engineer does not relieve the Contractor of the responsibility for providing materials and equipment which comply in all details with the requirements of the Contract Documents. The Contractor shall be solely responsible for submitting materials at such a time to allow a minimum of two weeks for Engineer's review.
- F. Electrical Drawings for the project have been developed by the Engineer using AutoCAD[™] Revision 2018 software. These drawing files will be made available to the Contractor for development of shop drawings and/or "As-Builts" with a signed waiver of responsibility.
- 1.18 SCHEDULE OF VALUES
 - A. Provide Schedule of Values per Division 1 and related project requirements.
 - B. Division 26 Breakdown: Provide schedule of values for the following categories (as a minimum):

- 1. Electrical Mobilization
- 2. Electrical Submittals
- 3. Electrical General Project Management, General Design, General Coordination
- 4. Branch Circuit Rough-in
- 5. Branch Circuit Trim
- 6. Service and Feeders
- 7. Panelgear, Disconnects, Starters
- 8. Light Fixtures
- 9. Electrical Punchlist, Closeout, and Owner Training
- C. The dollar value for "Electrical Punchlist, and Closeout" shall in no case be less than 2% of the total dollar value of the Division 26 work (or as indicated in Division 1, whichever is higher).

PART 2 - PRODUCTS

- 2.01 COMPETITIVE PRODUCTS
 - A. Any reference in the specifications to any article, device, product, material, fixture, form or type of construction by name, make or catalog number shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition. The Contractor, in such cases, may at his option use any article, device, product, material, fixture, form or type of construction which in the judgment of the Engineer, expressed in writing, is equal to that specified. However, any manufacturer not listed as an accepted bidder for a specific item must be submitted for acceptance in writing and with descriptive data verifying equal quality and performance at least ten (10) working days prior to the bid date for approval.

2.02 MANUFACTURER/EQUIPMENT PRIOR APPROVALS

- A. Any manufacturer/equipment not listed as an approved substitute for a specified item must be submitted for acceptance with detailed information to include:
 - 1. Manufacturer's Catalog Data
 - 2. Complete Physical and Technical Data
 - 3. Wiring Diagrams
 - 4. Detailed reference (written or highlighted) noting compliance with the appropriate Specification Section and all applicable Specification item numbers within that Section
 - 5. Complete type written index cross referencing all proposed substitutes and specified items
 - 6. Detailed reference to specified items (written or highlighted) noting equal quality and performance of proposed substitute equipment

- 7. Other descriptive data, as required by the Engineer
- B. If substitute material is determined to be acceptable by the Engineer, it will be included in a subsequent Addenda prior to bidding. The acceptance of a manufacturer's name or product by the Engineer does not relieve the Contractor of the responsibility for providing materials and equipment which comply in all details with the requirements of the Contract Documents.
- C. Only materials which are specified or published in addenda as acceptable shall be used.

2.03 MATERIALS

- A. All materials must be of the quality herein specified. All materials shall be new, of the best quality and free from defects. They shall be designed to ensure satisfactory operation and operational life in the environmental conditions which will prevail where they are being installed.
- B. Each type of material shall be of the same make and quality. The materials furnished shall be standard products of the manufacturers regularly engaged in the production of such equipment and shall be the manufacturer's latest standard design.
- C. All materials shall be U.L. or E.T.L. listed for the purpose for which they are used.
- D. Equipment in compliance with U.L. standards but not bearing their label is not acceptable. If the manufacturer cannot arrange for labeling of an assembled unit at the factory the unit shall be field evaluated per the Washington State Administrative Code (WAC) and the electrical inspector's requirements.

2.04 COMPLETE SYSTEM

A. All the systems mentioned shall be complete and operational in every detail except where specifically noted otherwise. Mention of certain materials in these specifications shall not be construed as releasing the Contractor from furnishing such additional materials and performing all labor required to provide a complete and operable system.

2.05 NAMEPLATES

- A. Provide nameplates constructed of plastic (black on white) laminated material engraved through black surface material to white sublayer (attach with screws on NEMA 1 enclosures). EXCEPTION (1): Emergency distribution system component labeling - white letters on red background. Exception (2): Series rated systems shall be yellow background with white letters.
 - 1. Service Entrance Label: Refer to Section 26 24 13.
 - 2. Panelboard Labels: Refer to Section 26 24 16.
 - 3. Switch and Receptacle Labels: Refer to Section 26 27 26.
 - 4. Motor Starter and Disconnect Labels: Refer to Section 26 28 16.
 - 5. Special Equipment/Outlet Labels: Refer to Appropriate Sections.

6. Under 600 Volt Feeder Tags: Refer to Section 26 05 19.

PART 3 - EXECUTION

3.01 GENERAL

- A. Careful consideration shall be given to clearances under and over beams, pipes and ducts, to provide proper headroom in all cases. Check drawings to determine heights of all suspended ceilings and size of pipe shafts where raceway and wire-ways shall run. Coordinate installation of Division 26 wiring and equipment with Division 23 and other trades. Where insufficient room for proper installation appears, obtain clarification from Engineer before any installation is begun.
- B. Cutting and Patching:
 - 1. Obtain permission from the Engineer and/or Owner's Representative prior to cutting. Locate cuttings so they will not weaken structural components. Cut carefully and only the minimum amount necessary. Cut concrete with diamond core drills except where space limitations prevent the use of such drills.
 - 2. All construction materials damaged or cut into during the installation of this work must be repaired or replaced with materials of like kind and quality as original materials by skilled labor experienced in that particular building trade.

3.02 COORDINATION

- A. The Contractor is responsible for accomplishing Division 26. The work shall coordinate with that of the other Contractors and/or other trades doing work in the building and shall examine all Drawings, including the several Divisions of Mechanical, Structural, Civil and Architectural, for Construction Details and necessary coordination. Specific locations of construction features and equipment shall be obtained from the Contract Documents, field measurements, and/or from the trade providing the material or equipment. No extra costs will be allowed for failure to obtain this information.
- B. All conflicts shall be reported to the Engineer in writing before installation for decision and correction. Special attention is called to the following items:
 - 1. Door swings to the end that switches will be located on "Strike" side of the door.
 - 2. Location of grilles, pipes, sprinkler heads, ducts and other mechanical equipment so that all electrical outlets, lighting fixtures and other electrical outlets and equipment are clear from and in proper relation to these items.
 - 3. Location of cabinets, counters and doors so that electrical outlets, lighting fixtures and equipment are clear from and in proper relation to these items.
 - 4. Type and height of ceiling.
 - 5. All device measurements referenced on drawings or specifications are to be centered of device unless noted otherwise.
- C. The Contractor will not be paid for work requiring reinstallation due to lack of coordination or interference with other Contractors or trades. This includes, but is not limited to, removing, replacing, relocating, cutting, patching, and finishing.

- D. Device and fixture locations may be changed within 15 feet without extra charge if so desired by the Engineer, before installation.
- 3.03 REQUESTS FOR INFORMATION (RFI)
 - A. It is our intent to provide a timely response for RFIs regarding Division 26 work. To further expedite this process, where a suggestion can be determined or derived at by the initiator of the RFI, it is required this suggestion be supplied with the submitted RFI. If no suggestion is given where one is possible, the RFI will be returned as incomplete.

3.04 CLEANING AND PAINTING

- A. All equipment, whether exposed to the weather or stored indoors shall be covered to protect it from water, dust and dirt.
- B. After installing, all metal finishes shall be cleaned and polished, cleaned of all dirt, rust, cement, plaster, grease and paint.
- C. All equipment with a primer coat of paint shall be given two (2) or more coats of a finish enamel and scratched surfaces be refinished to look like new. Markings, identification and nameplates shall be replaced.

3.05 EQUIPMENT IDENTIFICATION

- A. Provide identifying engraved bakelite nameplate on all equipment, including pull boxes, to clearly indicate its use, area served, circuit identification, voltage, and any other useful data.
- B. Each auxiliary system, including communications, shall be clearly labeled to indicate its function.

3.06 DEVIATION

A. Deviation from the shop drawings in construction or installation of equipment shall not be made unless Shop Drawings showing proposed deviations are submitted to and approved by the Engineer. If any equipment is furnished under this or other divisions with current, voltage or phase ratings that differ from those shown on the drawings, the Contractor shall notify the Engineer in writing immediately and shall not connect said equipment until instructed as to required changes by the Engineer. No extension of time will be granted as a result of such changes.

3.07 EXCAVATIONS

- A. All excavations are to be so conducted so that no walls or footings shall be disturbed in any way.
- B. Remove all surplus earth not needed for backfilling and dispose of same as directed.

3.08 WIRING METHODS

- A. All low voltage wiring shall be in Raceway with Junction Boxes and Fittings.
- B. All branch circuit wiring shall be installed in raceway with junction boxes and fittings.
- C. Provide access panels as needed for pull boxes and equipment located above ceiling or behind walls.

- D. All emergency systems outlet and junction boxes shall have a red plastic tag inside marked critical or life safety as applicable.
- E. Multiple feeder runs shall be rod hung, using a strut type channel with individual onehole clamps, back plates and machine screws.
- F. Any low voltage cables that are not terminated at both ends shall be tagged and labeled per code.

3.09 PENETRATIONS OF FIRE RATED ELEMENTS

A. Must be made such as to retain that rating.

3.10 HANGERS AND SUPPORTS

- A. Provide hangers, brackets, and suspension rods and supplementary steel to support equipment.
- B. Hangers provided under other divisions shall not be used for support of Division 26 equipment unless permitted by Engineer.

3.11 CHASES AND OPENINGS

A. Provide to the masonry and concrete trades all templates and details of chases, openings in floors and walls as required for Division 26 equipment installation.

3.12 PAINTING

A. Painting in general will be covered under another division of this specification, except items furnished under Division 26, 27, and 28 that are scratched, marred in shipment or installation, shall be refinished by the Division 26 Contractor.

3.13 WORKMANSHIP AND OBSERVATION

- A. Workmanship shall be of the best quality and none but competent workers shall be employed under the supervision of a competent foreman. All completed work shall represent a neat and workmanship like appearance.
- B. All work and materials shall be subject to observation at any and all times by representatives of the Engineer.

3.14 MISCELLANEOUS

- A. Provide complete seismic anchorage and bracing for the lateral and vertical support of conduit and electrical equipment, as required by the International Building Code.
- B. Conduits that cross seismic separations shall be installed with flexible connection suitable to accommodate conditions. Secure raceways on each side of a separation and provide a minimum of 36" length of flexible conduit to span separation.

3.15 CABLE AND WIRING ROUTED UNDERGROUND OR UNDERSLAB

A. All cables and conductors, both line voltage and low voltage, routed underground or underslab shall be U.L. listed for installation in wet locations per NEC and WAC codes.

END OF SECTION

PART 1 - GENERAL

- 1.01 WORK INCLUDED
 - A. Portions of the existing electrical lighting, power and signal systems are to be removed as detailed on the drawings.
- 1.02 RELATED DOCUMENTS
 - A. Section 26 00 00 Electrical General Conditions

PART 2 - PRODUCTS

- 2.01 EXISTING MATERIALS
 - A. Existing materials which are a part of the building shall remain the property of the Owner.
- 2.02 EXISTING MATERIALS RE-INSTALLED
 - A. Existing materials and equipment that are removed as a part of the work or stored in surplus may be re-installed as a part of the new system subject to approval of condition suitability by the Architect/Engineer. The requirements of the specifications (i.e. installation, warranty, testing, etc.) shall apply as if the materials were new, supplied by the Contractor.
- 2.03 EXISTING MATERIALS NOT TO BE RE-INSTALLED
 - A. In coordination with the Architect/Engineer, these materials shall be made available for his inspection and decision as to whether the Owner will retain possession. Items selected for retention shall be delivered to a location on the premises selected by the Owner and turned over to him. Take reasonable care to avoid damage to this material. If the Contractor fails to conform to this requirement, he shall purchase and turn over to the Owner replacement materials of like kind and quality.
 - B. All material not selected for retention by the Owner and debris shall be disposed of by the Contractor. This shall include, but not be limited to, removal of PCB type ballasts and fluorescent lamps which shall be disposed of in accordance with EPA requirements.

PART 3 - EXECUTION

- 3.01 EXISTING CONDITIONS
 - A. Examine the structure, building, and conditions under which Division 26 work is to be installed for conditions detrimental to proper and timely completion of the work. Do not proceed with work until deficiencies encountered in installation have been corrected. Report any delay or difficulties encountered in installation of Division 26 work which might be unsuitable to connect with work by other divisions of this specification. Failure to report conditions shall constitute acceptance of other work as being fit and proper for the installation of Division 26 work.

B. Maintain continuity of existing circuits of equipment to remain. Existing circuits of equipment shall remain energized. Circuits which are to remain but were disturbed during demolition shall have circuits, wiring, and power restored back to original condition.

3.02 DEMOLITION

A. Switchboards, panelboards, signaling systems, other electrical equipment free standing (or surface mounted), raceway (exposed) and conductors no longer in service as a result of this Contract shall be removed. Unused raceways or sleeves shall be cut flush at ceiling, floor or wall and filled with grout.

3.03 NEW DEVICES IN REMODEL AREAS

A. Provide surface mounting for devices on existing walls. Where existing boxes are indicated to be reused, extend box as necessary and provide new devices and plates.

3.04 EXISTING PANELBOARD

- A. Any modifications made to existing panels must be incorporated into the existing circuit index on the panel. If more than three circuits are modified a new typewritten index incorporating the changes to the existing index shall be installed in the existing panel.
- B. Listing shall match circuit breaker arrangements, typically with odd numbers on the left and even numbers on the right. Room numbers used shall be final room numbers used in the building as verified with the Owner.

END OF SECTION

PART 1 - GENERAL

- 1.01 GENERAL INCLUDES
 - A. Excavation and Associated Grading.
 - B. Trenching and Trench Protection.
 - C. Backfilling and Compaction.
 - D. Verification of Existing Utilities.
 - E. Protection of Utilities.
- 1.02 RELATED SECTIONS
 - A. Section 26 00 00 Electrical General Conditions
 - B. Section 26 05 33 Raceways
 - C. Section 26 50 00 Lighting

1.03 QUALITY ASSURANCE

- A. Inspection of Job Conditions: Prior to starting work and during work, the installer shall examine the work by others, site and job conditions under which excavation, trenching, and backfilling for underground utilities work will be performed, and notify the General Contractor in writing of unsatisfactory conditions or work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.
- B. Codes and Standards: Comply with requirements of the following codes and standards (Latest Edition) except as modified herein:
 - 1. International Conference of Building Officials, "International Building Code".
 - 2. Local requirements for all utility work.
 - 3. OSHA and WISHA regulations.
 - 4. APWA Standard Specifications.
 - 5. National Electrical Code NFPA 70.

1.04 RESPONSIBILITY

- A. The Contractor is solely responsible for compliance with the requirements of the drawings, specifications, local codes and standards, proper construction coordination with work of other trades, and protection and worker's safety. Contractor shall advise Engineer of any discrepancy in, or disagreement with the specifications and/or drawings prior to starting work and not proceed until issue is resolved. Commencement of work shall indicate Contractor's acknowledgement of his expertise in this type of work. Any delay resulting from failure to comply with this procedure will not be basis for an extension of the completion date.
- 1.05 APPLICABLE PUBLICATIONS
- A. The publications listed below form a part of this specification to the extent referenced.
- B. American Society of Testing and materials (ASTM) publications:

D 422-63	Particle Size Analysis of Soils.
D 423-66	Liquid Limit of Soils.
D 424-59	Plastic Limit and Plasticity Index of Soils.
D 1557-78	Moisture Density Relations of Soils using a 10 lb. (4.54kg)
	Rammer and 18 inches (457 mm) Drop.
D 2167-66	Density of Soil In-Place by the Rubber Balloon Method.
D 2217-66	Wet preparation of Soil Samples for Particle-Size Analysis and
	Determination of Soil Contents.
D 2487-69	Classification of Soils for Engineering Purposes.
D 2922-81	Test Methods for Density of Soil and Soil-Aggregate in Place by
	Nuclear Methods (Shallow Depth).
E 548-79	Generic Criteria for Use in the Evaluation of Testing and
	Inspection Agencies.

PART 2 - MATERIALS

2.01 SATISFACTORY MATERIALS

A. Materials classified as ASTM D2487, Unified Soil Classification System as SW, SP, GW, and GP are satisfactory for backfill use. Materials classified as SP-SM, GP-GM, GM, GC and ML are also satisfactory for backfill use provided that they contain moisture contents suitable for the intended use and are reasonably free of organic matter. Native material, not considered unsatisfactory as specified below, may comply. Except that no material shall have any object with a dimension exceeding 2 inches and no object shall be sharply angular.

2.02 UNSATISFACTORY MATERIALS

A. Materials classified in ASTM D2487, Unified Soil Classification System as PT, OH, and OL are unsatisfactory. Unsatisfactory materials also include man-made fills, refuse and all materials containing excessive organic matter or having moisture contents which are not suitable for the intended use, or having objects with dimensions exceeding 2 inches (boulders, etc.).

2.03 UNSTABLE MATERIAL

A. Unstable material shall consist of material too wet to properly support the utility conduit or appurtenance structure, and material identified as unsuitable in the National Electrical Code 300-5(F).

2.04 GRAVELLY SAND BORROW MATERIAL

A. Gravelly sand borrow material to provide backfill, or replace unsuitable soil, shall meet the requirements of SW, SP, GW, and GP materials, except that the maximum percentage passing the No. 200 sieve shall not exceed 5% based on the soil fraction passing the U.S. No. 4 sieve, and not contain discrete particles greater than 2 inches in diameter.

2.05 DEGREE OF COMPACTION

- A. Degree of compaction shall be expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D1557, Method D. Minimum compaction requirements shall be as specified in PART 3.
- 2.06 DRAINAGE GRAVEL
 - A. Shall be 3/4-inch washed gravel with no more than 2% passing 1/2-inch sieve opening.
- 2.07 SPECIAL BEDDING AND INITIAL BACKFILL MATERIAL
 - A. Minus 3/8-inch washed pea gravel.

PART 3 - EXECUTION

- 3.01 EXCAVATION
 - A. If workers enter any trench or other excavation four or more feet in depth that does not meet the open pit requirements of WSDOT Section 2.09.3(3)B, it shall be shored and cribbed. The Contractor alone shall be responsible for worker safety. All trench safety systems shall meet the requirements of the Washington Industrial Safety and Health Act, Chapter 49.17 RCW.
 - B. Excavation of every description and of whatever substances encountered shall be performed to allow the installation of all utilities at the lines and grades as required. During excavation, material satisfactory for backfilling shall be stockpiled in an orderly manner at a distance from the banks of the trench sufficient to avoid overloading and to prevent slides or cave-ins. Adequate drainage shall be provided for the stockpiles and surrounding areas by means of ditches, dikes, or other approved methods. The stockpiles shall also be protected from contamination with unsatisfactory excavated material or other material that may destroy the quality and fitness of the suitable stockpiled material.
 - C. If the Contractor fails to protect the stockpiles and any material becomes unsatisfactory as a result, such material shall be removed and replaced with satisfactory on-site or imported material from approved sources at no additional cost to the Owner.
 - D. Excavated material not required or not satisfactory for backfill shall be removed from the site and shall be disposed of off site, at the Contractor's expense, at the Contractor's waste area. Any excess satisfactory excavated materials shall not be mixed with unsatisfactory materials. Unsatisfactory materials shall not cover available suitable materials, or be disposed of in such a manner as to interfere with subsequent borrow operations.
 - E. Grading shall be done as may be necessary to prevent surface water from flowing into the excavation, and any water accumulating therein shall be removed so that the stability of the bottom and sides of the excavation is maintained. Unauthorized over-excavation shall be backfilled in accordance with paragraph 3.05 BACKFILLIING at no additional cost to the Owner.

F. The Contractor shall provide dewatering as required for installation of underground work.

3.02 TRENCH EXCAVATION

- A. The trench excavation shall meet the requirements of the National Electrical Code and local utility standards.
- B. Bottom Preparation: The bottoms of trenches shall be accurately graded to provide uniform bearing and support for the bottom quadrant of each section of the conduit and for bedding. Stones of 2 inches or greater in any dimension, or as recommended by the conduit manufacturer, whichever is smaller, shall be removed to avoid point bearing.
- C. Removal of Unsuitable Material: Where unsuitable material is encountered in the bottom of the trench, such material shall be removed to the depth directed and replaced to the proper grade with select granular material as provided in paragraph 3.05 BACKFILLING. When removal of unsuitable material is required due to the fault or neglect of the Contractor in his performance of the work, the resulting material shall be excavated and replaced by the Contractor without additional cost to the Owner.
- D. Bedding: The bedding surface for the conduit shall provide a firm foundation of uniform density throughout the entire length of the conduit. The conduit shall be bedded carefully in a soil foundation accurately shaped and rounded to conform to the lowest one-fourth of the outside portion of circular conduit or to the lower curved portion of conduit arch for the entire length of pipe or arch. When necessary, the bedding shall be taped. Provide bedding using pea gravel where noted on the drawings.

3.03 EXCAVATION FOR APPURTENANCES

A. Excavation for manholes, handholes or similar structures below grade shall be sufficient to leave at least 12 inches clear between the outer structure surfaces and the face of the excavation or support members. When concrete or masonry is to be placed in an excavated area, special care shall be taken not to disturb the bottom of the excavation. Excavation to the final grade level shall not be made until just before the concrete or masonry is to be placed.

3.04 JACKING, BORING, AND TUNNELING

A. Unless otherwise indicated, excavation shall be by open cut, except that sections of a trench may be jacked, bored, or tunneled if the raceway, cable or duct can be safely and properly installed and backfill can be properly tamped in such sections.

3.05 BACKFILLING

- A. Backfill material shall be compacted to 6" layers and as specified in Paragraph 3.06-Compaction.
 - 1. Trench Backfill: Trenches shall be backfilled to finish grade.
 - 2. Replacement of Unstable Material: Unstable material removed from the bottom of the trench of excavation shall be replaced with select granular material or gravel borrow placed in layers not exceeding 6 inches loose thickness.

3. Bedding and Initial Backfill: Bedding shall consist of satisfactory materials. Initial backfill shall be in 6-inch lift.

3.06 COMPACTION

A. Each layer of fill, or the excavated subgrade, shall be compacted to at least 95%, per ASTM D1557, of laboratory maximum density. Compaction shall be accomplished by approved tamping rollers, pneumatic-tired rollers, three-wheel power rollers, or another approved compaction equipment.

3.07 PROTECTION

A. Newly graded excavated or bedded areas shall be protected from traffic and from erosion, and any settlement or washing away that may occur from any cause, prior to acceptance, shall be repaired and grades reestablished to the required elevations and slopes.

1.01 WORK INCLUDED

A. Provide all wire, cable, and terminations complete.

- 1.02 RELATED DOCUMENTS
 - A. Section 26 00 00 Electrical General Conditions

PART 2 - PRODUCTS

- 2.01 WIRE AND CABLE (COPPER, 600-VOLT)
 - A. Interior and Above Grade: All wires to be Type THW or RHW. Type THWN/THHN or XHHW wire may be utilized at Contractors option, subject to code requirements. Wire and cables shall be brought to project in original containers bearing the underwriters label. Provide Type AVA wire where conductors are subject to temperature above 167 Degrees F.
 - B. Underground: All conductors to be type USE. Increase Raceway size when necessary to accommodate conductors per code. Exception: Underground conductors completely contained in code recognized Raceway and boxes may be Type THW, THWN or XHHW.
- 2.02 SPLICES
 - A. Above Grade: Solderless type only. Preinsulated "twist-on" type (limited to size #10 and smaller). Bolt on compression type with application of preformed insulated cover, heat shrinkable tubing or plastic insulated tape acceptable for all sizes.
 - B. Below Grade: Splices below grade shall be in handholes and shall be made watertight with epoxy resin type splicing kits similar to Scotchcast.
- 2.03 TERMINATIONS
 - A. Compression set, bolted or screw terminal.
 - B. Conductors #12 and smaller shall utilize eye or forked tongue type compression set terminator when termination is to a bolted or screw set type terminal block or terminal cabinet.
- 2.04 PLASTIC CABLE TIES
 - A. Nylon or Equivalent, locking type.
- 2.05 CABLE TAGS
 - A. Cable tags shall be installed on all three phase feeder cables. Tags shall be embossed with feeder power source and circuit number, i.e. panel A-26. Use tag part No. FT201 for cables up to 1-1/2 inch, use FT-205 for over 1-1/2 inch.

PART 3 - EXECUTION

3.01 GENERAL

A. Install all wiring in Raceway unless shown or specifically authorized otherwise.

3.02 WIRE SIZE

- A. No. 12 AWG minimum for power and lighting circuits.
- B. Provide solid wire for No. 10 AWG and smaller, and stranded conductors for No. 8 AWG and larger (600) volts.

3.03 TESTS

- A. In addition to the factory testing of all equipment and cable, the Contractor shall test all wiring connections for continuity and ground before any fixtures or other loads are connected. Tests shall be made with a 500V minimum DC "Megger" type tester. If tests indicate faulty insulation (less that 2 megohms), such defects shall be corrected and tested again. Contractor shall provide all apparatus to make tests and shall bear all expenses of required testing. Routine operation tests shall be made on all pieces of equipment to demonstrate that working parts are in operating condition. Results of all tests shall be recorded and submitted to the Architect. The Contractor shall immediately replace all parts, which fail to pass the test.
- B. Measure the OHMIC value of the Electric Service Entrance metallic "System Ground" with reference to "Earth Ground" using the "Multiple Ground Rod Fall-In-Potential" method and suitable instruments. Maximum resistance to ground shall be less than 10 ohms. If this resistance cannot be obtained with the ground system shown, notify the Architect immediately for further instructions. Provide OHMIC test results to Engineer.
- C. All circuits both in and out of the building shall test out free of grounds, short circuits and other defects.
- D. Check and record catalog number and ampere size of controller overload heaters installed, nameplate full-load amperes, and actual operating amperes of each motor. **IMPORTANT**: Submit recorded data in triplicate to the Engineer. Check proper load balance on the electrical system, direction of rotation, lubrication, and overload protection of all motors before placing in operation.
- E. Provide a log of ampere reading for all panels from phase to neutral for 4 wire panels and from phase to phase for 3 wire panels. These readings shall be taken with all loads activated.
- F. The final test of all equipment shall be made on dates designated by the Architect/Engineer and all readings shall be made in his presence.
- G. Feeders shall be checked to ensure all phases are energized before connecting to their respective motors. Each motor shall rotate in the proper direction for its respective load. Prior to rotation test, all bearings shall be inspected for proper lubrication.
- H. Minimum megger test for equipment shall be as follows:

Equipment Maximum Voltage Rating

Minimum Test Resistance 1,000-Volts or less 2 Megohms

- I. Provide certification of torque values for feeder and service entrance conductors per equipment manufacturer's recommendation.
- 3.04 CONDUCTOR SIZES, REFERENCED ON PLANS
 - A. Copper, type THW or RHW unless noted.
- 3.05 PULLING
 - A. Use no mechanical means for pulling No. 8 AWG conductors and smaller. Powdered soap stone or approved spray cream shall be the only lubricant used.
- 3.06 STRIPPING INSULATION
 - A. Do not ring the cable, always pare or pencil.
- 3.07 TAPING
 - A. If used shall be half lapped synthetic tape.
- 3.08 CONDUCTORS IN PANELS AND SWITCHBOARDS
 - A. Conductors in panels, switchboards, and terminal cabinets shall be neatly grouped and formed in a manner to "Fan" into terminals with regular spacing.
- 3.09 CABLE SUPPORTS
 - A. Provide conductor support devices as required by code in vertical cable runs.
- 3.10 RACEWAY SIZES REFERENCED ON DRAWINGS
 - A. Raceways are sized for copper, type THW, unless otherwise noted. Size all Raceways per code unless specifically noted to be larger on the drawings.

- 1.01 WORK INCLUDED
 - A. A grounding system shall be provided for neutral ground and equipment ground as required by code.
- 1.02 RELATED DOCUMENTS
 - A. Section 26 00 00 Electrical General Conditions

PART 2 - PRODUCTS

- 2.01 GROUNDING CONDUCTORS
 - A. Copper, code size, with physical protection where subject to damage. Bare or green insulated.
- 2.02 GROUND RODS
 - A. 3/4" x 8'-0" copper clad steel.

PART 3 - EXECUTION

- 3.01 GENERAL
 - A. Provide all grounding for electrical systems and equipment as required by codes and as specified herein.
- 3.02 GROUND RODS
 - A. Provide as shown and/or required. Connect the ground conductor to each rod.
- 3.03 SIZE OF GROUND WIRE
 - A. As required by code. Where ground wire is exposed to physical damage or is used outside of building, protect with conduit.
- 3.04 GROUND CONNECTION OF WATER PIPING
 - A. Metal internal piping shall be grounded, as part of this Contract. This includes jumpers for dielectric fittings.
- 3.05 GROUND CONNECTION OF BUILDING STEEL
 - A. Structural metal shall be grounded, as part of this Contract.
- 3.06 CONNECTION TO THE GROUND BUS
 - A. Provide connections in accordance with the codes; including but not limited to raceway systems, switchboard/panelboard frames, service neutral, separately derived systems, electrically operated equipment and devices. No device or equipment shall be connected for electrical service which has a neutral conductor connected to a grounding conductor or to the frame within the device or equipment.

3.07 METHOD OF CONNECTION

- A. Make all ground connections and ground cable splices by thermal welding. Grounding lugs, where provided as standard Manufacturer's items on equipment furnished, may be used.
- 3.08 FLEXIBLE RACEWAY
 - A. Shall not be used for grounding. Install separate ground conductor in all flexible raceway.
- 3.09 PVC RACEWAY
 - A. Install separate ground conductor in all PVC raceway as required per code.

3.10 DROP CORDS

A. Shall have a grounding wire and be connected with a grounding type plug and receptacle.

- 1.01 WORK INCLUDED
 - A. Provide outlet and pull boxes to enclose devices, permit the pulling of conductors and for wire splices and branches.
- 1.02 RELATED DOCUMENTS
 - A. Section 26 00 00 Electrical General Conditions

PART 2 - PRODUCTS

2.01 INTERIOR WIRING

- A. General: Outlet and pull boxes shall be pressed drawn steel, zinc coated with plaster ring where applicable. Welded boxes not allowed. Four-inch size minimum. Large pull boxes shall be fabricated sheet steel, zinc coated or baked enamel finish, with return flange and screw retained cover.
- B. Surface Metal Raceway: Boxes of same Manufacture and to match Raceway. Boxes to accommodate standard devices and device plate.
- C. Concrete and Masonry: Boxes for casting in concrete or mounting in masonry walls shall be the type specifically designed for that purpose.
- D. Install pull boxes so as to be accessible after completion of building construction.
- E. Ceiling outlet boxes shall be galvanized octagonal 4 inch, 1-1/2 inch deep (without fixture stud), 2-1/8 inches deep (with fixture stud).

2.02 EXTERIOR WIRING

- A. Above Grade: Outlet and junction boxes shall be cast or malleable iron or shall be cast of corrosion resistant alloy compatible with Raceway to which it is connected. Pull boxes shall be fabricated of heavy gauge steel and hot dipped galvanized. All boxes shall have gasketed covers.
- B. Below Grade: Where exposed to earth, boxes (handholes) shall be constructed of precast concrete with size, configuration, cover, grates and reinforcing as required by the particular installation. Manufacturer: Similar to Utility Vault 3030LA with base or Fogtite J11 Type 2 with base. Lid shall be H-20 rated where installed in traffic areas. Where not exposed to earth shall comply with Paragraph 2.02A above.
- C. Exterior outlet boxes shall be weather resistant and rain tight, with appropriate covers, gaskets and screws.

PART 3 - EXECUTION

3.01 ANCHORING

A. All boxes shall be firmly anchored directly or with concealed bracing to building studs or joints. Boxes must be so attached so that they will not "Rock" or "Shift" when devices are operated.

3.02 FLUSH MOUNTING

A. Except for surface mounted boxes or boxes above accessible ceilings, all boxes shall have front edge (box or plaster ring) even with the finished surface of the wall or ceiling.

3.03 ELECTRICAL OUTLETS

- A. General: Coordinate the work of this section with the work of other sections and trades. Study all Drawings that form a part of this Contract and confer with various trades involved to eliminate conflicts between the work of this section and the work of other trades. Check and verify outlet locations indicated on Architectural Drawings, door swings, installation details, layouts of suspended ceilings and locations of all plumbing, heating and ventilating equipment.
- B. Centered on Built-In Work: In the case of doors, cabinets, recessed or similar features, or where outlets are centered between such features, such as between a door jamb and a cabinet, make these outlet locations exact. Relocate any outlets which are located off center.
- C. Vertical and Horizontal Relationships: Where more than one outlet is shown or specified to be at the same elevation or one above the other, align them exactly on centerlines horizontally or vertically. Relocate as directed all such outlets (including lighting, receptacle, power signal and thermostat outlets) which are not so installed, at no additional cost to Owner.
- D. Device Outlet Height: Measure from the finished floor.
 *Switches
 4 Feet, Set Vertically, to Top of Box

*Receptacles,	18 Inches, Set Vertically to Centerline
Telecommunications	
Other	As Noted or as Directed by Architect
* Heights may vary. See Drawings	s for additional information

- E. Ceiling Location: For acoustical material locate outlet either at the corner joint or in the center of a panel, whichever is closer to the normal spacing. Locate all outlets in the same room in the same panel location.
- F. Installed In Sound Walls: Boxes installed in sound walls shall not be installed back to back. All boxes shall be separated by one stud space and shall be interconnected with flex conduit with a 90° loop.

3.04 ELECTRICAL WORK IN COUNTERBACKS, MILLWORK AND CASEWORK

A. Provide as shown and/or specified. Provide templates, where required, to other trades for drilling and cutting to ensure accurate location of electrical fixtures (outlets and devices) as verified with the Architect. Provide all wiring, devices, plates and connections required by said fixture.

3.05 CONNECTION TO EQUIPMENT

A. For equipment furnished under this or other Divisions of the Specifications, or by others. Provide outlet boxes of sizes and at locations necessary to serve such equipment. An outlet box is required if the equipment has pigtail wires for external connection, does not have space to accommodate circuit wiring used. Study equipment details to assure proper coordination.

3.06 BLANK COVERS

A. Provide blank covers or plates over all boxes not covered by equipment.

3.07 JUNCTION OR PULL BOXES

- A. Pull and junction boxes shall be installed as shown, and to facilitate pulling of wire and to limit the number of bends within code requirements. Boxes shall be permanently accessible and shall be placed only at locations approved by the Architect.
- B. In suspended ceiling spaces, boxes shall be supported from the structure independently from ceiling suspension system.
- C. The Drawings do not show every pull or Junction Box required. The Contractor is permitted to provide boxes deemed necessary by him for his work when installed in accordance with these Specifications.

3.08 ELECTRIC WATER COOLER

A. Conceal the Electrical Outlet behind the unit housing as provided for by the Manufacturer.

3.09 BOXES CONTAINING MULTIPLE DEVICES

- A. Boxes containing emergency and normal devices are permitted only with steel barriers Manufactured especially for the purpose of dividing the box into two completely separate compartments.
- B. Device Boxes Containing Multiple Devices and Wiring Rated Over 150 Volts to Ground and Over 300 Volts Between Conductors are permitted only with steel barrier manufactured especially for the purpose of dividing the box into separate compartments for each device having exposed live parts.

3.10 BOXES IN EARTH

A. Provide for all wire splices and as required to pull conductors. Boxes (handholes) shall be set in place on a 3" sand bed. Coverplates shall be flush to, and match the slope of, the final surface grade.

3.11 COLOR CODING

A. All Junction Boxes installed in accessible spaces and exposed in unfinished areas shall be color coded using spray paint or tape on the box and cover as applicable in the following manner:

277/480-Volt Sand 120/208-Volt Gray B. The colors shall match the colors used on the Raceway - See Section 26 05 33.

3.12 NAMEPLATES

A. For all line voltage junction boxes, provide engraved nameplate indicating circuit numbering of all wiring in junction box.

1.01 WORK INCLUDED

A. Provide Raceway System complete.

- 1.02 RELATED DOCUMENTS
 - A. Section 26 00 00 Electrical General Conditions

PART 2 - PRODUCTS - INDOORS

- 2.01 GALVANIZED RIGID STEEL CONDUIT (GRS)
 - A. General: Hot dipped galvanized.
 - B. Fittings: Galvanized malleable iron or noncorrosive alloy compatible with galvanized conduit. Erickson couplings, watertight split couplings (O.Z. type or equivalent) permitted. Running thread or set screw type fittings not approved.
- 2.02 INTERMEDIATE METAL CONDUIT (IMC)
 - A. General: Hot Dipped galvanized.
 - B. Fittings: Galvanized malleable iron or noncorrosive alloy compatible with galvanized conduit. Erickson couplings, watertight split couplings (O.Z. type or equivalent) permitted. Running thread or set screw type fittings not approved.

2.03 ELECTRICAL METALLIC TUBING (EMT)

- A. General: Hot dipped galvanized.
- B. Fittings: Raintight; steel or malleable iron type using a split corrugated compression ring and tightening nut or stainless-steel locking disc. Steel set screw fittings are acceptable for dry locations. Indenter, drive-on and pressure cast or die cast type set screw are not acceptable.

2.04 FLEXIBLE METAL CONDUIT (FMC, LFMC)

- A. Dry Locations:
 - 1. General: Galvanized flexible steel for dry locations only.
 - 2. Fittings: Malleable iron or steel, Thomas and Betts "squeeze" type or equal.
- B. Damp and Wet Locations:
 - 1. Liquid Tight: Polyvinyl chloride (PVC) weatherproof cover over flexible steel conduit.
 - 2. Fittings: Thomas and Betts "liquid tight" or equal.

2.05 SURFACE METAL RACEWAY

- A. Formed steel or aluminum type. Standard factory finish. Where color choice is available, consult Architect/Engineer for selection prior to ordering.
- 2.06 RIGID NON-METALLIC CONDUIT (PVC)

A. Schedule 40 rigid polyvinyl chloride type unless otherwise noted.

PART 3 - PRODUCTS – OUTDOORS

- 3.01 REINFORCED THERMOSETTING RESIN CONDUIT (RTRC)
 - A. For use in exterior environments.
 - B. UL 2515 listed and labelled as such on all conduit.
 - C. Conduit and fittings shall have the following salient attributes:
 - 1. UL 2515 listed and labelled as such on all conduit shipped.
 - 2. Manufactured using a single circuit filament winding process.
 - 3. Resin shall be epoxy based, with no fillers.
 - 4. All additive for increasing flame spread and lowering smoked density shall be halogen free.
 - 5. Internal conduit and elbow walls shall be smooth and all fibers embedded in the epoxy.
 - 6. All conduit and fitting shall be manufactured in the U.S.A. and marked as such.
 - Manufacturer shall have a current certificate, issued by an independent and accredited company, of compliance with an ISO 9001:2008 Quality Management System.
 - 8. Conduit shall be UL listed for the environment it is installed within.

PART 4 - EXECUTION

- 4.01 GENERAL
 - A. Install Raceway concealed in construction unless noted otherwise on the Drawings or specifically approved in writing by the Architect/Engineer.
 - B. Cut Raceway ends square, ream and extend maximum distance into all couplings and connectors.
 - C. Provide and install manufactured end caps on all Raceway ends during construction to prevent the entrance of water or dirt. Tape, as a cover, not permitted.
 - D. Swab out all Raceways before pulling wires.
 - E. All elbows for GRS and PVC Raceway shall be factory radius bends. For all other Raceway, use factory radius bends of 1-1/4" and larger diameter.
 - F. Raceway shall not penetrate sheet metal ducts unless permission is granted by Architect/Engineer. All sleeves shall be provided for Raceway installation.
 - G. Provide 2 3/4" C.O. stub into accessible ceiling space from all recessed panelboards or systems terminal boxes.
- 4.02 GALVANIZED RIGID STEEL CONDUIT

A. All Connections shall be watertight. Install for all Raceways in concrete or where subject to damage.

4.03 INTERMEDIATE METAL CONDUIT

A. Intermediate metal conduit is permitted as a substitute for galvanized rigid steel conduit except where GRS is required by code.

4.04 ELECTRICAL METALLIC TUBING

A. Install for wiring in masonry, frame construction, furred ceilings and above suspended ceilings. May be used for exposed work in unfinished areas where not subject to damage. Where construction involves masonry work, surface cut masonry units wherever such masonry units are to remain unplastered or uncovered in complete construction.

4.05 RACEWAYS UNDERGROUND

- A. Galvanized rigid steel conduit painted with two coats of bitumastic paint or galvanized rigid steel conduit with 15 mil. polyvinyl chloride (PVC) jacket (repair abrasions with PVC base paint or PVC)
- B. PVC Raceways may be used for underground runs when permitted by code. Field bends, when necessary, shall be formed only with factory recommended heater. Penetrations through floor and walls shall be galvanized rigid steel (GRS) conduit. PVC, if used, shall be increased in size from that shown to include code required ground wire.
- C. All underground bends in excess of 10 degrees and all elbows shall be GRS.
- D. Arrange and slope Raceways entering building to drain away from building.
- E. Ground wires shall be provided in all PVC Raceway.
- 4.06 INSERTS, SHIELDS AND SLEEVES
 - A. Furnish and set in place, in advance of pouring slabs and walls, all inserts and sleeves needed to execute Division 26 equipment installation.
 - B. Where supports in slabs are required after wall has been poured, use a drilled-in threaded insert, installed as recommended by Manufacturer.
 - C. Sleeves shall be provided for all wall penetrations.
- 4.07 RACEWAYS THAT STUB UP THROUGH FLOOR
 - A. Install at such depth that the exposed Raceway is vertical and no curved section of the elbow is visible.
 - B. PVC Raceway shall not be stubbed through floors.

4.08 SEALING OF RACEWAY PENETRATIONS

A. Exterior Wall Surfaces Above Grade: Seal around all penetrations with caulking approved by Engineer. For concrete construction above ground level, cast Raceway in wall or core drill wall and hard pack with a mixture of equal parts of sand and cement.

- B. Exterior Surfaces Below Grade: Cast Raceway into wall (or floor) or use manufactured seal assembly (such as O.Z. type "FSK") cast in place.
- C. Roofs: Provide mopped, lead, roof jack where Raceway penetrates roof membrane.
- D. Fire Rated Floors, Walls, Ceiling/Roofs: Concrete or masonry, seal around Raceway penetration with Dow Corning 3-6548 silicone RTV foam or approved equal. Plaster or gypsum wallboard, seal around Raceway penetration with plaster, fire tape per local Fire Marshal's requirements.

4.09 SEALING OF RACEWAYS

A. Seal interior of all Raceways which pass through buildings roofs, floors or through outside walls of the building, above or below grade. Seal on the end inside the building using duct sealing mastic, non-hardening compound type, specially designed for such service to maintain the integrity of the seal of the wall, floor or roof. Pack around the wires in the Raceways.

4.10 HANGERS FOR RACEWAYS

- A. In suspended ceiling spaces Contractor may, at his option, attach 1/2" or 3/4" EMT Raceways to the ceiling suspension system where such system is structurally suitable on independent wire secured at both ends; in which case, provide clips manufactured for the purpose.
- B. When more than two Raceways will use the same routing, group together on a patented channel support system (such as Unistrut).
- 4.11 SURFACE METAL RACEWAY
 - A. Install parallel to building surface (i.e., wall, ceiling, floor). Fasten to surface as recommended by Manufacturer. Mount so Raceway is in the least obvious location. Shall be used in lieu of conduit in finished areas.

4.12 FLEXIBLE CONDUIT

A. Flexible conduit shall be used **only** for connection to motors and equipment subject to vibration with 90 degrees loop minimum to allow for isolation and for lay-in fluorescent fixtures above T-Bar ceilings. For fixture installations, one end of flex must terminate in rough-in junction box. Flex conduit shall not be installed over 6' long or used to connect from fixture to fixture. Use liquid tight for pumps, equipment which is regularly washed down, and equipment in damp locations. Provide ground wire.

4.13 COLOR CODING

- A. General: Provide color bands of tape or paint one inch (25 mm) wide for Raceways up to two inches (51 mm) in diameter and one-half the Raceway diameter for larger Raceways, applied at panel and pullbox locations within each room, and 50 ft. (15.25 m) on centers within an area.
- B. Color Banding:

120/208 Volt Gray 277/480 Volt Sand C. The colors shall match the colors used on the boxes - See Section 26 05 32.

4.14 PULL CORDS

A. Nylon type shall be included in all installed empty Raceway.

1.01 WORK INCLUDED

A. When shown on drawings, provide dry type transformers complete. Transformers shall be UL listed and comply with NEMA Standard ST-20.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Tierney
- B. Sorgel Quiet Quality
- C. General Electric QL.
- D. Federal Pacific
- E. Similar units by Cutler-Hammer, Acme or Hevi-Duty may be utilized if the core and coil assembly is mounted on rubber isolation pads.
- 2.02 STANDARDS
 - A. ANSI C57.12.01/NEMA ST-20: General Requirements for Distribution, Power, and Regulating Transformers.
 - B. Underwriters Laboratories Standard 1561.
 - C. NEMA ST-20: Dry-Type Transformers for General Applications.
 - D. Transformers shall be NEMA TP-22016 Energy Efficient compliant and meet the requirements of the Department of Energy, 10 CFR Energy Conservation Standards for Distribution Transformers.

2.03 SHOP DRAWINGS

A. Prepare and submit for review prior to manufacture; include dimensioned front plan and section views, wiring and connection diagrams and bolting template. Contractor shall indicate on the drawings, mounting methods and connection lugs required.

2.04 CABINET

- A. Steel panel enclosure over core, coil, and terminal chamber with louvered openings for convection cooling. Cooling and terminal access shall be possible with both sides and rear of enclosure obstructed.
- B. Provide weatherproof or special enclosure when required for environment in which it is located.

2.05 WINDINGS

A. Separate primary and secondary. Windings shall have Class H insulation and shall be rated for continuous operation at rated KVA with temperature rise of not over 150 degrees C above a 40 degree C ambient, with a maximum hot spot temperature of 220 degrees C. Windings and core and coil assembly shall be treated and built to resist the effects of dirt and moisture.

- B. Core coil shall be mounted on rubber isolation mounting pads. Cores shall have a common core construction having low hysterisis and eddy current losses grounded to the transformer core. The neutral bus shall be sized and configured for at least 200% of the secondary full load current. Transformer impedance shall be a minimum of 3 and a maximum of 5%. The transformer shall be UL listed and suitable for non-sinusoidal loads with a K factor of 4.
- C. Shall contain grounded electrostatic shield.
- D. When transformers are Y-Y construction the core shall be a five-legged type. Tertiary winding is not permitted.

2.06 PRIMARY TAPS

A. Four full capacity taps, minimum of two 2-1/2 percent above and two 2-1/2 percent below normal (rated) primary voltage.

2.07 CONNECTIONS

A. Unless noted otherwise, three phase transformers shall have a 480-volt delta connected primary and 208Y/120-volt, three phase, four wire connected secondary, single phase transformers shall be 480-volt primary, 120/240 volt secondary. Provisions for external connections shall be made by means of a terminal board employing lugs conforming which are compatible with the external conductors installed. (Note: aluminum conductors require special lugs.) All connections shall be accessible for front and top of cabinet.

2.08 NOISE LEVEL

- A. Noise level shall not exceed ANSI Standard C89.2 sound levels of 45 db for sizes less than 51 KVA, 50 db for 51-150 KVA, 55 db for 151-300 and 60 db for greater than 300 as measured by NEMA ST20.
- B. When shown, transformers shall be ultra-quiet type. Noise level shall not exceed 35 db for all sizes through 300 KVA. Shall be similar to Tierney Quietran. All ultra-quiet transformers shall be factory certified to have noise levels not exceeding those specified. Forward certification to Engineer and include copy in the O&M Manual.

2.09 EFFECIENCY

A. Dry transformers shall have a minimum efficiency that complies with NEMA TP-2-2016.

2.10 VIBRATION ISOLATORS

- A. **Spring vibration isolators** shall be B-Line model HMT or equal with neoprene top and base.
- B. **Vibration pads** shall be cork, neoprene, and steel construction, B-Line model CNNK or equal.
- C. Neoprene pad spacers shall be B-Line model NNP or equal.

PART 3 - EXECUTION

3.01 MOUNTING

- A. Transformers shall be attached to the building structure to prevent overturning in the event of earthquake. All attachment nuts to have washer and rubber pad spacer under them. Provide neoprene pad spacers under mounting rails. Transformers shall be mounted on floor, wall or suspended from ceiling as noted in the contract documents or as required. Remove all shipping blocks prior to installation.
- B. Transformers with enclosures designed for floor mounting where suspended from ceiling shall be suspended on a trapeze constructed of a minimum of two horizontal structural channels hung from threaded rods attached to structural members or inserts in structural slab. Channel, rod, and inserts shall be sized for not less than 400% load safety factor.
- C. Transformers shall be installed with four spring vibration isolators, one at each corner, when any of the following conditions are present. Size each isolator for the full transformer weight.
 - 1. Transformer is 45 KVA or larger.
 - 2. Transformer is located higher than one floor above grade.
 - 3. Transformer is noted "SIM" in the contract documents.
- D. All transformers mounted directly on a wall shall be mounted with vibration pads sized to give 400% safety factor.

3.02 CONNECTIONS

- A. 208/120-volt three phase secondary transformers shall be considered "grounded neutral separately derived systems" and be grounded per code accordingly.
- B. Transformer raceway connections shall be flexible metal raceway. See Specification Section 26 05 33.
- C. Voltage Tap Connection: Connect all transformers at "normal" tap. After facility is completely energized, measure secondary voltages at all transformers and service switchboard. Forward a list to the Architect/Engineer for evaluation. Include copy in O&M Manuals. Reconnect taps as subsequently directed. All costs associated with this work shall be included in base bid.

- 1.01 RELATED DOCUMENTS
 - A. Section 26 00 00 Electrical General Conditions
- 1.02 WORK INCLUDED
 - A. Provide all service entrance and main distribution switchgear with equipment as shown and described, with continuous full load ampacities as indicated.

PART 2 - PRODUCTS

- 2.01 ACCEPTABLE MANUFACTURERS
 - A. Square-D
 - B. General Electric
 - C. Cutler-Hammer
 - D. Siemens
- 2.02 ENCLOSURES
 - A. Shall be freestanding, steel with steel angle or channel framework of adequate strength and rigidity necessary to resist all conditions of use to which it may be subjected and to support all equipment, devices and appurtenances contained therein. Front plates shall be installed in sections so that all parts of the board are front accessible without disturbing other parts. A removable lifting angle shall be provided at the top and bottom of each shipping section(s).
 - B. Minimum 12-gauge steel, except front panels and doors may be minimum 14 gauge.
 - C. Shall be front access only unless noted otherwise.
 - D. Provide on 3-inch housekeeping concrete pad with minimum 3-inch lip on front and sides.
 - E. Finish shall be factory applied; standard gray color for all exterior and interior painted surfaces. Other colors may be considered.
 - F. Outdoor installation shall be NEMA 3R.

2.03 SWITCHBOARD DIMENSIONS

A. Overall height of switchboards shall not exceed 90 inches (not including base channels). Length and depth shall not exceed dimensions as scaled or noted in contract documents. Manufacturers whose equipment dimensions exceed those indicated shall notify the Engineer in writing 10 days prior to bid date. These Manufacturers may not bid as "Not Conforming to Contract Documents". Contractor shall base bid only on equipment which fully complies with contract documents. Cost of building modifications or switchboard relocations, if permitted, or other additional work required to fit larger size switchboard(s) than shown on drawings shall be borne totally by the Contractor.

2.04 SWITCHBOARD BUSBARS

- A. Aluminum or copper at manufacturer's option, factory fabricated; carried to terminals for connection to service cables or busway. Brace switchboard components for symmetrical fault current shown plus a symmetrical offset (50,000 amp bracing minimum). Aluminum bus shall be tin plated over its full length.
- B. Busbar Joints:
 - Busbar to busbar shall be bolted, lapped and silver or tin plated, having low contact resistance and low temperature rise. For aluminum bus bolt using Grade 5 bolts with Belleville washers.
 - 2. Overcurrent devices shall be bolted to busbars using Grade 5 bolts and Belleville washers. Exception: Square-D I-line and 30-200A fused switches
- C. Conductor connectors shall be bolted to busbars using Grade 5 bolts and Belleville washers. Where aluminum conductors are utilized for feeders the connectors shall conform with Section 26 05 19.
- D. System of Bussing: Three phase, 4 wire, full size neutral unless otherwise noted.
- E. Ground Bus: Full length ground bus bonded to frame conforming to U.L. 891 for minimum size except larger as required by the code for grounding neutral conductor.

2.05 SWITCHBOARD COMPONENTS

- A. Switchboards shall include (but not limited to) the following components:
 - 1. Shall be full-fault current rated, series rating of devices is not allowed.
 - 2. Switches and fuses or breakers as shown. If fuses are used, provide all necessary fuses and spares per Section 26 28 13.
 - 3. Space for future switches or breakers as shown including complete bussing and required hardware for mounting devices. Space for metering and instrumentation components, and current limiters (when required).
 - 4. Miscellaneous appurtenances as required for a complete installation.
 - 5. Cleats for securing all conductors.
- B. When Serving as Service Entrance Equipment:
 - 1. Shall conform to UL 869 and have a Service Entrance Type UL label
 - 2. Shall be full-fault current rated, series rating of devices is not allowed. See drawings.
 - 3. Where utility company metering equipment is shown, provide current transformer space, meter base(s), metering conductors and miscellaneous appurtenances as required by serving utility.

4. Shall contain surge arrestors on all phases for voltage surge protection on secondary (under 600V) electrical wiring systems. Similar to Square-D, J9200.

ALARM FUNCTIONS

(ACCURACY % FULL SCALE)
Voltage Phase Loss
(less than 50% rms)
Current Phase Loss
(1/16 largest phase)
Phase Voltage Unbalance
(5 to 40% – 5% steps)
Phase Voltage Reversal
Overvoltage
(105 to 140% – 5% steps)
Undervoltage (95 to 60% – 5% steps)
Time Delay for Overvoltage,
Undervoltage, and Phase
Unbalance (0 to 20 seconds –
1-sec. steps)

Peak Demand

- C. Ground Fault Protection: Provide the following ground fault protection equipment on breakers (switches) rated 1000 amps or more, and as indicated.
 - 1. A current transformer (also called a sensor or current monitor) installed and connected to indicate the sum of all phase and neutral currents. (Zero sequence method). A current transformer on the grounding conductor is not acceptable.

- 2. A current transformer (also called a ground break relay) operated by the current transformer. Trip point shall be adjustable (calibrated scale indication) from 20% to 60% of the breaker or switch rating (or 1200 amps whichever is lower). The sensor shall also include an adjustable time delay (calibrated scale indication) from .1 second to .4 second (approximately).
- 3. A monitor or test panel whose functions shall furnish a means to test the ground fault system; monitor to control voltage; indicate when the sensor has tripped the breaker (switch); and reset the system.
- 4. A trip device on the breaker or switch operated by the ground fault sensor.
- D. Ground current meter and current transformer similar to Square-D #EA1GG/GF1 with current transformer on the neutral bonding jumper.

2.06 NAMEPLATES

- A. Nameplates shall be installed on all switchboards. Each individual switch shall be identified with a nameplate adjacent to the switch, describing the load connected.
- B. Provide a service entrance label nameplate on the main switchboard which includes the following:
 - 1. Architect
 - 2. Electrical Consultant
 - 3. Electrical Contractor
 - 4. Date of Installation
 - 5. Service Voltage & Bus Amperage Rating
 - 6. Symmetrical Short Circuit Current Rating
 - 7. Year of Manufacture
- C. Lettering size shall be suitable for the size of plate and information contained. Nameplates shall be engraved plastic (3/8-inch high minimum letters). Attach with stainless steel screws.
- D. Nameplate color shall be: Emergency System white on red, normal System white on black.
- E. Provide a riser diagram drawing using non-fading ink and mylar installed under glass and attached to the exterior of the main switchboard showing feeder runs, panels, transformers and raceway sizes.

2.07 SINGLE PHASING SENSORS

A. Provide single phasing sensors to trip the main switches in the event of a singlephase failure.

2.08 CLEATS

A. Provide for securing all feeder cables within the switchboard.

PART 3 - EXECUTION

3.01 MOUNTING

A. Shall be bolted to floor using 1/2" x 8" (minimum) black mild steel foundation anchor J-bolts and anchored similarly to building structure to prevent overturning in the event of earthquake. Provide 3" thick structural concrete "housekeeping pad". J-Bolts in the floor shall be set in the structural floor and extend through the housekeeping pad with sufficient threads to attach the switchboard.

3.02 WIRING

- A. Shall conform to applicable Sections of these specifications.
- B. Shall be secured to switchboard enclosure with cleats. Maximum spacing shall not exceed 24 inches.

3.03 SPACE

- A. Verify space available with equipment sizes and code required working clearances prior to submittals of shop drawings
- 3.04 GROUNDING
 - A. Provide pursuant to Section 26 05 26.
- 3.05 UTILITY REQUIREMENTS
 - A. When service switchboard includes utility company metering equipment, provide all devices and wiring to meet serving utility requirements.
- 3.06 TESTS
 - A. Torquing requirements and installation of all terminations 1,000 amps and above shall be certified by an independent testing agency.

- 1.01 RELATED DOCUMENTS
 - A. Section 26 00 00 Electrical General Conditions
- 1.02 WORK INCLUDED
 - A. Provide all panelboard equipment, complete; dead front type.

PART 2 - PRODUCTS

- 2.01 PANELBOARD TYPE
 - A. Panelboards shall be rated at proper voltage and current for intended use with busbars of copper or aluminum. Panels shall be 3-phase, 4-wire, 100% neutral, unless noted otherwise. Where aluminum is utilized, all lugs shall be of an approved compression type. Provide multiple lugs where conductors in parallel or "feed through" are shown on the Drawings.
 - B. Conductor Connectors shall be bolted to busbars using Grade 5 bolts and Belleville washers. Feeder conductor connectors shall be rated for 75 Degree C. wire when 75 Degree C. wire is indicated. Where aluminum conductors are utilized for feeders or branch circuits the connectors shall conform with Section 26 05 19.
 - C. Panelboards shall have a separate ground bus bonded to the panelboard frame.
 - D. Where 120-Volt, 15- or 20-Amp breakers are intended for switching loads they shall be of type rated for switching duty labeled "SWD."

2.02 ACCEPTABLE MANUFACTURERS

- A. General Electric
- B. Square-D
- C. Siemens
- D. Cutler-Hammer

2.03 CIRCUIT BREAKERS

- A. The following interrupting capacity, 10,000 AIC Symmetrical shall be considered minimum. Other ratings shall be as specified on panel schedules shown on the Drawings. Series rating of breakers is not allowed.
- B. Mount breakers in all panelboards so that breaker handles operate in a horizontal plane. Bolt in type only. Provide common trip on all multiple pole breakers.
- C. Where noted, provide spare breakers, complete for future connection of wiring circuits. Where "Space" is indicated for breakers, provide all bussing and breaker mounting hardware in the panelboard, provide steel knockouts in dead front metal closure of unused part of panel. If any steel knockouts are removed, provide breakers in such spaces or approved coverplates. Open spaces are not permitted.
- D. For multi-wire branch circuits, provide approved breaker handle ties where required by NEC 210.4.

2.04 CABINET FOR EACH PANELBOARD

- A. Flush or surface, as indicated; tight closing doors without play, when latched. Where two cabinets are located adjacent to each other in finished areas, provide matching trim of the same height. Where a remote-controlled switch or contactor is mounted in any panelboard, mount on same frame as panelboard interior with screw retained access door in dead front shield; common door over circuit breakers and remote-controlled device. Where flush mounted, provide (2) 3/4" conduits to accessible ceiling space for future expansion.
- B. All conduits for future expansion shall stub into a junction box, where located above grade, and shall be sealed in the panel.
- C. Provide cabinets of sufficient dimensions to allow for future expansion and addition of circuit breakers within the panelboards as indicated on panel schedules.
- D. Provide cabinet front with full-height hinged door. One door over the interior and an additional hinged dead front cover over interior and wireway (door-in-door). Full-height front cover hinged to box with concealed trim clamps. Provide flush door locks.
- E. Provide lock for each cabinet door. All Electrical Distribution Equipment Locks shall be keyed identically. Key system shall match existing. Supply Owner with minimum six keys.
- F. Fasten panelboard front with machine screws with oval counter-sunk heads, finish hardware quality, with escutcheons or approved trim clamps. Clamps accessible only when dead front door is open are acceptable. Surface mounted panelboards with fronts greater than 48 inches vertical dimension shall be hinged at right side in addition to hinged door over dead front.
- G. Finish: Provide factory prime coat for cabinets to be located in finished areas. Where cabinets are located in unfinished areas, standard lacquer or enamel finish, gray or blue-gray color, shall be substituted for factory prime coat.

2.05 SYSTEM OF NUMBERING AND BUS ARRANGEMENT

A. Shall be as shown on the Panel Schedules on the Drawings.

2.06 PANELBOARD NAMEPLATE

- A. Provide engraved and filled (or color layer engraved through outer layer) plastic nameplate with ½-inch high characters (for panel name); attached with screws to each NEMA 1 panelboard front. White on black, include voltage, phases, wires and minimum A.I.C. Rating in 3/8-inch characters.
- B. Nameplate color shall be:
 - 1. Emergency System: White letters on red
 - 2. Normal System: White letters on black
- C. Provide a service entrance label nameplate on the main panelboard which includes the following:
 - 1. Architect

- 2. Electrical Consultant
- 3. Electrical Contractor
- 4. Date of Installation
- 5. Service Voltage & Bus Amperage Rating
- 6. Symmetrical Short Circuit Current Rating
- 7. Year of Manufacture
- D. Provide a riser diagram drawing using non-fading ink and mylar installed under glass and attached to the exterior of the main panelboard showing feeder runs, panels, transformers and raceway sizes.

PART 3 - EXECUTION

3.01 MOUNTING

A. Secure in place with top of cabinet at 6'-0", unless otherwise noted. Top of cabinet and trim shall be level. Firmly anchor cabinets directly or with concealed bracing to Building Structure. When panels are not located in or directly on a wall, provide a support frame of formed steel channel which is anchored to the floor and Ceiling Structure. Interiors shall not be installed until Structure is totally enclosed. Where panels are mounted adjacent to each other, the top edges shall be at the same height.

3.02 CIRCUIT INDEX

A. For each branch circuit panelboard provide a typewritten index listing each circuit in the panelboard by number with its proper load designation. Mount with a transparent protective cover inside cabinet door. Listing shall match circuit breaker arrangements, typically with odd numbers on the left and even numbers on the right. Room numbers used shall be final room numbers used in the building as verified with the Owner, and not room number assigned on Plans.

3.03 CABINET PAINTING

- A. Cabinets furnished as prime painting shall be field painted to match color of adjacent wall. (See Division Painting).
- 3.04 SPACE
 - A. Verify space available with equipment sizes and Code Required Working Clearances prior to Submittal of Shop Drawings.
- 3.05 GROUNDING
 - A. Provide separate ground busbar for all panels supplying isolated ground circuits.
- 3.06 FEED THROUGH AND DOUBLE LUGS
 - A. Provide feed through or double lugs with amperage equal to the incoming feeder amperage unless shown as larger.

- 1.01 WORK INCLUDED
 - A. Provide all wiring devices and plates.
 - B. No push-in terminals allowed.
 - C. All devices color shall be white, unless otherwise noted.

PART 2 - PRODUCTS

- 2.01 ACCEPTABLE MANUFACTURERS
 - A. Hubbell
 - B. Pass & Seymour
 - C. Leviton
 - D. Cooper
- 2.02 SWITCHES
 - A. Emergency Push-Button Switches: Provide a red emergency push-button, momentary contact, yellow enclosure with clear plastic cover. Reset shall be by twisting the push-button.
 - 1. For Shut-Down of Fuel Supply: Switch shall be connected through an auxiliary contact tied to the fuel system pump. Label shall read: "Fuel Shut-Down". Switches shall be located as indicated on the Drawings..
 - 2. Approved Manufacturer: STI Safety Technology International.
 - B. "Industrial Specification Grade", quiet type, rated 277-volt, 20 amp, unless noted, with plastic handle. Single pole, double pole, 3-way, or locking type as required. Meets Fed. Spec. WS-896 Provide matching styles and colors in other devices as required for the conditions of installation. Hubbell CSB120, Eaton CSB120, Leviton 1221, and P&S 20AC1
 - C. Interchangeable type shall be rated same as above.
 - D. LED Dimmer: LED 0-10V dimmer switch shall be compatible with supplied LED board and driver. Dimmer switch shall have vertical slide with a positive "on/off" button. Dimmer shall have high and low end, field adjustable trim setting. Provide with associated power pack for control. Lutron Diva or approved equal.
 - E. Momentary Contact Line Voltage Switches: Single pole, double throw, 3-wire, normally open. Rating same as above.
 - F. Timer Switch: Provide electronic light timer switch where indicated on drawings. The timer switch shall be connected to the room lighting and fan. The timer switch shall be programmable for time-out from 5 minutes to 2 hours. Set timer for standard 20 minutes time-out period, time scrolls up, flash off, beeper on. Manufacturer: Watt Stopper – Inteli-switch Digital Time Switch.

- G. Motor rated switches: Switches serving as motor disconnecting means shall be horsepower rated with overload relays and meet requirements as stated above. See manual starters in Section 26 24 19, 'Manual Starters'.
- H. Device plates shall be Hubbell and Cooper Type 302 stainless steel.

2.03 RECEPTACLES

- A. In All Unfinished Areas & Non-Occupy Able Spaces: Provide "Industrial Specification Grade", Duplex NEMA 5-20R configuration (20-Amp, 120-Volt) unless shown otherwise. Must have "rivetless ground" contact manufactured as an integral component of the external ground screw terminal. Meets Fed Spec. WC-596 Hubbell HBL5362, Cooper 5362, P&S 5362A, and Leviton 5362.
- B. Self-Testing Ground-Fault Circuit-Interrupter Duplex Receptacles: 20A. 125V AC; 2-pole, 3 wire grounding; 10,000 amps current interrupting; green light indicator when power is 'on'; red light indicator when device is in the tripped position; Red "EOL" (end of life) indicator with rapid flash when the unit has reached end of life and/or cannot provide GFCI protection. Provide GFI receptacles where required by code.
- C. Faceless Self-Testing Ground-Fault Circuit-Interrupter Device: 20A. 125V AC; 2pole, 3 wire grounding; 10,000 amps current interrupting; green light indicator when power is 'on'; red light indicator when device is in the tripped position; Red "EOL" (end of life) indicator with rapid flash when the unit has reached end of life and/or cannot provide GFCI protection. Provide faceless self-testing ground fault device ahead of switched receptacles that require GFI protection per code. Mount device in same backbox as the device it is protecting.
- D. Weather Resistant (WR) / Ground Fault Circuit-Interrupter (GFCI) Outdoor Duplex Receptacles: NEMA 5-20R. Hubbell GFTR201 or equal, for 20 Amp, 125-Volt AC.
- E. Special Purpose Receptacles: For special purpose receptacles, see drawings for voltage, amperage, and phase. Provide with matching plug delivered to the Owner.

2.04 OCCUPANCY SENSORS

A. Provide self-adjusting occupancy sensor light switching devices for control of lighting in all rooms and offices shown on drawings. Sensors shall be ceiling or wall mounted to provide adequate coverage. Occupancy sensors shall be "Leviton", Model OSC20-M0W for ceiling mounting, OSW12-M0W for wall mounting, complete with OSP20-RD0 power pack and associated mounting hardware. Provide "Leviton" ODSOD-ID wall switch sensors where shown. Sensors shall be wired to maintain switching and circuits shown on drawings.

2.05 DEVICE PLATES

- A. Interior: Plates for recessed boxes shall be Hubbell and Cooper Type 302 stainless steel. Attachment screws shall match finish of plate. Plates for surface mounted boxes shall be of pressed stainless steel with size to fit exactly the box used.
 - 1. Where a duplex receptacle is indicated next to a USB receptacle, provide a dualgang faceplate and mount both devices in the same backbox under the same faceplate.

B. Exterior: Intermatic # WP1010MC, for vertical mount and # WP1010HMC for horizontal mount, or equivalent for receptacles. Metal cover shall be raintight while-in-use.

2.06 LABELING

- A. For NEMA 5-20R receptacles, each device shall be identified with a clear label with black typing stating the panel & circuit number.
- B. For receptacles other than NEMA 5-20R, the coverplate shall have ampere rating, voltage and phase engraved on a phenolic label and attached to the cover plate.

2.07 MULTIOUTLET ASSEMBLY (WHEN SHOWN)

A. Provide assemblies complete, including necessary fittings and hardware with circuits as indicated on Plans and outlet spacing as indicated. All assemblies shall contain ground wire. Wiremold or equal.

2.08 SPARE DEVICES

A. Provide the following spare devices:

Device	Quantity
Single-pole switch	2
Duplex receptacle	2
Dedicated duplex receptacle	2
GFI receptacle	2
20A, single-phase equipment connection	1
20A, three-phase equipment connection	1

B. Each spare device shall include 100 feet of conduit, wire, faceplate and labor; all as required for a complete installation. Location of these units to be determined by the Owner's representative at the site. Unused devices shall be turned over to the Owner.

PART 3 - EXECUTION

3.01 MOUNTING

- A. Rigidly fasten each device to the outlet box at proper position with the wall to bring receptacle flush with plate or switch handle the proper distance through the plate.
- B. Occupancy sensors that are ceiling mounted shall be located a minimum of 4'-0" away from a mechanical equipment diffuser.

3.02 ORIENTATION

- A. Set Switches vertical with handle operating vertically, up position "ON" at +48" above finished floor.
- B. Set Receptacles vertical with ground slot down at +18" above finished floor.
- C. Set Exterior Receptacles horizontal at +18" above finished grade.

3.03 DEVICE PLATES

- A. Shall be stainless steel for each new wiring device and for each telephone and signal equipment outlet, except where equipment mounted thereon covers the outlet box completely.
- B. Provide new covers on existing outlet boxes being reused.

3.04 DIMMER SWITCHES

- A. Provide a separate neutral for each phase.
- B. LED dimmer switches require a 4 square backbox per switch.

3.05 RECEPTACLE GROUNDING

- A. Provide bare bonding wire between receptacle grounding terminal and box. Plaster ear screws connecting frame to the box will not be acceptable for grounding.
- B. Provide green insulated grounding conductor in all branch circuits supplying ground-fault circuit-interrupter type receptacles.

3.06 HANDICAPPED ACCESS

A. Comply with requirements of Washington State Handicapped Access Code.

- 1.01 RELATED DOCUMENTS
 - A. Section 26 00 00 Electrical General Conditions
- 1.02 WORK INCLUDED
 - A. Provide all fuses as required. Provide three (3) spare of each size and type required. Fuses shall not be installed until equipment is ready to be energized. This measure prevents fuse damage during shipment of the equipment from the manufacturer to the jobsite or from water that may contact the fuse before the equipment is installed. Final tests and inspections shall be made prior to energization of the equipment. This shall include a thorough cleaning, tightening, and review of all electrical connections and inspection of all grounding conductors. All fuses shall be furnished by the Electrical Contractor. All fuses shall be of the same manufacturer.

PART 2 - PRODUCTS

- 2.01 MAINS, FEEDERS, AND BRANCH CIRCUITS
 - A. Circuits 0 to 600 amperes shall be protected by current limiting BUSSMANN LOW-PEAK Dual-Element Fuses LPN-RK (250 volts) or LPS-RK (600 volts). All dualelement fuses shall have separate overload and short-circuit elements. Fuse shall incorporate a spring activated thermal overload element having a 284°F. melting point alloy and shall be independent of the short-circuit clearing chamber. The fuse must hold 500% of rated current for a minimum of 10 seconds and be listed by Underwriters Laboratories, Inc., with an interrupting rating of 200,000 amperes r.m.s. symmetrical. The fuses shall be UL Class RK1 to maintain the Engineered protection of the system components.
 - B. Motor Circuits: All individual motor circuits with full load amperes ratings (FLA) of 480 amperes or less shall be protected by BUSSMANN LOW-PEAK Dual-Element Fuses LPN-RK (250 volts) or LPS-RK (600 volts). Larger H.P. motors shall be protected by BUSSMANN Type KRP-C Low-Peak Time-Delay Fuses of the ratings shown on the drawings. All other motors, (such as 1.0 service factor motors) shall be protected by BUSSMANN LOW-PEAK Dual-Element Fuses LPN-RK (250 volts) or LPS-RK (600 volts) installed in ratings of approximately 115% of the motor full load current except as noted above. The fuses shall be UL Class RK1 Dual Element Time Delay or Class L.

2.02 SPARE FUSES

A. Spare fuses shall be provided with a minimum of three of each ampere rating. See Section 26 50 00 for quantities of spare fusing required for ballasted light fixtures.

2.03 ACCEPTABLE MANUFACTURERS

- A. Bussman
- B. Little Fuse

2.04 SPARE FUSE CABINET

A. Provide a spare fuse cabinet for the above-required spare fuses. Cabinet front and lock shall match panelboard equipment specified in Section 26 24 16.

2.05 NAMEPLATE

A. Provide Nameplate "Spare Fuse Cabinet." Construct and attach in accordance with Section 26 24 16, Paragraph 2.06.

PART 3 - EXECUTION

3.01 FUSES

- A. Install in all fusible devices provided under this Contract.
- 3.02 SPARE FUSE CABINET
 - A. Locate in Main Distribution Switchboard Room or as shown on drawings.

- 1.01 RELATED DOCUMENTS
 - A. Section 26 00 00 Electrical General Conditions
- 1.02 WORK INCLUDED
 - A. Provided all disconnects, fused and unfused, required by code for equipment furnished under this and other divisions of these specifications and as shown on the drawings.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. General Electric
- B. Square-D
- C. Siemens
- D. Cutler-Hammer
- 2.02 DISCONNECTS
 - A. Switch shall be heavy-duty type, shall be quick-break and shall be horsepower rated. Switch shall have blades as required to open all ungrounded conductors and shall be single throw unless noted.
 - B. Enclosure shall have interlocking cover to prevent opening door when switch is closed. Door interlock shall include a defeating scheme, shall be padlockable in the "Off" position.
 - C. Enclosure shall be suitable for environment in which mounted. All exterior enclosures shall have a minimum raintight rating.

2.03 FUSED SWITCHES (OR FUSED DISCONNECTS)

- A. Shall be as above with addition of fuse space and clips to accept only fuses as noted in Section 26 28 13.
- B. Fuses shall be sized in accordance with manufacturer's requirements of protected equipment.

2.04 NAMEPLATES

A. Provide nameplates on all enclosures and include the following information: Load served, voltage, phase, panel and circuit number. Construct and attach in accordance with Section 26 00 00, Paragraph 2.05.

PART 3 - EXECUTION

3.01 SUPPORTS
A. Secure solidly to wall or approved mounting frame. Disconnects supported only by Raceway are not acceptable.

3.02 SPLICES

- A. Wiring space within enclosure shall not be used as a junction box.
- 3.03 INSTALLATION
 - A. All material installation shall be in accordance with manufacturers' recommendations and the provisions of applicable codes.
 - B. Fuses shall not be installed until equipment is ready to be energized.

END OF SECTION

PART 1 - GENERAL

- 1.01 RELATED DOCUMENTS
 - A. Section 26 00 00 Electrical General Conditions
- 1.02 WORK INCLUDED
 - A. Provide the lighting system complete and operational.
 - B. Recessed fixtures installed in fire-resistive ceiling construction shall have the same fire rating as the ceiling or shall be provided with fireproofing boxes having materials of the same fire rating as the ceiling.

1.03 FIXTURE SCHEDULE MANUFACTURER'S SERIES NUMBERS

- A. Are a design series reference and do not necessarily represent the number, size, wattage or the type of lamp, ballast or special requirements as specified hereinafter.
- 1.04 SUBMITTALS
 - A. Shall be neatly and clearly marked to indicate the fixtures, lamps and ballasts fully comply with contract documents. When substitute fixtures are submitted (if permitted) the data shall clearly cross reference (written or highlighted) that the substitute fixture complies with every detail of the specified fixture. Fixtures not fully complying with contract documents are not permitted.

PART 2 - PRODUCTS

- 2.01 METAL PARTS
 - A. Interior Fixtures: Steel or aluminum with 300°F, baked enamel finish, brushed aluminum with baked acrylic clear lacquer finish, or stainless steel with a brushed finish, manufacturer's standard color unless specified otherwise.
 - B. Exterior Fixtures: Corrosion resisting metal, a (non-ferrous, stainless steel or special finish) and in all cases suitable for outdoor service without tarnishing or other damage due to exposure; manufacturer's standard colors unless specified otherwise; cadmium plate all metal parts concealed by canopies, including screws, plates and brackets. All exposed fasteners shall be tamperproof.

2.02 LIGHT TRANSMITTING COMPONENTS

- A. Virgin acrylic or polycarbonate plastic (0.125-inch thick overall minimum), UV stabilized or glass. Shall be contained in a captive metal frame that remains attached to the fixture when door is in open position.
- 2.03 SPECIAL PARTS
 - A. Adapters, Plates, Brackets and Anchors: Provide where required by construction features of the building to suitably mount lighting fixture. All such appurtenances and mounting methods shall be approved by the Architect/Engineer prior to fabrication and installation.
 - B. Low Voltage Transformers: Provide and install where required to power individual or linear runs of low voltage light fixtures.

2.04 LAMPS

A. Solid-State Lighting: Fixtures shall have a lumen maintenance life expectancy (L₇₀) of > 50,000 hours, a CRI of > 82, and a CCT as indicated. Each solid-state fixture model shall be tested in accordance with IES LM-79.

2.05 HANGING FOR PENDANT FIXTURES

- A. Rigid type, with not less than 5 thread engagement at each end, consisting of iron pipe, with brass or aluminum tubing casing, or painted tubing not less than 0.040 inches thick.
- B. Aircraft cable, stainless steel, sized appropriately by manufacturer for weight and seismic zone.
- C. Provide a canopy for each fixture hanger except where fixture conceals the outlet box directly without a canopy.
- D. Provide a safety chain for all glass pendant fixtures and for all fixtures mounted in gymnasiums.

2.06 OUTDOOR LIGHTING STANDARDS

- A. Provide watertight insulating fuse in the base of lighting standards to individually protect each lighting fixture; buss Style "HEB" or approved, waterproof fuseholder with Buss fuse of appropriate capacity and voltage. Provide fuse for each hot circuit wire; do not fuse neutral.
- B. Provide concrete preformed round poles with base plate for bolting to concrete foundation. Natural exposed aggregate finish. Height as noted on drawings.
- C. Provide concrete foundations as shown on drawings. Field verify locations with Architect prior to installation of bases.
- 2.07 OUTDOOR GROUND MOUNTED LIGHTING FIXTURES
 - A. Provide concrete foundations for mounting of ground mounted lighting fixtures. Foundation shall be a minimum of 6" deeper than the light fixture and a minimum of 6" all around the base of the fixture. Provide #4 rebar with 3" minimum ring ties at 8" on center. The #4 rebar shall be vertically spaced approximately 6" apart. Field verify locations with Architect prior to installation of bases.

2.08 EXIT SIGNS

A. Fronts: Cutout stencils made of minimum #20-gauge sheet steel or sheet aluminum with red glass or plastic back of the cutout. Mount fronts either on concealed hinges or pull-out type with chain catch. Removable cutout arrows shall indicate direction of travel.

PART 3 - EXECUTION

- 3.01 LIGHTING FIXTURES GENERAL
 - A. Size and mounting height from finished floor to bottom of fixture as indicated on the drawings. Verify mounting provisions prior to the ordering of fixtures. Fixtures shall be UL listed for the location, and application in which they are installed.

- B. Ceiling fixtures shall be coordinated with and suitable for installation in, on or from the ceiling as shown. Installation and support of fixtures shall be in accordance with NFPA 70 and manufacturer's recommendations.
- C. Recessed fixtures installed in seismic areas shall be installed utilizing specially designed seismic clips.
- D. Suspended fixtures installed in seismic areas shall have 45° swivel hangers and shall be located with no obstructions within the 45° range in all directions. The stem, canopy and fixture shall be capable of 45° swing.
- 3.02 DIFFUSERS AND ENCLOSURES
 - A. Install lighting fixture diffusers only after construction work, painting and clean up are completed. Prior to final acceptance, remove all lamps, reflectors and diffusers, wash, rinse and reinstall.
- 3.03 ADJUSTMENT OF FIXTURES
 - A. Make all final spotlight and adjustable light settings under the direction of the Engineer during a scheduled period of time prior to the completion of the project. Include costs for all equipment and personnel expenses required for adjustment.
 - B. For fixtures with indirect lighting, notify Engineer prior to installation of any circumstance where the fixture lamp source will be within 12" of ceiling.
- 3.04 SUPPORT OF HID AND INCANDESCENT FIXTURES
 - A. Surface or Pendant Type: Attach to heavy formed steel straps attached to the outlet box by means of threaded stems with locknuts, or directly to the outlet box where the fixture is specifically so designed.
 - B. Recessed Type: Mount in frames suitable for the ceiling, with the recessed portion of the fixture securely supported from the ceiling framing. For fixtures supported by a ceiling suspension system, provide two safety chains secured to structural members above suspended ceiling.

3.05 SUPPORT OF FLUORESCENT AND LED FIXTURES

- A. Recessed Troffer Type: For fixtures supported by the ceiling suspension system, provide integral tabs, which rotate into position after fixture is lifted into the ceiling cavity. Provide two safety chains secured to structural members above suspended ceiling. Circuit connection shall be through use of 60-inch flexible conduit from a rigidly supported junction box. For plaster or GWB ceilings, provide a plaster frame compatible with light fixture.
- B. Recessed Downlight Type: Mount in frames suitable for the ceiling, with the recessed portion of the fixture securely supported from the ceiling framing. For fixtures supported by a ceiling suspension system, provide two safety chains secured to structural members above suspended ceiling.
- C. Surface and Pendant Mounted Type:
 - 1. Where mounted on accessible ceilings, hang from structural members by means of hanger rods through ceiling or as approved.

- 2. Where ceiling is of insufficient strength to support weight of lighting fixture, provide additional framing to support as required. Fixtures shall be supported from structure with seismic bracing independent of ceiling.
- 3. For Pendant Mount Type: Provide a unistrut channel for mounting fixtures entire fixture length unless light fixture is designed specifically for supporting itself. Provide 3/8-inch thread rod secured to structural members for support of unistrut channel.
- 4. Continuous Runs of Fixtures: Straight when sighting from end to end, regardless of irregularities in the ceiling. Where fixtures are so installed, omit ornamental ends between sections.

3.06 LOCATION

- A. Mount to the dimensions shown on the drawings. Mount at quarter points where no dimensions appear. Architect shall specify mounting locations where no dimensions appear and quarter point mounting is impractical or not indicated on the drawings.
- B. Refer to details, mechanical drawings, and coordinate with mechanical Contractor for equipment and ductwork mounted in ceilings to prevent conflict with light fixtures prior to installation. If conflicts cannot be resolved with the Mechanical Contractor, notify Architect/Engineer.

3.07 CONCRETE FOUNDATIONS

A. Install at locations shown taking care to provide soil compaction same as required under paving to avoid settling and tilting of pole. Provide for all steel, concrete or aluminum poles shown. Concrete foundations shall have a minimum raceway sweeps of 90 degrees and anchor bolts shall be accurately set in foundations using a template supplied by the pole manufacturer. Concrete work and grouting, see Division 03 of the specifications. When concrete work has cured, base plates shall be leveled and grouted in place. Pole anchor bases shall then be set on base plates, leveled plumb on foundations, and secured with holding nuts.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including General Conditions and General Requirements, apply to this work as if specified in this Section. Work related to this Section is described in the following sections:
 - 1. Section 01 35 43.19 Export Soil Management
 - 2. Section 02 41 13 Selective Site Demolition
 - 3. Section 31 23 19 Dewatering
 - 4. Section 31 23 33 Trenching and Backfilling
 - 5. Section 31 41 00 Shoring and Underpinning
 - 6. Section 31 63 29 Concrete Piers and Drilled Shafts
 - 7. Section 33 10 00 Water Utilities
 - 8. Section 33 30 00 Sanitary Sewer Utilities
 - 9. Section 33 40 00 Storm Drainage Utilities
 - 10. Section 34 05 17 Railroad Work

1.02 DESCRIPTION OF WORK

- A. The work includes excavation, trenching, shoring, filling, backfilling, subgrade preparation, grading, and compaction.
- B. Excavated soil and aggregate generated as a result of the work shall be exported offsite and disposed of in accordance with all applicable regulations.

1.03 QUALITY ASSURANCE

- A. On-site Testing and Inspection: Tacoma Rail will provide and pay for on-site testing and inspection services. The Contractor shall assist in obtaining samples and may obtain copies of test results performed by Tacoma Rail at no cost. Tests conducted for the sole benefit of the Contractor shall be at the Contractor's expense.
- B. Compaction Control Tests: Tacoma Rail will provide and pay for laboratory and on-site field compaction control tests in accordance with the applicable provisions of these specifications.
 - The compaction control density shall be the maximum density at optimum moisture content as determined by ASTM D 1557, Standard Methods for Moisture-Density Relationships of Soil and Soil Aggregates, Methods B, C or D as applicable, but shall be no less than 95% of dry density for fill, backfill, crushed surfacing and trench backfill above the bedding zone. Compact trench bedding zone material to 90% of dry density.
 - 2. Field tests to determine in-place compliance with required densities as specified, shall be performed in accordance with ASTM D 1556, D 2167, or D 2922.

C. Shoring shall be provided in accordance with Specification 31 41 00 – Shoring and Underpinning, applicable local, State and Federal safety codes. Design, agency approval, permits, construction, maintenance, and removal of all shoring elements are the sole responsibility of the Contractor

1.04 SUBMITTALS

- A. Submit in accordance with Submittal Procedures, the following:
 - 1. Source characterization, testing, reporting, and certification for all off-site borrow materials.

1.05 SITE CONDITIONS

- A. Subsurface investigations have been made at and near Tacoma Rail in connection with this Project. Review and make determinations about the anticipated soil and foundation conditions from the information and report in Appendix A.
- B. Anticipate encountering groundwater at any location within the project site. The groundwater elevation varies depending upon proximity to the shoreline, soil conditions, tidal conditions, and weather. See Section 31 23 19 Dewatering.
- C. Verify the location of existing utilities at the site, and use an independent private locate company to assist. Those utilities which are to remain shall be protected from damage and remain operational. Damage to utilities which are to remain shall be repaired by the Contractor at its own expense.

PART 2 - PRODUCTS

2.01 FILL AND BACKFILL

A. Material used for fill and backfill shall be clean, free-draining, sandy gravel or gravelly sand obtained from natural deposits and imported to the site. Naturally occurring earth, sand, gravel, clays, or mixtures of the above, excavated during construction is expected to be contaminated and shall not be used as fill or backfill. Individual particles shall be free from all objectionable coating. The material shall contain no organic matter or soft friable particles considered objectionable by the Engineer.

Material used for fill and backfill shall be imported fill material consisting of bank run gravel for trenches meeting the requirements of Washington State Department of Transportation Standard Specifications Section 9-03.19. The amount of fines shall not exceed 5 percent based on the minus ³/₄-inch fraction. Off-site borrow materials shall be characterized as specified in sections 2.07 and 2.08 at the Contractor's expense.

Material shall be graded between the limits specified below:

<u>Sieve Size</u>	Percent Passing (by weight)
8-inch	100
4-inch	95-100
3/4-inch	60-90
U.S. No. 10	25-65
U.S. No. 40	10-40
U.S. No. 200	0-4

The moisture content of fill material shall be within minus 2 percent to plus 1 percent of the optimum moisture content at the time of compaction.

2.02 EXCAVATION

- A. Naturally occurring earth, sand, gravel, clays, or mixtures of the above, excavated during construction is expected to be contaminated with regulated materials and compounds. Excavated soils shall be handled, loaded transported and legal disposed of off-site by the Contractor. Excavated soils shall not be reused on-site.
- B. Characterization of naturally occurring site soils is available from Tacoma Rail.

2.03 GRAVEL BORROW

Gravel Borrow shall meet the requirements of Specification 32 11 23 – Crushed Surfacing. Imported gravel base shall be characterized as specified in paragraphs 2.07 and 2.08 at the Contractor's expense.

2.04 GRAVEL BACKFILL FOR PIPE ZONE BEDDING

Gravel backfill for pipe zone bedding shall consist of crushed, processed or naturally occurring granular material. It shall be free from various types of wood waste or other extraneous or objectionable materials. It shall have such characteristics of size and shape that it will compact and shall meet the following specifications for grading and quality:

Percent Passing (by weight)
100
75-100
50-100
20-80
3-24
10.0 Max.
35 min.

Imported bedding material shall be characterized as specified in sections 2.07 and 2.08 at the Contractor's expense.

2.05 GRAVEL BACKFILL FOR DRAINS

Gravel Backfill for Drains shall conform to the following gradation:

Sieve Size	Percent Passing (by weight)
1" square	100
3/4" square	80-100
3/8" square	0-40
U.S. No. 4	0-4
U.S. No. 200	0-2

Imported bedding material shall be characterized as specified in sections 2.07 and 2.09 at the Contractor's expense.

2.06 PEA GRAVEL

Pea gravel material must be non-plastic, rounded to sub-rounded aggregate material. A minimum of 70 percent by weight of the pea gravel must have at least one fractured face. Pea gravel shall conform to the following gradation:

Sieve Size	Percent Passing (by weight)
3/8" square	95-100
U.S. No. 4	0-30
U.S. No. 8	0-15
U.S. No. 200	0-2

Imported pea gravel material shall be characterized as specified in sections 2.07 and 2.09 at the Contractor's expense.

2.07 QUARRY SPALLS

A. Quarry spalls shall meet the requirements of the Washington State Department of Transportation Standard Specifications Sections 9-13. Quarry spalls shall be characterized as specified in sections 2.07 and 2.09 at the Contractor's expense.

2.08 OFF-SITE BORROW SOURCE CHARACTERIZATION

- A. Off-site borrow source characterization shall be performed by the Contractor as specified in Section 2.08 to assure that imported materials are natural, native, virgin materials, free of contaminants, including debris or recycled materials, and meet the requirements of the contract documents.
- B. Each source of off-site borrow material shall be tested once per year for physical properties.
- C. Each source source of off-site borrow for sands and gravels shall be tested once per calendar year for metals.
- D. Each source of off-site borrow for soils, including materials to be used for fill and backfill, shall be tested for metals, chemical compounds and hydrocarbons once for every 500 cubic yards of material to be imported.
- E. The Engineer maintains the right to reject any materials that have been determined to be substandard for any reason. In the event of rejection, it shall be the responsibility of the contractor to remove all stockpiles of rejected material from the site.
 - 1. General

Materials shall of the quality, size, shape, gradation, or equal to that manufacture as specified herein. The Contractor shall submit a characterization of any and all imported material prior to any on-site placement. The characterization will include source identification, analyses of a material source sample, and a source inspection report. The material shall not be imported to the site until approved by the Engineer. Once approved and imported to the site, the Contractor shall perform an on-site inspection of the material to verify that it is the material sampled for characterization and approval.

2. Source Identification

The Contractor shall provide documentation of the origin of imported materials and maps identifying specific location(s) of material source(s). Physical and chemical characterization reports available from the material supplier shall be provided to the Engineer.

3. Inspection of Source

The Contractor shall inspect all material sources. During such inspection, the Contractor shall assure that materials to be delivered to the jobsite are likely to meet the appropriate specifications. The Contractor shall provide the Engineer two weeks notice of such inspections. The Engineer or a designated representative may accompany the Contractor to witness such inspections. This witnessing shall in no way release the Contractor from complying with the specifications and in no way shall be construed as approval of any particular source of material.

4. Testing, Reporting, and Certification

Off-site borrow materials shall be in accordance with the requirements of Section 2.08 unless waived by the Engineer.

5. Inspection of Materials at the Jobsite

The Contractor shall visually visually inspect import material upon delivery. Materials shall be inspected for presence of foreign, recycled, or reprocessed material. The Engineer may at any and all times perform an independent inspection. Material may be tested according to Section 2.09 at the Engineer's discretion. Material may be rejected due to the presence of deleterious substances or as a result of substandard test results.

2.09 CHARACTERIZATION TESTING, REPORTING, AND CERTIFICATION OF OFF-SITE MATERIAL

- A. The Contractor shall provide characterization and testing as described below for offsite borrow materials. Testing results shall meet the criteria shown in Table 31 00 00 -1 to be considered acceptable.
- B. The Contractor shall provide test sample(s) of excess materials to be exported. The sample data shall be provided at 21 days before proposed export of the materials.
- C. The Contractor is responsible for all testing costs associated with characterization of off-site borrow materials.
- D. The Contractor shall provide the following information with each sample submitted:
 - 1. Material Source
 - 2. Proposed On-site Use
 - 3. Sampling dates
 - 4. Chain of custody
 - 5. Sampling locations
 - 6. Contractor's certification that the samples submitted are representative of the materials that shall be used at the site.
- E. Characterization Testing shall include:

- 1. Physical Properties:
 - a. Grain Size Distribution (ASTM D 422-63)
 - b. Maximum Dry Density (ASTM D1557)
- 2. Metals and Chemicals:
 - a. Import Material Screening Criteria as indicated in Table 31 00 00 1 Import Material Screening Criteria
 - b. Petroleum Hydrocarbons (NWTPH-Gx (Gasoline) and -Dx (Diesel/Oil))

Chemical / Metal Name	Gravel/Rock Criteria (mg/kg)	Soil Criteria (mg/kg)
Volatile Organic Compounds (EPA Metho	a 8260)	
Benzene	-	0.004
Ethylbenzene	-	6.0
Toluene	-	7.0
Xylenes	-	9.0
Tetrachloroethylene (PCE)	-	0.05
Semi-Volatile Organic Compounds (EPA	Method 8270)	
acenaphthene		97.9
anthracene		2,275
benzo[a]anthracene		0.130
benzo[a]pyrene		0.1
benzo[b]fluoranthene		0.440
benzo[k]fluoranthene		13.7
benzoic acid	-	257
benzyl alcohol	-	8,000
bis(2-ethylhexyl) phthalate	-	13.9
chrysene	-	95.5
benzyl butyl phthalate	-	12.8
cresol;o-	-	2.3
cresol;p-	-	8,000
dibenzo[a,h]anthracene	_	0.1

Table 31 00 00 - 1 - Import Material Screening Criteria

dibenzofuran	-	80	
di-butyl phthalate	-	56.5	
dichlorobenzene;1,2-	-	8.4	
dichlorobenzene;1,4-	-	0.2	
diethyl phthalate	-	72.2	
dimethylphenol;2,4-	-	1.3	
di-n-octyl phthalate	-	800	
fluoranthene	-	631	
fluorene	-	101	
hexachlorobenzene	-	0.09	
hexachlorobutadiene	-	0.6	
indeno[1,2,3-cd]pyrene	-	1.2	
methyl naphthalene;2-	-	320	
naphthalene	-	0.006	
nitrosodiphenylamine;N-	-	0.0009	
pentachlorophenol	-	0.003	
phenol	-	11	
pyrene	-	655	
trichlorobenzene;1,2,4-	-	0.06	
Pesticides / PCBs (EPA Method 8081/8082)			
ddd	-	0.3	
dde	-	0.4	
ddt	-	2.9	
Polychlorinated biphenyls (PCBs)	-	0.5	
Metals (EPA Method 6010/6020/7041)			
Arsenic	13.8	13.8	
Cadmium	2.0	2.0	
Chromium (total)	113	113	
Chromium (VI)	-	0	
Copper	136	136	
Lead	250	250	
Mercury	0.14	0.14	
Nickel	61	61	

	Zinc 1	100 100	
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PART 3 - EXECUTION

3.01 GENERAL

A. Excavating, filling and grading shall be completed within the tolerances established or within reasonably close conformity with the alignment grade and cross sections indicated on the Drawings or as established within these specifications.

3.02 EXCAVATION

- A. Excavation: Shall be the naturally occurring earth, sand, gravel, clays, or mixtures of the above, required to be moved for the construction of crushed surfacing and pavements, trackbed, slopes, approaches, vehicle parking and circulations areas, building pads, service yard and associated work.
 - 1. Excavation material shall be moved with the use of mechanical equipment, such as shovels, loaders, bulldozers, graders, rippers, etc., but shall not require drilling and blasting or drilling and line breaking.
 - 2. Excavation by sluicing method will not be permitted unless specifically approved by the Engineer.
- B. Materials excavated during construction are expected to be contaminated with regulated materials and compounds. Excavated soils shall be handled, loaded transported and legal disposed of off-site by the Contractor. Excavated soils shall not be reused on-site.
 - 1. Contractor shall ensure that transport truck gross weight meets federal and/or state Department of Transportation (DOT) requirements and the requirements of the receiving facility, whichever is more stringent.
 - 2. Contractor shall take measures to prevent debris from being spill edfrom trucks or tracked from the site to local streets. Contractor shall sweep streets adjacent to the site as necessary or as directed by the Engineer.
 - 3. Contractor shall ensure that any vehicle transporting materials offsite are properly labeled and placarded in accordance with federal and state DOT requirements.
- C. Unsuitable Excavation: Shall consist of unstable materials, such as peat, muck, water impregnated clays, swampy or other undesirable materials, including buried logs, stumps, or trash. Unsuitable excavation materials shall be removed to the depth designated by the Engineer.

Unsuitable material excavated shall be replaced with Gravel Backfill for Drains per paragraph 2.04 as directed by the Engineer.

D. Excavated soil and aggregate generated as a result of the work shall be exported offsite and disposed of in accordance with all applicable regulations.

3.03 EXCAVATION FOR TRACK, STRUCTURES AND UTILITIES

- A. Excavate as necessary for track, structure and utilities to the lines and grades indicated on the drawings.
- B. Excavation below the designed depth, except as directed by the Owner, shall be backfilled with quarry spalls, or other suitable backfill material as approved by the Engineer and compacted as specified, at no extra cost to Tacoma Rail.
- C. Brace and shore sides of excavations. Comply with all federal, state, and local regulations regarding shoring, bracing, and other protection requirements.
- D. Keep water out of excavated pits and trenches by pumping or other means of dewatering. Water level shall be kept below the bottom of concrete pours before, during, and for a minimum of three days thereafter.
- E. Protect excavated material, stockpiled for use as backfill, from contamination by other materials and from damage by weather by covering with waterproof sheeting or other suitable means.

3.04 FILL, BACKFILL AND COMPACTION FOR STRUCTURES AND UTILITIES

- A. Trenches for all underground structures including manholes, catch basins, vaults, underground storage tanks, handholes and/or other structures, shall be over excavated by one foot. The subgrade shall be prepared, and a minimum of 12 inches of Gravel Backfill for Drains, or more if specified on the Drawings, shall be placed and compacted. If subgrade is soft and cannot be adequately compacted, contact Engineer for direction.
- B. Place backfill and structural backfill to lines and grades indicated on the Drawings.
- C. Remove water from excavated areas, by pumping or other means, before placing any fill material.
- D. Compact subgrade, as specified in paragraph 3.06, before placing any fill or backfill material.
- E. Do not place any fill against concrete walls/structures until the concrete has attained its specified design strength and/or certain other construction sequence criteria, if noted on the drawings, are met, or as specifically approved by the Owner.
- F. Pipe zone bedding material shall provide uniform support along the entire pipe barrel, without load concentration at joint collars or bells. All adjustments to line and grade shall be made by scraping away or filling in with bedding material under the body of the pipe and not by blocking or wedging. Bedding disturbed by pipe movement, or by removal of shoring movement of a trench shield or box, shall be reconsolidated prior to backfill. Pipe zone bedding shall be placed in loose layers and compacted to 90 percent maximum density. Bedding shall be placed, spread, and compacted before the pipe is installed so that the pipe is uniformly supported along the barrel. Lifts of not more than 6 inches in thickness shall be placed and compacted along the sides of the pipe to the height shown in the Drawings. Material shall be worked carefully under the pipe haunches and then compacted. If the Engineer determines that the material existing in the bottom of the trench is satisfactory for bedding the pipe, the existing material shall be loosened, regraded, and compacted to form a dense, unyielding base.

- G. Backfill by placing material in horizontal layers not exceeding 8-inches upon earth which has been undisturbed, stabilized, or otherwise approved by the Engineer.
 - 1. Construct in compacted layers of uniform thickness. Carry the layers up full width from the bottom. Compact with modern, efficient compacting units, or as directed by the Engineer. The compacting units may be of any type, provided they are capable of compacting each lift of the material to the specified density. The Engineer may order the use of any particular compacting unit discontinued if it is not capable of compacting the material to the required density within a reasonable time, or if the equipment may damage underlying or adjacent soils or structures.
 - 2. Unless noted elsewhere compact each layer to 95% of the maximum density as determined by compaction control tests described in Paragraph 1.04 above. Use small mechanical or vibratory compactor units to compact the layers adjacent to structures that are inaccessible to other compaction equipment.

3.05 COMPACTION

A. Compaction shall be performed with approved compaction equipment suited to the soil and the area being compacted. Moisten or aerate material as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used. Each lift of material placed shall be uniformly compacted to the density indicated for the specific material and use set forth in these Specifications. The percent of density required is in relation to the maximum density obtainable at optimum moisture content (Compaction Control Density) as determined in paragraph 3.07 "Compaction Control Tests."

3.06 COMPACTION CONTROL TESTS

Laboratory and field tests shall be performed in accordance with the applicable provisions of these Specifications.

- A. Compaction control density shall be the maximum density at optimum moisture content as determined by ASTM D 1557, Standard Methods for Moisture Density Relationships of Soil and Soil Aggregates, Methods B, C or D as applicable but shall be no less than 95% of dry density for Select Fill and Backfill and no less than 98% of dry density for Base Course Material.
- B. Field tests to determine in place compliance with required densities as specified, shall be performed in accordance with ASTM D1556, D2167, or D2922.

3.07 PREPARATION FOR CRUSHED SURFACING:

- A. Preparation of Subgrade
 - 1. Immediately prior to placement of surfacing materials, ballast or HMA base layers, clean the entire width of the area of all debris and dispose of as directed by the Engineer. All depressions or ruts which contain storm water shall be drained.
 - 2. Shape the entire subgrade to a smooth uniform surface, true to line, grade, and cross section as staked by the Engineer. Compact the subgrade material to 95% of the maximum density as determined by compaction tests ASTM Designation D1557. If soft or spongy material underlying the upper eight inches of the area being prepared precludes satisfactory compaction of the upper eight inches, loosen, aerate, or excavate, replace and compact to the required density as directed by the Engineer.

- 3. Remove and dispose of excess material which cannot be disposed of by normal drifting to low spots during blading and shaping operations or by placing in subgrade areas deficient in materials or by wasting, all as directed by the Engineer. Subgrade areas deficient in materials shall be brought to grade by importing suitable materials from other subgrade areas or other sources as directed by the Engineer. Materials added to subgrade areas deficient in materials shall be watered and compacted as necessary to yield a true finished subgrade as described above.
- 4. Once it is prepared, maintain the subgrade for surfacing in the finished condition until the first course of surfacing has been placed.
- B. Finishing Subgrades
 - 1. Before any paving or base material is placed, the subgrade shall be brought to the proper line, grade and cross section and shall be so maintained until the crushed surfacing and paving is placed.
 - 2. Compact the subgrade for pavement to 95% of maximum density as defined for Compaction Control Density, Article "Compaction Control Tests" these Specifications, to a minimum depth of six inches.
- C. Subgrade Protection
 - 1. Take all precautions necessary to protect the subgrade from damage; hauling over the finished subgrade shall be limited to that which is essential for construction purposes.
 - 2. Equipment used for hauling over the prepared subgrade which, in the opinion of the Engineer, is causing undue damage to the prepared subgrade or to the underlying materials, shall be removed from the work at the request of the Engineer.
 - 3. Repair at the Contractor's expense all cuts, ruts and breaks in the surface of the subgrade prior to placing surfacing, treated base, or paving materials.
 - 4. Protect the prepared subgrade from both the Contractor's traffic and public traffic and maintain the subgrade by blading and rolling as frequently as may be necessary to preserve the subgrade in a completely satisfactory condition.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including General Conditions and General Requirements, apply to this work as if specified in this Section. Work related to this Section is described in the following sections:
 - 1. Section 02 41 13 Selective Site Demolition
 - 2. Section 31 00 00 Earthwork
 - 3. Section 31 23 33 Trenching and Backfilling
 - 4. Section 31 41 00 Shoring and Underpinning
 - 5. Section 31 63 29 Concrete Piers and Drilled Shafts
 - 6. Section 33 10 00 Water Utilities
 - 7. Section 33 30 00 Sanitary Sewer Utilities
 - 8. Section 33 40 00 Storm Drainage Utilities
 - 9. Section 34 05 17 Railroad Work

1.01 DESCRIPTION OF WORK

A. This work includes all necessary measures to keep excavations and pipe trenches dry during construction. The work covered by this specification consists of providing all supervision, labor, materials, and equipment required to dewater excavations and trenches.

1.02 SITE CONDITIONS

A. The Contractor should anticipate encountering groundwater in excavations. Tacoma Rail has subsurface investigations made at and near the project site, the information is available for review as described in Section 00 31 00.

1.03 QUALITY CONTROL

- A. It shall be the sole responsibility of the Contractor to control the rate and effect of the dewatering operations in such a manner as to avoid all objectionable settlement and subsidence.
- B. All dewatering operations shall be adequate to ensure the integrity of the finished project and shall be the responsibility of the Contractor.

1.04 SUBMITTALS

- A. The Contractor shall submit a dewatering plan which addresses the methods proposed in dewatering excavations and trenches and handling the dewatering discharge in accordance with the City of Tacoma Special Authorization to Discharge.
- B. Dewatering plan shall include:
 - 1. Water pumping, conveyance and storage equipment.
 - 2. Anticipated pumping rates and durations.
 - 3. Water treatment best management practices.
 - 4. Water discharge.
 - 5. Schedule for completion of work within the trench.
 - 6. Sequence of installation and removal for dewatering measures.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products that are required to accomplish, or to be incorporated into, the work of this Section shall be as selected by the Contractor, subject to review by the Engineer.

2.02 EQUIPMENT

A. The Contractor shall have available on this site of work sufficient pumping equipment and/or other machinery to ensure that the operation of the dewatering system can be maintained.

PART 3 - EXECUTION

3.01 GENERAL

- A. Site work for excavations and pipe trenches shall be kept free from water to facilitate fine grading, construction of structures, the proper laying and joining of pipe and appurtenances, and placement of backfill material. Adequate pumping equipment shall be provided to handle and dispose of the water without damage to adjacent property. Trenches shall be dewatered if, at the decision of the Engineer, the quantity of water present prevents the proper installation of structures, pipes and ductbanks. Water in pipe trenches shall not be allowed to flow through the pipe.
- B. The Contractor shall provide and maintain at all times during construction, ample means and devices with which to promptly remove and properly dispose of all water entering trenches and excavations and other parts of the work, whether the water be surface water or underground water. No piping shall be laid in water, nor shall water be allowed to rise over them until the concrete or mortar has set at least 24 hours or until the pipeline has been adequately backfilled to prevent buoyancy. No embankment material shall be placed in standing water. The Contractor shall be responsible for obtaining all water discharge permits as required. No water shall be discharged to areas or work built or under construction.

- C. Water shall be disposed of in such a manner as not to be a nuisance or menace to the public health.
- D. Written permission shall be secured from the Engineer before locating any wells, well points, or drain lines for purposes of dewatering within the limits of an excavation. The Engineer shall have the right to require that any dewatering well, line, or trench drains left in place within the excavation limits be filled with concrete or grout as herein specified, and shown on the Record Drawings.
- E. Dewatering of excavations must be controlled to prevent damage from settlement due to possible lowering of the adjacent groundwater table.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including General Conditions and General Requirements, apply to this work as if specified in this Section. Work related to this Section is described in the following sections:
 - 1. Section 01 35 43.19 Export Soil Management
 - 2. Section 02 41 13 Selective Site Demolition
 - 3. Section 31 00 00 Earthwork
 - 4. Section 31 23 19 Dewatering
 - 5. Section 31 41 00 Shoring and Underpinning
 - 6. Section 31 63 29 Concrete Piers and Drilled Shafts
 - 7. Section 33 10 00 Water Utilities
 - 8. Section 33 30 00 Sanitary Sewer Utilities
 - 9. Section 33 40 00 Storm Drainage Utilities
 - 10. Section 34 05 17 Railroad Work

1.02 DESCRIPTION OF WORK

A. Work herein generally covers trenching, bedding, backfilling and compaction required for installation of site utilities and site storm drainage. Trench excavation and backfill shall include all excavation, backfilling, disposal of surplus and unsuitable material and all other work incidental to the construction of trenches.

1.03 SITE CONDITIONS

- A. Tacoma Rail has subsurface investigations made at and near the proposed project site. The information is available for review by the Contractor.as described in Section 00 31 00, Available Project Information.
- B. The Contractor should anticipate the presence of groundwater at or near the existing ground surface at much of the project site. The groundwater elevation varies depending upon proximity to the shoreline, tidal conditions and weather.

1.04 SUBMITTALS

- A. For each off-site source of material, submit test reports for the following:
 - 1. Grain Size Distribution, ASTM D 422-63.
 - 2. Weight per unit volume of uncompacted material, ASTM C-29.
 - 3. Specific gravity of material as determined from absolute volume, in accordance with ASTM No. D854.

PART 2 - PRODUCTS

2.02 BEDDING MATERIAL

A. Refer for Section 31 00 00 - Earthwork

2.03 BACKFILL MATERIAL

- A. Refer to Section 31 00 00 Earthwork
- 2.04 UNDERGROUND MARKING TAPE
 - A. Underground marking tape shall consist of inert polyethylene plastic, 4- mil thickness that is impervious to all known alkalis, acids, chemical reagents and solvents likely to be encountered in the soil, with a metallic foil core to provide the most positive detection and pipeline locators.
 - B. The tape shall be color coded and shall be imprinted continuously over its entire length in permanent black ink. The message shall convey the type of line buried below and shall also have the word "Caution" prominently shown. Color coding of the tape shall be as follows:

Utility	Tape Color
Stormwater	Green
Electrical	Red
Sanitary Sewer	Green

C. The width of the tape shall be as recommended by the manufacturer for the depth of installation and detection.

PART 3 - EXECUTION

3.01 TRENCH EXCAVATION

A. The Contractor shall maintain, at all times during the execution of this work, safe and stable excavations. All trench excavation and preparation shall comply with Section 7-08.3(1) of the Washington State Department of Transportation Standard Specifications, 2018 edition.

3.02 BEDDING AND BACKFILLING

A. Backfill trenches with bedding material as specified and as called for on the Drawings. Fine- grade the bedding material to the required slope and excavate to accommodate bell and spigot joints so the entire length of each pipe will be uniformly supported. Trench backfill shall be common material placed in horizontal layers not to exceed eight inches in loose thickness and carefully compacted by the use of small vibratory or mechanical compactors until the cover is one (1) foot above the top of the pipe. Subsequent layers of trench backfill shall not exceed eight inches in loose thickness but may be compacted by any method, which will not exceed the allowable stresses for the pipe. Compaction testing will be performed in conformance with Section 31 00 00 - Earthwork.

B. Backfill utility structures with structural backfill as specified in Section 31 00 00 Earthwork and as called for on the Drawings.

3.03 COMPACTION

- A. Compaction shall be performed with approved compaction equipment suited to the soil and the area being compacted. Moisten or aerate material as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used. Each lift of material placed shall be uniformly compacted to the density indicated for the specific material and use set forth in these Specifications.
- B. The Contractor shall properly place and compact all bedding and backfill materials to at least 90% of dry density (ASTM D 1557) in the bedding zone and 95% of dry density in trench backfill zone, and shall correct any deficiencies resulting from insufficient or improper compaction of such materials throughout the contract period.

3.04 COMPACTION CONTROL TESTS

- A. Laboratory and field tests shall be performed in accordance with the applicable provisions of these Specifications.
- B. Compaction control density shall be the maximum density at optimum moisture content as determined by ASTM D- 1557, Standard Methods for Moisture- Density Relationships of Soil and Soil Aggregates, Methods B, C or D as applicable.
- C. Field tests to determine in- place compliance with required densities as specified, shall be performed in accordance with ASTM D1556, D2167, or D2922.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including General Conditions and General Requirements, apply to this work as if specified in this Section. Work related to this Section is described in the following sections:
 - 1. Section 02 41 13 Selective Site Demolition
 - 2. Section 31 00 00 Earthwork
 - 3. Section 31 23 19 Dewatering
 - 4. Section 31 23 33 Trenching and Backfilling
 - 5. Section 31 41 00 Shoring and Underpinning
 - 6. Section 31 63 29 Concrete Piers and Drilled Shafts
 - 7. Section 33 10 00 Water Utilities
 - 8. Section 33 30 00 Sanitary Sewer Utilities
 - 9. Section 33 40 00 Storm Drainage Utilities
 - 10. Section 34 05 17 Railroad Work

1.02 DESCRIPTION OF WORK

- A. This Section describes the work necessary to furnish, place, maintain and remove shoring required for all structure and trench excavations greater than four (4) feet deep. Shoring shall be provided in accordance with Section 2-09.3(3) D Shoring and Cofferdams of the Washington State Department of Transportation Standard Specifications for Road, Bridge and Municipal Construction, 2018 Edition and applicable local, State and Federal safety codes.
- B. Design, approvals, and construction of all shoring are the exclusive responsibility of the Contractor. A Professional Engineer, licensed in the State of Washington, shall be used to design all aspects of the shoring.

1.03 SITE CONDITIONS

- A. The Contractor should anticipate to encounter groundwater at or near the existing ground surface at much of the project site. The groundwater elevation varies depending upon proximity to the shoreline, tidal conditions and weather.
- B. The Contractor shall ascertain to his own satisfaction the extent and method in which shoring will be required to meet all required safety codes based on the nature of the material in which it will appear, and the extent to which such occurrence of water shall affect his bid.

1.04 SUBMITTALS

A. Submit plans in accordance with Section 01 33 00, Submittal Procedures, 10 working days prior to beginning excavation, showing proposed shoring methods and construction details.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products that are required to accomplish, or to be incorporated into, the work of this Section shall be as selected by the Contractor, subject to review by the Engineer.

PART 3 - EXECUTION

3.01 GENERAL

- A. The method of shoring shall be according to the Contractor's design. The design, planning, installation and removal, if required, of sheeting and bracing shall be accomplished in such a manner as to maintain the required excavation or trench section and to maintain the undisturbed state of soils below and adjacent to the excavation.
- B. Damages resulting from improper support or from failure to support excavations shall be the sole responsibility of the Contractor.
- C. In trenching operations, the use of horizontal strutting below the barrel of pipe or the use of pipe as support for trench bracing will not be permitted.
- D. Sheet piling and timbers in trench excavations shall be withdrawn in a manner so as to prevent subsequent settlement of the pipe or additional backfill loading which might overload the pipe.
- E. That portion of cribbing or sheeting extending below the springline of pipe shall be left in place unless satisfactory means of reconsolidating bedding or side support disturbed by cribbing or sheeting removal can be demonstrated.
- F. If a movable box is used in lieu of cribbing or sheeting, and the bottom cannot be kept above the spring line of the pipe, the bedding or side support shall be carefully reconsolidated behind the movable box prior to placing initial backfill.

END OF SECTION

PART 1 – GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this section is described in:
 - 1. Section 01 13 00 Submittals and Shop Drawings
 - 2. Section 03 10 00 Concrete Forming and Accessories
 - 3. Section 03 20 00 Concrete Reinforcing
 - 4. Section 03 30 00 Cast-in-Place Concrete
 - 5. Section 31 00 00 Earthwork

1.02 DESCRIPTION OF WORK

- A. The extent and location of the drilled shaft work for pole foundations is indicated on the Drawings. The work shall consist of furnishing all materials, labor, tools, equipment, services, and incidentals necessary to construct the shafts.
- B. Provisions for handling the excavated materials, which may be suspect soils containing regulated materials, are provided in Section 31 00 00 Earthwork.

1.03 REFERENCES

- A. Geotechnical report: See Section 00 31 00 Available Project Information.
- B. American Petroleum Institute (API) Specifications, Standards, and Test Methods, designated by basic reference in this section (use the most current edition at the time of bid unless otherwise indicated).
- C. American Society for Testing Materials (ASTM), Standard Specifications and Standard Test Methods, designated by basic reference in this section (use the most current edition at the time of bid unless otherwise indicated).
- D. Standard Specifications for Road, Bridge, and Municipal Construction, M41-10, 2018 edition, by Washington State Department of Transportation (WSDOT Standard Specifications).

1.04 QUALITY ASSURANCE

- A. Shaft Construction Tolerances
 - 1. Shafts shall be constructed so that the center at the top of the shaft is within a horizontal tolerance of 1 inch.
 - 2. Shafts shall be within 1.5 percent of plumb.
 - 3. During drilling or excavation of the shaft, the Contractor shall make frequent checks on the plumbness, alignment, and dimensions of the shaft. Any deviation exceeding the allowable tolerances shall be corrected with a procedure approved by the Engineer.
 - 4. Shaft steel reinforcing bar placement tolerances shall conform to Section 6-02.3(24)C of the WSDOT Standard Specifications.

- B. Crosshole Sonic Log (CSL) Testing
 - 1. The Contractor shall perform CSL testing of 6 shafts in accordance with section 3.07 of this section. Shafts to be tested shall include:
 - a. (2) 28" shafts between grids 1 and 4,
 - b. (2) 32" shafts on grids 5 or 6, and
 - c. (2) 32" shafts between grids 7 and 14.
- C. Shaft Preconstruction Conference
 - 1. A shaft preconstruction conference shall be held at least five working days prior to the Contractor beginning any shaft construction work at the site to discuss construction procedures, personnel, and equipment to be used, and other elements of the approved shaft installation plan as specified in paragraph 1.04.B of this section.
 - 2. The Contractor shall accommodate the crosshole sonic log testing by furnishing and installing access tubes in accordance with paragraph 3.04 of this section.
 - 3. If synthetic slurry is used to construct the shafts, the frequency of scheduled site visits to the project site by the synthetic slurry manufacturer's representative shall be discussed.
 - 4. Representing the Contractor shall be the superintendent, on site supervisors, and all foremen in charge of excavating the shaft, placing the casing and slurry as applicable, placing the steel reinforcing bars, and placing the concrete. If synthetic slurry is used to construct the shafts, the slurry manufacturer's representative or approved Contractor's employee trained in the use of the synthetic slurry shall also attend.
 - 5. Representing Tacoma Rail will be the Engineer, key inspection personnel, and others as designated by Tacoma Rail.
 - 6. If the Contractor's key personnel change, or if the Contractor proposes a significant revision of the approved shaft installation plan, an additional conference shall be held before any additional shaft construction operations are performed.

1.05 DEFINITIONS

- A. CSL Testing Agency: Organization hired by Contractor that provides CSL testing in accordance with the requirements of paragraph 3.07 of this section.
- B. Design Position: The location of the centroid of the shaft at final top of shaft elevation (x, y, and z coordinates) as shown.
- C. Elevations: Referenced to mean lower low water (MLLW).
- D. Permanent Casing: Casing designed as part of the shaft structure and installed to remain in place after construction is complete.
- E. Temporary Casing: Casing installed to facilitate shaft construction only, which is not designed as part of the shaft structure, and which shall be completely

removed after shaft construction is complete, unless otherwise shown in the drawings.

- F. Top of Shaft Soil Excavation shall be defined as the highest existing ground point within the shaft diameter. For shafts where the top of shaft is above the existing ground line and where the drawings show embankment fill placed above the existing ground line to the top of shaft and above, the top of shaft soil excavation shall be defined as the top of shaft. Excavation through embankment fill placed above the top of shaft will not be included in the measurement.
- 1.06 SUBMITTALS

Submit in accordance with Section 01 13 00 – Submittals and Shop Drawings, the following:

- A. Construction Experience
 - 1. Prior to the start of drilled shaft construction, the Contractor shall submit a project reference list to the Engineer for approval verifying the successful completion by the Contractor of at least three separate foundation projects with drilled shafts of diameters, depths, and ground conditions equal to or larger than those shown in the drawings. A brief description of each project and the owner's contact person's name and current phone number shall be included for each project listed.
 - 2. Prior to the start of drilled shaft construction, the Contractor shall submit a list identifying the on-site supervisors and drill rig operators assigned to the project to the Engineer for approval. The list shall contain a detailed summary of each individual's experience in shaft excavation operations, and placement of assembled steel reinforcing bar cages and concrete in shafts.
 - 3. On-site supervisors shall have a minimum two years of experience in supervising construction of drilled shaft foundations of similar size (diameter and depth) and scope to those shown in the drawings, and similar geotechnical conditions to those described in the geotechnical report and summary of geotechnical conditions. The work experience shall be direct supervisory responsibility for the on-site shaft construction operations. Project management level positions indirectly supervising on-site shaft construction operations are not acceptable for this experience requirement.
 - 4. Drill rig operators shall have a minimum one year experience in construction of drilled shaft foundations.
 - 5. The Engineer will approve or reject the Contractor's qualifications and field personnel within 10 working days after receipt of the submission. Work shall not be started on any drilled shaft until the Contractor's qualifications and field personnel are approved by the Engineer. The Engineer may suspend the drilled shaft construction if the Contractor substitutes unqualified personnel. The Contractor shall be fully liable for the additional costs resulting from the suspension of work and no

adjustments in contract time resulting from the suspension of work will be allowed.

B. Shaft Installation Plan

The Contractor shall submit a shaft installation narrative for approval by the Engineer. In preparing the narrative, the Contractor shall reference the available subsurface data provided in the contract test hole boring logs and the geotechnical report(s) prepared for this project. This narrative shall provide at least the following information:

- 1. An overall construction operation sequence.
- 2. List, description and capacities of proposed equipment, including but not limited to cranes, drills, auger, bailing buckets, final cleaning equipment and drilling unit. The narrative shall describe why the equipment was selected, and describe equipment suitability to the anticipated site and subsurface conditions. The narrative shall include a project history of the drilling equipment demonstrating the successful use of the equipment on shafts of equal or greater size in similar soil conditions. The narrative shall also include details of shaft excavation and cleanout methods.
- 3. Disposal of excavation soil and debris shall be in accordance with Section 31 00 00 Earthwork.
- 4. Details of the method(s) to be used to ensure shaft stability (i.e., prevention of caving, bottom heave, etc. using temporary casing, slurry, or other means) during excavation (including pauses and stoppages during excavation) and concrete placement. If permanent casings are required, casing dimensions and detailed procedures for permanent casing shall be provided.
- 5. Detailed procedures for mixing, using, maintaining, and disposing of the slurry shall be provided. A detailed mix design (including all additives and their specific purpose in the slurry mix), and a discussion of its suitability to the anticipated subsurface conditions, shall also be provided for the proposed slurry.
- 6. The submittal shall include a detailed plan for quality control of the selected slurry, including tests to be performed, test methods to be used, and minimum and/or maximum property requirements that must be met to ensure that the slurry functions as intended, considering the anticipated subsurface conditions and shaft construction methods, in accordance with the slurry manufacturer's recommendations and the requirements of this section. As a minimum, the slurry quality control plan shall include the following tests:

Property	Test Method
Density	Mud Weight (Density), API 13B-1, Section 1
Viscosity	Marsh Funnel and Cup, API 13B-1, Section 2.2
PH	Glass Electrode, pH Meter, or pH Paper
Sand Content	Sand, API 13B-1, Section 5

- 7. The method used to fill or eliminate all voids below the top of shaft between the plan shaft diameter and excavated shaft diameter, or between the shaft casing and surrounding soil, if permanent casing is specified.
- 8. Reinforcing steel shop drawings, details of reinforcement placement, including bracing, centering, and lifting methods, and the method to assure the reinforcing cage position is maintained during construction, including use of bar boots and/or reinforcing steel cage base plates, and including placement of rock backfill below the bottom of shaft elevation provided the conditions of paragraph 3.03 of this section. The reinforcing steel assembly and installation plan shall include, as a minimum:
 - a. Procedure and sequence of steel reinforcing bar cage assembly.
 - b. Tie pattern, tie types, and tie wire gages for all ties on bracing.
 - c. Number and location of primary handling steel reinforcing bars used during lifting operations.
 - d. Type and location of reinforcing bar splices.
 - e. Details and orientation of internal cross-bracing, including a description of connections to the reinforcing bar cage.
 - f. Description of how temporary bracing is removed.
 - g. Location of support points during transportation.
 - h. Cage weight and location of center of gravity.
 - i. Number and location of pick points used for lifting for installation, and for transport.
- 9. Details of concrete placement, including proposed operational procedures for pumping methods, and a sample uniform yield form to be used by the Contractor for plotting the volume of concrete placed versus the depth of shaft for all shaft concrete placement (except concrete placement in the dry).
- C. Synthetic Slurry Technical Assistance

If synthetic slurry is used to construct the shafts, the Contractor shall provide or arrange for technical assistance in the use of the synthetic slurry as specified in paragraph 3.02.A.1 of this section. The Contractor shall submit four copies of the following to the Engineer:

- 1. The name and current phone number of the synthetic slurry manufacturer's technical representative assigned to the project. The representative will visit the site for each shaft installation.
- 2. The name(s) of the Contractor's personnel assigned to the project and trained by the synthetic slurry manufacturer in the proper use of the synthetic slurry. The submittal shall include a signed training certification letter from the synthetic slurry manufacturer for each trained Contractor's employee listed, including the date of the training.
- D. CSL Testing Organization and Personnel

At least seven calendar days prior to beginning shaft construction, the Contractor shall submit the name of the independent testing organization, and the names of the personnel, conducting the CSL tests to the Engineer for approval. The submittal shall include documentation that the qualifications specified below are satisfied. The independent testing organization and the testing personnel shall meet the following minimum qualifications:

- 1. The testing organization shall have performed CSL tests on a minimum of three deep foundation projects in the last two years.
- 2. Personnel conducting the tests for the testing organization shall have a minimum of one year experience in CSL testing and interpretation.
- E. Waste facility to be used for disposal of spoils in contact with synthetic slurry or water slurry with polymer-based additives.
- F. Work shall not begin until all the required submittals have been approved in writing by the Engineer. All procedural approvals given by the Engineer will be subject to trial in the field and shall not relieve the Contractor of the responsibility to satisfactorily complete the work.

PART 2 – PRODUCTS

- 2.01 CASING
 - A. All permanent casing shall be of steel base metal conforming to ASTM A 36. All permanent casing shall be of ample strength to resist damage and deformation from transportation and handling, installation stresses, and all pressures and forces acting on the casing.
 - B. All temporary casing shall be a smooth wall structure of steel base metal, except where corrugated metal pipe is shown in the drawings as an acceptable alternative material. All temporary casing shall be of ample strength to resist damage and deformation from transportation and handling, installation and extraction stresses, and all pressures and forces acting on the casing. The casing shall be capable of being removed without deforming and causing damage to the completed shaft, and without disturbing the surrounding soil.
 - C. The casing shall be watertight and clean prior to placement in the excavation.
 - D. The outside diameter of the casing shall not be less than the specified diameter of the shaft. The inside diameter of the casing shall not be greater than the specified diameter of the shaft plus six inches, except as otherwise noted for

shafts 5'-0" or less in diameter, and as otherwise noted in paragraph 3.01.C of this section for temporary telescoping casing. The inside diameter of casings for shafts 5'-0" or less in diameter shall not be greater than the specified diameter of the shaft plus 1'-0".

- E. Where the minimum thickness of the casing is specified in the drawings, it is specified to satisfy structural design requirements only. The Contractor shall increase the casing thickness as necessary to satisfy the requirements of paragraph 2.01.A of this section.
- 2.02 REINFORCING STEEL
 - A. Reinforcing steel used in the construction of shafts shall conform to ASTM A 615. See Section 03 20 00 - Concrete Reinforcing.
 - B. Steel reinforcing bar centralizers shall be steel, conforming to the details shown in the drawings. The Contractor may propose the use of alternative steel reinforcing bar devices as part of the shaft installation plan submittal subject to the Engineer's review and approval of such devices.

2.03 CONCRETE

Concrete used in the construction of shafts shall be Class 4000P conforming to Section 6-02 of the WSDOT Standard Specifications. When shafts are constructed in water, the concrete used for the casing shoring seal shall be Class 4000W conforming to Section 6-02 of the WSDOT Standard Specifications.

2.04 SLURRY

Slurry, if used, shall conform to one of the following:

A. Mineral Slurry conforming to the following requirements:

Property	Test	Red	quirement
Density (pcf)	Mud Weight (Density) 13B-1, Section 1	API	64.3 to 75
Viscosity (seconds/quart)	Marsh Funnel and Cup 13B-1, Section 2.2	API	26 to 50
PH	Glass Electrode, pH Meter, pH Paper	or	8 to 11
Sand Content Prior to Final Cleaning (percent)	Sand API 13B-1, Section 5		4.0 max.
Sand Content Immediately Prior to Placing Concrete (percent)	Sand API 13B-1, Section 5		4.0 max.

- 1. Use of mineral slurry in salt water installations shall not be allowed.
- 2. Slurry temperature shall be at least 40 degrees F when tested.
- B. Synthetic Slurry conforming with the following requirements:

1. The following synthetic slurries are approved as slurry systems, with additives that have been load tested for the California Department of Transportation (Caltrans):

Product	Manufacturer
ShorePac GCV	CETCO
	1500 West Shure Drive
	Arlington Heights IL, 60004
SlurryPro CDP	KB International, LLC
	Suite 216, 735 Broad Street
	Chattanooga, TN 37402-1855

- 2. Other synthetic slurry products may be approved for use provided the product meets the acceptance criteria established by WSDOT, including status as an approved synthetic slurry (with load tested additives) with the California Department of Transportation (Caltrans).
- 3. The sand content of synthetic slurry prior to final cleaning and immediately prior to placing concrete shall be less than 2.0 percent, in accordance with API 13B-1, Section 5.
- C. Water Slurry (with or without site soils)
 - 1. Water with or without site soils may be used as slurry when casing is used for the entire length of the drilled hole. Use of water slurry without full-length casing may only be used with the approval of the Engineer.
 - 2. Water slurry shall conform to the following requirements:

Property	Test	Requirement
Density (pcf)	Mud Weight (Density) API 13B-1, Section 1	65 max.
Sand Content (percent)	Sand API 13B-1, Section 5	1.0 max.

- 3. Use of water slurry in salt water installations shall not be allowed.
- 4. Slurry temperature shall be at least 40 degrees F when tested.
- 2.05 ACCESS TUBES FOR CROSSHOLE SONIC LOG (CSL) TESTING
 - A. Access tubes for CSL testing shall be steel pipe of 0.145 inches minimum wall thickness and at least 1-1/2 inch inside diameter.
 - B. The access tubes shall have a round, regular inside diameter free of defects and obstructions, including all pipe joints, in order to permit the free, unobstructed passage of 1.3-inch maximum diameter source and receiver probes used for the crosshole sonic log tests. The access tubes shall be watertight, free from corrosion with clean internal and external faces to ensure good bond between the concrete and the access tubes. The access tubes shall be fitted with

watertight threaded PVC caps on the bottom and the top, secured in position by means as approved by the Engineer, on the top.

2.06 GROUT

A. Grout for filling the access tubes at the completion of the crosshole sonic log tests shall be a neat cement grout conforming to Section 9-36.5 of the WSDOT Standard Specifications.

PART 3 – EXECUTION

3.01 SHAFT EXCAVATION

- A. General
 - 1. Shafts shall be excavated to the required depth as shown in the drawings or as directed by the Engineer. Shaft excavation operations shall conform to this section and the shaft installation plan as approved by the Engineer, except as otherwise specified by the Engineer. Once the excavation operation has been started, the excavation shall be conducted in a continuous operation until the excavation of the shaft is completed, except for pauses and stops as noted, using approved equipment capable of excavating through the type of material expected. Pauses during this excavation operation, except for casing splicing and removal of obstructions, are not allowed.
 - 2. Pauses, defined as momentary interruptions of the excavation operation, shall be allowed only for casing splicing, tooling changes, slurry maintenance, and removal of obstructions. Shaft excavation operation interruptions not conforming to this definition shall be considered stops. Stops for uncased excavations (including partially case excavations) shall not exceed 16 hours duration. Stops for fully cased excavations shall not exceed 65 hours duration.
 - 3. If the shaft excavation is not complete at the end of the shift or series of continuous shifts, the shaft excavation operation may be stopped, provided one of the following two conditions are met. For the condition of an uncased excavation, the Contractor shall, before the end of the work day, install casing to the depth of the depth of the excavation. The outside diameter of the casing shall not be smaller than six inches less than either the Plan diameter of the shaft or the actual excavated diameter of the hole, whichever is greater. Prior to removing the casing and resumption of shaft excavation, the annular space between the casing and the excavation shall be sounded. If the sounding operation indicates that caving has occurred, the casing shall not be removed and shaft excavation shall not resume until the Contractor has stabilized the excavation in accordance with the shaft installation plan. For the condition of either a cased or uncased excavation, the Contractor shall backfill the hole with either CDF or granular material. The hole shall be backfilled to the ground surface if the excavation is not cased, or to a minimum of five feet above the bottom of casing (temporary or permanent), if the excavation is cased.

- 4. During stops, the Contractor shall stabilize the shaft excavation to prevent bottom heave, caving, head loss, or loss of ground. The Contractor bears full responsibility for selection and execution of the method(s) of stabilizing and maintaining the shaft excavation.
- 5. If slurry is present in the shaft excavation, the Contractor shall conform to the requirements of paragraph 3.02.B of this section regarding the maintenance of the minimum level of drilling slurry throughout the stoppage of the shaft excavation operation, and shall recondition the slurry to the required slurry properties in accordance with paragraph 3.02 of this section prior to recommencing shaft excavation operations.
- 6. The shaft casing shall be equipped with cutting teeth or a cutting shoe as required and installed by either rotating or oscillating the casing. Installing the casing by vibrating means shall not be allowed unless approved by the Engineer.
- B. The Contractor shall furnish and install casings to the elevations indicated on the drawings.
- C. The Contractor may use temporary telescoping casing for the shafts, subject to the following conditions:
 - 1. The Contractor shall submit the request to use temporary telescoping casing to the Engineer for approval. The request shall specify the diameters of the temporary telescoping casing, and shall specify the shafts where use is requested. The Contractor shall not proceed with the use of temporary telescoping casing until receiving the Engineer's approval.
 - 2. The minimum diameter of the shaft shall be as shown in the drawings.
 - 3. The temporary telescoping casing shall conform to paragraphs 2.01.A, 2.01.B, 2.01.C, and 2.01.E of this section.
- D. The Contractor shall conduct casing installation and removal operations and shaft excavation operations such that the adjacent soil outside the casing and shaft excavation for the full height of the shaft is not disturbed. Disturbed soil is defined as soil whose geotechnical properties have been changed from those of the original in-situ soil, and whose altered condition adversely affects the structural integrity of the shaft foundation.
- E. The Contractor shall use appropriate means such as a cleanout bucket, smooth mouth grab, or air lift to clean the bottom of the excavation of all shafts. No more than 2 inches of loose or disturbed material shall be present at the bottom of the shaft just prior to placing concrete.
- F. The excavated shaft shall be inspected and approved by the Engineer prior to proceeding with construction. The bottom of the excavated shaft shall be sounded with an airlift pipe, a tape with a heavy weight attached to the end of the tape, or other means acceptable to the Engineer to determine that the shaft bottom meets the requirements of the contract documents.

- G. When obstructions are encountered, the Contractor shall notify the Engineer promptly. An obstruction is defined as a specific object (including, but not limited to, boulders, logs, and man-made objects) encountered during the shaft excavation operation which prevents or hinders the advance of the shaft excavation. The Contractor shall immediately notify the Engineer when efforts to advance past the obstruction to the design shaft tip elevation result in the rate of advance of the shaft drilling equipment being significantly reduced relative to the rate of advance for the portion of the shaft excavation in the geological unit that contains the obstruction. The Engineer will discuss with the Contractor whether to remove, break-up, or push aside the obstruction. The method of dealing with such obstructions and the continuation of excavation shall be as proposed by the Contractor and approved by the Engineer.
 - 1. Where below-ground obstructions prevent shafts from being driven in the required plan location, to the required tip penetration, or to the prescribed capacity, the Engineer may direct that special methods be employed to install the shafts. Jetting or blasting shall not be permitted.
 - 2. Payment for special methods, structure modifications, techniques proposed by the Contractor, or other means developed collaboratively between the Contractor and Engineer, will be made as an adjustment to the contract price.
- H. When permanent casing is specified, excavation shall conform to the specified outside diameter of the shaft. After the casing has been filled with concrete, all void space occurring between the casing and shaft excavation shall be filled with a material which approximates the geotechnical properties of the in-situ soils, in accordance with the shaft installation plan specified in paragraph 1.04.B.6 of this section and as approved by the Engineer.
- I. Drilling equipment shall not be operated from an existing structure.
- J. The Contractor shall use slurry, in accordance with paragraph 3.02 of this section, to maintain a stable excavation during excavation and concrete placement operations once water begins to enter the shaft excavation and remain present.

3.02 SLURRY INSTALLATION REQUIREMENTS

- A. Synthetic Slurry Technical Assistance
 - 1. If synthetic slurry is used, the manufacturer's representative, as identified to the Engineer in accordance with paragraph 1.04.C of this section, shall:
 - a. Provide technical assistance for the use of the synthetic slurry,
 - b. Be at the site prior to introduction of the synthetic slurry into each drilled hole requiring, and
 - c. Remain at the site during the construction and completion of each shaft to adjust the slurry mix to the specific site conditions.
 - 2. If the manufacturer's representative is not present at the site, the Contractor's employee trained in the use of the synthetic slurry, as identified to the Engineer in accordance with paragraph 1.04 of this

section, shall be present at the site throughout the remainder of shaft slurry operations for this project to perform the duties specified in paragraphs 3.02.A.1.a) through c) of this section.

- B. Minimum Level of Slurry in the Excavation
 - 1. When slurry is used to maintain a stable excavation, the slurry level in the excavation shall be maintained above the groundwater level the greater of the following dimensions, except as otherwise noted in paragraph 3.04.B.3 of this section:
 - a. Not less than 5 feet for mineral slurries.
 - b. Not less than 10 feet for water slurries.
 - c. Not less than ten feet for synthetic slurries
 - d. One shaft diameter
 - e. Dimension as required to provide and maintain a stable hole.

The Contractor shall provide casing, or other means, as necessary to meet these requirements.

- 2. The slurry level shall be maintained above all unstable zones a sufficient distance to prevent bottom heave, caving or sloughing of those zones.
- 3. Throughout all stops in shaft excavation operations, as specified in paragraph 3.01.A of this section, the Contractor shall monitor and maintain the slurry level in the excavation the greater of the following elevations:
 - a. No lower than the water level elevation outside the shaft,
 - b. Elevation as required to provide and maintain a stable hole.
- C. Slurry Sampling and Testing
 - 1. Mineral slurry and synthetic slurry shall be mixed and thoroughly hydrated in slurry tanks, ponds, or storage areas. The Contractor shall draw sample sets from the slurry storage facility and test the samples for conformance with the appropriate specified material properties before beginning slurry placement in the drilled hole. Mineral slurry shall conform to the material specifications in paragraph 2.04.A of this section. Synthetic slurry shall conform to the quality control plan included in the shaft installation plan in accordance with paragraph 1.06.B.5 of this section and as approved by the Engineer. A sample set shall be composed of samples taken at mid-height and within two feet of the bottom of the storage area.
 - 2. When synthetic slurry is used, the Contractor shall keep a written record of all additives and concentrations of the additives in the synthetic slurry. These records shall be provided to the Engineer once the slurry system has been established in the first drilled shaft on the project. The Contractor shall provide revised data to the Engineer if changes are made to the type or concentration of additives during construction
- 3. The Contractor shall sample and test all slurry in the presence of the Engineer, unless otherwise directed. The date, time, names of the persons sampling and testing the slurry, and the results of the tests shall be recorded. A copy of the recorded slurry test results shall be submitted to the Engineer at the completion of each shaft, and during construction of each shaft when requested by the Engineer.
- 4. Sample sets of all slurry, composed of samples taken at mid-height and within two feet of the bottom of the shaft, shall be taken and tested during drilling as necessary to verify the control of the properties of the slurry. As a minimum, sample sets of synthetic slurry shall be taken and tested at least once every four hours after beginning its use during each shift. Sample sets of all slurry shall be taken and tested at least once every two hours if the slurry is not recirculated in the drilled hole or if the previous sample set did not have consistent specified properties. All slurry shall be recirculated, or agitated with the drilling equipment, when tests show that the sample sets do not have consistent specified properties.
- 5. Sample sets of all slurry, as specified, shall be taken and tested prior to final cleaning of the bottom of the hole and again just prior to placing concrete. Cleaning of the bottom of the hole and placement of the concrete shall not start until tests show that the samples taken at midheight and within two feet of the bottom of the hole have consistent specified properties.
- D. The Contractor shall clean, recirculate, de-sand, or replace the slurry to maintain the required slurry properties.
- E. The Contractor shall demonstrate to the satisfaction of the Engineer that stable conditions are being maintained. If the Engineer determines that stable conditions are not being maintained, the Contractor shall immediately take action to stabilize the shaft. The Contractor shall submit a revised shaft installation plan which addresses the problem and prevents future instability. The Contractor shall not continue with shaft construction until the damage that has already occurred is repaired in accordance with the specifications, and until receiving the Engineer's approval of the revised shaft installation plan.
- F. When mineral slurry, conforming to this section, is used to stabilize the unfilled portion of the shaft, the Contractor shall remove the excess slurry buildup inside of the shaft diameter prior to continuing with concrete placement. The Contractor shall use the same methods of shaft excavation and the same diameter of drill tools to remove the excess slurry buildup as was used to excavate the shaft to its current depth.
- G. The Contractor shall dispose of the slurry and slurry-contacted spoils as specified in the shaft installation plan as approved by the Engineer, and in accordance with the following requirements:
 - 1. Water slurry with no additives may be infiltrated to uplands within the provided that the groundline at the disposal site is at least five feet above the current water table, and that disposal operations conform to the temporary erosion and sedimentation control (TESC) requirements

established for this project. For the purposes of water slurry disposal, upland is defined as an area that has no chance of discharging directly to the water, including wetlands or conveyances that indirectly lead to wetlands or waters of Commencement Bay or adjoining waterways.

- 2. Spoils in contact with this slurry may be disposed of as clean fill.
- 3. Synthetic slurry and water slurry with polymer-based additives and mineral slurries shall be contained and disposed of at a waste water treatment facility or into a sanitary sewer in accordance with the Contractor's permit requirements by the Contractor at an approved facility. Spoils in contact with synthetic slurry or water slurry with polymer-based additives shall be contained and disposed of by the Contractor at an approved waste facility. Prior to beginning shaft excavation operations, the Contractor shall coordinate with the waste facility operator and the Jurisdictional Health Department (JHD) to determine requirements for shaft spoils disposal at the facility. The Contractor shall submit the location of the waste facility, requirements for disposal of shaft spoils (as approved by the waste facility operator and the JHD), copies of any permits required and obtained, and any associated test results to the Engineer prior to disposal. The Contractor shall stockpile spoils on 6-mil plastic and cover with 6-mil plastic to protect from runoff until approval from the waste facility operator and JHD is given to dispose of spoils.
- 4. Mineral slurry shall be disposed off-site at an upland location, meeting all agency jurisdictional requirements, in an area that has no chance of discharging directly to waters of the State, including to wetlands or waters of Commencement Bay or adjoining waterways.
- 5. Spoils in contact with mineral slurry may be disposed as excess fill in accordance Section 31 00 00 Earthwork.
- 6. Alternative methods may be considered by the Engineer for the handling and management of slurry and grout. The Contractor shall submit a written plan of these processes to the Engineer for review. Work shall not commence until the plan has been approved by the Engineer.

3.03 ASSEMBLY AND PLACEMENT OF REINFORCING STEEL

- A. The reinforcing steel cage shall be rigidly braced to retain its configuration during handling and construction. Individual or loose bars shall not be permitted. The Contractor shall show bracing and any extra reinforcing steel required for fabrication of the cage on the shop drawings. Shaft reinforcing bar cages shall be supported on a continuous surface to the extent possible. All rigging connections shall be located at primary handling bars, as identified in the reinforcing steel assembly and installation plan as approved by the Engineer. Internal bracing is required at each support and lift point.
- B. The reinforcement shall be carefully positioned and securely fastened to provide the minimum clearances listed below, and to ensure that no displacement of the reinforcing steel bars occurs during placement of the concrete. The steel reinforcing bars shall be securely held in position throughout the concrete

placement operation. The Contractor shall submit details of the proposed reinforcing cage spacers along with the shop drawings. The reinforcing steel spacers at each longitudinal space plane shall be placed at least at the quarter points around the circumference of the steel reinforcing bar cage, and at a maximum longitudinal spacing of either 2.5 times the shaft diameter or 20'-0", whichever is less.

- C. Place bars as shown in the drawings with minimum concrete cover as indicated.
- D. Shaft excavation shall not be started until the Contractor has received approval from the Engineer for the reinforcing steel spacers required when the casing is to be pulled during concrete placement.

3.04 ACCESS TUBES FOR CROSSHOLE SONIC LOG TESTING

- A. The Contractor shall install access tubes for crosshole sonic log testing in all drilled shafts, except as otherwise noted, to permit access for the crosshole sonic log test probes. If, in the opinion of the Engineer, the condition of the shaft excavations permits shaft construction in the dry, the Engineer may specify that the access tubes be omitted.
- B. The Contractor shall securely attach the access tubes to the interior of the reinforcement cage of the shaft. One access tube shall be furnished and installed for each foot of shaft diameter, rounded to the nearest whole number, as shown in the drawings. The access tubes shall be placed around the shaft, inside the spiral or hoop reinforcement and three inches clear of the vertical reinforcement, at a uniform spacing measured along the circle passing through the centers of the access tubes. If the vertical reinforcement is not bundled and each bar is not more than one inch in diameter, the access tubes shall be placed two inches clear of the vertical reinforcement. If these minimums cannot be met due to close spacing of the vertical reinforcement, then the access tubes shall be bundled with the vertical reinforcement.
- C. The access tubes shall be installed in straight alignment and as near to parallel to the vertical axis of the reinforcement cage as possible. The access tubes shall extend from the bottom of the reinforcement cage to at least 2 feet above the top of the shaft. Splice joints in the access tubes, if required to achieve full length access tubes, shall be watertight. The Contractor shall clear the access tubes of all debris and extraneous materials before installing the access tubes. The tops of all access tubes shall be de-burred. Care shall be taken to prevent damaging the access tubes during reinforcement cage installation and concrete placement operations in the shaft excavation.
- D. The access tubes shall be filled with potable water as soon as possible after concrete placement (but no later than one day after concrete placement), and the top watertight threaded caps shall be reinstalled in a manner as approved by the Engineer. The Contractor shall keep all of a shaft's access tubes full of water through the completion of CSL testing of that shaft. When temperatures below freezing are possible, the Contractor shall protect the access tubes against freezing by wrapping the exposed tubes with insulating material, adding anti-freeze to the water in the tubes, or other methods as approved by the Engineer.

3.05 PLACING CONCRETE

- A. Concrete placement shall commence immediately after completion of excavation and placement of steel reinforcing cage by the Contractor and inspection by the Engineer. Immediately prior to commencing concrete placement, the shaft excavation and the properties of the slurry (if used) shall conform to the requirements herein. Concrete placement shall continue in one operation to the top of the shaft, or as shown in the drawings. The Contractor shall place concrete between the upper construction joint of the shaft and the top of the shaft in the dry.
- B. During concrete placement, the Contractor shall monitor, and minimize, the difference in the level of concrete inside and outside of the steel reinforcing bar cage. The Contractor shall conduct concrete placement operations to maintain the differential concrete head as 1'-0" maximum.
- C. When placing concrete in the dry, only the top 5 feet of concrete shall be vibrated except that the entire depth of concrete placed in the shaft-column steel reinforcing bar splice zone shall be vibrated. If a temporary casing is used it shall be removed before vibration. This requirement may be waived if a temporary casing is used and removed with a vibratory hammer during the concrete placement operation. Vibration of concrete does not affect the maximum slump allowed for the concrete class specified.
- D. If water is not present, the concrete shall be deposited through the center of the reinforcement cage by a method which prevents segregation of aggregates and splashing of concrete on the reinforcement cage. The concrete shall be placed such that the free-fall is vertical down the center of the shaft without hitting the sides, the steel reinforcing bars, or the steel reinforcing bar cage bracing. The Section 6-02.3(6) restriction in the WSDOT Standard Specifications for 5'-0" maximum free-fall shall not apply to placement of Class 4000P concrete into a shaft.
- E. When placing concrete underwater, including when water in a shaft excavation exceeds three inches in depth with an infiltration rate of 12 inches of depth or more in one hour, the Contractor shall place the concrete by pressure feed using a concrete pump, with a watertight tube having a minimum diameter of 4 inches. The discharge end of the tube on the concrete pump shall include a device to seal out water while the tube is first filled with concrete. Concrete placement by gravity feed is not allowed.
- F. Throughout the underwater concrete placement operation, the discharge end of the tube shall remain submerged in the concrete at least 5 feet and the tube shall always contain enough concrete to prevent water from entering. The concrete placement shall be continuous until the work is completed, resulting in a seamless, uniform shaft. If the concrete placement operation is interrupted, the Engineer may require the Contractor to prove by core drilling or other tests that the shaft contains no voids or horizontal joints. If testing reveals voids or joints, the Contractor shall repair them or replace the shaft at no expense to Tacoma Rail. Responsibility for coring costs, and calculation of time extension, shall be in accordance with paragraph 3.07.H of this section.

- G. Before placing any fresh concrete against concrete deposited in water or slurry, the Contractor shall remove all scum, laitance, loose gravel and sediment on the upper surface of the concrete deposited in water or slurry and chip off any high spots on the upper surface of the existing concrete that would prevent the steel reinforcing bar cage from being placed in the position required by the drawings. Prior to performing any of the crosshole sonic log testing operations specified in paragraph 3.07 of this section, the Contractor shall remove the concrete at the top of the shaft down to sound concrete.
- H. The Contractor's construction operation in the vicinity of a shaft excavation with freshly placed concrete and curing concrete shall conform to Section 6-02.3(6)D of the WSDOT Standard Specifications.
- I. Except for shafts where the shaft concrete is placed in the dry, the Contractor shall complete a uniform yield form, consistent with the sample form submitted to the Engineer as part of the shaft installation plan as specified herein, for each shaft and shall submit the completed form to the Engineer within 24 hours of completing the concrete placement in the shaft.

3.06 CASING REMOVAL

- A. As the temporary casing is withdrawn, a minimum 5-foot head of concrete shall be maintained to balance the foundation material and water pressure at the bottom of the casing.
- B. Tops of permanent casings for the shafts shall be removed to the top of the shaft or finished ground line, whichever is lower, unless directed otherwise by the Engineer. For those shafts constructed within a permanent body of water, tops of permanent casings for shafts shall be removed to the low water elevation, unless directed otherwise by the Engineer.
- C. The Contractor shall completely remove all temporary casings, except as noted. The Contractor may leave some or all of the temporary casing in place provided all the following conditions are satisfied:
 - 1. The Contractor shall submit the following information in writing to the Engineer:
 - a. The Contractor shall completely describe the portion of the temporary casing to remain.
 - b. The Contractor shall specify the reason(s) for leaving the portion of the temporary casing in place.
 - c. The Contractor shall submit structural calculations, using the design specifications and design criteria specified in the General Notes of the drawings, in accordance with Section 6-01.9 of the WSDOT Standard Specifications, indicating that leaving the temporary casing in place is compatible with the structure as designed in the drawings.
 - 2. The Contractor shall have received the Engineer's written approval of the submitted request to leave the temporary casing in place.

3.07 NONDESTRUCTIVE TESTING OF SHAFTS (CSL TESTING)

- A. The Contractor shall provide for crosshole sonic log testing and analysis on all completed shafts designated for testing by the Engineer. The testing and analysis shall be performed by the independent testing organization submitted by the Contractor and approved by the Engineer in accordance with paragraph 1.06.D of this section.
 - 1. The testing shall be performed after the shaft concrete has cured at least 96 hours. Additional curing time prior to testing may be required if the shaft concrete contains admixtures, such as set retarding admixture or water reducing admixture, added in accordance with Section 6-02.3(3) of the WSDOT Standard Specifications. The additional curing time prior to testing required under these circumstances shall not be grounds for additional compensation or extension of time to the Contractor in accordance with Section 1-08.8 of the WSDOT Standard Specifications.
 - 2. Crosshole sonic log testing shall be conducted at all shafts in which access tubes for test probe access have been installed (see paragraph 1.04.B of this section).
- B. After placing the shaft concrete and before beginning the CSL testing of a shaft, the Contractor shall inspect the access tubes. Each access tube that the test probe cannot pass through shall be replaced, at the Contractor's expense, with a 2-inch-diameter hole cored through the concrete for the entire length of the shaft. Unless directed otherwise by the Engineer, cored holes shall be located approximately 6 inches inside the reinforcement and shall not damage the shaft reinforcement. Descriptions of inclusions and voids in cored holes shall be logged and a copy of the log shall be submitted to the Engineer. Findings from cored holes shall be preserved, identified as to location, and made available for inspection by the Engineer.
- C. The Contractor shall submit the results and analysis of the crosshole sonic log testing for each shaft tested to the Engineer for approval. The Engineer will determine final acceptance of each shaft, based on the CSL test results and analysis for the tested shafts, and will provide a response to the Contractor within three working days after receiving the test results and analysis submittal.
- D. Except as otherwise noted, the Contractor shall not commence subsequent shaft excavations until receiving the Engineer's approval and acceptance of the first shaft, based on the results and analysis of the crosshole sonic log testing for the first shaft. The Contractor may commence subsequent shaft excavations prior to receiving the Engineer's approval and acceptance of the first shaft, provided the Engineer approves continuing with shaft construction based on the Engineer's observations of the construction of the first shaft, including, but not limited to, conformance to the shaft installation plan as approved by the Engineer, and the Engineer's review of Contractor's daily reports and Inspector's daily logs concerning excavation, steel reinforcing bar placement, and concrete placement.
- E. If the Contractor requests, the Engineer may direct that additional testing be performed at a shaft. If subsequent testing at a shaft indicates the presence of a defect(s) in the shaft, the testing costs and the delay costs resulting from the

additional testing shall be borne by the Contractor in accordance with Section 1-05.6 of the WSDOT Standard Specifications. If this additional testing indicates that the shaft has no defect, the testing costs resulting from the additional testing will be paid by Tacoma Rail in accordance with Section 1-05.6 of the WSDOT Standard Specifications.

- F. For all shafts determined to be unacceptable, the Contractor shall submit a plan for further investigation or remedial action to the Engineer for approval. All modifications to the dimensions of the shafts, as shown in the drawings, required by the investigation and remedial action plan shall be supported by calculations and working drawings as specified in Section 6-01.9 of the WSDOT Standard Specifications. All investigation and remedial correction procedures and designs shall be submitted to the Engineer for approval. The Contractor shall not begin repair operations until receiving the Engineer's approval of the investigation and remedial action plan.
- G. If the Engineer determines that the concrete placed under slurry for a given shaft is structurally inadequate, that shaft will be rejected. The placement of concrete under slurry shall be suspended until the Contractor submits to the Engineer written changes to the methods of shaft construction needed to prevent future structurally inadequate shafts, and receives the Engineer's written approval of the submittal.
- H. At the Engineer's request, the Contractor shall drill a corehole in any questionable quality shaft (as determined from crosshole sonic log testing and analysis or by observation of the Engineer) to explore the shaft condition.
 - 1. Prior to beginning coring, the Contractor shall submit the method and equipment used to drill and remove cores from shaft concrete to the Engineer and receives the Engineer's written approval. The coring method and equipment shall provide for complete core recovery and shall minimize abrasion and erosion of the core.
 - 2. If a defect is confirmed, the Contractor shall pay for all coring costs in accordance with Section 1-05.6 of the WSDOT Standard Specifications. If no defect is encountered, Tacoma Rail will pay for all coring costs in accordance with Section 1-05.6 of the WSDOT Standard Specifications. Materials and work necessary, including engineering analysis and redesign, to effect corrections for shaft defects shall be furnished to the Engineer's satisfaction at no additional cost to Tacoma Rail.
- I. All access tubes and cored holes shall be dewatered and filled with grout after tests are completed. The access tubes and cored holes shall be filled using grout tubes that extend to the bottom of the tube or hole or into the grout already placed.

END OF SECTION

PART 1 – GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including General Conditions and General Requirements, apply to this work as if specified in this Section. Work related to this Section is described in the following sections:
 - 1. Section 01 35 43.19 Export Soil Management
 - 2. Section 03 30 00 Cast-in-Place Concrete
 - 3. Section 31 00 00 Earthwork
 - 4. Section 32 12 16 Asphalt Paving
 - 5. Section 34 05 17 Railroad Work

1.02 DESCRIPTION OF WORK

The work includes the requirements for furnishing, transporting and delivering crushed surfacing, Work includes producing, transporting, and delivering base courses in conformance with these Specifications.

1.03 CHARACTERIZATION TESTING, REPORTING, AND CERTIFICATION OF FURNISHED MATERIAL

Off-site borrow source characterization and testing shall be performed by the Contractor to assure that furnished materials are natural, native, virgin materials, free of contaminants, including debris or recycled materials, and meet the requirements of the contract documents.

Each source of sands and gravels shall be tested once per calendar year for metals.

The Engineer maintains the right to reject any materials that have been determined to be substandard for any reason. In the event of rejection, it shall be the responsibility of the Contractor to remove all stockpiles of rejected material from the site.

A. General

Materials shall be of the quality, size, shape, gradation, or equal to that manufacture as specified herein. The Contractor shall submit a characterization of any and all imported material prior to any material delivery. The characterization will include source identification, analyses of a material source sample, and a source inspection report. The material shall not be delivered until approved by the Engineer. Once approved and delivered to the Site, the Contractor shall perform an on-site inspection of the material to verify that it is the material sampled for characterization and approval.

B. Source Identification

The Contractor shall provide documentation of the origin of imported materials and maps identifying specific location(s) of material source(s). Physical and chemical characterization reports available from the material supplier shall be provided to the Engineer.

C. Inspection of Source

The Contractor shall inspect all material sources. During such inspection, the Contractor shall assure that materials to be delivered to the jobsite are likely to meet the appropriate specifications. The Contractor shall provide the Engineer two weeks notice of such inspections. The Engineer or a designated representative may accompany the Contractor to witness such inspections. This witnessing shall in no way release the Contractor from complying with the specifications and in no way shall be construed as approval of any particular source of material.

D. Inspection of Materials at the Jobsite

The Contractor shall visually inspect import material upon delivery. Materials shall be inspected for presence of foreign, recycled, or reprocessed material. The Engineer may at any and all times perform an independent inspection. Material may be tested at the Engineer's discretion. Material may be rejected due to the presence of deleterious substances or as a result of substandard test results.

- E. The Contractor shall provide characterization and testing as described below for furnished materials. Testing results shall meet the Import Material Screening Criteria shown in Table 31 00 00 -1 to be considered acceptable. The Contractor is responsible for all testing costs associated with characterization of furnished materials.
- F. Characterization and testing shall include:
 - 1. Physical Properties:
 - a. Grain Size Distribution (ASTM D 422-63)
 - b. Maximum Dry Density (ASTM D1557)
 - c. Sieve analyses for all materials specified in accordance with ASTM C 136.
 - d. Los Angeles Wear (ASTM C131)
 - e. Degradation Factor (WSDOT Test Method T 113)
 - 2. Metals and Chemicals:

a. Import Material Screening Criteria as indicated in Table 31 00 00 - 1 - Import Material Screening Criteria

Chemical / Metal Name	Gravel/Rock Criteria (mg/kg)	Soil Criteria (mg/kg)			
Metals (EPA Method 6010/602	20/7041)				
Arsenic	13.8	13.8			
Cadmium	2.0	2.0			
Chromium (total)	113	113			
Chromium (VI)	-	0			
Copper	136	136			
Lead	250	250			
Mercury	0.14	0.14			
Nickel	61	61			
Zinc	100	100			

Table 31 00 00 - 1 – Import Material Screening Criteria

PART 2 – PRODUCTS

2.01 CRUSHED SURFACING

Crushed surfacing base course and top course shall comply with Section 9-03.9(3) of the Washington State Department of Transportation Standard Specifications for Road, Bridge and Municipal Construction, 2018 edition.

PART 3 – EXECUTION

3.01 EQUIPMENT

All equipment necessary for the satisfactory installation of crushed surfacing shall meet the requirements of Section 4-04.3(1) of the Washington State Department of Transportation Standard Specifications for Road, Bridge and Municipal Construction, 2018 Edition, as amended to provide for the following:

Equip grading machines or trimmers with a spirit level or other type slope indicator which will continuously indicate the average, transverse slope of the screed. Bubble or indicator movement should be no less than 1/8 inch for each 0.1 percent change in transverse slope.

3.02 PREPARATION AND PROTECTION OF SUBGRADE

Prepare and protect subgrade as specified in Section 31 00 00 – Earthwork and obtain approval of the Engineer before placing crushed surfacing materials.

3.03 PLACEMENT OF CRUSHED SURFACING AGGREGATES

- A. Prior to placement Contractor shall blend the various source materials to create a homogenous, well graded, mixture.
- B. Equipment necessary for the satisfactory performance of this construction shall be on the project and approved by the Engineer prior to beginning work. If central-mix-plant methods are used, the central mixing plant shall comply with the applicable portions Section 4-04.3(3) of the WSDOT Standard Specifications, 2018 Edition.
- C. Prepare subgrades as specified above and obtain approval of the Engineer before placing base course or surfacing materials.
- D. Mixing: After each layer of material is placed, mix the material by motor graders or other approved equipment until the mixture is uniform throughout. Add water as directed by the Engineer to facilitate mixing and compacting.
- E. Placing and Spreading: Spread each layer of material by means of approved spreading equipment. Such equipment may be bottom-dump hauling equipment with transverse spreading facilities; self-propelled spreading and leveling machines; or spreader boxes equipped with wheels or so constructed as to preclude damage to the subgrade or underlying courses. Spreading in small areas of less than 2,000 square yards or in areas irregular in shape may be accomplished by other means as directed by the Engineer. Material shall be placed in layers not exceeding six inches.
- F. Shaping and Compacting: Immediately following spreading and shaping, compact each layer to at least ninety five percent (95%) of the maximum dry density determined in accordance with ASTM D-1557 before the next succeeding layer is placed thereon. When the thickness of the base course is less than 0.15 feet, density testing may not be required and the Engineer will determine the number of coverage's required for the particular compaction equipment available.
- G. Vibratory compactors or rollers shall be adequate in design and number to provide compaction and obtain the specified density for each layer while still moist. Apply a mist spray of water as needed to replace moisture lost by evaporation. The completed layer shall have a smooth, tight, uniform surface true to the line, grade and cross section indicated on the Drawings.\

- H. Variations in the surface of the top course shall be a maximum of 1/4 inch in 10 feet. Shave off or fill in variations greater than the allowable and recompact that area.
- I. Surface Maintenance: Maintain the surface of each layer of material true to line, grade and cross section by blading, watering and rolling until placing the succeeding course. Place the first course of material on all available subgrade before placing the succeeding course unless otherwise authorized by the Engineer. Should irregularities develop in any surface during or after compaction, remedy by loosening the surface and correcting the defects, then thoroughly recompact the entire area, including the surrounding surface. In the event that additional materials are necessary to make the repairs, they shall be provided at no additional cost to the Port.
- J. Route hauling equipment over the roadway in such a manner as to be most effective in the compacting of the material. Hauling over the surfacing in the process of construction will not be permitted when, in the opinion of the Engineer, the effect will be detrimental.

END OF SECTION

PART 1 – GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including General Conditions and General Requirements, apply to this work as if specified in this Section. Work related to this Section is described in the following sections:
 - 1. Section 02 41 13 Selective Site Demolition
 - 2. Section 31 00 00 Earthwork
 - 3. Section 32 11 23 Crushed Surfacing
 - 4. Section 34 05 17 Railroad Work

1.02 DESCRIPTION OF WORK

The extent of Hot Mix Asphalt (HMA) Pavement Class ½" PG 70-22 "Asphalt Paving" work is indicated on the Drawings. The work includes the requirements for producing, transporting, placing, shaping and compacting of one or more courses of materials in conformance with these specifications and the dimensions and sections indicated on the Drawings.

1.03 QUALITY ASSURANCE

Tacoma Rail will provide necessary inspection services. Sampling and testing for compliance with the Contract provisions shall be in accordance with Section 01 33 00 of these Specifications. The Contractor may obtain copies of results of tests performed by Tacoma Rail, at no cost. Tests conducted for the sole benefit of the Contractor, shall be at the Contractor's expense.

1.04 SUBMITTALS

The Contractor shall also submit certificates of Specification compliance for materials to be used.

- A. Hot mix asphalt mix design taking into account the specific plan and equipment to be used.
- B. Material data sheets for asphalt materials, certificates of compliance for asphalt materials and aggregates.
- C. Gradation and material test results for aggregates used for HMA, including Los Angeles Wear, Degradation Factor, and fracture requirements.
- D. Name, contact information and current accreditation documentation for AASHTO accredited independent testing agency.

E. Acceptance testing results.

1.05 ACCEPTANCE TESTING REQUIREMENTS

- A. Acceptance sampling and testing of Hot Mix Asphalt shall be performed at the Contractor's expense by an independent AASHTO accredited testing and inspection agency. Testing agency shall be accredited by AASHTO for the specific testing methods to be performed. Acceptance testing shall be provided under nonstatistical evaluation on up to three samples when ordered by the Engineer.
- B. Sampling shall be performed in accordance with Washington State Department of Transportation Test Method T 716.
- C. The Contractor shall perform sampling in the presence of the Engineer and in accordance with WSDOT FOP for WAQTC/AASHTO T 168.
- D. Testing Methods:
 - 1. Testing of HMA for compliance of asphalt binder content shall be by WSDOT FOP for AASHTO T308.
 - 2. Testing of HMA for compliance of gradation shall be by WAQTC FOP for AASHTO T27/T11.
- E. The results of all acceptance testing shall be provided to the Engineer.

PART 2 – PRODUCTS

- 2.01 ASPHALT CONCRETE PAVEMENT
 - A. Asphalt concrete pavement shall be Hot Mix Asphalt Class 1/2" PG 70-22.
 - B. The Performance Graded Asphalt Binder (PGAB) shall meet the requirements of AASHTO M320 Table 1. Additionally, all performance grade (PG) asphalt binders shall meet the following requirements:

		Additional Requirements by Performance Grade (PG) Asphalt Binders									
Property	Test Method	PG 58-22	PG 64-22	PG 64-28	PG 70-22	PG 70-28	PG 76-28				
RTFO Residue: Elastic Recovery ¹	AASHTO T301 ²			60% Min.	60% Min.	60% Min.	60% Min.				

¹Elastic Recovery @ 25°C±0.5°C

²Specimen conditioned in accordance with AASHTO T240 – RTFO

C. The materials of which HMA is composed shall be of such sizes, grading, and quantity that, when proportioned and mixed together, they will produce a well graded mixture within the requirements listed below. The aggregate percentage refers to completed dry mix, and includes mineral filler when used.

Aggregate Gradation Control Points												
Sieve Sizes Percent Passing	3/8 Inch	1/2 Inch	3/4 Inch	1 Inch								
1-1/2"				99-100								
1"			99-100	90-100								
3/4"		99-100	90-100	90 Maximum								
1/2"	99-100	90-100	90 Maximum									
3/8"	90-100	90 Maximum										
No. 4	90 Maximum											
No. 8	32-67	28-58	23-49	19-45								
No. 200	2.0-7.0	2.0-7.0	2.0-7.0	1.0-7.0								

2.02 ASPHALT MATERIALS

- A. Aggregate
 - 1. General Requirements

Preliminary testing of aggregates for source approval shall meet the following test requirement:

Los Angeles Wear, 500 Rev.	30% max.
Degradation Factor, Wearing Course	30 min.
Degradation Factor, Other Course	20 min.
Sand Equivalent	45 min.

Aggregate sources that have 100 percent of the mineral material passing the No. 4 sieve shall be limited to no more than 5 percent of the total weight of aggregate.

Aggregates shall be uniform in quality, substantially free from wood, roots, bark, extraneous materials, and adherent coatings. The presence of a thin, firmly adhering film of weathered rock will not be considered as coating unless it exists

on more than 50 percent of the surface area of any size between consecutive laboratory sieves.

Aggregate removed form deposits contaminated with various types of wood waste shall be washed, processed, selected, or otherwise treated to remove sufficient wood waste so that the oven dried material retained on a No. 4 sieve shall not contain more than 0.1 percent by weight of material with a specific gravity less than 1.0.

2. Gradation

The Contractor may furnish aggregates for use on the same contract from multiple stockpiles. The gradation of the aggregates shall be such that the completed mixture complies in all respects with the pertinent requirements paragraph 2.01.C.

Acceptance of the aggregate gradation shall be based on samples taken from the final mix.

- 3. Mineral Filler: Mineral filler, when used in HMA mix, shall conform to the requirements of AASHTO M 17.
- 4. Test Methods for Aggregates: The properties enumerated in these Specifications shall be determined in accordance with the following methods of test:

Title	Test Method
FOP for AASHTO T 2 for Standard Practice for Sampling Aggregates	FOP for AASHTO T 2
Organic Impurities in fine Aggregates for Concrete	AASHTO T 21
Clay Lumps and Friable Particles in Aggregates	AASHTO T 112
Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine	AASHTO T 96
Material Finer than 0.075mm (No. 200) Sieve in Mineral Aggregates by Washing	AASHTO T 11
FOP for AASHTO for Determining the Percentage of Fracture in Coarse Aggregates	FOP for AASHTO T 335
FOP for WAQTC/AASHTO for Sieve Analysis of Fine and Coarse Aggregates	FOP for WAQTC T 27/T 11

FOP for AASHTO T 176 for Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test	FOP for WAQTC T 176
Method of Test of Determination of Degradation Value	WSDOT T 113
Particle Size Analysis of Soils	WSDOT T 88

- B. Asphalt shall be PG 70-22 conforming to AASHTO Specification M 320.
- C. Joint sealant shall conform to the requirements of WSDOT Standard Specification Section 9-04.2(1)A.
- D. Tack coat shall be emulsified asphalt, CSS-1 or CSS-1h, conforming to following table:

	Туре		Rapid	Setting	Medium Setting							Slow Setting			
Grade	AASHTO	CRS-1		CRS-1		CM	CMS-2S		IS-2	CMS-2h		CSS-1		CSS-1h	
	Method	Min	Мах	Min	Max	Min	Мах	Min	Max	Min	Мах	Min	Max	Min	Max
Tests on Emulsified Asphalts:															
Viscosity SFS @ 77°F (25°C)	T 59											20	100	20	100
Viscosity SFS @ 122°F (50°C)	T 59	20	100	150	400	50	450	50	450	50	450				
Storage stability test 1 day %	T 59		1		1		1		1		1		1		1
Demulsibility 35 ml															
0.8% sodium dioctyl															
Sulfosuccinate, %ª	T 59	40		40											
Particle charge test	T 59	Pos		Pos		Pos		Pos		Pos		Pos ^b		Pos ^b	
Sieve Test, %	T 59		0.10		0.10		0.10		0.10		0.10		0.10		0.10
Cement mixing test, %	T 59												2.0		2.0
Distillation															
Oil distillate by vol. of emulsions %	T 59		3	1.5	3		20		12		12				
Residue, %	T 59	60		65		60		65		65		57		57	

Tests on Residue From Distillation Tests:															
Penetration, 77°F (25°C)	T 49	100	250	100	250	100	250	100	250	40	90	100	250	40	90
Ductility, 77°F (25°C) 5 cm/min., cm	T 51	40		40		40		40		40		40		40	
Solubility in trichloroethylene, %	T 44	97.5		97.5		97.5		97.5		97.5		97.5		97.5	

The CSS-1 and CSS-1h may be diluted with water at a rate not to exceed one part water to one part emulsified asphalt. Do not allow the tack coat material to exceed the maximum temperature recommended by the asphalt supplier.

2.03 ASPHALT MIXING

Plants used for the preparation of HMA shall conform to the following requirements:

- A. Equipment for Preparation of Asphalt Binder: Tanks for the storage of asphalt binder shall be equipped to heat and hold the material at the required temperatures. The heating shall be accomplished by steam coils, electricity, or other approved means so that no flame shall be in contact with the storage tank. The circulating system for the asphalt binder shall be designed to ensure proper and continuous circulation during the operating period. A valve for the purpose of sampling the asphalt binder shall be placed in either the storage tank on in the supply line to the mixer.
- B. Thermometric Equipment: An armored thermometer, capable of detecting temperature ranges expected in the HMA mix, shall be fixed in the asphalt binder feed line at a location near the charging valve at the mixer unit. The thermometer location shall be convenient and safe for access by Inspectors. The plant shall also be equipped with an approved dial-scale thermometer, a mercury actuated thermometer, an electric pyrometer, or another approved thermometric instrument placed at the discharge chute of the drier to automatically register or indicate the temperature of the heated aggregates. This device shall be in full view of the plant operator.
- C. Heating of Asphalt Binder: The temperature of the asphalt binder shall not exceed the maximum recommended by the asphalt binder manufacturer. The asphalt binder shall be heated in a manner that will avoid local variations in heating. The heating method shall provide a continuous supply of asphalt binder to the mixer at a uniform average temperature with no individual variations exceeding 25°F. Also, when a warm mix asphalt (WMA) additive is included in the asphalt binder, the temperature of the asphalt binder shall not exceed the maximum recommended by the manufacturer of the WMA additive.
- D. Sampling and Testing of Mineral Materials: The HMA plant shall be equipped with a mechanical sampler for the sampling of the mineral materials.
- E. Sampling HMA: The HMA plant shall provide for sampling HMA by one of the following methods:

- 1. A mechanical sampling device attached to the HMA plant.
- 2. Platforms or devices to enable sampling from the hauling vehicle without entering the hauling vehicle.

PART 3 — EXECUTION

3.01 HAULING AND DELIVERY

A. Hauling Equipment: Trucks used for hauling HMA shall have tight, clean, smooth metal beds and shall have a cover of canvas or other suitable material of sufficient size to protect the mixture from adverse weather. Whenever the weather conditions during the work shift include, or are forecast to include, precipitation or an air temperature less than 45°F, the cover shall be securely attached to protect the HMA.

In order to prevent the HMA mixture from adhering to the hauling equipment, truck beds are to be sprayed with an environmentally benign release agent. Excess release agent shall be drained prior to filling hauling equipment with HMA. Petroleum derivatives or other coating material that contaminate or alter the characteristics of the HMA shall not be used. For hopper trucks, the conveyer shall be in operation during the process of applying the release agent.

3.02 ASPHALT HANDLING EQUIPMENT

A. Hot Mix Asphalt Pavers: HMA pavers shall be self-contained, power-propelled units, provided with an internally heated vibratory screed and shall be capable of spreading and finishing courses of HMA plant mix material in lane widths required by the paving section shown in the Plans.

Prior to the use of any HMA paver, the Contractor shall certify the paver is equipped with the most current equipment available from the manufacturer for the prevention of the segregation of the coarse aggregate particles. The certification shall list the make, model, and year of the paver and any equipment that has been retrofitted to the paver.

The screed shall be operated in accordance with the manufacturer's recommendations and shall effectively produce a finished surface of the required evenness and texture without tearing, shoving, segregating, or gouging the mixture. A copy of the manufacturer's recommendations shall be provided upon request by the Owner. Extensions will be allowed provided they produce the same results, including ride, density, and surface texture as obtained by the primary screed. Extensions without augers and an internally heated vibratory screed shall not be used.

The paver shall be equipped with automatic screed controls with sensors for either or both sides of the paver. The controls shall be capable of sensing grade from an outside reference line, sensing the transverse slope of the screed, and providing automatic signals that operate the screed to maintain the desired grade and transverse slope. The sensor shall be constructed so it will operate from a reference line or a mat referencing device. The transverse slope controller shall be capable of maintaining the screed at the desired slope within plus or minus 0.1 percent. The paver shall be equipped with automatic feeder controls, properly adjusted to maintain a uniform depth of material ahead of the screed.

Manual operation of the screed will be permitted in the construction of irregularly shaped and minor areas.

The Contractor shall furnish and install all pins, brackets, tensioning devices, wire, and accessories necessary for satisfactory operation of the automatic control equipment.

Any cleaning or solvent type liquids spilled on the pavement shall be thoroughly removed before paving proceeds.

B. Material Transfer Device/Vehicle: Direct transfer of HMA from the hauling equipment to the paving machine will not be allowed in the top 0.30 feet of the pavement section of hot mix asphalt (HMA) used in traffic lanes with a depth of 0.08 feet or greater. A material transfer device or vehicle (MTD/V) shall be used to deliver the HMA from the hauling equipment to the paving machine. HMA for prelevel, pavement repair, or HMA placed in irregularly shaped and minor areas are excluded from this requirement. At the Contractor's request the Engineer may approve paving without an MTD/V; the Engineer will determine if an equitable adjustment in cost or time is due.

3.03 PLACING ASPHALT CONCRETE

- A. The asphalt concrete shall be prepared from materials as previously described and by plants and methods conforming to these specifications.
- B. Bituminous courses shall be placed when the crushed surfacing is dry and weather is not rainy. No mix shall be placed at atmospheric temperature below 40°F unless otherwise approved by the Engineer. Paving shall be placed using an approved type of paving machine. Workers shall not be allowed to walk or stand on the finished mixture before it has been rolled.
- C. Asphalt concrete shall be placed in two lifts of equal thickness over the crushed surfacing course as shown in the plans. Lifts shall not exceed 3 inches and a tack coat shall be applied as needed in between.
- D. The mixture shall be laid upon an approved surface, spread, and struck off to the grade and elevation established. HMA pavers complying with Section 3.02 shall be used to distribute the mixture.
- E. On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impractical, the paving may be done with other equipment or by hand.
- F. Paved slopes and paved ditch sections shall be shaped and thoroughly compacted to avoid spalling at the edges.

3.04 TACK COAT

Tack coat of emulsified asphalt shall be applied to all surfaces on which any course of HMA is to be placed or abutted, including pavement, catch basins, manholes and other structures. Rate of application shall be 0.10 gal/sq. yd. Tack coat requirement between lifts may be waived by the Engineer if the base course surface is kept thoroughly clean and the time lag between placement of base and wearing course is small.

3.05 COMPACTION

- A. Immediately after the HMA has been spread and struck off, and after surface irregularities have been adjusted, the mix shall be thoroughly and uniformly compacted. The completed course shall be free from ridges, ruts, humps, depressions, objectionable marks, and irregularities and shall conform to the line, grade, and cross-section shown in the Plans.
- B. Compaction shall take place when the mixture is in the proper condition so that no undue displacement, cracking, or shoving occurs. Areas inaccessible to large compaction equipment shall be compacted by mechanical or hand tampers. Any HMA that becomes loose, broken, contaminated, shows an excess or deficiency of asphalt, or is in any way defective, shall be removed and replaced with new hot mix that shall be immediately compacted to conform to the surrounding area.
- C. The type of rollers to be used and their relative position in the compaction sequence shall generally be the Contractor's option, provided the specified densities are attained. An exception shall be that pneumatic tired rollers shall be used for compaction of the wearing course beginning October 1st of any year through March 31st of the following year. Coverage with a steel wheel roller may precede pneumatic tired rolling. Unless the Engineer has approved otherwise, rollers shall only be operated in the static mode when the internal temperature of the mix is less than 175°F. Regardless of mix temperature, a roller shall not be operated in a mode that results in checking or cracking of the mat.
- D. Density of the pavement in place shall be a minimum of 91% or the reference maximum density as determined by WSDOT Test Method 716. The reference maximum density shall be determined as the moving average of the most recent five determinations for the lot of asphalt concrete being placed.

3.04 JOINT SEAL

Apply joint sealer to the edges of new paving joints, catch basins, manholes, at the meet lines to concrete structures and as directed by the Engineer.

3.05 SURFACE SMOOTHNESS

A. The completed surface of all courses shall be of uniform texture, smooth, uniform as to crown and grade, and free from defects of all kinds. The completed surface of the

wearing course shall not vary more than 1/8 inch from the lower edge of a 10-foot straightedge placed on the surface parallel to the centerline. The transverse slope of the completed surface of the wearing course shall vary not more than 1/4 inch in 10 feet from the rate of transverse slope shown in the Plans.

- B. When deviations in excess of the above tolerances are found that result from a high place in the HMA, the pavement surface shall be corrected by one of the following methods:
 - 1. Removal of material from high places by grinding with an approved grinding machine, or
 - 2. Removal and replacement of the wearing course of HMA, or
 - 3. By other method approved by the Engineer.

Correction of defects shall be carried out until there are no deviations anywhere greater than the allowable tolerances.

- C. Deviations in excess of the above tolerances that result from a low place in the HMA and deviations resulting from a high place where corrective action, in the opinion of the Engineer, will not produce satisfactory results will be accepted with a price adjustment.
- D. When utility appurtenances such as manhole covers and valve boxes are located in the pavement, the Roadway shall be paved before the utility appurtenances are adjusted to the finished grade.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including General Conditions and General Requirements, apply to this work as if specified in this Section. Work related to this Section is described in the following sections:
 - 1. Section 32 12 16 Asphalt Paving

1.02 DESCRIPTION OF WORK

The work includes the requirements for providing and installing pavement markings as indicated on the Drawings. This work includes all labor, materials, and equipment to fabricate and install signs indicated on the Drawings.

1.03 QUALITY ASSURANCE

Employ at least one person who shall be present at all times during execution of this portion of the work, shall be thoroughly familiar with the type of materials being installed and the best methods for their installation and shall direct all work performed under this section.

1.04 SUBMITTALS

Submit in accordance with Section 01 33 00 – "Submittal Procedures", the following:

- A. Manufacturer's current technical specifications and installation instructions.
- B. Material certificates signed by material supplier and Contractor, certifying that each material item complies with or exceeds specified reference standards.

PART 2 - PRODUCTS

2.01 PAVEMENT MARKING PAINT

Pavement marking paint shall be no heat, low VOC waterborne paint, top dressed with glass beads. Pavement marking paint color shall be white or as depicted on the Plans. Paint shall not be used if there is evidence of heavy caking or settling in the original container or if the paint has been stored for more than one year from the date of manufacture.

2.02 SIGNING

Signing materials and fabrication shall be completed according to the Washington State Department of Transportation (WSDOT) Standard Specification, 2018 Edition, Section 9-28 Signing Materials and Fabrication. The sign shall be a sheet aluminum sign conforming to WSDOT Standard Specification 9-28.8, and hardware per Standard Specification 9-28.11, and reflective sheeting per Standard Specification 9-28.12 and timber sign posts shall be constructed per Drawings and WSDOT Standard Specification 9-28.14(1).

PART 3 - EXECUTION

3.01 GENERAL

Install no driving area striping, pavement markings and signage as indicated on the Drawings and as directed by the Engineer.

3.02 SURFACE PREPARATION

Sweep and clean surface to eliminate loose material and dust. All contaminants within the areas to receive pavement markings shall be removed. Large areas of tar, grease or foreign materials may require sandblasting, steam cleaning or power brooming to accomplish complete removal.

3.03 PAINT APPLICATION

Apply paint in two coats with mechanical equipment to produce uniform straight edges. All materials shall be applied in accordance with Washington State Department of Transportation Standard Specifications, 2018 Edition, Section 8-22.3. A manufacturer's representative shall be present to approve installation procedures and conditions of surface prior to application.

3.04 GLASS BEADS

All paint markings shall be top dressed with beads. The application rate on painted markings shall be seven pounds of beads per gallon of paint. The bead application system shall provide a uniform bead distribution over the entire surface of the marking. Beads shall be applied to paint markings at the same time the paint is applied to the roadway and shall be dispensed by a pressurized bead gun system.

3.05 SIGNING

All permanent signing located within 30 feet from edge of the lane shall be turned out approximately three degrees from the pavement edge of oncoming traffic lanes. All sign post shall be plumb and signs level.

END OF SECTION

PART 1 – GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including General Conditions and General Requirements, apply to this work as if specified in this Section. Work related to this Section is described in the following sections:
 - 1. Section 02 41 13 Selective Site Demolition
 - 2. Section 31 00 00 Earthwork
 - 3. Section 31 23 19 Dewatering
 - 4. Section 31 23 33 Trenching and Backfilling
 - 5. Section 31 41 00 Shoring and Underpinning

1.02 DESCRIPTION OF WORK

A. The extent of Water Utilities work is indicated on the drawings. Work includes the requirements for providing the water systems complete in place including excavation, bedding, backfill, compaction, installation of pipe sleeves, valves and valve boxes, coordination with electrical work, etc., all in conformance with these specifications and the dimensions and sections indicated on the drawings or within the lines and grades established by the Engineer.

1.02 RELATED SECTIONS

- A. Section 22 05 00, Common Work Results for Plumbing
- B. Section 22 05 53, Identification for Plumbing Piping and Equipment

1.03 QUALITY ASSURANCE

- A. Qualification of Workers: Employ the services of a qualified utility contractor, who will be thoroughly familiar with the type of materials being installed and the best methods for their installation, and who shall direct all work performed under this section.
- B. Codes and Standards: Comply with the applicable provisions of all pertinent codes and regulations. References made herein for manufactured materials, such as pipe, fittings, valves, hydrants and specialties; refer to designations for American Water Works Association (AWWA), American National Standards Institute (ANSI) and to the latest edition of the Standard Specifications and Standard Plans for Road, Bridge, and Municipal Construction prepared jointly by the Washington State Department of Transportation (WSDOT) and the American Public Works Association (APWA).
- C. City of Tacoma: The Contractor shall coordinate with and comply with the applicable provisions of all pertinent local codes and regulations of Tacoma Public Utilities / Tacoma Water, Tacoma Building and Land Use Services, and City of Tacoma Fire Department (TFD) concerning testing, flushing, disinfection, installation, inspection and materials used. The Contractor shall also acquire a Commercial Fire Protection System permit from TFD prior to beginning work on any part of the fire water system.

- D. Tacoma Water facilities must remain accessible at all times. Any damage to Tacoma Water facilities occurring as a result of work performed by the Contractor shall be repaired by Tacoma Water at the expense of the Contractor.
- E. All water system components unless noted otherwise shall be rated for a working pressure of at least 125 psi and a testing pressure of 225 psi, meet current Safe Drinking Water Act lead free requirements and be approved for potable use by National Sanitation Foundation (NSF).

1.04 SUBMITTALS

Submit the following in accordance with Section 01 33 00 - Submittal Procedures for the following products:

- A. Piping, Fittings, Valves, Accessories
 - 1. Manufacturer's catalog cuts and shop drawings to demonstrate that all items conform to the specifications for the following:
 - a. Pipe, fittings, couplings and accessories
 - b. Valves
 - c. Pipe supports
 - d. Blow-off assembly
 - e. Expansion joints
 - 2. Manufacturer's shop drawings for AGPI water piping, including pipe lengths, fitting locations, support locations, anchor locations, and connections to below ground copper piping and water service cabinet.

1.05 PRODUCT HANDLING

- A. Pipe shall be handled in conformance with section 7-09.3 (13) of the WSDOT Standard Specifications. Handle pipe to prevent damage to the pipe, pipe lining, or coating. Damage to the pipe, pipe lining, or coating, if any, shall be repaired as directed by the Engineer or replaced at the Contractor's expense.
- B. At times when pipe laying is not in progress, close the open ends of the pipe with a watertight plug or by other means approved by the Engineer to ensure cleanliness inside the pipe.

PART 2 – PRODUCTS

2.01 PIPE AND FITTINGS

- A. General: Materials shall be in accordance with the applicable references within WSDOT Standard Specifications, Section 7-09.2.
- B. Buried Water Pipe, 2 inches and less in diameter:
 - 1. Copper pipe annealed, seamless, and conforming to the requirements of ASTM B88, Type K rating for both below ground pipe and for above ground pipe where specified on the plans.

- 2. Fittings shall be wrought copper, conforming to ASTM B 75 for materials and ANSI B16.22 for dimensions, or cast bronze, conforming with ASTM B 62 for materials and ANSI B16.18 for dimensions. Solder joints with 95/5 solder and NAPP gas.
- 3. New copper service lines 2" or less in diameter shall be one continuous piece of pipe from the corporation stop to the curb stop and one continuous piece of pipe from the curb stop to the inlet valve or tee at the first fixture or service point, with no fittings when these distances are less than 100' in length. Only one fitting shall be allowed per 100' of pipe.
- C. Above Ground Pre-Insulated (AGPI) Water Piping:
 - 1. AGPI water piping shall be pre-insulated and pre-fabricated piping system system with all necessary fittings, expansion loops and accessories necessary for a complete installation. AGPI water piping shall be labeled in accordance with Section 22 05 53, Identification for Plumbing Piping and Equipment.
 - 2. AGPI water piping service pipe and fittings shall be copper as specified in Article 2.01.B. of this Section and the size indicated on the Plans.
 - Service pipe and fittings shall be insulated with 90-95% closed-cell polyurethane with 2 lb/ft3 nominal density and thermal conductivity (k) of 0.18 Btuin/hr/ft2/degree F at 73 degrees Fahrenheit.
 - 4. Heat tracing shall be contained with a small diameter conduit contained within the pipe insulation and shall be factory applied as an integral part of all straight pipe runs and fittings. Heat tracing shall be provided to maintain a temperature of 50 degrees F in an ambient temperature of 10 degrees F.
 - 5. AGPI water piping system shall include a water tight high density polyethylene (HDPE) jacket wrapping around the assembly of the carrier pipe, insulation and heat tracing.
 - 5. Anchors shall be prefabricated and furnished as an integral part of the total water piping system.
 - 6. It shall be the Contractors responsibility to coordinate and construct the necessary pipe supports for the AGPI water piping system.

2.02 ACCESSORIES

- A. Service Saddle and Corporation Stop:
 - 1. Water service saddle shall in accordance with WSDOT Standard Specifications, Section 9-30.6(1) and corporation stop shall be in accordance with WSDOT Standard Specifications, Section 9-30.6(2).
 - 2. Saddle shall be nylon coated with stainless steel straps, U-bolts and taper thread. Saddle shall be Romac Industries, or approved equal. Corporation stop shall be brass body conforming to AWWA C800, 300 psi working pressure as manufactured by the Ford Meter Box Company.
- B. Adapters, Couplings and Unions: Coupling adapters at tie-ins to existing pipes, if required, shall be Smith Blair or approved equal. Provide dielectric unions and couplings at connections between dissimilar materials.

- C. Heat Tracing:
 - Heat tracing in Valve Boxes: Self-regulating Low Temperature Cable for metallic pipe shall have a protective high temperature overjacket. Input shall be 120 volts, output 6 watts per foot of cable. Cable shall not be hard wired. Cable shall come with accessories, including but not limited to power connection boot, end termination boot, thermostat, mounting brackets and caution labels in full compliance with NEC. Heat tracing cable shall be 3M or as approved by the Engineer.

2.03 VALVES

- A. Curb Stop Valve: The shut-off for 2 inch and smaller water service extension lines of a curb stop ball valve with quarter turn T-handle conforming to AWWA C800 and a stainless steel self-centering rod with a stainless- steel pin installed within a stop box housing with a 1" upper section and an Erie style lid. The curb stop shall have valve head checks that limit rotation to 90 degrees and operate clockwise to shut off. The "T" handle on the curb stop will be parallel with the water main when the water is turned off. When installed, the curb stop shall not be less than 3' or more than 5' below the surface of the ground.
- B. Curb Stop Box: Curb stop box shall be extension type with arch base. Box shall be cast iron and furnished with a cast iron lid and brass pentagon plug. The upper part of the box shall be spring loaded and shall telescope into the base to allow for grade adjustment. Curb Stop Box shall be furnished with stainless steel stationary rods, shut-off rods and pentagon keys. Arch base of curb stop box shall be seated on concrete blocks or pavers so that base is evenly and firmly supported on the bottom of the trench.
- C. Ball Valves:
 - 1. Size: Two (2) inches and smaller
 - 2. Material: Bronze
 - 3. Rating: 600 psi W.O.G.
 - 4. Ball and Stem: 316 Stainless steel
 - 5. Seats: reinforced Teflon
 - 6. Connection: Threaded
 - 7. Manufacturer: Watts, Series FBV-3, or approved equal.

2.04 BACKFLOW PREVENTION ASSEMBLIES

- A. 2-inch
 - 1. Type: Reduced Pressure Principle
 - 2. Design: Check valves shall be ductile iron and loaded to one psi in the direction of flow. A pressure differential relief valve shall be located between the two check valves.
 - 3. Accessories: Ball Valves and Test Cocks

- 4. Working pressure: Max. 175 psi
- 5. Hydrostatic Test Pressure: 350 psi
- 6. Approvals: By State and Local Authorities
- 7. Body: Bronze
- 8. Ends: Threaded or Flanged, see Drawings
- 9. Servicing: provide unions for removal or assembly outside of ball valves.
- 10. Manufacturer: FEBCO Series 825Y, Watts LF909, or approved equal.

2.05 BACKFLOW PREVENTION ENCLOSURE

- A. Backflow prevention enclosure shall be fiberglass, flip top, lockable, insulated and heated enclosure anchored to concrete pavement or pad. Enclosure shall be certified to ASSE 1060. Enclosure shall incorporate one-way drain ports sized for full port backflow discharge and designed to allow water discharge and prevent wind, debris and small animal entry into the enclosure.
- B. Fiberglass enclosure shall be fabricated from minimum of 1/8" thick Thixotropic polyester resin reinforced with fiberglass strand, with a smooth finish, protected with UV inhibited isopthalic polyester gel coat. Enclosure Insulation shall be R8 and a minimum of 1 ½" thick, and be unicellular, non-wicking, polyisocynate, sprayed in place to form a monolithic bond.
- C. Enclosure drains shall be sized for full port backflow discharge and designed to prohibit the intrusion of debris and/or vermin. Enclosure shall be anchored to a concrete slab from within the enclosure with steel anchors and shall be lockable.
- D. Enclosure heating:
 - Heating equipment will protect the piping and equipment from exterior temperatures to -30°F. ETL listed thermostatically controlled wall mounted air forced heaters or UL listed self regulating cable(s) shall be furnished and designed by the manufacturer of the enclosure to maintain the equipment at +40°F, In accordance with ASSE 1060 1.2.2.1.
 - 2. Heating equipment shall be wall mounted to the supplied heater plates and a minimum 8" above the slab unless it is UL or ETL certified and NEC approved for submersion.
 - 3. Power source shall be protected with a GFI receptacle, U.L. 943, NEMA.3R. Mounted a minimum of 8" from the bottom of the receptacle to the top of the slab.
 - 4. Separate 20 amp circuits are recommended for each heater, so in the event a circuit fails all other circuits will remain powered. Installations must be in accordance with the local and national codes.
 - 5. The heaters shall be ETL listed for wet/damp locations.

2.06 VALVE BOX AND COVERS

A. Valve Box shall be in accordance with WSDOT Section 9-30.3(4). Frame and Lid shall be tested for accuracy of fit. Castings and extensions shall be hot-dipped in asphaltic

varnish Royston Roskote #612XM. Manufacturer: Olympic Foundry, or approved equal.

PART 3– EXECUTION

3.01 TRENCHING, BEDDING AND BACKFILL

- A. All earthwork related to water piping shall conform to the requirements of Section 31 00 00 Earthwork, Section 31 23 33 Trenching and Backfilling and Section 31 23 19 Dewatering and the details and notes on the Drawings. Provide shoring as necessary to support existing items noted to remain in place.
- B. In the event that water is encountered or accumulates in the trench, it shall be removed during the pipe-laying operation and be maintained in a water-free condition until the ends of the pipe are sealed and provisions are made to prevent floating of the pipe. At no time allow trench water to enter the pipe.

3.02 COORDINATION WITH OTHERS

A. Prior to starting work coordinate shut downs, demolition, testing, flushing, disinfection and reopening water supply with the Port, Tacoma Water, Tacoma Fire Department and others as required by permit.

3.03 HANDLING THE PIPE

A. During installation, handle the pipe as specified in paragraph 1.05 above. Pipe that has become damaged or contaminated shall be removed from the trench, cleaned, and repaired as required and re-laid.

3.04 LAYING PIPE

- A. General: Construction shall conform to manufacturer instructions and requirements in accordance with WSDOT Section 7-09.3. Fully extend each joint of restrained joint piping during installation.
- B. Rubber Gasket of Joint:
 - 1. Cleaning and Assembling Joint: Clean the inside of the bell to remove oil, grit, tar (other than standard coating) and other foreign material from the joint. Flex the circular rubber gasket inward and insert in the gasket seat provided in the socket, then release with the gasket fitting over the bead in the gasket seat. Apply a thin film of gasket lubricant to the inside surface of the gasket. Gasket lubricant shall be as supplied by the pipe manufacturer and approved by the Engineer.
 - 2. Clean the spigot end of the pipe and enter into the rubber gasket in the socket, using care to keep the joint from contacting the ground. Complete the joint by forcing the plain end to the bottom of the socket using a device approved by the Engineer. Pipe that is not furnished with a depth mark shall be marked before assembly to ensure that the spigot end is inserted to the full depth of the joint.

3.05 INSTALLATION OF AGPI WATER PIPING

A. Install AGPI Water Piping in accordance with manufacturers recommendations. The Contractor shall ensure that a factory trained field service instructor is present during critical stages of piping installation and testing, including but not limited to the first two days of pipe installation.

3.06 VALVE INSTALLATION

- A. Inspect all valves upon delivery in the field to ensure proper working order before installation. Set and joint to the pipe in the manner set forth in the AWWA Standards for the type of connection ends furnished. Inspect the valves carefully for damage to the outer protective coatings. Where the coating has been ruptured or scraped off, clean the damaged area thoroughly to expose the iron base installation, and recoat the cleaned area with two or more field coats of Quigley Triple A-1 0, Triple A-20, or approved equal.
- B. Install valves in the positions shown on the drawings and provide with a valve box, where required, so arranged that no load or shock will be transmitted to the valve. Arch base of curb stop box shall be seated on concrete blocks or pavers so that base is evenly and firmly supported on the bottom of the trench.Center the box over the operating nut, and set the box cover flush with the finished paved surface.
- C. After installation, all valves shall be subjected to the field test for piping. If defects in design, materials, or workmanship appear during these tests, correct such defects with the least possible delay as directed by the Engineer.
- D. Valve boxes shall be positioned during backfill to be in a plumb alignment. Valve box shall not rest directly on the body of the valve, or the water main. Set the upper casting flush with finish pavement and align to match grade.
- E. Concrete pad with rebar as shown on the valve details shall be constructed where indicated on the Drawings. Construction, materials and finished of the concrete shall conform to section 03 30 00 Cast-in-Place Concrete. The concrete pad shall be set flush with the immediately surrounding finished grade.

3.06 FIELD TESTS

- A. Test all piping and appurtenances in accordance with the requirements of WSDOT Standard Specifications Section 7-09.3 (23), Tacoma Water and Tacoma Fire Department.
- B. Test copper pipe on wharf in accordance with pipe and fitting manufacturer's requirements.

3.07 FLUSHING & DISINFECTION OF POTABLE WATER LINES

A. Before being placed in service, flush and disinfect all new, repaired portions, or extensions of potable water lines in accordance with the requirements of WSDOT Standard Specifications Section 7-09.3(24) and 7-09.3(24)A and Tacoma Water. Dispose of test water in accordance with applicable regulations.

END OF SECTION

PART 1 – GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including General Conditions and General Requirements, apply to this work as if specified in this Section. Work related to this Section is described in the following sections:
 - 1. Section 02 41 13 Selective Site Demolition
 - 2. Section 31 00 00 Earthwork
 - 3. Section 31 23 19 Dewatering
 - 4. Section 31 23 33 Trenching and Backfilling
 - 5. Section 31 41 00 Shoring and Underpinning
 - 6. Section 33 30 00 Sanitary Sewer Utilities

1.02 DESCRIPTION OF WORK

A. The location and extent of "Sanitary Sewage Utilities" work is indicated on the drawings. The work includes the requirements for furnishing and installing sanitary sewer pipe, sanitary sewer dump points and sanitary sewer storage tank.

1.02 QUALITY ASSURANCE

- A. Qualification of Workers: Employ the services of a qualified utility contractor, who will be thoroughly familiar with the type of materials being installed and the best methods for their installation, and who shall direct all work performed under this section.
- B. Codes and Standards: Comply with the applicable provisions of all pertinent codes and regulations. References made herein for manufactured materials, such as pipe, fittings, valves and specialties; refer to designations for American Water Works Association (AWWA), American National Standards Institute (ANSI) and to the latest edition of the Standard Specifications and Standard Plans for Road, Bridge, and Municipal Construction prepared jointly by the Washington State Department of Transportation (WSDOT) and the American Public Works Association (APWA).

1.03 SUBMITTALS

Submit the following in accordance with Section 01 13 00 – Submittals and Shop Drawings:

- A. Manufacturer's literature and cut sheets for pipes and fittings including couplings and gaskets.
- B. Manufacturer's literature on manholes, cleanouts, covers, lids, grates and frames.

1.04 PRODUCT HANDLING

- A. Pipe shall be handled in conformance with section 7-09.3 (13) of the WSDOT Standard Specifications. Handle pipe to prevent damage to the pipe, pipe lining, or coating. Damage to the pipe, pipe lining, or coating, if any, shall be repaired as directed by the Engineer or replaced at the Contractor's expense.
- B. At times when pipe laying is not in progress, close the open ends of the pipe with a watertight plug or by other means approved by the Engineer to ensure cleanliness inside the pipe.

PART 2 – PRODUCTS

2.01 PIPE AND FITTINGS

- A. Sanitary sewer pipe and fittings shall be polyvinyl chloride (PVC) unless otherwise noted and shall conform to WSDOT Standard Specifications Section 9-05.12 and approved for sanitary sewer use.
- 2.02 SANITARY DUMPING POINT
 - A. Self closing foot operated cover shall be ductile iron with a locking hasp and a foot lever for opening.
 - B. Concrete for sanitary dumping point apron slab shall be Class 4000

2.03 SANITARY DUMPING POINT SEWER HOSE

- A. Hose used for sanitary dumping port to be EDPM rubber hose with polyethelene helix.
- 2.04 OIL RETENTION TANK
 - A. Refer to Specification Section 33 40 00.
- 2.05 OIL RETENTION TANK DUMPING POINT
 - A. Self closing foot operated cover shall be ductile iron with a locking hasp and a foot lever for opening.

2.04 SEWAGE HOLDING TANK

- A. Sewage Holding Tank to be Cuz Concrete 3,000 Gallon Single Comp. Trash Tank or approved equivalent.
- B. Precast concrete tank with a single inlet and no outlet, 3,000 gallon capacity. Tank shall be fabricated with 4000 psi concrete and grade 60 reinforcing steel. Tank shall include two manway risers, 24 inches in diameter, extending to finish grade with solid ductile iron frames, lids, and risers suitable for HS-20 vehicular loading.
- C. The tank shall be of sufficient thickness and construction to withstand the imposed loading due to saturated soil at the specified burial depth for each available tank height. All station components must function normally when exposed to the external soil and hydrostatic pressures developed at the specified burial depth. The tank shall be fabricated with features to support concrete anchoring to prevent floatation. Concrete anchoring shall be provided in accordance with the manufacturer's recommendations based on an anticipated groundwater elevation of +12.00.
- D. Depth of tank shall be as indicated on the drawings.
- E. Tank trenching, bedding, installation and backfill shall be done in accordance with the manufacturer's recommendation.

2.05 SEWAGE HOLDING TANK FLOAT GAUGE

- A. Gauge shall be a Pnemercator MP450s UST Level Gauging Probe or approved equivalent.
- B. Gauge shall be rigid magnetostrictive level gauging probe encased in a 4-inch aluminum drop tube. Probe shall be designed for UST applications and shall have performance characteristics permitting 0.1 GPH or better in-tank leak test with

continuous gauging accuracy of +/- 0.0005 inches for product, +/- 0.001 for water and +/- 0.001 degrees F for (relative) temperature.

- C. Probe shall contain an array of at least five (5) temperature sensors along its length for accurate volumetric temperature compensation. Probe to console communication shall employ digital transmission techniques carried over standard, readily available two-conductor, shielded cable, with a maximum cable length restriction of no less than 4000 feet. Probe operating temperature and pressure shall be -40 to +175 degrees F and 150 PSIG respectively.
- D. Probes shall be supplied with product float, water float, six (6) foot leader cable with watertight connector, and centering rings for riser mounted applications. Probe shall be UL/CSA approved for use in Class I, Division I, Group C & D hazardous locations.

2.06 TANK LIQUID LEVEL CONTROL AND ALARM PANEL

- A. Alarm panel shall be Pneumercator TMS 2000 or approved equal.
- B. Control and alarm panel controller shall be microprocessor-based, and shall be designed and constructed with modular architecture easily permitting either factory or field upgrades and servicing. Configuration and set-up data shall be maintained in non-volatile memory having a minimum fifty (50) year data retention without requiring power of any kind. Replacement or substitution of any controller plug-in card shall not require system re-configuration. Real-Time clock and non-critical log data, such as inventory, delivery, alarm, theft, error, and leak reports shall be maintained in battery backed non-volatile memory with a minimum data retention of from (5)-(10) years in the event of a power outage. System shall include digital display for viewing tank information and LED indicators for the alarm conditions.
- C. System shall have the capability to continuously monitor up to two (2) dual-float magnetostrictive in-tank level probes and up to eight (8) secondary containment leak or point-level sensors. Leak and point-level sensor inputs shall support a means to detect sensor open-circuit and short-circuit wiring faults as a standard feature when used in conjunction with fault-reporting sensors.
- D. System shall be capable of providing hardcopy environmental compliance reports, which exit the front panel or are stored internally with optional autowinder take-up spool. The RS-232 serial port shall be standard for communications with a local PC computer. Ethernet network interface card shall be available for LAN/WAN connections. System shall operate on switch selectable 115/230 VAC (+/- 10%), 50/60 Hz. Maximum power consumption shall be 20 watts.
- E. The console shall be housed in a lockable wall mounted NEMA 4 weatherproof enclosure.
- F. The console shall include microprocessor board, probe/sensor card, power supply, control I/O and communications interfaces. Front panel display shall include audible and visual alarms, membrane pushbutton controls, and optional impact printer. The display shall be nine digit, seven segment, quasi-alphanumeric sunlight- readable LED type, with LED alarm annunciators for five (5) alarm conditions; leak, three (3) tank product setpoints, and one (1) bottom water setpoint per tank. LED alarm lights

shall be visible from at least 60 feet and the seven-segment display data shall be readable from no less than twenty (20) feet.

- G. Displays shall include product gross or net, percent of capacity, 90/95/100% ullage, product and water level, product temperature, and product type. As a standard, two (2) programmable relay outputs and two (2) contact closure inputs shall be provided. Optionally, a modular card containing an additional four (4) relays and four (4) contact closure inputs, eight (8) relays and eight (8) contact closure inputs, or sixteen (16) relays shall be made available.
- H. All relays and contact closure inputs shall be user-programmable for activation by the following event types; Theft, Power Fail Recovery, System Error, Tank Leak, Product Setpoints, Water Setpoints, Leak/Point Level Sensors, Contact Closure inputs and Line Leak. The system shall be supplied with three industrial quality front panel sealed membrane pushbuttons labeled MODE, TANK SELECT, and TEST. Membrane pushbuttons shall be utilized in conjunction with the display screen to select tank quantities, view, set, acknowledge alarm conditions; set/review configuration data, initiate system tests, view inventory and other logged data. The system shall provide hardcopy environmental compliance and status reports via front panel 24-column printer or with optional autowinder take-up spool.
- I. The RS-232 serial port shall be provided as standard for two-way communications with a PC computer. Microsoft Windows compatible software shall be provided to retrieve and display current tank statuses, remotely read, write and initialize system setup, clock, and configuration data. An RS-485 port shall be provided as standard for connection to "smart" peripherals, such as remote "slave" display and annunciator panels. The system shall be independently third party certified for UST petroleum storage tanks and have the capability to automatically or manually conduct a static volumetric tank tightness test to an accuracy of 0.2 GPH for monthly monitoring and 0.1 GPH for annual precision testing, with minimum test times of two hours and eight hours respectively. System shall be capable of performing both tests with as little as 20% of tank capacity.

EXECUTION

- 3.01 TRENCHING, BEDDING AND BACKFILL
 - A. All earthwork related to sanitary sewer piping shall conform to the requirements of Section 31 00 00 – Earthwork, Section 31 23 33 - Trenching and Backfilling and Section 31 23 19 - Dewatering and the details and notes on the Drawings. Provide shoring as necessary to support existing items noted to remain in place.
 - B. In the event that water is encountered or accumulates in the trench, it shall be removed during the pipe-laying operation and be maintained in a water-free condition until the ends of the pipe are sealed and provisions are made to prevent floating of the pipe. At no time allow trench water to enter the pipe.

3.02 SURVEYS

A. Layout of alignment and grade of site sewer piping shall be established by a Land Surveyor State licensed in Washington. Check the line and grade during installation to ensure that the Work is within the following allowable tolerances:

- 1. Fine grade and prepare bedding so the pipe can be initially placed with a variation from true line or grade, measured at each joint, of not more than 1/32 inch per inch diameter or 1/2 inch maximum, provided that:
 - a. A resulting level or backsloping length of pipe does not occur; and
 - b. No more than one half of the permissible variation shall be accumulated between successive joints.
 - c. Pipe laid within these tolerances shall not be subjected to any further adjustment. Measurement for grade shall be taken at the pipe invert, NOT TOP OF PIPE. Eccentricity of pipe barrels, with respect to jointing surfaces, shall not produce grade interruption adverse to flow of more than 1/4 inch maximum.

3.03 INSTALLATION OF UNDERGROUND PIPE

- A. Furnish all necessary machinery for the work and pump, bail, or otherwise remove any water which accumulates in the trench. Perform all work necessary to keep the trench clear of water while the foundation and the masonry are being constructed or the pipe is being laid.
- B. Placing: Place the pipe from downstream to upstream with the bells pointing upstream in appropriate bedding graded to conform with the grades and alignment indicated on the Drawings and prepared as specified. Ensure that the pipe has a full, solid bearing along its entire length. Provide small depressions for pipe bells when utilized. Make minor adjustments to line and grade by scraping away, or filling in with, bedding material. Do not support pipes on blocks or mounds of any nature.
- C. Jointing: Take care to properly align the pipe and clean the bell and spigot or tongue of the pipe. Gaskets must be straight, properly lubricated and without twist. The pipe shall be partially supported by hand, sling, or crane, as required, to minimize lateral pressure on the gasket and to maintain concentricity until the pipe has been forced into final longitudinal position in accordance with the manufacturer's recommendations. Pipe handling, after the gasket has been affixed, shall be carefully controlled to avoid bumping the gasket and, thus, knocking it out of position or loading it with dirt or other foreign material. Gaskets so disturbed shall be removed, cleaned, relubricated and replaced before the joint is attempted.
- D. Apply sufficient restraint to the line to ensure that the joints, once home, are held so by tamping fill material under and alongside the pipe. At the end of the day's work, block the last pipe in such a manner as may be required to prevent creep during down time.

3.04 HANDLING THE PIPE

A. During installation, handle the pipe as specified in paragraph 1.05 above. Pipe that has become damaged shall be removed from the trench, cleaned, and repaired as required and re-laid.

3.05 LAYING PIPE

A. Furnish all necessary machinery for the Work and pump, bail or otherwise remove water which accumulates in the trench. Perform all Work necessary to keep the trench clear of water while the foundation and masonry are being constructed or the pipe is being laid.
- Placing: Place the pipe on appropriate bedding graded to conform with the grades and alignment indicated on the drawings and prepared as specified. Exercise care that the pipe has a full, solid bearing along its entire length. Make small depressions for pipe bells when utilized. Make minor adjustments to line and grade by scraping away, or filling in bedding material. Do not support pipes on blocks or mounds of any nature.
- 2. Ductile Pipe: Join and install ductile-iron pipe with ductile-iron or cast-iron push-on joint fittings and rubber gaskets in accordance with AWWA C600, except that anchorages are not required.

3.05 MANHOLES

- A. Furnish all necessary machinery for the Work and pump, bail or otherwise remove water which accumulates in the trench. Perform all Work necessary to keep the trench clear of water while the foundation and masonry are being constructed or the pipe is being laid.
 - 1. Place manholes at the elevation and location indicated on the drawings, upon the appropriate bedding prepared in accordance with Section 31 00 00 Earthwork.
 - 2. Construct cast-in-place manholes in accordance with the drawings. Concrete and reinforcing steel shall conform to the requirements of Division 3 Concrete.
 - 3. Carefully place precast manholes on the prepared bedding to be fully and uniformly supported in true alignment, and ensure that all entering pipes can be inserted on the proper grade.
 - 4. Thoroughly wet all lift holes and all joints between precast elements; completely fill with mortar and smoothed and pointed both inside out, to ensure watertightness.
 - 5. Place and align precast sections to provide vertical sides and vertical alignment of the ladder rungs. The completed manhole shall be rigid, true to dimensions and watertight.
 - 6. In precast manhole sections where steel loops have been provided in lieu of lift holes, remove the loops flush with the inside wall surface after the manhole has been completed. No sharp cutoff protrusions will be permitted. If concrete spalling occurs as a result of the loop removal, restore the spalled area with mortar to a uniform smooth surface.
 - 7. Grade Adjustments: Initially construct manholes of the type noted on the project drawings so as to provide adjustment space for setting cover fastenings to a finished grade. The manhole grade furnished by the Engineer for manhole construction indicates the approximate top grade for the manhole plus or minus two-tenths foot, and the final grade will be set by the Engineer after backfilling has been completed to the grade established by the Engineer.
 - 8. Where Work is in paved areas which have been brought to grade, provide not less than eight inches or more than 16 inches between the top of the cone or slab and the underside of the manhole casting ring for adjustment of the casting ring to grade.

- 9. Pipe Connections: Place all un-reinforced pipes entering or leaving the manhole on firmly compacted bedding, particularly within the area of the manhole excavation, which normally is deeper than that of the sewer trench. Take special care to see that the openings through which pipes enter the structure are completely and firmly rammed full of mortar to ensure watertightness.
- 10. Backfill: Hand-place backfill around the manhole and extending at least one pipe length into each trench and tamp with selected material up to an elevation of six inches above the crown of all entering pipes. Work shall conform to the applicable provisions of Section 31 00 00 Earthwork.

3.06 ACCEPTANCE TESTING

- A. After completion of the following, authorization from the Engineer shall be required before the Contractor can perform initial acceptance testing:
 - 1. Acceptable placement of applicable pipe, bedding and backfill material.
 - 2. Acceptable completion of all applicable manhole channels and grout work.
 - 3. Acceptable debris removal, cleaning and flushing of all applicable pipes and structures.
- B. Completed gravity pipe installation shall be tested in accordance with the Low Pressure Air Test requirements of WSDOT Section 7-17.3(2)F. Infiltration testing in accordance with WSDOT Section 7-17.3(2)C is required for pipe installed below the ground water elevation.
- C. Completed sanitary sewer force main installation shall be tested in accordance with the Hydrostatic Pressure Test requirements of WSDOT Section 7-09.3(23), except that hydrostatic pressure used for testing shall be 150 psi.
- D. Before final acceptance, the Contractor shall inspect all drainage lines, 6 inches and larger diameter, by the use of a television camera, utilizing an Owner approved independent inspection service company. The television inspection requirements shall include the provisions of:
 - 1. A color analog/digital camera with pan and tilt capacity in order to view all main lines, lateral lines, and structures including channels.
 - 2. A dye solution to be introduced in sufficient quantity to travel from the structure that is the highest point of inspection to the downstream terminus of the inspection limits. Red or purple dye shall be used for PVC pipe and green dye for ductile iron and concrete pipe.
 - 3. A one-inch reference ball to be mounted to the camera in order to drag along the bottom of the pipe during the entire inspection procedure.
 - 4. Linear measure references to be measured from the center of the beginning structure to the center of the next inline structure and include the direction of flow. The locations of lateral pipes and all distinctive pipe conditions shall be referenced

to the centerline of the beginning structure. All structure references shall utilize the designated structure reference numbers shown on the plans.

- E. The following television inspection information shall be provided to the Engineer:
 - 1. A clear movie format on DVD which encompasses the limits of the inspection area and including all reference data as described herein. A tape reference time and date for the start of each run shall also be indicated.
 - 2. A written report shall be provided corresponding to the taped inspection and including all reference data as described herein. The report shall consist of a written narrative of all distinctive pipe conditions including ponding areas in excess of ¼ inch

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including General Conditions and General Requirements, apply to this work as if specified in this Section. Work related to this Section is described in the following sections:
 - 1. Section 02 41 13 Selective Site Demolition
 - 2. Section 31 00 00 Earthwork
 - 3. Section 31 23 19 Dewatering
 - 4. Section 31 23 33 Trenching and Backfilling
 - 5. Section 31 41 00 Shoring and Underpinning
 - 6. Section 34 05 17 Railroad Work

1.02 DESCRIPTION OF WORK

A. The location and extent of the "Storm Drainage Utilities" work is indicated on the Drawings. The work includes the requirements for furnishing and installing storm drain pipes, and storm drain structures.

1.03 QUALITY ASSURANCE

- A. Except as specified in article 3.08 of this Section, Tacoma Rail will provide testing and inspection service to the satisfaction of the Engineer. The Contractor may obtain test results from the Engineer at no cost. Tests conducted for the sole benefit of the Contractor, or before a product is approved, shall be at the Contractor's expense.
- B. Qualification of Workmen: Employ at least one person who shall be present at all times during execution of this portion of the work, shall have all portions of the Drawings and Specifications applicable to that portion of the contract, shall be thoroughly familiar with the type of materials being installed and the best methods for their installation, and shall direct all work performed under this Section.
- C. Codes and Standards: The Contractor shall comply with the applicable provisions of all pertinent codes and regulations. References made herein for manufactured materials such as pipes, fittings, and specialties refer to designations for the latest edition of materials published by the American Association of State Highway and Transportation Officials (AASHTO), the American Society for Testing Materials (ASTM), the American Public Works Association (APWA) Standard Specification for Municipal Public Works Construction, and the WSDOT/APWA 2018 Standard Specifications for Road, Bridge and Municipal Construction.

1.04 SUBMITTALS

- A. Submit the following in accordance with Section 01 33 00 "Submittal Procedures" for the following products:
 - 1. Manufacturer's literature on pipe and fitting materials.
 - 2. Manufacturer's literature on trench drain and area drain components.

- 3. Manufacturer's certificates of compliance for pipe and fitting materials.
- 4. Manufacturer's literature on the metal castings for manholes, catch basins and cleanouts.
- 5. Manufacturer's literature on valves and actuators.
- 6. Butterfly Valve manufacturer's flow test data from an accredited hydraulics laboratory.
- 7. Certificates of compliance with AASHTO HS-25 load rating requirements for precast structures and metal castings.
- 8. Shop drawings for precast catch basins and manholes.

PART 2 - PRODUCTS

- 2.01 STORM DRAINAGE PIPE
 - A. High density polyethylene pipe (HDPE) shall be manufactured in accordance with the specifications set-forth in AWWA C906 "Standard for Polyethylene (PE) Pressure Pipe and Fittings, 4 inch (100 mm) Through 63 inch (1,600 mm), for Water Distribution and Transmission." HDPE storm drainage pipe shall conform to the requirements of ASTM Standard F-714, IPS DR11 and made from PE4710 resin conforming to ASTM D2513 with the cell classification of 445574C/E conforming to ASTM D3350 and listed with the Plastic Pipe Institute's (PPI) TR4. Pipe shall be carbon black in color, and shall not include markings indicating that the pipe is for potable water or reclaimed water usage Pipe shall be furnished in laying lengths of not less than 50 feet.
 - B. HDPE pipe joints shall be made by butt heat fusion in accordance with ASTM D2657 and ASTM D3261, or with flange adapters.
 - C. Ductile iron shall be used at points noted on the Drawings. Ductile Iron pipe shall be push on joint pipe by US Pipe or American Pipe.

2.02 ORT DRAIN

- A. High density polyethylene pipe (HDPE) shall be manufactured in accordance with the specifications set-forth in AWWA C906 "Standard for Polyethylene (PE) Pressure Pipe and Fittings, 4 inch (100 mm) Through 63 inch (1,600 mm), for Water Distribution and Transmission." HDPE storm drainage pipe shall conform to the requirements of ASTM Standard F-714, IPS DR11 and made from PE4710 resin conforming to ASTM D2513 with the cell classification of 445574C/E conforming to ASTM D3350 and listed with the Plastic Pipe Institute's (PPI) TR4. Pipe shall be carbon black in color, and shall not include markings indicating that the pipe is for potable water or reclaimed water usage Pipe shall be furnished in laying lengths of not less than 50 feet.
- B. HDPE pipe joints shall be made by butt heat fusion in accordance with ASTM D2657 and ASTM D3261, or with flange adapters.

2.03 TRENCH DRAIN

- A. The surface drainage system shall be Zurn Z886 complete with Class C stainless steel grate and frame as manufactured by Zurn, Inc. or approved equal.
- B. Modular channel sections shall be fabricated from high density polyethylene (HDPE) and shall have a positive mechanical connection between channel sections that will not separate during installation
- C. Channels shall have rebar clips or other component to mechanically lock into concrete encasement at not less than 10 inches on center.
- D. Channels shall have a 4 inch wide throat and a smooth radiused self cleaning bottom with a Manning's coefficient of 0.009 and a slope of 0.75% cast into the channels.
- E. Channel outlets shall be 6 inch diameter end outlets unless otherwise noted.
- F. Trench top frame shall be Type 304 stainless steel
- G. The grate covers shall be reinforced slotted stainless steel independently certified to meet Load Class C per DIN EN1433, and H-20 loading requirements. Grates shall be fabricated fromASTM A351 Type 304 stainless steel, and provide an open area of 12.0 sq. in. per linear foot of grate. Grates shall be furnished with vandal proof lock down mechanisms.
- 2.04 AREA DRAINS
 - A. Area drains shall be 7" diameter top drain, Dura-Coated cast iron body with bottom outlet, frame for medium- duty cast iron deep flange slotted grate, Zurn Z507 or approved equal.
- 2.05 MANHOLES AND CATCH BASINS
 - A. Catch Basins shall be of precast concrete and shall be made up from the components indicated on the Drawings and shall conform to the Washington State Department of Transportation Standard Plans for Road, Bridge and Municipal Construction, most recent edition for dimensions and functionality.
 - B. Metal frame and grate or cover for catch basins and manholes shall be ductile iron of the size and style indicated on the Drawings.
 - C. Pipe penetrations shall be furnished with flexible boot connectors, Kor-N-Seal or approved equal.
 - D. Mortar shall be mixed 1:1; Type I cement and sand.

2.06 PIPE COUPLING

A. Pipe couplings for joining new pipe to existing pipe shall conform to the performance requirements of ASTM C 1173 and shall include a PVC gasket, stainless steel clamps and stainless steel shear ring. Gasket shall conform to ASTM D 5926 with a minimum tensile strength of 1000 psi and minimum elongation at rupture of 250 percent. Shear ring shall be designed to resist heavy earth loads and shear forces, and retain pipe alignment. Shear ring shall be stainless steel, 0.012 inch or greater thickness.

2.07 BUTTERFLY VALVE

A. Butterfly valve shall be manufactured in accordance with the latest version of AWWA C504. The butterfly valve shall be a tight closing, rubber seated design providing bi-

directional bubble tightness. The valve shall be suitable for throttling service and/or operation after long periods of inactivity. Flomatic Model 45 or approved equal.

- B. The valve body shall be constructed of ductile iron ASTM A536, for valve class 150B and 250B pressure ratings. Cast iron bodies are not acceptable. Flanges shall be in conformance with ANSI Standard B16.1, Class 125 drilling.
- C. The shaft bearings shall be sleeve type constructed of a self lubricating, corrosionresistant material. The bearings shall be designed to support horizontal and/or vertical shaft loading.
- D. The valve disc shall be constructed of cast ductile iron ASTM A536 with 316 stainless steel edges, with the exception of 3" and 4" sizes, which shall be constructed of cast 316 stainless steel per ASTM A351. The valve disc shall be a center positioned, concentric design without ribs or obstructions for improved flow and low head loss.
- E. The valve shaft shall be a one piece through disc design construct- ed of stainless steel ASTM A276 type 316. The shaft shall be fastened to the disc utilizing taper pins providing leak-proof connection between the shaft and disc.
- F. The valve seat and interior waterway shall be bonded and vulcanized with rubber. The seat shall cover the entire interior water way and flange surface.
- G. The packing shall be a rubber, V-type design that is self adjusting and wear compensating. The valve packing arrangement shall allow for removal of the actuator without failure of packing seal.
- H. Valve shall be coated with a fusion bonded NSF61 epoxy powder.
- I. Butterfly valves shall be hydrostatic and leak tested in accordance with AWWA C504.

2.08 ROTATING VALVE ACTUATOR

- A. Powered valve actuator shall be housed in an explosion proof and waterproof enclosure. Actuator power supply shall be 120VAC, single phase and control power shall be 110/220 VAC single phase.
- B. Actuator shall be furnished with two limit switches, internal thermal stall protection, mechanical stops, manual override and a continuous position indicator.
- C. Actuator shall have an integral space heater for freeze protection.
- D. Actuator shall be furnished with two local control unit panels to be located as indicated on the Plans. Local control units shall include open/stop/close selector switch.

2.09 SPILL CONTAINERS (ORT DISCHARGE POINT AND TANK PUMPOUT ACCESS)

- A. Spill container to be Franklin Fueling Systems Defender Series Spill Containers Product Number 705556111BLK or approved equivalent.
- B. Spill containers shall be five gallon, double wall, below grade level fueling system spill containers with visual monitoring.
- C. Containers shall be housed in a steel manway skirt with a fiberglass composite locking gasketed cover that prevents water intrusion.

D. Container lids and manways shall be rated for HS-20 vehicle loading.

2.10 WASTE OIL HOLDING TANK

- A. Waste oil holding tank to be Highland Tank 3,000 gal 64" Double Wall HighGaurd tank or approved equal.
- B. Double wall carbon steel tank, 3000 gallon capacity with polyurethane external finish.
- C. Interstitial monitoring tube or pipe. Interstitial monitoring sensors shall be connected to alarm panel as specified in Section 33 30 00. Interstitial monitoring sensor shall be discriminating type, Pneumercator ES825-200F or approved equal.
- D. Tank shall be furnished complete with not less than six 4-inch pipe fittings spaced along the crown of the tank for vents and fluid piping.
- E. The tank shall be of sufficient thickness and construction to withstand the imposed loading due to saturated soil at the specified burial depth for each available tank height. All station components must function normally when exposed to the external soil and hydrostatic pressures developed at the specified burial depth. The tank shall be fabricated with features to support concrete anchoring to prevent floatation. Concrete anchoring shall be provided in accordance with the manufacturer's recommendations based on an anticipated groundwater elevation of +12.00.
- F. Depth and diameter of tank shall be as indicated on the drawings.
- G. Tank ranching, bedding, installation and backfill shall be done in accordance with the manufactures recommendation.
- H. An air test of the primary tank and interstitial space should be done above ground prior to installation. Pressure should not exceed 5 psi while a bubble solution is applied to welded seams. Refer to instructions on side of tank or per PEI RP100-2000.
- I. A corrosion control system with a limited 30-year warranty against failure due to exterior corrosion and internal corrosion shall be provided.
- 2.11 WASTE OIL HOLDING TANK FLOAT GAUGE AND ALARM PANEL
 - A. Control and alarm panel and gauge shall be as specified in Section 33 30 00.

PART 3 - EXECUTION

- 3.01 GENERAL
 - A. It shall be the Contractor's responsibility to verify the actual locations (horizontal and vertical) of all utilities prior to beginning trench excavation. If utilities are to remain in place, provide protection from damage during construction operations.

3.02 EARTHWORK

- A. Excavation, bedding, and backfilling shall be as specified in Section 31 00 00, Earthwork, of these Specifications.
- 3.03 SURVEYS
 - A. Layout of alignment and grade of site drainage piping shall be established by a Land Surveyor State licensed in Washington. Check the line and grade during installation to ensure that the Work is within the following allowable tolerances:

- 1. Fine-grade and prepare bedding so the pipe can be initially placed with a variation from true line or grade, measured at each joint, of not more than 1/32 inch per inch diameter or 1/2 inch maximum, provided that:
 - 1) A resulting level or backsloping length of pipe does not occur; and
 - 2) No more than one-half of the permissible variation shall be accumulated between successive joints.
 - 3) Pipe laid within these tolerances shall not be subjected to any further adjustment. Measurement for grade shall be taken at the pipe invert, NOT TOP OF PIPE. Eccentricity of pipe barrels, with respect to jointing surfaces, shall not produce grade interruption adverse to flow of more than 1/4 inch maximum.

3.04 INSTALLATION OF UNDERGROUND PIPE

- A. Contractor shall hold a pre-construction conference onsite with culvert manufacturer and Engineer a minimum of 2 weeks prior to beginning culvert installation.
- B. Furnish all necessary machinery for the work and pump, bail, or otherwise remove any water which accumulates in the trench. Perform all work necessary to keep the trench clear of water while the foundation and the masonry are being constructed or the pipe is being laid.
- C. Placing: Place the pipe from downstream to upstream with the bells pointing upstream in appropriate bedding graded to conform with the grades and alignment indicated on the Drawings and prepared as specified. Ensure that the pipe has a full, solid bearing along its entire length. Provide small depressions for pipe bells when utilized. Make minor adjustments to line and grade by scraping away, or filling in with, bedding material. Do not support pipes on blocks or mounds of any nature.
- D. Jointing: Take care to properly align the pipe and clean the bell and spigot or tongue of the pipe. Gaskets must be straight, properly lubricated and without twist. The pipe shall be partially supported by hand, sling, or crane, as required, to minimize lateral pressure on the gasket and to maintain concentricity until the pipe has been forced into final longitudinal position in accordance with the manufacturer's recommendations. Pipe handling, after the gasket has been affixed, shall be carefully controlled to avoid bumping the gasket and, thus, knocking it out of position or loading it with dirt or other foreign material. Gaskets so disturbed shall be removed, cleaned, relubricated and replaced before the joint is attempted.
- E. Apply sufficient restraint to the line to ensure that the joints, once home, are held so by tamping fill material under and alongside the pipe. At the end of the day's work, block the last pipe in such a manner as may be required to prevent creep during down time.

3.05 INSTALLATION OF BUTTERFLY VALVES

- A. Butterfly valves for storm drainage system shall be installed normally open and electrically connected to momentary switch.
- 3.06 INSTALLATION OF MANHOLES AND CATCH BASINS

- A. Furnish all necessary labor, materials, or equipment to pump, bail, or otherwise dewater the trench or pit for the duration of the construction and backfill period.
- B. Manholes/Catch Basins
 - Place manholes/catch basins at the elevation and location indicated on the Drawings upon the appropriate bedding prepared in accordance with Section 31 00 00 – "Earthwork".
 - 2. Carefully place precast manholes/catch basins on the quarry spall and structural fill bedding so as to be fully and uniformly supported in true alignment, making sure that all entering pipes can be inserted on proper grade.
 - 3. All lift holes and all joints between precast elements shall be thoroughly wetted and then completely filled with mortar, smoothed and point both inside and out, to ensure watertightness.
 - 4. Place precast sections and align to provide vertical sides and vertical alignment of the ladder rungs. The completed catch basin shall be rigid, true to dimensions and watertight.
 - 5. In precast manhole/catch basin sections where steel loops have been provided in lieu of lift holes, remove the loops flush with the inside wall surface after the catch basin has been completed. No sharp cutoff protrusions will be permitted. If concrete spalling occurs as a result of the loop removal, restore the spalled area with mortar to a uniformly smooth surface.
- C. Grade Adjustment: The manhole/catch basin casting frame or casting ring may be either cast into a concrete collar or set flange down on pre-cast concrete adjustment rings and mortared, as directed by the Engineer. It shall not, in any case, be grouted to final grade until the final elevation of the pavement in which it is to be placed has been established and permission has been given by the Engineer to grout the casting in place. Provide not less than eight inches or more than 16 inches between the top of the cone or slab and the underside of the manhole casting ring for adjustment of the casting ring to grade. Bricks for grade adjustment shall not be used. Location of manholes/catch basins will be staked by the Contractor.
- D. Pipe Connections: Place all pipes entering or leaving the structure on firmly compacted bedding, particularly within the area of the structure excavation, which normally is deeper that that of the sewer trench. All openings in the walls of catch basins constructed with precast sections for the insertion of pipe connections and outlet trap castings shall, after pipe or castings have been placed to their final position, be grouted tight in place to present a smooth uniform surface inside and outside. Pipe placed through walls to which connections will be made shall be so placed that the socket end of the pipe is backed against the outside surface of the catch basin as closely as practicable for the angle of entrance. The spigot end of the pipe shall be cut square with the last point of contact with the inside wall surface. Provide flexible joints within 12 inches of the catch basin structure.
- E. Backfill: Hand-place backfill around the manhole, extending at least one pipe length into each trench and tamp with selected material up to an elevation of six inches above the crown of all entering pipes. Conform to the applicable provisions of Section 31 00 00 – "Earthwork".

3.07 INSTALLATION OF TRENCH DRAIN SYSTEM

A. The trench drain system shall be installed in accordance with the manufacturer's installation instructions and recommendations.

3.08 ACCEPTANCE TESTING

- A. After completion of the following, authorization from the Engineer shall be required before the Contractor can perform acceptance testing:
 - 1. Acceptable placement of applicable pipe, bedding, and backfill material.
 - 2. Acceptable completion of all applicable manhole channels and grout work.
 - 3. Acceptable debris removal, cleaning, and flushing of all applicable pipes and structures.
- B. Contractor shall perform leak testing for storm drainage and ORT drainage piping in accordance with ASTM F2164, "Standard Practice for Field Leak Testing of Polyethylene (PE) and Crosslinked Polyethylene (PEX) Pressure Piping Systems Using Hydrostatic Pressure."
- C. Before final acceptance, the Contractor shall inspect all drainage lines by the use of a television camera, utilizing a Port approved independent inspection service company. The television inspection requirements shall include the provisions of:
 - 1. A color analog/digital camera with pan and tilt capacity in order to view all main lines, lateral lines, and structures including channels.
 - 2. A dye solution to be introduced in sufficient quantity to travel from the structure that is the highest point of inspection to the downstream terminus of the inspection limits. Red or purple dye shall be used for PVC pipe and green dye for ductile iron and concrete pipe.
 - 3. A one-inch reference ball to be mounted to the camera in order to drag along the bottom of the pipe during the entire inspection procedure.
 - 4. Linear measure references to be measured from the center of the beginning structure to the center of the next inline structure and include the direction of flow. The locations of lateral pipes and all distinctive pipe conditions shall be referenced to the centerline of the beginning structure. All structure references shall utilize the designated structure reference numbers shown on the plans.
- D. The following television inspection information shall be provided to the Engineer:
 - 1. A clear movie format on DVD which encompasses the limits of the inspection area and including all reference data as described herein. A tape reference time and date for the start of each run shall also be indicated.
 - 2. A written report shall be provided corresponding to the taped inspection and including all reference data as described herein. The report shall consist of a written narrative of all distinctive pipe conditions including ponding areas in excess of 1/4 inch.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this Section is described in the following sections:
 - 1. Section 02 41 13 Selective Site Demolition
 - 2. Section 31 00 00 Earthwork
 - 3. Section 34 11 16 Field Welding
 - 4. Section 34 11 32 Timber Ties

1.02 DESCRIPTION OF WORK

- A. This Section specifies the material requirements and performance criteria for trackwork and special trackwork to be furnished by the Contractor and installed in accordance with the Contract Drawings.
- B. The extent and location of railroad work is indicated on the drawings. The work includes the requirements for providing railroad track complete with rail, ties and all appurtenances necessary for a complete, operable railway system.

1.03 REFERENCED STANDARDS:

- A. American Railway Engineering and Maintenance-of-Way Association Manual for Railway Engineering (AREMA) 2018.
- B. American Railway Engineering and Maintenance-of-Way Association Portfolio of Trackwork Plans (AREMA PORTFOLIO) 2018.
- C. Code of Federal Regulations Title 49 Transportation, Chapter II Federal Railroad Administration, Department of Transportation, Part 213 Track Safety Standards.
- D. Code of Federal Regulations Title 49 Transportation, Chapter II Federal Railroad Administration, Department of Transportation, Part 214 Railroad Workplace Safety.

1.04 CONTRACTOR FURNISHED MATERIAL:

A. Contractor shall provide all materials required for completion of the Work, except those materials identified on the Drawings and in the Specifications as Owner Furnished Material.

1.05 SUBMITTALS:

- A. Submit the following in accordance with Section 01 13 00 Submittals and Shop Drawings:
 - 1. Certification of Rail
 - a. Contractor to provide Certifications of compliance from suppliers or manufacturers that Rail delivered to the site is in conformance with AREMA

Specifications Chapter 4, Part 1 Design of Rail and Part 2 Manufacture of Rail.

- b. The chemical analysis of the rails listed by heat number, and the specified chemical analysis elements.
- c. The Brinell hardness of the rails shipped by heat numbers.
- 2. Certification of Other Track Material
 - Contractor to provide Certifications of compliance from suppliers or manufacturers that Joint Bars, Compromise Joints, Track Bolts, Nuts and Washers delivered to the site are in conformance with AREMA Specifications Chapter 4, Part 3 Joining of Rail.
- 3. Certification of Tie Plates
 - a. Contractor to provide Certifications of compliance from suppliers or manufacturers that Tie Plates delivered to the site are in conformance with AREMA Specifications Chapter 5, Part 1 Tie Plates and these specifications.
 - b. Contractor to provide shop drawing detailing all tie plates using elastic fasteners.
- 4. Certification of Elastic Fasteners on Timber Ties
 - a. Contractor to provide Certifications of compliance from suppliers or manufacturers that Elastic Fasteners delivered to the site are in conformance with AREMA Specifications Chapter 5, Part 9, Design Qualification Specifications for Elastic Fasteners of Timber Cross Ties.
 - b. Contractor to provide shop drawing detailing elastic fasteners and clamping force.
- 5. Certification of Screw Spikes
 - a. Contractor to provide Certifications of compliance from suppliers or manufacturers that Screw Spikes delivered to the site are in conformance with AREMA Specifications Chapter 5, Part 10, Section 10.1 Steel Screw Spikes.
- 6. Ballast
 - a. The Contractor shall provide laboratory certification that the railroad ballast meets the Specifications of this Section.
 - b. Offsite borrow source characterization in accordance with Section 31 00 00, Earthwork.
- 7. Vertical and Horizontal Alignment Verification: Vertical and horizontal control survey of finished top of rail. Submittal to consist of a table of as constructed top of rail elevations at 20 foot intervals along the both rails for all new track. Submittal to be reviewed and approved by Engineer. Engineer will evaluate measurements of the vertical and horizontal alignment of the new trackwork to verify consistency with the FRA Safety Standards for Track Geometry Gage and

Alignment for Class 3 track, except where more stringent tolerances are required as specified on the Drawings and in these Specifications.

- 8. PRECAST CONCRETE TRACK PANELS
 - a. The Contractor shall provide shop drawing detailing all precast concrete track panels and proposed horizontal and vertical layout. Shop drawings shall indicate fastener and lifter placement.
 - b. Contractor shall submit concrete mix design prior to fabrication.

1.06 QUALITY ASSURANCE:

- A. The Contractor performing railroad work shall be regularly engaged in the furnishing and installation of railroad trackwork, and shall employ at least one (1) supervisory person who is thoroughly trained and experienced in trackwork construction. The supervisor shall be completely familiar with the design and application of the work described in this Section and shall direct all work performed under this Section.
- B. The Contractor shall own a copy of the American Railway Engineering and Maintenance-of- Way Association - Manual for Railway Engineering (AREMA) 2018, Chapters 1, 4, 5, and 30.

PART 2 - PRODUCTS

2.01 GENERAL:

- A. Furnish and install all track materials and products to complete the railroad trackwork, as shown on the Drawings. Completed railroad track shall conform in all regards to the AREMA Manual of Railway Engineering.
- B. Trackwork will use a resilient fastening system, Pandrol type E, or approved equal unless noted otherwise on the drawings.

2.02 RAIL:

- A. The Contractor shall provide new rail. All rail shall be 115 RE, as shown on the Drawings, meeting the requirements of AREMA Manual, Chapter 4, Part 2, Specification Section "Specifications for Steel Rails". The Contractor shall provide high strength head hardened rail. High strength head hardened rail shall have a minimum surface Brinell Hardness number of 370.
- B. The rail for this track to generally be constructed using lengths of 39 feet or 78 feet.
- C. Bolt holes within the rail are not acceptable, except at the ends of the rail at locations where joint bars are used.
- D. The rail section shall conform to the dimensions shown in AREMA Manual, Chapter 4, Part 1 for 115 RE.

2.03 RAILWAY BALLAST AND WALKWAY ROCK:

A. Railway ballast shall conform to the material requirements and be manufactured in accordance with AREMA Chapter 1, Part 2 Ballast. Ballast shall be manufactured by mechanical crushing from ledge rock, talus, or quarry rock and 100% of the material shall have at least one fractured face and 95% of the material retained on a 3/4-inch screen shall have three (3) fractured faces.

- B. Railway Ballast material shall not contain more than a total of 1% by weight of wood wastes, clay lumps, dust, or other extraneous material. Carbonate rock and slag is prohibited for use as ballast.
- C. The material from which railway ballast is manufactured shall meet the following test requirements:
 - 1. Los Angeles, Wear, 500 Rev. 35% max.
 - 2. Railway Ballast shall conform to AREMA No. 4 gradation requirements when sampled from stock pile to be loaded for shipment:

Table 34 05 17–A, AREMA No. 4 Gradation			
Sieve Size	Passing % by Weight		
2 inch	100		
1 1/2 inch	90-100		
1 inch	20-55		
¾ inch	0-15		
1/2 inch	-		
3/8 inch	0-5		

3. Walkway rock shall be railway ballast conforming to AREMA No. 5 gradation requirements when sampled from stock pile to be loaded for shipment:

Table 34 05 17–B, AREMA No. 5 Gradation				
Sieve Size	Passing % by Weight			
1 1/2 inch	100			
1 inch	90-100			
³ ⁄ ₄ inch	40-75			
1/2 inch	15-35			
3/8 inch	0-15			
No. 4	0-5			

4. Gradation test shall be determined in accordance to ASTM C-136, utilizing square opening sieves conforming to ASTM Specifications E-11.

5. Material qualities shall be as follows:

Table 34 05 17–C, Ballast Material Qualities				
Property	Minimum	Maximum	Test Method	
Percent Passing No. 200 Sieve	-	1%	ASTM C117	
Bulk Specific Gravity - Rock	2.6	-	ASTM C127	
Absorption – Rock	-	1.3 %	ASTM C127	
Clay Lumps and Friable Particles	-	0.5 %	ASTM C142	
Degradation	-	35%	ASTM C535 ASTM C131	
Flat and Elongated Particles	-	5%	ASTM D 4791 Test C, Length > 3 times avg thickness	

2.04 JOINT BARS AND COMPROMISE JOINTS:

- A. Joint bars shall conform to the AREMA Manual, Chapter 4, Part 3 "Joining of Rail", Section 3.1 and 3.2. Joint Bars shall be 6-hole, 36 inches long, conforming to the AREMA Manual for Railway Engineering, Section 3.2 "Joint Bars and Assemblies."
- B. The bars shall be smoothly rolled, or forged, true to template and shall accurately fit the rails for which they are intended and shall provide a true alignment of the gage and running surfaces of the two rails being connected. A variation of $\pm 1/32$ inch from the specified size of holes, or $\pm 1/16$ inch from the specified location of holes, and of $\pm 1/8$ inch from the specified length of joint bar will be permitted.

2.05 WELDED RAIL JOINTS:

- A. Rail joints within the limits of precast concrete track panels shall be field welded, rail welding shall be performed in compliance with Section 34 11 16.
- 2.06 TIE PLATES:
 - A. Tie plates shall conform to AREMA Manual Chapter 5, Part 1, "Specifications for Steel Tie Plates".
 - B. Either low carbon or high carbon steel tie plates may be furnished.
 - C. Tie plates shall accommodate two elastic spring clips and at least four screw spikes to secure the plates to the timber ties. Tie plates to have a minimum length of 16". Tie plates shall have minimum width of 7-3/4" and minimum thickness of 5/8" under the rail in base section.

- D. Tie plates to have 1" diameter holes to accommodate 15/16" diameter screw spikes.
- E. Tie plates to provide for 115 RE with 5.5" base. 115 lb. tie plates to be provided under 115 lb. rail remaining near the turnouts at each end of the work.
- F. Tie plate section to be canted 1:40,+/-5, toward the center line of track.
- G. Tie plates shall have smooth flat bases with no ridges or indentations.
- 2.07 TRACK BOLTS, NUTS, AND SPRING WASHERS:
 - A. Track bolts and square nuts shall be new, conforming to the current AREMA Manual, Chapter 4, Part 3, "Specifications for Heated Treated Carbon Steel Track Bolts and Carbon Steel Nuts". Spring washers shall be new conforming to the current AREMA manual Chapter 4, Part 2, "Specification for Spring Washers". For each track bolt, provide a square nut and spring washer of proper size for each bolt.
- 2.08 ELASTIC RAIL CLIPS:
 - A. The elastic rail clips to be used shall be one piece, threadless fasteners of spring steel Pandrol e-2055 Rail or approved equal, which must meet all the following requirements:
 - B. An easy to install one piece elastic spring steel rail clip without threaded elements which can be easily removed from its housing without any possible damage to or the loss of the lateral support provided by the shoulder. The design and configuration of the clips, their housing and their area in contact with the rail should be such that a nominal rail seat clamping force of 2500 pounds per clip is provided and frequent rail slippage can be allowed without stressing, bending, twisting or damaging the clips or their housing.
- 2.09 SCREW SPIKES:
 - A. Screw spikes shall be new, conforming to the current AREMA Manual, Chapter 5, Part 10, Section 10.1.
 - B. Screw spikes used to fasten the plates to the timber ties shall be one piece with reinforced throat, 3/4" square head, 15/16-inch diameter, 6-inches long per AREMA plan 1S-12 AREMA Rectangle Head Screw Spike.
 - C. The head shall be concentric with and firmly joined to the body of the screw. The material shall be free from injurious defects and shall have a workmanlike finish. Screws shall be provided with plain finish.
 - D. Finished screws shall conform to the following minimum requirements for tensile properties:
 - 1. High Strength
 - a. Tensile Strength, psi 120,000 Min
 - b. Yield Strength, psi 80,000 Min
 - c. Elongation, % 18 Min
 - E. Except for heat-treated screws, steel mill cert data may be used for tensile strength with approval of the Port.

F. A letter or brand indicating the manufacturer shall be located on the top of the washer of each screw.

2.10 PRECAST CONCRETE TRACK PANELS

- A. Modules shall be a monolithic pour, and shall be 6000 psi precast concrete.
- B. Modules shall have four (4) each embedded lifters for placement.
- C. Fasteners shall be Pandrol Brand or approved equal embedded shoulders.
- D. Copies of the concrete mix design to be submitted for approval prior to the start of the casting operation.
- E. Panel dimensions shall comply with approved shop drawings.
- F. Tolerances:
 - 1. The top surface, which will be in contact with the rail, shall no undulate in any direction more than 3/32".
 - 2. Curb height shall not vary more than 1/16" from the height indicated on the plans.
- G. Curing shall follow the recommendations and procedures of PCI in 4th edition division 4

PART 3 - EXECUTION

- 3.01 GENERAL:
 - A. The track will be constructed using timber ties and bolted rail. In general, the track is to be constructed using 39-foot or 80-foot rail lengths. Burned or sheared rail will not be accepted. Tie spacing will be 21 inches on center for tangent track and 19-1/2 inches on center for curved track.
 - B. Track construction shall be in conformance with the standards of the American Railway Engineering and Maintenance-of-Way Association and the requirements set forth below.
 - C. Track construction shall be performed in conformance with CFR 49 Chapter II, Part 214.

3.02 RAILWAY BALLAST:

- A. Ballast sections shall conform to typical cross section shown in the Drawings.
- B. Ballast shall be unloaded at required locations in a manner to minimize redistribution and handling.
- C. The ballast shall be placed before the ties are laid. Raise both rails uniformly to the designed grade.
- D. Care shall be taken when distributing materials from trucks and off-track equipment to prevent forming of ruts that would impair proper drainage of subgrade surface.
- E. Ballast shall only be installed over subgrade which has been prepared in accordance with this Specification and has been approved by the Engineer.

- F. Place ballast in lifts not more than 6 inches in thickness before compaction. Layers shall extend beyond the edge of the ties as shown on the Contract Drawings before compaction. Compact ballast thoroughly to form a stable section able to support the subsequent layers and loads.
- G. Compaction of ballast shall be by means of vibratory compaction equipment or specifically manufactured for compaction purposes. Self-propelled, pneumatic-tired roller shall have a gross weight of 10 to 15 tons, and the vibratory compactor shall have a weight of not less than 10 tons and shall be capable of applying a dynamic load of not less than 18,000 pounds at 1300 to 1500 cycles per minute. Proposed compaction equipment shall be approved by Engineer.
- H. Engineer will approve the compacted ballast prior to installation of track and appurtenant work over ballast. Each lift of ballast within initial layer shall be uniformly spread and compacted with not less than four passes of either a self propelled, pneumatic-tired roller or vibratory compactor or until no waving or creeping occurs.
- I. Track shall be assembled on compacted ballast to permit placement of additional ballast for subsequent raising and tamping and to provide full depth under ties.
- J. Final track raise shall not exceed 2 inches, and ballast shall be compacted with a 16 tool vibrating squeeze-type mechanical tamper making one full tamping insertion per tie for each inch of raise. Ballast in crib areas shall be compacted by a means approved by Engineer. Track shall be raised, aligned and tamped to within the specified tolerances.
- K. Ballast shall be thoroughly tamped within a space from 15 inches inside each rail to ends of ties. In tamping ties within above described limits, simultaneous tamping shall be performed under each rail. Tamping is not permitted at center of tie except within limits of turnouts and crossings.
- L. Pneumatic or electric tamping tools, either hand held or machine mounted, shall be used. Hand tamping with shovels or picks is not permitted.
- M. Two tamping tools shall always be used opposite each other on same tie. Tamping tools shall be started from a nearly vertical position and worked downward past bottom of tie, after which tool should be slanted downward to force ballast under tie. Double tamp every joint tie.
- N. Ballast shall be mechanically dressed to provide proper section as shown on Drawings.
- O. Excess ballast shall be removed, or may, at Contractor's option, be placed as directed by Engineer. Payment will not be made for ballast in excess of dimensions shown on Drawings.
- P. Overworked and excessively tamped ballast shall be removed and replaced at Contractor's expense.

3.03 TRACK CONSTRUCTION:

- A. Trackwork: Lay rails on timber tie track with staggered joints such that joints in opposite rails shall be staggered not less than 12 feet apart. Use temporary shims to secure proper spacing between the ends of rails. The rail temperature, at the time of laying, shall determine the number and thickness of shims required. Shim thickness shall be in accordance with table 5.2 in AREMA Section 5.1.4.
- B. Space timber ties 21 inches on center for tangent track and 19-1/2 inches on center for curved track, unless otherwise noted. Any deviation from the specified spacing shall be approved by the Engineer prior to installation of spikes or hold down devices.
- C. Care shall be taken in handling or spacing ties to not damage them with picks or spiking hammers. Ties shall be lifted and supported during storage, transportation, and placed in such a manner as to prevent damage. Ties shall not be dropped to the roadbed. Tie tongs, lining bars, other suitable tools or tie spacing equipment shall be used.
- D. Place wood ties with heartwood face down and square to the rail, except as otherwise shown in the Drawings.
- E. Ties shall be placed within 0.5 inches of perpendicular to the opposite rail.
- F. Cribs shall be filled to full height unless otherwise directed by the Engineer.
- G. Tie Plates: Set tie plates in correct position on the ties, true to gage, and with shoulders in full contact with the rail. Place one tie plate under each rail at each tie.
- H. Joint Bars: Secure joint bars in place with the full number of bolts, nuts and lockwashers. Stagger bolts, with heads placed inside and outside alternately, and draw tight before fastening rail to tie.
 - 1. A lubricant shall be applied on the rail within the area of the joint bar at time of installation.
 - 2. Rail joints shall be applied so that bars are not cocked between base and head of rail. Bars are to be properly seated in rail.
 - 3. Rail joints are not to be placed in limits of paving on asphalt crossing.
- I. Screw Spikes: Two screw spikes to be provided each side of rail for a total of four screw spikes per plate.

3.04 PRECAST CONCRETE TRACK PANEL INSTALLATION

A. The Contractor shall prepare the subgrade, install track panels and install rail in accordance with the manufacturer's installation instructions.

3.05 TRACK LAYING:

A. The Contractor shall construct the track in conformance with the approximate alignment and profile data (at select locations where available) shown on the Drawings. Alignment is based on the center line of track, equidistant between gage sides of the rails. The Contractor shall match into existing track horizontal and vertical alignment on all legs of new turnouts, unless otherwise noted.

- B. Where track alignment and profile data is not provided, the Contractor shall match existing track alignment and profile and make any necessary adjustments to meet the FRA Safety Standards for Track Geometry Gage and Alignment for Class 3 track, except where more stringent tolerances are required as specified on the Drawings and in these Specifications.
- C. The Contractor shall perform final surfacing and tamping following all other track construction items affecting the track structure. The ballast is to conform to the ballast section shown on the Drawings.
- D. The Contractor shall place the track in good alignment before the final ballast lift is made. The maximum throw for final lining shall not exceed 2 inches. Contractor shall set hubs for the alignment before the final lift is made and final alignment shall conform to the hubs.
- E. Gage of Track:
 - 1. Gage of track is the inside dimension between running rails, measured at right angles to the alignment of the track 5/8" below top of rail. The standard gage of track is 4'-8 1/2".
- F. Track Tolerances:
 - 1. The final gage, cross level, and horizontal and vertical alignment of all track shall be within the tolerance shown below:
 - 2. Gage variation:
 - a. Gage variation shall not exceed 1/8"(+/-) in new track construction.
 - b. New track will be laid to 4'-8 1/2" gage.
 - 3. Cross Level:
 - a. Deviation from cross level: No reverse cross level on curves will be allowed. A maximum deviation of minus 1/2 inch cross level on inside rail of curve will be allowed. A maximum of 1/4" cross level deviation will be allowed on tangent track.
 - 4. Horizontal Track Alignment:
 - a. Maximum allowable deviation of the middle ordinate from a 62-foot chord,
 - (a) On curves: 3/8 inch
 - (b) On tangents: 1/4 inch
- G. Vertical Track Profile:
 - 1. The maximum permissible variation from profile elevation detailed on profile drawings shall be + 1/2 inch, -0 inch
- H. Maximum permissible runoff per 40 feet in any interim raise shall not exceed: 1 inch
- I. The maximum permissible variation from a uniform profile on either rail at the midordinate of a 62-foot chord shall not exceed: 1/4 inch

3.06 DRILLING:

- A. Rail ends for bolted joints shall be drilled in accordance with AREMA standards. Any additional holes in rail will be sufficient cause for rejection.
- B. Holes in rail shall be drilled to proper size and not punched, slotted, or cut with a torch, and holes shall be chamfered to remove sharp edges.
- C. A variation of 1/32 inch in size and location of bolt holes shall be allowed.
- D. Holes shall be located with proper size rail drilling template and marked with a center punch prior to drilling. Drilling through joint bars is prohibited.

3.07 RAIL ENDS:

- A. Rail shall be cut with rail saw to a tolerance of 1/32 inch from square. All burrs shall be removed and ends made smooth. Torch cut rails will be rejected.
- B. Battered or mismatched ends shall be built up or ground off

3.08 SURFACE, LINE AND GRADE

- A. Contractor shall perform all surfacing within the stated project limits as specified to bring line and surface into compliance within track geometry tolerances specified in this section.
- B. Contractor shall surface track to zero crosslevel.
- C. Ballast shall be spread and track raised in a series of lifts. No single lift shall be higher than 2 inches. In raising track, jacks or equipment shall be regulated to avoid bending of angle bars or straining of joints. When jacks are used they shall be simultaneously used and properly spaced at not more than quarter points of rail to avoid breaks or bends in rail when track is raised. Both rails shall be raised simultaneously and to proper crosslevel by raising jacks.
- D. Each tie shall be tamped from 15 inches inside rail to end of tie. Tamping shall not be permitted at middle of tie. Both ends of a tie shall be tamped simultaneously and tamping inside and outside rail shall be done at same time. Equipment used for surfacing truck shall be subject to approval by Engineer.
- E. Ties that become loose during track raising shall be unfastened realigned, and refastened before tamping. During each track raise, track is to be uniformly tamped.
- F. After ballasting is completed and track is surfaced and lined, according to tolerances, ballast shall be trimmed neatly and surplus material shall be spread evenly along ballast shoulder.
- G. Contractor shall perform necessary operations to assure that all ties are at right angles to track.
- H. Contractor shall perform two tamping squeezes per tie up to 1-1/2 inches of raise with one additional insertion and squeeze for each additional 1 inch of raise. Joint ties shall be given one additional squeeze than other ties. The maximum allowable raise per surfacing pass shall be 2 inches.

- I. In locations where squeeze tampers cannot fill and compact ballast, such as at frogs, guard rails, switch points of turnouts and headblocks, etc., mechanically tamp with air tools or other hand-held power tamping tools.
- J. On curves, high rail shall be used as line rail and low rail shall be used as grade rail.
- K. When surfacing turnouts, the straight side of turnout shall be used as the line rail.
- L. After ballast regulating in turnouts, Contractor shall immediately clean excess ballast from switch point area, including switch points, switch rods, connecting rods, and guardrail and frog area.
- M. After ballast is regulated and dressed, Contractor shall ensure that resilient fasteners, track bolts and rail anchors are tight and in proper alignment.
- N. Contractor caused damage to signal equipment, shall be repaired at Contractor's sole expense.

3.09 TESTING:

A. Before final acceptance of trackwork, the Port will provide for a suitable test locomotive to be run over the entire length of new trackage in the presence of the Engineer. There shall be no noticeable settlement or deflection of ties and rail during the test. The Contractor shall re-line, surface, tamp, or otherwise correct any and all deficiencies as directed by the Engineer.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. The provisions and intent of the Contract, including General Conditions and General Requirements, apply to this work as if specified in this Section. Work related to this Section is described in the following sections:
 - 1. Section 34 05 17 Railroad Work

1.02 DESCRIPTION

A. This section specifies the material requirements and performance criteria for connection of rail segments by aluminothermic (thermite) welding.

1.03 SUBMITTALS

- A. Submit the following information:
 - 1. Welding Plan describing how welding will be accomplished in and out of track to the greatest extent practicable.
 - 2. Procedure: Submit proposed materials, methods and procedures to be used for thermite welding of CWR. Include procedure, materials and methods and include the following items:
 - a. Manufacturer's trade name for welding process.
 - b. Method used for cutting and cleaning of rail ends.
 - c. Minimum and maximum spacing between rail ends.
 - d. Method used for maintaining rails in alignment during welding.
 - e. Method used for preheating including time and temperature.
 - f. Tapping procedure including minimum time required to cool weld under mold insulation.
 - g. Method used, including a description of special tools and equipment for removing gates and risers and finishing weld to the final contour.
 - h. Details for compromise welds for different rail sections to be joined.
 - 3. Test Reports.
 - 4. Welding Records.

1.04 QUALIFICATIONS

1. Welding shall be performed under direct supervision of an experienced welding foreman or supervisor with a minimum of three years experience in thermite welding, working on a Class I Railroad.

PART 2 - PRODUCTS

2.01 MATERIALS

A. For thermite welding, materials and equipment shall be as manufactured by "Boutet", "Orgotherm", or other approved equivalent for standard rail.

PART 3 - EXECUTION

3.01 GENERAL

- A. For thermite welding, methods and procedures shall comply with AREMA Manual, Chapter 4, Section 3.13 "Specification for the Quality Assurance of Thermite Welding of Rail," and with welding kit manufacturer's recommendations and as specified herein.
- B. Rail ends for thermite welding shall be prepared in accordance with recommendations of welding kit manufacturer.
- C. For thermite welding, rail ends shall be preheated prior to welding to a sufficient temperature and for sufficient time to ensure full fusion of weld metal to rail ends without cracking of rail or weld.
- D. Completed weld shall be finished by mechanically controlled grinding to conform to same requirements specified for shop welding.
- E. Welds shall not be made within six (6) inches of bolt holes, or pin holes, closer than 13 feet to an existing thermite weld, or within 3 feet of plant weld.
- F. Follow Manufacturers recommendations for compromise welds.
- G. Follow recommendations of rail manufacturer for welding heat-treated or high strength rails.
- H. Welds must be in cribs between ties and located no closer than four (4) inches to nearest tie.

3.02 FIELD WELDING RECORD

- A. Field welding record shall be continuously maintained and furnished weekly to Engineer. Record shall include the following details:
 - 1. Date and time of weld(s)
 - 2. Location by station, stating track and rail

- 3. Contractor 's foreman
- 4. Air and rail temperature
- 5. Anchorage and rail stress
- B. Rail shall be painted in legible characters at least 1-1/2 inches high at each field weld with the following information:
 - 1. Date of Weld (MO/DAY/YR)
 - 2. Initials of welder performing weld
 - 3. Air temperature at time of weld (AT XXX)
 - 4. Rail temperature at time of weld (RT XXX)
 - 5. Example: 5/5/93 ABC AT90 RT120

3.03 TOLERANCES OF FIELD WELDS

- A. Maximum dimensional tolerance variations, based upon use of 36-inch straight edge, are as follows:
 - 1. Rail Head:

	a.	Vertical Offset	0. 020 inches
	b.	Horizontal Offset	0.040 inches
	C.	Vertical Crown	0.030 - 0.045 inches
	d.	Horizontal Kink	0. 020 inches
2.	2. Rail Base:		
	a.	Horizontal Offset	0.060 inches

b. Offset Bending 0.010 per inch

3.04 FINISHING OF FIELD WELDS

- A. Sharp edges and burrs are to be removed, including chimneys from welds. All welds shall be ground smooth.
- B. Weld joints shall be smooth on top and sides and straight in line. No overgrinding is permitted.
- C. Weld joints shall be smooth on sides and bottom. Offset blending permitted at rate of 0.010 per inch.

- D. Weld joints shall be smooth on both sides to within 1/8 inch of original contour. Width of remaining upset will be between 1/2 inch and 5/8 inch.
- E. Finishing of welds must be sufficient to allow testing using the Ultrasonic test method as described below. Welds rejected because of insufficient or unsatisfactory finishing of welds will be refinished, repaired or replaced at the Contractor's expense until the weld meets the testing criteria.

3.05 FIELD WELD TESTING

- A. Rail welds shall be tested by the Contractor through use of a testing agency using Ultrasonic testing method in accordance with ASTM E 164. The results of testing shall be provided to the Engineer.
- B. Each completed weld shall have full penetration and complete fusion and be entirely free of cracks. Total area of internal defects such as porosity and slag inclusions shall not exceed 0.060 square inch and largest single porosity or slag defect permitted shall not exceed 1 /8 inch in diameter.
- C. Other causes for rejection of welds shall be:
 - 1. Cracks that show in finished weld are cause to reject weld.
 - 2. Pit holes that show in web and base of weld after finish grinding are cause to reject weld. Pit holes in head not exceeding 1/4 inch in depth may, if approved by Engineer, be repaired by gas welding.
- D. Welded joints not meeting these specifications and tolerances shall be replaced by Contractor at no additional cost to the Port. Defective weld shall be cut out, and a new section of rail not less than 13 feet long shall be inserted, welded and retested at no additional cost to the Port.

3.06 CUTTING IN SHORT SECTION RAIL AND THERMITE WELDING THE ENDS

- A. A short section of rail shall be cut in the CWR, when directed by the Engineer, for the following reasons:
 - 1. To repair defective rail.
 - 2. To repair defective welds.
 - 3. To de-stress rail.
 - 4. To make a connection between rail strings or adjust rail to meet a specific point (i.e. to connect CWR to stock rail or frog).
- B. The short section of rail to be cut in shall be at least 13 feet long and shall be of the same weight, size, section, and class of rail being replaced or joined.
- C. Before cutting out rail in CWR, prevent remaining CWR from further movement by applying full anchors for at least 200 feet each way. After cutting CWR, a rail

expander/puller or other means shall be used to prevent rail movement until a weld or temporary joint is installed.

- D. The ends of the short rail section and the CWR shall be sawed or abrasive cut.
- E. Follow procedures specified for completing field welding by thermite process.
- F. Repair of rail due to damage by Contractor shall be at Contractor's expense.
- G. When repairing a defective rail or weld, the new rail shall be the same length as rail being replaced, or as required to achieve thermal adjustment.
- H. When performing field welding, rail temperature adjustments must be made in accordance with Section 34 05 17 using either heating of rail or mechanical rail pullers. The first weld of a replacement plug may be at ambient temperature, but the second (destress weld or rail closure weld) must be made while rail is heated to 105° Fahrenheit, or pulled mechanically to equal a neutral temperature of 105° Fahrenheit.

END OF SECTION

PART 1 - GENERAL

- A. RELATED WORK SPECIFIED ELSEWHERE
- B. The provisions and intent of the Contract, including the General Conditions and General Requirements, apply to this work as if specified in this section. Work related to this Section is described in the following sections:
- C. Section 34 05 17 Railroad Work
- 1.02 DESCRIPTION OF WORK
 - A. The Work of this Section consists of the furnishing, handling, and installation of timber cross ties for use in railroad track construction.
- 1.03 REFERENCES:
 - A. AMERICAN RAILWAY ENGINEERING AND MAINTENANCE OF WAY ASSOCIATION (AREMA) Chapter 30 - Ties
 - B. AMERICAN WOOD-PRESERVERS' ASSOCIATION (AWPA)
 - C. A1 Analysis of Creosote and Oil-Type Preservatives
 - D. M2 Standard for Inspection of Treated Timber Products
- 1.04 SUBMITTALS:
 - A. Submit the following in accordance with Section 01 13 00 Submittals and Shop Drawings:
 - B. Submit the name, address and phone number of the timber tie supplier.
 - C. Submit the completed inspectors report form as described by AWPA M2 Standard for Inspection of Treated Timber Products, including step by step work sheets of preservative analysis and retention analysis. Submit to the Owner prior to shipment of the ties from the treatment plant.
 - D. Submit Certificates of Compliance that ties comply with these specifications, AREMA specifications and AWPA standards prior to shipping timber ties.

PART 2 - PRODUCTS

- 2.01 TIMBER CROSS TIES:
 - A. General:
 - 1. Crossties shall meet the requirements of AREMA Chapter 30 Part 3.
 - B. Material:
 - 1. The following woods can be used for crossties:
 - a. Mixed hardwood consisting of black or honey locust, red or white oak.

- C. Physical Requirements:
 - 1. Except as hereinafter provided, all ties shall be free from any defects that may impair their strength or durability as cross ties, such as decay, large splits, large shakes, slanting grain, or large or numerous holes or knots.
- D. Design:
 - Standard track ties shall be 7" x 9" x 8'-6". Thickness, width, and length specified are minimum dimensions for green ties. Dry or treated ties may be 1/4 inch thinner or narrower than the specified sizes. Ties exceeding these dimensions by more than 1 inch shall be rejected. The grade of each tie shall be determined at the point of most wane on the top face of the tie within the rail-bearing areas. The rail-bearing areas are those sections between 20 inches and 40 inches from the center of the tie. The top of the tie shall be the narrowest face and/or the horizontal face farthest from the heart or pith center.
 - 2. All rail-bearing areas shall measure as follows: 7-inch grade cross ties shall be 7" x 9" in cross section with a maximum of 1 inch of wane (uncut edge) in the top rail-bearing areas. A maximum of 20% of the ties in any given quantity may be square-sawn 7" x 8" in cross section with no wane in the rail-bearing areas. Wane shall be permitted on the bottom face so long as it does not exceed 1 inch at any given point.
- E. Inspection:
 - 1. Place: Ties shall be inspected when delivered on site.
 - 2. Decay: Decay is the disintegration of the wood substance due to the action of wood destroying fungi. "Blue stain" is not decay and is permissible in any wood.
 - 3. Holes: A large hole is one more than 1/2 inch in diameter and 3 inches deep within, or more than one-fourth the width of the surface on which it appears and 3 inches deep outside, the sections of the tie between 20 inches and 40 inches from its middle. Numerous holes are any number equaling a large hole in damaging effect. Such holes may be caused in manufacture or otherwise.
 - 4. Knots: Within the rail bearing areas, a large knot is one having an average diameter more than 1/3 the width of the surface on which it appears; but such a knot will be allowed if it is located outside the rail bearing areas. Numerous knots are any number equaling a large knot in damaging effect.
 - 5. Shake: A shake is a separation along the grain, most of which occurs between the rings of annual growth. One which is not more than 1/3 the width of the tie will be allowed, provided it does not extend nearer than I inch to any surface.
 - 6. Split: A split is a separation of the wood extending from one surface to an opposite or adjacent surface. Do not count the end as a surface when measuring the length of a split. In unseasoned cross ties, a split no more than 1/8 inch wide and/or 4 inches long is acceptable. In a seasoned cross tie, a split no more than 1/4 inch wide and/or longer than the width of the face across which it occurs is

acceptable. In seasoned cross ties, a split exceeding the limit is acceptable, provided split limitations and anti-splitting devices are approved by the buyer and properly applied.

- 7. Checks: A check is a separation of the wood due to seasoning which appears on one surface only. Do not count the end as a surface. Ties with continuous checks whose depth in a fully seasoned and/or treated tie is greater than 1/4 the thickness and longer than 1/2 the length of the tie will be rejected.
- 8. Slope of Grain: Except in woods with interlocking grain a slope in grain in excess of 1 in 15 will not be permitted.
- 9. Bark Seams: A bark seam or pocket is a patch of bark partially or wholly enclosed in the wood. Bark seams will be allowed provided they are not more than 2 inches below the surface and/or 10 inches long.
- 10. Manufacturing Defects: All ties must be straight, square-sawn, cut square at the ends, have top and bottom parallel, and have bark entirely removed. Any ties which do not meet the following characteristics of good manufacture will be rejected:
 - a. A tie will be considered straight when a straight line from a point on one end to a corresponding point on the other end is no more than 1-1/2 inches from the surface at all points.
 - b. A tie is not well-sawn when its surfaces are cut into with scoremarks more than 1/2 inch deep, or when its surfaces are not even.
 - c. The top and bottom of a tie will be considered parallel if any difference at the sides or ends does not exceed 1/2 inch.
 - d. For proper seating of nail plates, tie ends must be flat, and will be considered square with a sloped end of up to 1/2 inch, which equals a 1 in 20 cant.

2.02 ANTI-SPLITTING DEVICES:

- A. Timber cross ties shall be equipped with anti-splitting devices of the type specified regardless of whether or not the wood has shown any tendency to split. Products used shall conform to the AREMA Manual, Chapter 30, Part 1, Section 3.1.6, "Specifications for Devices to Control the Splitting of Wood Ties".
- B. Timber cross ties shall be equipped on each end with gang nails (steel nail plates).
- C. Anti-splitting devices shall be applied in accordance with the AREMA Manual, Chapter 30, Part 3, Section 3.1.7, "Application of Anti-splitting Devices".
- 2.03 INCISING:
 - A. Timber cross ties and switch ties shall be incised on all four sides in the pattern specified in the AREMA Manual, Chapter 3, Part 6, "Wood Preserving".

DIVISION 34 – TRANSPORTATION SECTION 34 11 32 – TIMBER TIES

2.04 TIE PRESERVATIVE TREATMENT:

- A. Timber cross ties and switch ties shall be pressure treated in accordance with AREMA Chapter 30 Part 3 Section 3.7.2 "Treatment" by the empty cell process. Process and preservative to be used on material and retention required shall be as follows:
 - 1. Wood 50% Creosote / 50% Oil Process
 - 2. Doug Fir 8 lb. or Refusal L&R
 - 3. Hardwood (non oak) 7-1/2 lb. or Refusal L&R
 - 4. Oak 7-1/2 lb. or Refusal Bethel or L&R
- B. Ties will be accepted by the Engineer based on the Manufacturer's Certification of Compliance and Treatment Inspection Reports.
- C. Ties shall be free of excess preservative. Ties exuding a minor amount of preservative will be permitted.
- 2.05 TIE PRESERVATIVE FOR FIELD REPAIR OF DAMAGED TIES:
 - A. Tie preservative will be a greased based preservative compound such as Osmose Cop-R Plastic II or Tenino Copper Naphthenate or approved equal.

PART 3 - EXECUTION

- 3.01 HANDLING:
 - A. Timber ties shall be carefully handled to avoid damage in accordance with the AREMA Manual, Volume 1, Chapter 30, Part 3, Section 3.5.
- 3.02 PROTECTION:
 - A. Protection of timber ties from loss or damage shall be the responsibility of the Contractor. Ties shall be protected against surface damage caused by metal banding or other aspects of handling following tie treatment. Any damage done to a tie that exposes any white (untreated) wood shall be painted with tie preservative specified in this Section to the satisfaction of the Engineer.

END OF SECTION

<u>APPENDIX A – Geotechnical</u> Information



MEMORANDUM

DATE:	August 7, 2019		
то:	Steve Kingsley, PE, Naomi Medley		
FROM:	Michael Chamberlain, Lorne Arnold, PE, Garry Horvitz, PE		
RE:	Tacoma Rail East End Service Facility – Geotechnical Design Recommendations Tacoma, Washington 19469-00		

This memorandum presents our geotechnical engineering design recommendations for the two locomotive servicing bays Tacoma Rail plans to add to the existing facility located at 2601 State Route 509 North, South Frontage Road in Tacoma, Washington (Figure 1). We understand that the addition of these service bays will involve a new 40,000 gallon diesel tank, a 1,500 cubic foot sand storage silo, some underground waste storage tanks, a storage shed, and a piping bridge to carry conduits over the tracks (Figure 2).

The recommendations contained within this memorandum are based on information provided to us by you, available historical subsurface information in the site vicinity, explorations performed at the site for this study, and our previous knowledge and experience working on similar projects.

Our scope of work for this study included:

- Perform two Cone Penetration Tests (CPTs) to depths of 30 to 40 feet near the southern end of the piping bridge and within the footprint of the diesel storage tank.
- Review existing geotechnical documentation, plans, and calculations in comparison to the soils observed in the exploration, and provide a preliminary assessment of whether the design assumptions for soil conditions are appropriate;
- Perform additional geotechnical analysis required to support the currently proposed design not addressed in existing geotechnical recommendations; and
- Summarize our findings and geotechnical engineering design recommendations in this memorandum.

We understand that a historical geotechnical report produced by E3RA in 2000 and plans for the original service facility provided a general basis of design for the geotechnical elements of this project. The recommendations contained within this memorandum represent our assessment of the suitability of



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these historical documents for the current project and our updates and supplements to the historical documents, where appropriate.

We completed this work in general accordance with our contract dated June 10, 2019 and signed July 1, 2019. This memorandum is for the exclusive use of KPFF Consulting Engineers (KPFF) and their consultants for specific application to the subject project component and site. We completed this memorandum in accordance with generally accepted geotechnical practices for the nature and conditions of the work completed in the same or similar localities, at the time the work was performed. We make no other warranty, express or implied.

Site and Project Description

We understand that the addition of two new service bays to the existing Tacoma Rail facility will involve a new 40,000-gallon diesel tank, a 1,500-cubic-foot sand storage silo, some underground waste storage tanks, a storage shed, and a piping bridge to carry conduits over the tracks.

The Tacoma Rail East End service facility site is located just north of North Frontage Road in Tacoma, Washington, approximately 0.25 miles to the east of the intersection between Milwaukee Way and North Frontage Way. The site is currently covered by a combination of asphalt pavement and gravel. A Conex is present in the center of the site and a wash bay exists at the eastern extent of the site. Rail lines are present to the north, where the planned service bays will be constructed.

Historical Documents

A historical geotechnical engineering of the site, including three borings ranging in depth from 39 to 69 feet below ground surface (bgs), was completed by E3RA in 2000. The E3RA report of February 28, 2000 is titled "Geotechnical Report – Proposed Tacoma Rail Equipment Storage Building, 2601 SR 509 North Frontage Road, Port of Tacoma, Washington." We understand this report is not currently available in its complete form; however, we were able to obtain the text of the report body – figures and attachments, including boring logs, have not been found. The portions of the E3RA report available are included with this memo as Attachment 1. We understand that the contents of the complete E3RA report were the geotechnical basis of design for the previous service facility improvements plans by STV Incorporated dated January 26, 2011. The general notes sheet from the STV Incorporated plans, which contain the foundation notes, is included in this memorandum as Attachment 2.

Additionally, we previously prepared a geotechnical report titled "Geotechnical Engineering Design Study – Port of Tacoma North Lead Rail Project" dated March 18, 2016 for a project just to the north of the project site. We understand that KPFF consulted this report as a supporting document while producing their plans.



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Subsurface Conditions

The two CPTs (CPT-1 and CPT-2) completed at the site were extended to depths of approximately 71 feet and 32 feet bgs, respectively, at locations shown on Figure 2. CPT-1 was pushed to a greater depth than originally planned due to the presence of a thick soft and compressible layer of soil within the upper 40 feet of the exploration. CPT-1 was performed within the footprint of the planned fuel tank while CPT-2 was pushed just to the south of the piping bridge, as near to the proposed sand silo as was possible with the existing rail lines and structures. A report on the CPT testing containing exploration logs is presented in Attachment 3.

We based our interpretation of subsurface conditions on materials encountered in our recent explorations at the site, along with available existing subsurface information. The explorations performed for this study represent subsurface conditions at discrete locations on the relevant part of the project site, and actual conditions in other areas will vary. The nature and extent of any such variations may not become evident until additional explorations are performed or until construction activities begin. If significant variations are observed at that time, we should be contacted to modify our conclusions and recommendations to reflect actual site conditions.

Soil Conditions

Both CPTs performed at the site encountered soil conditions that were generally similar to the conditions reported in the historical E3RA report for the site. These soil conditions can be generally categorized as described below.

Granular Fill. Both CPTs and the E3RA report noted the existence of a layer of medium dense to dense sand to gravel from the ground surface to a depth of 4 to 5 feet bgs. The E3RA report noted the existence of chunks of wood within the fill soils between depths of 2 to 4 feet.

Fine-grained Alluvium. Both CPTs and the E3RA report noted the existence of very loose or very soft deposits of silt and clay with occasional interbeds of silty sand immediately beneath the granular fill layer. This layer was noted to extend from a depth of approximately 5 to 42 feet in CPT-1, and from 4 to 18 feet and 25 to 32 feet in CPT-2. The E3RA report observed this layer from about 5 to 23 feet and then again from 37 to 57 feet bgs. This material is generally observed to be soft and compressible and susceptible to consolidation settlement when loaded.

Granular Alluvium. Both CPT-2 and the E3RA report observed a layer of medium dense to dense, sand to silty sand between depth ranges of 18 to 25 feet and 23 to 37 feet, respectively. Both CPT-1 and the E3RA report observed that very dense, sand to gravelly sand was again encountered at the site from 42 to 72 feet and 57 to 69 feet, respectively.


Groundwater

Pore pressure dissipation tests were performed within both CPTs to assess the static groundwater table elevation at the time the explorations were performed. A static groundwater table depth of 8.8 and 8.4 feet bgs was observed in CPT-1 and CPT-2, respectively.

The historical E3RA report stated that groundwater was observed at depths between 4.5 and 5 feet bgs within their explorations. The report also notes that their explorations were performed during an extended period of wet weather and that the observed groundwater conditions may represent the yearly high levels.

The 2016 Hart Crowser report for the North Lead Rail project just north of the project site observed wet soils and evidence of groundwater as shallow as depths of 2 to 3 feet bgs within their test pit explorations.

Groundwater elevations may fluctuate with seasonal variations in precipitation, irrigation, and other factors. Based on our CPT explorations at the site and historical information, the groundwater should be anticipated at shallow depths at the site. We recommend considering a groundwater table depth of approximately 2.5 feet bgs in design.

Seismic Considerations and Recommendations

Seismic Basis of Design

We understand these structures will be designed following the 2015 International Building Code (IBC). Accordingly, we have provided seismic design recommendations considering the 2015 IBC and ASCE 7-10, which the 2015 IBC references.

Seismic Site Class

We determined the soil site class using information about the supporting foundation soils in accordance with the 2015 IBC. The seismic site class can be determined considering the soil characteristics and using a travel-time weighted average of the estimated shear wave velocity profile from a CPT extending to a depth of 100 feet bgs. Since our deepest CPT exploration was advanced less than 100 feet bgs, we assumed the shear wave velocity at the bottom of the deepest CPT as remaining constant to 100 feet to determine the site class. Using this approach, we determined that the site should be designated as seismic Site Class E. This Site Class E designation is made without regard for liquefaction potential.

Our analyses have identified that a liquefaction hazard is present at the site (discussed in further detail in the *Liquefaction Potential* section of this report). The 2015 IBC indicates that sites where a liquefaction hazard is identified should be represented as Site Class F and a site-specific ground response analysis should be completed to determine the response spectrum for design. However, through



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correspondence with KPFF, we understand that the fundamental period of vibration for all of the structures at the site are below 0.5 seconds. In accordance with Section 20.3.1 of ASCE 7-10, a site response analysis is not required under these conditions, and the **Site Class E** designation is considered appropriate.

Seismic Design Parameters

The seismic basis of design for the 2015 IBC is the risk-targeted maximum considered earthquake (MCE_R), which represents the earthquake shaking level with a 2 percent probability of exceedance in 50 years (return period of 2,475 years), adjusted to a 1 percent probability of collapse in 50 years. The design response spectrum was developed using the U.S. Geological Survey (USGS) Design Web Service.

The mapped parameters consist of a peak ground acceleration and 5 percent damped spectral accelerations at periods of 0.2 second and 1.0 second. The mapped values correspond to a site shear wave velocity of 2,500 feet per second (corresponding to Site Class B) and must be modified to account for Site Class E. The mapped seismic parameters from USGS corresponding to a soft rock site (Site Class B) with site shear wave velocity of 2,500 feet per second, and site coefficients applicable to seismic Site Class E are presented in Table 1.

Parameter	Value			
Latitude	47.2479			
Longitude	-122.3946			
Site Class	E			
Mapped Values				
Mapped spectral response acceleration at short periods, S_S	1.285 g			
Mapped spectral response acceleration at 1-second periods, S ₁	0.499 g			
Mapped peak ground acceleration, PGA	0.500 g			
Site Coefficients				
Site Class E Coefficient for Ss, F₂	0.9			
Site Class E Coefficient for S_1 , F_v	2.4			
Site Class E Coefficient for PGA, FPGA	0.9			

Table 1 – Seismic Design Parameters According to 2015 IBC

Liquefaction Potential

Liquefaction is caused by a rapid increase in pore-water pressure that reduces the effective stress between soil particles, resulting in sudden loss of shear strength in the soil. Granular soils that rely on inter-particle friction for shear strength are susceptible to liquefaction during strong ground shaking.



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We performed site-specific liquefaction analyses of the saturated soils at the site based on the recommendations of Idriss and Boulanger (2008 and 2014). In accordance with ASCE Minimum Design Loads for Buildings and Other Structures (ASCE 7-10), which the 2015 IBC refers to, we completed the liquefaction analysis using the site class adjusted Maximum Considered Earthquake Geometric Mean PGA (PGA_M). We use a PGA_M of 0.45 g and an associated earthquake magnitude of 7.1 in our analyses.

Based on our analyses, liquefaction is likely to occur in isolated areas of loose to medium dense, saturated, sand to silty sand at the site. Limited, discontinuous zones of potentially liquefiable sandy soils were identified at varying depths within each of the CPT explorations completed.

Based on our analyses and knowledge of the geologic setting of the site, we estimate that the postliquefaction ground settlement across the site may be on the order of 2 to 6 inches. We anticipate that differential settlements on the order of 2 to 3 inches may occur over a distance of 50 feet.

Engineering Analysis and Design Recommendations

Shallow Foundations

Bearing Resistance and Settlement

We understand that the planned fuel tank and sand silo structures at the site are planned to be supported on mat foundations embedded between about 2 and 3 feet below finished grade with bearing pressures (assuming 100 percent dead load) of about 490 and 1200 pounds per square foot (psf), respectively. We recommend an allowable bearing capacity for shallow foundations embedded at least 2 feet of 2000 psf.

As discussed in the *Soil Conditions* section of this report, a thick layer of soft silt and clay alluvium is present beneath the site. This soft, compressible soil is susceptible to consolidation settlement when loaded. Based on our CPT explorations at the site and input from KPFF regarding the planned foundation footprints and loading, we estimate long-term consolidation settlement beneath the sand silo and fuel tank of about 3 to 4 inches. We expect 90 percent of the total consolidation settlement to occur over a one to two month period after the dead load is applied. This assumes that footings are constructed in accordance with the recommendations provided in this memorandum. We expect the differential settlement between the two structures to be up to 1 inch.

Foundation Subgrade Preparation

The exposed subgrade should be carefully prepared and protected before construction of foundations. Any loosening of the materials during construction could result in more settlement. It is important that foundation excavations be cleaned of loose or disturbed soil before placing any concrete and that there is no standing water in any foundation excavation. Any local areas of especially loose sand, soft soils, or unsuitable material (i.e. wood debris) should be removed and replaced with well-compacted structural



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fill. Any visible organic and other unsuitable material should be removed from the exposed subgrade. We recommend these conditions be observed by a Hart Crowser representative during construction. The foundation settlement estimate described above assumes careful preparation and protection of the exposed subgrade before placement of concrete or precast footings. Contract documents should be written to provide for overexcavation and replacement of unsuitable soils that could be encountered during construction. See the *Overexcavation Considerations* section of this memorandum for additional recommendations pertaining to overexcavation.

Groundwater may be encountered near the planned footing subgrade elevation. We recommend that the groundwater be maintained at least 2 feet below the footing subgrade at all times until the foundation is poured to prevent the risk of heave, piping, boiling, softening, and other loss or disturbance of subgrade material.

Drilled Shaft Foundations

Axial Capacity and Settlement

The compressive capacity of drilled shaft foundations is achieved through a combination of end-bearing support at the pile tip and side friction between the pile material and the soil along the embedded pile length and will depend on the foundation diameter and the depth of embedment. Table 2 provides recommended ultimate axial capacities for the expected shaft sizes and shaft embedment depths communicated to us by KPFF. We recommend using a factor of safety of 2.5 for compression loads and 3.0 for uplift loads.

Shaft Diameter (inches)	Embedment Depth (feet)	Ultimate Axial Capacity in Compression (kips)	Ultimate Axial Capacity in Uplift (kips)
	6	15.5	4.2
28	9	22.8	8.1
	12	31.3	12.9
	9	25.8	8.7
32	12	34.5	13.8
	15	44.0	19.8

Table 2 – Ultimate Drilled Shaft Axial Capacities

Settlement at the top of the drilled shaft foundations is expected to be generally less than 0.25 inches, with the exception of shafts located near the fuel tank/sand silo structures. We estimate that long-term settlement for these shafts is likely to be on the order of 1 to 2 inches due to the influence of the adjacent structures. We expect the differential settlement between the structures on shallow foundations (fuel tank and sand silo) and the adjacent shafts to be approximately 2 inches. This



settlement estimate is based on subsurface information and analysis at discrete locations on the site and our experience with similar projects.

Group Effects on Axial Capacity

When deep foundations are grouped together, the resulting axial capacity is not necessarily the sum of the capacity of the individual foundation elements. Group effects must be considered for center-to-center spacing of less than 4 diameters. The axial capacity of the group must be reduced by an efficiency factor that depends on the spacing of the foundation elements relative to their diameter. The Federal Highway Administration (FHWA; FHWA-NHI-10-016) recommends a group efficiency factor (η) of:

 $\eta = 0.65$ for a center-to-center spacing of 2.5 diameters, and

 $\eta = 1.0$ for a center-to-center spacing of 4.0 diameters or more.

Actual value of η applicable to the drilled shafts foundations may be determined by linear interpolation between spacings of 2.5 and 4 diameters. We recommend a center-to-center spacing of at least 3 times the shaft diameter.

Lateral Capacity

We anticipate lateral deflections of shafts will be calculated using AllPile software. For AllPile analysis, we recommend using the parameters in Table 3.

Soil Unit	Depth bgs	AllPile	Unit Weight (pcf)	Effective Friction	Cohesion	PY Modulus,	Soil Strain, E ₅₀
	(feet)	Model	Above gwt	Angle (degrees)	(psf)	K (pci)	(percent)
Med. Dense/Dense Granular Fill	0 to 2.5	Sand/ Gravel	120	36	-	150	-
Med. Dense/Dense Granular Fill	2.5 to 5	Sand/ Gravel	58	36	-	100	-
Soft Silty Alluvium	Below 5 feet	Silt	53	-	400	30	2

Table 3 – Soil Properties for Lateral Drilled Shaft Analysis

Notes: pcf = pounds per cubic foot • pci = pounds per cubic inch



Construction Considerations

Overexcavation Considerations

If unsuitable material or soils are identified at the subgrade elevation beneath planned shallow foundations or utilities at the site, it may be necessary to overexcavate these materials to provide a firm and unyielding base for planned improvements. However, due to the presence of soft silts beneath the upper 5 feet of granular soils, the extent of overexcavation should be limited. If competent soils are not identified within the first 24 inches of overexcavation, a woven geotextile fabric may need to be installed over the overexcavated subgrade, followed by free-draining crushed rock or quarry spalls. Quarry spalls should be compacted by thoroughly tamping with the heel of an excavator bucket or using a similar procedure. The geotextile should then be wrapped over top of the spalls. A minimum of 6 inches of crushed surfacing base course (CSBC) or 1.25-inch-minus gravel should then be placed to backfill up to the required foundation bearing elevation. The geotextile wrapped over the spalls should act to separate the spalls from the smaller crushed rock above.

We recommend that a Hart Crowser field representative should determine the need for and extents of overexcavation.

Structural Fill

Structural fill is required for backfill in open cut and overexcavated areas, beneath footings, behind retaining walls, and above utility installations. The suitability of soil for structural fill depends primarily on its grain size distribution and moisture content when placed. As the fines content (fraction passing the U.S. No. 200 mesh sieve) increases, soil becomes more sensitive to small changes in moisture. With more than about 5 percent fines (by weight), soil cannot be consistently compacted to a firm, relatively unyielding condition when the moisture content is more than 2 percent above or below optimum. Structural fill must also be free of organic matter and other debris.

Generally, any fill material with moisture content at or near optimum can be compacted as structural fill provided it is placed on a firm and relatively unyielding subgrade surface. However, if fill is to be placed during wet weather, we recommend using clean fill, that is, soil with a fines content (fraction passing the U.S. No. 200 mesh sieve) of 5 percent or less (by weight).

For structural fill placement and compaction, we recommend:

Place and compact all structural fill in lifts with a loose thickness no greater than 8 to 10 inches. If small hand-operated compaction equipment is used to compact structural fill within 12 inches of utility pipes or other structures, the lifts should not exceed 4 to 6 inches in loose thickness, depending on the equipment used. The maximum particle size within the structural fill should be no

more than two-thirds of the loose lift thickness to allow full compaction of the soil surrounding the large particles.

- Generally, compact structural fill that is beneath footings, behind walls, and within 2 feet of the bottom of pavement sections to a minimum of 95 percent of the modified Proctor maximum dry density, as determined by the ASTM D1557 test procedure.
- Structural fill that is more than 2 feet below pavement sections, and within 2 feet of the back of subgrade walls should be compacted to at least 92 percent.
- Within 2 feet of subgrade walls, use hand compaction equipment to avoid overstressing the wall.
- Control the moisture content of the fill to within 2 percent of the optimum moisture based on laboratory Proctor tests. The optimum moisture content corresponds to the maximum attainable Proctor dry density.
- Generally, place structural fill only on dense and relatively unyielding subgrade (see Foundation Subgrade Preparation section). If subgrade areas are wet, clean material with at least 30 to 35 percent gravel content (material coarser than a U.S. No. 4 sieve) may be needed to bridge moisture-sensitive subsoils. In some cases, clean crushed rock or quarry spalls may be needed to stabilize weak or wet subgrade soil.
- Where free-draining material is required, such as around drainage pipes, use a well-graded sand and gravel with less than 3 percent passing the U.S. No. 200 mesh sieve (based on the minus 3/4-inch fraction of the material).
- Perform a representative number of in-place density tests to verify adequate compaction. A Hart Crowser representative should verify each structural fill lift and the subgrade area below it.
- Before using any material as structural fill, have it sampled and tested to determine its maximum dry density and gradation.

Drilled Shaft Construction

The contractor should carefully review this geotechnical memorandum and the exploration logs, and acknowledge the following construction considerations:

Conditions such as caving soil and groundwater can loosen soil at the bottom of the drilled shaft borehole and reduce bearing capacity in the zone of disturbed soil. Caving soils also slow production rates. The contractor should be prepared to case the drilled shaft holes where loose soils, or groundwater seepage could cause loss of ground. The actual need for casing should be determined in the field at the time of installation. We recommend that the contractor and a Hart Crowser



representative closely monitor drilled shaft installation for these conditions so that the contractor can adjust construction methods to match field conditions.

- The contractor should be prepared to excavate the drilled shafts in a manner that prevents heave or boiling at the bottom of the drilled shaft excavation. It may be possible to over-drill the borehole and backfill the bottom of the borehole with structural concrete bearing on undisturbed soil.
- Drilling slurry may be used instead of casing only if reviewed and approved by the geotechnical and structural engineers.
- The contractor should tremie concrete to the bottom of the hole. Lean mix, concrete, and controlled density fill should not be end-dumped through water or slurry.
- Excavation of a shaft should not commence until at least 12 hours after the concrete for the adjacent shaft has been placed.
- The shaft toe must be cleaned out no more than 6 hours before placing concrete to limit the settling of suspended solids into the toe, which would reduce its geotechnical stiffness.
- A Hart Crowser field representative should be on site to observe the drilled shaft installations.

Backfill any excavation extending below the planned foundation elevation with lean or structural concrete, as noted above.

Temporary Open Cuts

Temporary soil cuts for site excavations more than 4 feet deep should be adequately sloped back to prevent sloughing and collapse in accordance with Washington State Department of Labor and Industries (L&I) Division of Occupational Safety and Health (DOSH) guidelines (WAC Chapter 296-155 Part N). The stability and safety of cut slopes depends on a number of factors, including:

- Type and density of the soil;
- Presence and amount of any seepage;
- Depth of cut;
- Proximity and magnitude of the cut to any surcharge loads, such as stockpiled material, traffic loads, or structures;
- Duration of the open excavation; and
- Care and methods used by the contractor.

Because of the variables involved, slope angles required for stability in temporary cut areas can be only estimated, not determined precisely, before construction. It is the contractor's responsibility to ensure



that the excavation is properly sloped or braced for worker protection in accordance with DOSH guidelines and other applicable local or federal safety requirements.

While soil conditions may vary along the wall alignment, the contractor should anticipate encountering Type C soil types primarily, as described in DOSH guidelines, which require temporary slope inclinations of 1.5H:1V or flatter, as appropriate.

- For planning purposes only, assume a temporary slope inclination of 1.5H:1V or flatter, until actual soil conditions can be verified in the field during construction. If groundwater seepage is encountered within the excavation slopes, the cut slope may need to be inclined flatter than 1.5H:1V.
- Protect the slope from erosion with plastic sheeting for the duration of the excavation to reduce the risk of surface erosion and raveling.
- Limit the open excavation to the shortest time possible.
- Place no surcharge loads (such as from equipment or materials) within 10 feet of the top of the slope, in general. However, more or less stringent requirements may apply, depending on field conditions and actual surcharge loads.
- If adequate sloping or slot cutting is not feasible because of site spatial constraints or other factors, temporary excavations should be supported by an appropriate shoring system.

References

ASCE 2010. Minimum Design Loads for Buildings and Other Structures, ASCE Standard ASCE/SEI 7-10.

R.W. Boulanger and Idriss, I.M. 2014. CPT and SPT Based Liquefaction Triggering Procedures. Report No. UCD/CGM-14/01, Center for Geotechnical Modelling, Department of Civil and Environmental Engineering, University of California, Davis, April 2014.

Hart Crowser 2016. Geotechnical Engineering Design Study – Port of Tacoma North Lead Rail Project 19151-00, March 2016.

IBC 2015. 2015 International Building Code. Published by International Code Council.

Idriss, I.M. and R.W. Boulanger 2008. Soil Liquefaction during Earthquakes. EERI Publication MNO-12.

WSDOT 2015. Geotechnical Design Manual, Publication M 46-03.11.



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WSDOT 2018. Standard Specifications for Road, Bridge, and Municipal Construction, Publication M 41-10.

Attachments:

Figure 1 – Vicinity Map Figure 2 – Site and Exploration Plan Attachment 1 – Historical E3RA Geotechnical Report Attachment 2 – STV Plan General Notes

Attachment 3 - Cone Penetration Test (CPT) Results (Completed by ConeTec)

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ATTACHMENT 1 Historical E3RA Geotechnical Report

GEOTECHNICAL REPORT PROPOSED TACOMA RAIL EQUIPMENT STORAGE BUILDING 2601 SR 509 NORTH FRONTAGE ROAD PORT OF TACOMA, WASHINGTON

Submitted to:

Mountain Construction 7457 South Madison Street Tacoma, Washington 98409

Submitted by: E3RA P.O. Box 44890 Tacoma, Washington 98444

February 28, 2000

February 28, 2000

Mountain Construction 7457 South Madison Street Tacoma, Washington 98409

Attention: Mr. Larry Fockler

Subject: Geotechnical Report Proposed Tacoma Rail Equipment Storage Building 2601 SR 509 North Frontage Road Port of Tacoma, Washington

Dear Larry:

E3RA is pleased to submit report describing our geotechnical engineering evaluation for the above-referenced project. The purpose of our evaluation was to derive conclusions and recommendations concerning the construction of a new equipment storage building in the existing Tacoma Rail storage yard.

As outlined in our proposal letter dated November 21, 2003, our scope of work comprised subsurface explorations, geotechnical research, geotechnical engineering analyses, and report preparation. This report has been prepared for the exclusive use of Mountain Construction and their consultants, for specific application to this project, in accordance with generally accepted geotechnical engineering practice.

1.0 SITE AND PROJECT DESCRIPTION

The project site is an existing rail yard located at 2601 SR509 North Frontage Road in the Port of Tacoma area, as shown on the enclosed *Location Map* (Figure 1). Currently, railroad equipment and supplies are stored in the open in the area proposed for the storage building, and two railroad sidings, trending east-west, cross the storage area and terminate near the east end of the storage yard.

Improvement plans call for the construction of a high metal building with two bays. Bay 1 will straddle the two siding tracks that currently occupy the site. A third siding track will be constructed south of the two existing sidings that currently occupy the south. Bay 2 will cover the proposed third siding track.

We understand that the structure will be about 27 feet high at the roof peak, will be 180 feet long, and will be a maximum of 56 feet wide.

2.0 EXPLORATORY METHODS

We explored surface and subsurface conditions at the project site on February 4, 2003. Our exploration and testing program comprised the following elements:

- A visual surface reconnaissance of the site;
- Three borings (designated B-1 through B-3), advanced at strategic locations across the site; and
- A review of published geologic and seismologic maps and literature.

Table 1 summarizes the approximate functional locations and termination depths of our subsurface explorations, and Figure 2 depicts their approximate relative locations. The following text section describes our procedures used for auger borings.

TABLE 1 APPROXIMATE LOCATIONS AND DEPTHS OF EXPLORATIONS					
Exploration Functional Location Termination Depth (feet)					
B-1	Center of proposed structure	69			
B-2	Southwest part of proposed structure	39			
B-3	East edge of proposed structure	39			
Elevation datum:	Elevation datum: Not available				

The specific number, locations, and depths of our explorations were selected in relation to the existing and proposed site features, under the constraints of surface access, underground utility conflicts, and budget considerations. We estimated the relative location of each exploration by measuring from existing features and scaling these measurements onto a layout plan supplied to us. No topographic information was available at the time of our study. Consequently, the data listed in Table 1 and the locations depicted on Figure 2 should be considered accurate only to the degree permitted by our data sources and implied by our measuring methods.

It should be realized that the explorations performed for this evaluation reveal subsurface conditions only at discrete locations across the project site and that actual conditions in other areas could vary. Furthermore, the nature and extent of any such variations would not become evident until additional explorations are performed or until construction activities have begun. If significant variations are observed at that time, we may need to modify our conclusions and recommendations contained in this report to reflect the actual site conditions.

2.1 Auger Boring Procedures

Our exploratory borings were advanced through the soil with a hollow-stem auger, using a truck-mounted drill rig operated by an independent drilling firm working under subcontract to E3RA. A geologist from our firm continuously observed the borings, logged the subsurface conditions, and collected representative soil samples. All samples were stored in watertight containers and later transported to a laboratory for further visual examination and testing. After each boring was completed, the borehole was backfilled with a mixture of bentonite chips and soil cuttings.

Throughout the drilling operation, soil samples were obtained at 5-foot depth intervals by means of the Standard Penetration Test (SPT) per ASTM:D-1586. This testing and sampling procedure consists of driving a standard 2-inch-diameter steel split-spoon sampler 18 inches into the soil with a 140-pound hammer free-falling 30 inches. The number of blows required to drive the sampler through each 6-inch interval is counted, and the total number of blows struck during the final 12 inches is recorded as the Standard Penetration Resistance, or "SPT blow count." If a total of 50 blows are struck within any 6-inch interval, the driving is stopped and the blow count is recorded as 50 blows for the actual penetration distance. The resulting Standard Penetration Resistance values indicate the relative density of granular soils and the relative consistency of cohesive soils.

The enclosed *Boring Logs* describe the vertical sequence of soils and materials encountered in each boring, based primarily on our field classifications and supported by our subsequent laboratory examination and testing. Where a soil contact was observed to be gradational, our logs indicate the average contact depth. Where a soil type changed between sample intervals, we inferred the contact depth. Our logs also graphically indicate the blow count, sample type, sample number, and approximate depth of each soil sample obtained from the borings, as well as any laboratory tests performed on these soil samples. If any groundwater was encountered in a borehole, the approximate groundwater depth is depicted on the boring log. Groundwater depth estimates are typically based on the moisture content of soil samples, the wetted height on the drilling rods, and the water level measured in the borehole after the auger has been extracted.

3.0 SITE CONDITIONS

The following sections of text present our observations, measurements, findings, and interpretations regarding surface, soil, groundwater, and seismic conditions at the project site.

3.1 Surface Conditions

The site is relatively level and not vegetated. A one-lane service road crosses the south side of the site, paralleling the siding tracks which traverse the length of the proposed building footprint. The remainder of the surface of the site is graveled. On the day of our field investigations, wheeled rail maintenance equipment and a caboose occupied the siding tracks. Other maintenance equipment and supplies are stored onsite.

3.2 Soil Conditions

According to published geologic maps, soil conditions in the site vicinity are characterized by alluvium deposited by the Puyallup River. Our on-site explorations indicated somewhat variable

near-surface soil conditions and confirmed the mapped stratigraphy. In general, we observed 4 to 5 feet of medium dense to dense fill consisting of gravelly sand and sandy gravel overlying very loose or very soft, wet to saturated, native alluvial sands and silts to a depth of about 23 feet. Some chunks of wood were noted in fill soils at depths of 2 to 4 feet. A somewhat denser layer of alluvium consisting of sand and silty sand was encountered from depths of 23 to about 37 feet, but its consistency varied somewhat over the site. Softer, silty soils were then encountered at a depth of about 37 feet in all of our borings. Only boring B-1, located in the center of the proposed building, continued below 40 feet. Soils there were comprised of silts and peaty silts from 37 to 57 feet. At a depth of 57 feet, we encountered stiff silt underlain by very dense, gravelly sand. This boring was terminated at a depth of 69 feet.

The enclosed exploration logs provide a detailed description of the soil strata encountered in our subsurface explorations.

We interpret these soils to be currently above their optimum moisture contents. The upper fill soils and the clean sand found underlying the upper fill soils in borings B-1 and B-3 are relatively insensitive to moisture content variations, and the silty soils found underlying the upper, granular fill material observed in boring B-2, and underlying the entire site at depths greater that 15 feet, are highly moisture sensitive.

3.3 Groundwater Conditions

At the time of drilling (February 4, 2003), we observed groundwater at a depth of 4½ feet in boring B-1, located in the center of the proposed structure, and at a depth of 5 feet in boring B-3, located on the east edge of the proposed structure. Groundwater was not observed in boring B-2, located in the southwest part of the proposed structure, probably due to siltier subsurface conditions there.

Because our explorations were performed during an extended period of generally wet weather, these observed groundwater conditions may closely represent the yearly high levels; somewhat lower levels probably occur during the summer and fall months. At all times of the year, groundwater levels would likely fluctuate in response to precipitation patterns, off-site construction activities, and site utilization.

3.4 Seismic Conditions

Based on our analysis of subsurface explorations and our review of published geologic maps, we interpret the on-site soil conditions to correspond to a seismic soil profile type S-E, as defined by Table 16-J of the *1997 Uniform Building Code*. Current (1996) *National Seismic Hazard Maps* prepared by the U.S. Geological Survey indicate that a bedrock site acceleration coefficient of about 0.30 is appropriate for an earthquake having a 10-percent probability of exceedance in 50 years (corresponding to a return interval of 475 years). According to Figure 16-2 of the *1997 Uniform Building Code*, the site lies within seismic risk zone 3.

3.5 Liquifaction Potential

Liquefaction is a sudden increase in pore water pressure and a sudden loss of soil shear strength caused by shear strains, as could result from an earthquake. Research has shown that saturated, loose sands with a fines silt and clay content less than about 25 percent are

most susceptible to liquefaction. Although other soil types are generally considered to have a low susceptibility, liquefaction may still occur during a strong earthquake. Our on-site subsurface explorations found saturated, loose, sand layers or lenses underlying the site at depths of about 5 to 15 feet in borings B-1 and B-3. These soils may be sensitive to liquefaction.

4.0 CONCLUSIONS AND RECOMMENDATIONS

Improvement plans call for the construction of an equipment storage building on the east part of the equipment storage yard. We offer the following general geotechnical conclusions and recommendations concerning this project.

- <u>Feasibility</u>: Based on our field explorations, research, and analyses, the proposed structure appears feasible from a geotechnical standpoint, contingent on proper subgrade preparation.
- <u>Foundation Options</u>: We recommend that the structure be founded on conventional spread footings based on properly prepared subgrades. Footing subgrades should be about 2 feet below existing elevations. Because some wood was observed at proposed subgrade elevations, over-excavation of footing subgrades may be necessary. Details of footing subgrade preparation are presented in Section 5.
- <u>Seismic Considerations</u>: Based on our literature review and subsurface interpretations, we recommend that the project structural engineer use the following seismic parameters for design of buildings, retaining walls, and other site structures:

Design Parameter	Value
Acceleration Coefficient (USGS)	0.30
Risk Zone (UBC)	3
Soil Profile Type (UBC)	S-E

• <u>On-Site Soil Reuse</u>: Our visual soil classifications and laboratory testing indicate that the upper fill soils are reusable under most moisture conditions but that most of the native alluvium below 4 feet is not adequate for use as structural fill.

The following text sections of this report present our specific geotechnical conclusions and recommendations concerning site preparation, footing subgrades, drainage, and structural fill. WSDOT Standard Specifications and Standard Plans cited herein refer to WSDOT publications M41-10, *1996 Standard Specifications for Road, Bridge, and Municipal Construction*, and M21-01, *Standard Plans for Road, Bridge, and Municipal Construction*, respectively.

4.1 Site Preparation

Preparation of the project site should involve temporary drainage, cutting, filling, excavations, and subgrade compaction.

<u>Temporary Drainage</u>: We recommend intercepting and diverting any potential sources of surface or near-surface water within the construction zones before stripping begins. Because the selection of an appropriate drainage system will depend on the water quantity, season, weather conditions, construction sequence, and contractor's methods, final decisions regarding drainage systems are best made in the field at the time of construction. Nonetheless, we anticipate that curbs, berms, or ditches placed around the work areas will adequately intercept surface water runoff.

<u>Clearing and Stripping</u>: After surface and near-surface water sources have been controlled, the construction areas should be cleared and stripped of all debris, asphalt, and concrete. Our explorations indicate that little or no sod or topsoil will be encountered across the site, but significant variations appear to exist. Furthermore, it should be realized that if the stripping operation proceeds during wet weather, a generally greater stripping depth might be necessary to remove disturbed moisture-sensitive soils; therefore, stripping is best performed during a period of dry weather.

<u>Site Excavations</u>: We anticipate that excavations ranging up to about 4 feet deep will be required to accommodate the proposed foundation, as well as other underground utilities. Based on our explorations, we expect that these excavations will encounter dense, granular fill soils. The upper soils can be excavated with conventional earthworking equipment, in our estimation. Although our explorations did not reveal rubble within the fill soils, such obstacles could be present at random locations within these deposits.

<u>Dewatering</u>: Our explorations did not encounter groundwater at the proposed footing subgrade elevation of 2 feet below existing grades, but groundwater was observed at depths of 4½ to 5 feet. However, if groundwater is encountered, we anticipate that an internal system of ditches, sumpholes, and pumps will be adequate to temporarily dewater the excavation.

<u>Temporary Cut Slopes</u>: All temporary soil slopes associated with site cutting or excavations should be adequately inclined to prevent sloughing and collapse. For the various soil layers that will likely be exposed in on-site cuts and excavations, we tentatively recommend a maximum inclination of $1\frac{1}{2}$ H:1V.

<u>Subgrade Compaction</u>: Exposed subgrades for footings, floors, pavements, and other structures should be compacted to a firm, unyielding state before new concrete or fill soils are placed. Any localized zones of loose granular soils observed within a subgrade should be compacted to a density commensurate with the surrounding soils. Because chunks of wood may be scattered across the site at footing subgrade elevation, some over-excavation may be necessary. Always, any organic, soft, or pumping soils observed within a subgrade should be overexcavated and replaced with a suitable structural fill material.

<u>Site Filling</u>: We anticipate that grading plans will call for minor filling across the site. Backfilling of several feet will be necessary behind foundation stemwalls. Our conclusions regarding the reuse of on-site soils and our comments regarding wet-weather filling are presented subsequently. Regardless of soil type, all fill should be placed and compacted according to our recommendations presented in the *Structural Fill* section of this report.

<u>On-Site Soils</u>: Because only minor cuts are planned for the project, we expect that only small quantities of on-site soils will be generated during earthwork activities. Nonetheless, we offer the following evaluation of these on-site soils in relation to potential use as structural fill.

- <u>Surficial Fill Soils</u>: The crushed rock, gravelly sand, ad sandy gravel observed mantling the site will provide a favorable source of fill soils that can be used in a broad range of weather conditions, although aeration or sprinkling might be needed to achieve an optimum moisture content during especially wet or dry conditions, respectively. Some chunks of wood were observed in these soils. Wood and other organic debris must be removed before these soils can be reused.
- <u>Upper Alluvium</u>: The upper alluvial sands underlying the surficial fill soils to depths of 9 feet do not appear suitable for reuse due to their high moisture contents. However, these soils may be reusable after they are drained and aerated and organic debris is removed. The upper alluvial silts do not appear reusable as structural fill at their present moisture content and will not provide a good source of structural fill.

<u>Permanent Slopes:</u> All permanent cut slopes and fill slopes should be adequately inclined to minimize long-term raveling, sloughing, and erosion. We generally recommend that no permanent slopes be steeper than 2H:1V.

4.2 Spread Footings

In our opinion, conventional spread footings will provide adequate support for the proposed storage facility if the subgrades are properly prepared. We offer the following comments and recommendations for purposes of footing design and construction.

<u>Footing Depths and Widths</u>: We recommend that the bases of all exterior footings should be founded 2 feet below existing grades, where they will bear on at least two feet of granular fill and will be sufficiently deep for frost protection.

<u>Footing Overexcavations</u>: Overexcavations may be necessary within footing subgrade soils due to the presence of woody debris. Because foundation stresses are transferred outward as well as downward into the bearing soils, all footing overexcavations composed of structural fill also should extend horizontally outward from the edge of each footing a distance equal to the

overexcavation depth. Therefore, an overexcavation that extends 2 feet below the footing base should extend 2 feet outward from the footing edges. For overexcavations composed of CDF or concrete, this horizontal distance should be at least half of the overexcavation depth.

<u>Overexcavation Backfill</u>: We recommend that all footing overexcavation backfill be composed of well-graded sands and gravels, such as "Ballast" per WSDOT Standard Specification 9-03.9(1), or uniformly graded crushed rock, such as "Crushed Surfacing Base Course" per WSDOT standard Specification 9-03.9(3). Non-organic granular on-site soils could be used as overexcavation backfill if they are placed at a moisture content near optimum, and they contain no organic debris. Higher-strength materials, such as controlled-density fill (CDF) or lean-mix concrete (LMC), could also be used if desired for their ease of placement. Overexcavation backfill soil should be compacted to at least 95 percent of the Modified Proctor maximum dry density (based on ASTM:D-1557).

<u>Subgrade Observation</u>: All footing subgrades should consist of firm, unyielding, native soils or structural fill materials. Footings should never be cast atop loose, soft, or frozen soil, slough, debris, or surfaces covered by standing water. We recommend that an E3RA representative observe the condition of all subgrades before any concrete is placed.

<u>Bearing Pressures</u>: In our opinion, for static loading, footings that bear on properly prepared subgrades can be designed for a maximum allowable soil bearing pressure of 2.000 pounds per square foot (psf). A one-third increase in allowable soil bearing capacity may be used for short-term loads created by seismic or wind related activities.

<u>Footing Settlements</u>: Our analysis of the soils encountered in our three borings indicates that total footing settlements should be less than one inch. Differential settlements are not expected to exceed one half of this value. However, our experience in the Commencement Bayare has revealed that pockets of native, compressible soils and debris can exist near the surface. For that reason, as a safeguard, we recommend that the building should be constructed so that it can be re-leveled at a later date if needed.

<u>Footing Backfill</u>: To provide erosion protection and lateral load resistance, we recommend that all footing excavations be backfilled on both sides of the footings and stemwalls after the concrete has cured. Either imported structural fill or granular non-organic on-site soils can be used for this purpose, contingent on suitable moisture contents at the time of placement. Regardless of soil type, all footing backfill soil should be compacted to a density of at least 90 percent (based on ASTM:D-1557).

<u>Lateral Resistance:</u> Footings that have been properly backfilled as recommended above will resist lateral movements by means of passive earth pressure and base friction. For the fill soils that we expect will be encountered at subgrade elevations, we recommend using an allowable passive earth pressure of 200 pcf (equivalent fluid weight) and an allowable base friction coefficient of 0.35

4.3 Structural Fill

The term "structural fill" refers to any materials placed under foundations, retaining walls, slabon-grade floors, sidewalks, pavements, and other structures. Our comments, conclusions, and recommendations concerning structural fill are presented in the following paragraphs.

<u>Materials</u>: Typical structural fill materials include clean sand, granulithic gravel, pea gravel, washed rock, crushed rock, quarry spalls, controlled-density fill (CDF), lean-mix concrete (LMC), well-graded mixtures of sand and gravel (commonly called "gravel borrow" or "pit-run"), and miscellaneous mixtures of silt, sand, and gravel. Recycled asphalt, concrete, and glass, which are derived from pulverizing the parent materials, are also potentially useful as structural fill in certain applications. Soils used for structural fill should not contain any organic matter or debris, nor any individual particles greater than about 6 inches in diameter.

<u>Fill Placement</u>: Generally, pea gravel, washed rock, quarry spalls, CDF, and LMC do not require special placement and compaction procedures. In contrast, clean sand, granulithic gravel, crushed rock, soil mixtures, and recycled materials should be placed in horizontal lifts not exceeding 8 inches in loose thickness, and each lift should be thoroughly compacted with a mechanical compactor.

<u>Compaction Criteria</u>: Using the Modified Proctor test (ASTM:D-1557) as a standard, we recommend that structural fill used for various on-site applications be compacted to the following minimum densities:

Fill Application	Minimum
	Compaction
Footing subgrade and bearing pad	95 percent
Foundation backfill	95 percent

<u>Subgrade Observation and Compaction Testing</u>: Regardless of material or location, all structural fill should be placed over firm, unyielding subgrades prepared in accordance with the *Site Preparation* section of this report. The condition of all subgrades should be observed by E3RA before filling or construction begins. Also, fill soil compaction should be tested by means of in-place density tests performed during fill placement so that adequacy of soil compaction efforts may be evaluated as earthwork progresses.

<u>Soil Moisture Considerations</u>: The suitability of soils used for structural fill depends primarily on their grain-size distribution and moisture content when they are placed. As the "fines" content (that soil fraction passing the U.S. No. 200 Sieve) increases, soils become more sensitive to small changes in moisture content. Soils containing more than about 5 percent fines (by weight) cannot be consistently compacted to a firm, unyielding condition when the moisture content is more than 2 percentage points above or below optimum. For fill placement during wet-weather site work, we recommend using "clean" fill, which refers to soils that have a fines content of 5 percent or less (by weight) based on the soil fraction passing the U.S. No. 4 Sieve.

<u>CDF Strength Considerations</u>: CDF is normally specified in terms of its compressive strength, which typically ranges from 50 to 200 psi. CDF having a strength of 50 psi (7,200 psf) provides adequate support for most structural applications and can be readily excavated with hand shovels. A strength of 100 psi (14,400 psf) provides additional support for special applications but greatly increases the difficulty of hand-excavation. CDF having a strength greater than about 100 psi requires power equipment to excavate and, as such, should not be used where future hand-excavation might be needed.

5.0 RECOMMENDED ADDITIONAL SERVICES

Because the future performance and integrity of the structural elements will depend largely on proper site preparation, drainage, fill placement, and construction procedures, monitoring and testing by experienced geotechnical personnel should be considered an integral part of the construction process. Consequently, we recommend that E3RA be retained to provide the following post-report services:

- Review all construction plans and specifications to verify that our design criteria presented in this report have been properly integrated into the design;
- Prepare a letter summarizing all review comments (if required by the City of Tacoma);
- Attend a pre-construction conference with the design team and contractor to discuss important geotechnically related construction issues;
- Observe all exposed subgrades after completion of stripping and overexcavation to confirm that suitable soil conditions have been reached and to determine appropriate subgrade compaction methods;
- Monitor the placement of all structural fill and test the compaction of structural fill soils to verify their conformance with the construction specifications;
- Probe all completed subgrades for footings and slab-on-grade floors before concrete is poured, in order to verify their bearing capacity;
- Prepare a post-construction letter summarizing all field observations, inspections, and test results (if required by the City of Tacoma).

6.0 CLOSURE

The conclusions and recommendations presented in this report are based, in part, on the explorations that we performed for this study; therefore, if variations in the subgrade conditions are observed at a later time, we may need to modify this report to reflect those changes. Also, because the future performance and integrity of the project elements depend largely on proper initial site preparation, drainage, and construction procedures, monitoring and testing by

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experienced geotechnical personnel should be considered an integral part of the construction process. E3RA is available to provide geotechnical observation and soils testing throughout construction.

We appreciate the opportunity to be of service on this project. If you have any questions regarding this report or any aspects of the project, please feel free to contact our office.

Sincerely,

Fred Rennebaum, P.E.G. Senior Geologist

James E. Brigham, P.E. Principal

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Enclosures: Figure 1 — Location Map Figure 2 — Site & Exploration Plan Boring Logs B-1 through B-3

ATTACHMENT 2 STV Plan General Notes

REINFORCING STEEL

- ALL REINFORCING STEEL SHALL BE DETAILED AND PLACED IN CONFORMANCE WITH T "BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE" (ACI-318), AND THE "MANUAL OF STANDARD PRACTICE FOR REINFORCED CONCRETE" X-RAY BY THE C.R. OR AS MODIFIED BY THE CONSTRUCTION DOCUMENTS REINFORCING BARS-A-615 GRADE 60 OR A-706 GRADE 60 UNLESS NOTED OTHERWISE.
- 2. PROVIDE SMOOTH WELDED WIRE FABRIC COMPLYING WITH ASTM A185. LAP FABRIC T SPACES (12" MINIMUM). PROVIDE DEFORMED WIRE STIRRUPS, SIZE D4 AND LARGER ONLY, COMPLYING WITH ASTM A497.
- 3. BARS SHALL BE CLEAN OF RUST, GREASE, OR OTHER MATERIALS LIKELY TO IMPAIR BOND. ALL REINFORCING BAR BENDS SHALL BE MADE COLD.
- 4. THE CLEAR DISTANCE BETWEEN PARALLEL BARS SHALL NOT BE LESS THAN 1 1/2" UNLESS NOTED OTHERWISE.
- 5. REINFORCING BAR SPLICES SHALL BE MADE AS INDICATED ON THE DRAWINGS. MINIMI LENGTH FOR REINFORCING STEEL BARS IN MASONRY SHALL BE 48 BAR DIAMETERS, 24" MINIMUM. MINIMUM SPLICE LENGTH FOR REINFORCING STEEL BARS IN CONCRET SHALL BE AS PER THE CODE. LAP ALL HORIZONTAL BARS AT CORNERS AND INTERSECTIONS. STAGGER ALL SPLICES UNLESS NOTED OTHERWISE ON PLANS.
- 6. ALL BARS SHALL BE MARKED SO THEIR IDENTIFICATION CAN BE MADE WHEN THE FINAL IN-PLACE INSPECTION IS MADE.
- 7. WHERE WELDING OF REINFORCING IS APPROVED BY THE STRUCTURAL ENGINEER, IT SHALL BE DONE BY AWS CERTIFIED WELDERS USING E90XX OR APPROVED ELECTRODES. WELDING PROCEDURES SHALL CONFORM TO THE REQUIREMENTS OF STRUCTURAL WELDING CODE- REINFORCING STEEL", AWS-D1.4, LATEST REVISION. REINFORCING BARS TO BE WELDED SHALL CONFORM TO THE REQUIREMENTS OF A-706.
- 8. BARS IN SLABS SHALL BE SECURELY SUPPORTED ON WELL-CURED CONCRETE BLOC OR APPROVED METAL CHAIRS, PRIOR TO PLACING CONCRETE.
- 9. REINFORCING STEEL SHALL BE DETAILED IN ACCORDANCE WITH THE "A.C.I. DETAILING MANUAL, LATEST EDITION.
- 10. COMPLETE AND DETAILED REINFORCING PLACEMENT DRAWINGS SHALL BE PREPARED AND SUBMITTED TO THE ARCHITECT FOR APPROVAL BY THE STRUCTURAL ENGINEER PRIOR TO FABRICATION IN ACCORDANCE WITH THE SPECIFICATIONS AND APPLICABLE CODES. THESE DRAWINGS SHALL BE AVAILABLE ON THE JOB SITE PRIOR TO PLACING OF CONCRETE.
- 11. MILL TEST REPORTS FOR GRADE 60 BARS SHALL BE SUBMITTED PRIOR TO PLACEME OF CONCRETE.
- 12. CONTINUOUS INSPECTION OF CONCRETE SHALL INCLUDE INSPECTION DURING INSTALLATION OF REINFORCING STEEL. INSPECTION SHALL BE SCHEDULED SO THAT PLACEMENT OF REINFORCING STEEL, CONDUIT, SLEEVES, AND EMBEDDED ITEMS MAY BE CORRECTED PRIOR TO PLACEMENT OF OVERLYING GRIDS OR REINFORCING STEEL
- 13. ALL GRADE 60 REINFORCING STEEL SHALL BE CLEARLY MARKED TO DIFFERENTIATE THEM FROM GRADE 40 REINFORCING STEEL IF CONCURRENTLY ON SITE.
- 14. BEND REINFORCING STEEL COLD UNLESS OTHERWISE ACCEPTED BY ARCHITECT OR STRUCTURAL ENGINEER. PROVIDE SPECIAL INSPECTION OF ALL COLD BENT REINFORCING.
- 15. UNLESS DETAILED OTHERWISE, REINFORCING STEEL IN CONTINUOUS BEAMS AND SPANDRELS SHALL HAVE THE TOP STEEL SPLICED @ MID-SPAN & THE BOTTOM STE SPLICED OVER SUPPORTS (30 DIA. MIN.) AT DISCONTINUOUS ENDS THE TOP STEEL SHALL BE BENT DOWN 12 DIA. OR 12" MIN. WHICHEVER IS GREATER.
- 16. THE FOLLOWING MINIMUM CONCRETE COVER SHALL BE PROVIDED FOR REINFORCEMEN UNLESS NOTED OTHERWISE ON THE DRAWINGS:

		MINIMUM	COVE
A	. CONCRETE CAST AGAINST AND PERMANENTLY		z
	EXPUSED IN EARTH		3
E	B. CONCRETE EXPOSED TO EARTH OR WEATHER:		
	NO. 6 THROUGH NO. 18 BAR		2
	NO 5 BAR, W31 OR D31 WIRE & SMALLER	1.	-1/2
С	CONCRETE NOT EXPOSED TO WEATHER OR IN CONTACT WITH GROUND:		
	SLABS, WALLS, JOISTS:		
	NO. 11 BAR & SMALLER		1
	BEAMS, COLUMNS: PRIMARY REINFORCEMENT TIES, STIRRUPS,		

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INFORMATION CONFIDENTIAL: DESIGNED BY All plans, drawings, specifi- cations, and or information DRAWN BY	

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Facoma Rail/ Tacoma

Public Utilities.

SPIRALS

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ALL CONCRETE CONSTRUCTION SHALL CONFORM WITH CHAPTER 19 OF THE CODE AND WITH THE PROVISIONS OF ACI 318, LATEST EDITION. REINFORCED CONCRETE IS DESIGNED BY THE "ULTIMATE STRENGTH DESIGN METHOD". CONCRETE MIXES SHALL BE DESIGNED BY THE APPROVED TESTING LABORATORY AND APPROVED BY THE STRUCTURAL ENGINEER. THE COMPRESSIVE STRENGTH OF THE CONCRETE SHALL BE PROPORTIONED BASED ON SECTION 1905 OF THE CODE. PROVIDE NORMAL WEIGHT CONCRETE (145 pcf), WITH PROVEN SHRINKAGE CHARACTERISTICS OF LESS THAN 0.05%, ATTAINING MINIMUM COMPRESSIVE STRENGTHS AT 28 DAYS (f'c) AS FOLLOWS, UNLESS NOTED OTHERWISE: CONTINUOUS FOOTINGS 4000 psi SPREAD FOOTINGS 4000 psi RETAINING WALLS 4000 psi PORTLAND CEMENT SHALL CONFORM TO ASTM C–150, TYPE II. AGGREGATE FOR HARDROCK CONCRETE SHALL CONFORM TO ALL REQUIREMENTS AND TESTS OF ASTM C–33 AND PROJECT SPECIFICATIONS. EXCEPTIONS MAY BE USED ONLY WITH PERMISSION OF THE STRUCTURAL ENGINEER
REINFORCED CONCRETE IS DESIGNED BY THE "ULTIMATE STRENGTH DESIGN METHOD". CONCRETE MIXES SHALL BE DESIGNED BY THE APPROVED TESTING LABORATORY AND APPROVED BY THE STRUCTURAL ENGINEER. THE COMPRESSIVE STRENGTH OF THE CONCRETE SHALL BE PROPORTIONED BASED ON SECTION 1905 OF THE CODE. PROVIDE NORMAL WEIGHT CONCRETE (145 pcf), WITH PROVEN SHRINKAGE CHARACTERISTICS OF LESS THAN 0.05%, ATTAINING MINIMUM COMPRESSIVE STRENGTHS AT 28 DAYS (f'c) AS FOLLOWS, UNLESS NOTED OTHERWISE: CONTINUOUS FOOTINGS 4000 psi SPREAD FOOTINGS 4000 psi RETAINING WALLS 4000 psi MATTION DEMENT SHALL CONFORM TO ASTM C-150, TYPE II. AGGREGATE FOR HARDROCK CONCRETE SHALL CONFORM TO ALL REQUIREMENTS AND TESTS OF ASTM C-33 AND PROJECT SPECIFICATIONS. EXCEPTIONS MAY BE USED ONLY WITH PERMISSION OF THE STRUCTURAL ENGINFER
CONCRETE MIXES SHALL BE DESIGNED BY THE APPROVED TESTING LABORATORY AND APPROVED BY THE STRUCTURAL ENGINEER. THE COMPRESSIVE STRENGTH OF THE CONCRETE SHALL BE PROPORTIONED BASED ON SECTION 1905 OF THE CODE. PROVIDE NORMAL WEIGHT CONCRETE (145 pcf), WITH PROVEN SHRINKAGE CHARACTERISTICS OF LESS THAN 0.05%, ATTAINING MINIMUM COMPRESSIVE STRENGTHS AT 28 DAYS (f'c) AS FOLLOWS, UNLESS NOTED OTHERWISE: CONTINUOUS FOOTINGS 4000 psi SPREAD FOOTINGS 4000 psi RETAINING WALLS 4000 psi PORTLAND CEMENT SHALL CONFORM TO ASTM C-150, TYPE II. AGGREGATE FOR HARDROCK CONCRETE SHALL CONFORM TO ALL REQUIREMENTS AND TESTS OF ASTM C-33 AND PROJECT SPECIFICATIONS. EXCEPTIONS MAY BE USED ONLY WITH PERMISSION OF THE STRUCTURAL ENGINFER
PROVIDE NORMAL WEIGHT CONCRETE (145 pcf), WITH PROVEN SHRINKAGE CHARACTERISTICS OF LESS THAN 0.05%, ATTAINING MINIMUM COMPRESSIVE STRENGTHS AT 28 DAYS (f'c) AS FOLLOWS, UNLESS NOTED OTHERWISE: CONTINUOUS FOOTINGS 4000 psi SPREAD FOOTINGS 4000 psi RETAINING WALLS 4000 psi PORTLAND CEMENT SHALL CONFORM TO ASTM C-150, TYPE II. AGGREGATE FOR HARDROCK CONCRETE SHALL CONFORM TO ALL REQUIREMENTS AND TESTS OF ASTM C-33 AND PROJECT SPECIFICATIONS. EXCEPTIONS MAY BE USED ONLY WITH PERMISSION OF THE STRUCTURAL ENGINFER
CONTINUOUS FOOTINGS 4000 psi SPREAD FOOTINGS 4000 psi SLABS ON GRADE 3000 psi RETAINING WALLS 4000 psi PORTLAND CEMENT SHALL CONFORM TO ASTM C-150, TYPE II. AGGREGATE FOR HARDROCK CONCRETE SHALL CONFORM TO ALL REQUIREMENTS AND TESTS OF ASTM C-33 AND PROJECT SPECIFICATIONS. EXCEPTIONS MAY BE USED ONLY WITH PERMISSION OF THE STRUCTURAL ENGINEER
PORTLAND CEMENT SHALL CONFORM TO ASTM C-150, TYPE II. AGGREGATE FOR HARDROCK CONCRETE SHALL CONFORM TO ALL REQUIREMENTS AND TESTS OF ASTM C-33 AND PROJECT SPECIFICATIONS. EXCEPTIONS MAY BE USED ONLY WITH PERMISSION OF THE STRUCTURAL ENGINEER
AGGREGATE FOR HARDROCK CONCRETE SHALL CONFORM TO ALL REQUIREMENTS AND TESTS OF ASTM C-33 AND PROJECT SPECIFICATIONS. EXCEPTIONS MAY BE USED ONLY WITH PERMISSION OF THE STRUCTURAL ENGINEER
CONCRETE MIXING OPERATION, ETC. SHALL CONFORM TO ASTM C-94.
PLACEMENT OF CONCRETE SHALL CONFORM TO CODE SECTION 1905 AND PROJECT SPECIFICATIONS. CLEAN AND ROUGHEN TO 1/4" AMPLITUDE ALL CONCRETE SURFACES AGAINST WHICH NEW CONCRETE IS TO BE PLACED.
ALL REINFORCING BARS, ANCHOR BOLTS AND OTHER CONCRETE INSERTS SHALL BE WELL SECURED IN POSITION PRIOR TO PLACING CONCRETE.
SUBMIT CONCRETE DESIGN MIX DATA FOR EACH TYPE AND COMPRESSIVE STRENGTH OF CONCRETE REQUIRED SIGNED BY AND BEARING THE SEAL OF A REGISTERED CIVIL ENGINEER TO THE ARCHITECT OR STRUCTURAL ENGINEER. BASE DESIGN MIX ON FIELD EXPERIENCE OR TRIAL MIXTURES AS STIPULATED IN IBC SECTION 1905.3.
SUBMIT SHOP DRAWINGS TO ARCHITECT OR STRUCTURAL ENGINEER INDICATING LOCATIONS OF CONCRETE CONSTRUCTION JOINTS FOR REVIEW PRIOR TO PLACING CONCRETE. LOCATE JOINTS AT LOCATIONS TO MINIMIZE EFFECTS OF SHRINKAGE AS WELL AS BEING PLACED AT POINTS OF LOW STRESS.
SLUMP SHALL NOT EXCEED 4 INCHES.
DO NOT USE CONCRETE OR GROUT CONTAINING CHLORIDES.
PROVIDE SLEEVES FOR PLUMBING AND ELECTRICAL OPENINGS IN NEW CONCRETE BEFORE PLACING. LOCATE EXISTING REINFORCING USING NON-DESTRUCTIVE METHODS PRIOR TO CORING NEW HOLES IN EXISTING CONCRETE. DO NOT CUT ANY EXISTING REINFORCING WHICH MAY CONFLICT WITH NEW HOLES UNLESS SPECIFICALLY APPROVED THE ENGINEER. SLEEVES SHALL NOT DISPLACE OR INTERRUPT REINFORCING BARS NOT BE SPACED CLOSER THAN A MINIMUM OF 6 X SLEEVE DIAMETER.
CONDUITS LARGER THAN $1-1/2$ " DIAMETER SHALL NOT BE EMBEDDED IN STRUCTURAL CONCRETE EXCEPT WHERE SPECIFICALLY APPROVED BY THE STRUCTURAL ENGINEER. CONDUITS SHALL NOT DISPLACE OR INTERRUPT REINFORCING BARS AND SHALL NOT BE SPACED CLOSER THAN A MINIMUM OF 6 X CONDUIT DIAMETER. NO PIPES OF ANY SIZE SHALL BE EMBEDDED IN CONCRETE, UNLESS SPECIFICALLY APPROVED BY THE STRUCTURAL ENGINEER.
PROVIDE KEYS IN CONSTRUCTION JOINTS UNLESS DETAILED OTHERWISE. THOROUGHLY CLEAN, REMOVE LAITANCE AND THOROUGHLY WET AND REMOVE STANDING WATER IN CONSTRUCTION JOINTS BEFORE PLACING NEW CONCRETE. AT VERTICAL JOINTS, SLUSH WITH A COAT OF NEAT CEMENT BEFORE PLACING NEW CONCRETE.
PERFORM CONCRETE WORK IN COMPLIANCE WITH ACI 301.
MAINTAIN CONCRETE ABOVE 50 DEGREES FAHRENHEIT AND IN A MOIST CONDITION FOR A MINIMUM OF 7 DAYS AFTER PLACEMENT UNLESS OTHERWISE ACCEPTED BY ARCHITECT (STRUCTURAL ENGINEER).
CONSOLIDATE CONCRETE IN PLACE USING A MECHANICAL VIBRATOR.
BEFORE PLACING CONCRETE SECURE REINFORCING STEEL, ANCHOR BOLTS, DOWELS, AND OTHER INSERTS IN POSITION TO PREVENT MOVEMENT.
ALL SLABS ON EARTH SHALL HAVE "QUICK—JOINT" INSTALLED TO PROVIDE APPROXIMATELY 20 FOOT SQUARES UNLESS DETAILED OTHERWISE ON THE PLANS.
WHERE CONCRETE POURS ARE STOPPED, THE JOINT SHALL BE FORMED PER TYPICAL CONSTRUCTION JOINT DETAIL.

GENERAL NOTES (CONT.)

14. SEE MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS FOR THE FOLLOWING:

NEW PIPE RUNS, SLEEVES, HANGERS, TRENCHES, WALL AND SLAB O ETC., EXCEPT AS SHOWN OR NOTED.

NEW ELECTRICAL CONDUIT RUNS, BOXES, OUTLETS IN WALLS AND SL NEW CONCRETE INSERTS FOR ELECTRICAL, MECHANICAL OR PLUMBING SIZE AND LOCATION OF NEW MACHINE OR NEW EQUIPMENT BASES, A BOLTS FOR MOTOR MOUNTS.

15. DESIGN LOADS:

A. INDUSTRIAL LOADS:

TRAIN DESIGN LOADS - COOPER E80 LOADING

Y 16. SEISMIC ANALYSIS PER CHAPTER 16, DIVISION IV OF THE 2006 INTER BUILDING CODE – VOLUME 2, UTILIZING THE STATIC LATERAL FORCE DESIGN PARAMETERS:

-				
⊥ =	1.0	S1	=	
Rp =	2.5	Fa	=	
ap =	1.0 (SPECIAL ACCESS FLR.)	Fv	=	
SITE CLASS =	D	Sms	=	1
Ss =	1.214 g	Sm1	=	(
	·	Sds	=	0

17. WIND LOADS:

- A. BASIC WIND SPEED = 85 mphB. EXPOSURE C - PROJECTED AREA METHOD.
- C. BASED ON STRUCTURES LESS THAN 60 FEET IN HEIGHT.
- D. MULTIPLY BY APPROPRIATE COEFFICIENTS BEFORE USING FOR DESIGN SITUATIONS (SEE IBC SECTION 1609).
- CONSTRUCTION JOINTS
- ALL CONSTRUCTION JOINTS SHALL BE CONSTRUCTED IN ACCORDANCE SECTION 1906.4 AND THE TYPICAL CONSTRUCTION JOINT DETAILS SH STRUCTURAL DRAWINGS.
- 2. ALL SURFACES OF CONSTRUCTION JOINTS SHALL BE CLEANED TO RE OR OTHER FOREIGN MATTER PRIOR TO PLACING THE ADJACENT CONC
- 'ED 3. THE CONTRACTOR SHALL SUBMIT THE PROPOSED LOCATIONS OF CON TO THE ENGINEER FOR APPROVAL BY THE STRUCTURAL ENGINEER BE CONSTRUCTION.

FOUNDATION

- 1. FOUNDATION DESIGN IS BASED ON RECOMMENDATIONS IN GEOTECHNI PREPARED BY E3RA. DATED FEB, 2000.
- 2. FOOTINGS ARE DESIGNED BASED ON THE FOLLOWING INFORMATION: ALLOWABLE BEARING

CONTINUOUS FOOTING (D+L)	=	2,000 PSF	
PAD FOOTING (D+L)	=	2,000 PSF	
ACTIVE EARTH PRESSURE	=	35 PSF/FT OF DEPTH	
ACTIVE EARTH PRESSURE	=	60 PSF/FT OF DEPTH	Ī
PASSIIVE EARTH PRESSURE	=	300 PSF/FT OF DEPTH	_
COEFFICIENT OF FRICTION	=	0.3	
SEISMIC PRESSURE	=	EFP = 10 PCF	[

FOOTING SHALL BEAR ON ENGINEERED FILL MATERIAL AS INDICATED REPORT. SPREAD FOOTINGS FOR BUILDING STRUCTURES SHOULD EME INCHES MINIMUM. AS SPECIFIED PER THE RECOMMENDATIONS OF THE REPORT. MINIMUM DEPTH OF FOOTINGS BELOW LOWEST ADJACENT GF BE 24". IT IS ACCEPTABLE TO INCREASE BEARING PRESSURE FOR SI LOADING SUCH AS SEISMIC OR WIND.

- 3. CONTRACTOR TO PROVIDE FOR DE-WATERING OF EXCAVATIONS FROM SURFACE WATER, GROUND WATER OR SEEPAGE, IF REQUIRED.
- 4. CONTRACTOR SHALL PROVIDE FOR DESIGN AND INSTALLATION OF ALL SHEATHING AND SHORING REQUIRED AND SHALL BE SOLELY RESPONS ALL EXCAVATION PROCEDURES INCLUDING LAGGING, SHORING AND PR OF ADJACENT PROPERTY, STRUCTURES, STREETS AND UTILITIES IN AC WITH ALL NATIONAL, STATE AND LOCAL SAFETY ORDINANCES.
- 5. EXCAVATION FOR NEW FOOTINGS SHALL BE APPROVED BY THE INSP ENGINEER PRIOR TO PLACING THE CONCRETE AND REINFORCING. (NOTIFY THE INSPECTOR WHEN INSPECTION OF EXCAVATION IS READ TO SUBMIT LETTER OF COMPLIANCE.
- 6. ALL EXCAVATIONS SHALL BE PROPERLY BACKFILLED WITH APPROVED

PSM	CITY OF TA DEPARTMENT OF PUBLIC UT (TACOMA	COMA TLITIES, RAIL DIVISION RAIL)	
AHS		STV Incorporated	
M. PETERSON		1055 WEST 7TH STREET, SUITE 3150 LOS ANGELES, CA. 90017	TACOMA RAIL
6-11	SUBMITTED: PROJECT MANAGER	APPROVED:	

	-	<u>GENERAL NOTES</u>
PENINGS,	1.	THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS PRIOR TO STARTING CONSTRUCTION. THE ARCHITECT SHALL BE NOTIFIED OF ANY DISCREPANCIES OR INCONSISTENCIES.
LABS.	2.	ALL WORK SHALL CONFORM TO THE MINIMUM STANDARDS OF THE FOLLOWING
IG FIXTURES. ANCHOR		CODES: 2009 INTERNATIONAL BUILDING CODE AND LATEST REVISIONS REFERRED TO HERE AS "THE CODE", AND ANY OTHER REGULATING AGENCIES WHICH HAVE AUTHORITY OVER ANY PORTION OF THE WORK, INCLUDING THE STATE OF WASHINGTON DIVISION OF INDUSTRIAL SAFETY, AND THOSE CODES & STANDARDS LISTED IN THESE NOTES AND SPECIFICATIONS
	3.	THESE NOTES AND SPECIFICATIONS. THE CONTRACTOR SHALL VERIFY ALL EXISTING CONDITIONS AND DIMENSIONS PRIOR TO STARTING CONSTRUCTION. THE ARCHITECT SHALL BE NOTIFIED OF ANY
	4.	ALL DRAWINGS AND SPECIFICATIONS ARE CONSIDERED TO BE A PART OF THE CONTRACT DOCUMENTS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REVIEW
RNATIONAL ANALYSIS.		OF CONSTRUCTION. ANY DISCREPANCIES THAT OCCUR SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT PRIOR TO START OF CONSTRUCTION SO THAT A CLARIFICATION CAN BE ISSUED. ANY WORK PERFORMED IN CONFLICT WITH THE CONTRACT DOCUMENTS OR ANY CODE REQUIREMENTS
0.417 g		SHALL BE CORRECTED BY THE CONTRACTOR AT THEIR OWN EXPENSE AND AT NO EXPENSE TO THE OWNER OR ARCHITECT.
1.01 1.58 1.232 a	5.	NOTES AND DETAILS ON DRAWINGS SHALL TAKE PRECEDENCE OVER GENERAL
0.660 g 0.821		CONSTRUCTION SHALL BE AS SHOWN FOR SIMILAR WORK. DETAILS AND SCHEDULES INDICATED AS "TYPICAL" MAY NOT BE SPECIFICALLY REFERENCED ON DRAWINGS. DETERMINE WHERE EACH TYPICAL DETAIL OR SCHEDULE APPLIES BEFORE PROCEEDING WITH WORK. IF CONDITIONS ARE FOUND WHICH ARE NOT SPECIFICALLY DETAILED AND NO TYPICAL DETAIL OR SCHEDULE APPLIES, PROMPTLY
SPECIFIC	6.	THE CONTRACT STRUCTURAL DRAWINGS AND SPECIFICATIONS REPRESENT THE FINISHED STRUCTURE. THEY DO NOT INDICATE THE METHOD OF CONSTRUCTION. THE CONTRACTOR SHALL PROVIDE ALL MEASURES NECESSARY TO PROTECT THE STRUCTURE AND ITS OCCUPANTS DURING CONSTRUCTION. SUCH MEASURES SHALL INCLUDE, BUT NOT BE LIMITED TO, BRACING, SHORING FOR LOADS
E WITH CODE HOWN ON THE		DUE TO CONSTRUCTION EQUIPMENT, THE INSTALLATION OF BARRIERS TO MINIMIZE EXCESSIVE NOISE, ETC. OBSERVATION VISITS TO THE SITE BY THE STRUCTURAL ENGINEER SHALL NOT INCLUDE INSPECTION OF THE ABOVE ITEMS.
EMOVE DUST, CHIPS, CRETE.	7.	OPENINGS, POCKETS, ETC., LARGER THAN 6" SHALL NOT BE PLACED IN CONCRETE SLABS, DECKS, WALLS, UNLESS SPECIALLY DETAILED ON THE STRUCTURAL DRAWINGS NOTICY THE STRUCTURAL ENGINEER WHEN DRAWINGS
NSTRUCTION JOINTS DEFORE STARTING		BY OTHERS SHOW OPENINGS, POCKETS, ETC., LARGER THAN 6" NOT SHOWN ON THE STRUCTURAL DRAWINGS, BUT WHICH ARE LOCATED IN STRUCTURAL MEMBERS.
	8.	PIPES SHALL NOT BE EMBEDDED IN STRUCTURAL CONCRETE EXCEPT WHERE SPECIFICALLY APPROVED.
ICAL REPORT	9.	BRACE PIPING AND DUCTS COMPLYING WITH LATEST EDITION OF "GUIDELINES FOR SEISMIC RESTRAINTS OF MECHANICAL SYSTEMS" BY THE SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION.
	10.	ASTM SPECIFICATIONS ON THE DRAWINGS SHALL BE OF THE LATEST REVISION.
JON-RESTRAINED]	11.	SHOP DRAWINGS:
RESTRAINED]		A. REVIEW AND STAMP SHOP DRAWINGS PRIOR TO SUBMISSION TO ARCHITECT (STRUCTURAL ENGINEER). REVIEW FOR COMPLETENESS AND COMPLIANCE WITH CONTRACT DOCUMENTS.
NVERTED TRIANGLE] IN SOIL BED 24		B. SUBMIT SHOP DRAWINGS TO ARCHITECT (STRUCTURAL ENGINEER) AS INDICATED OR SPECIFIED FOR REVIEW AND ACCEPTANCE PRIOR TO FABRICATION. REVIEW WILL BE FOR GENERAL CONFORMANCE WITH DESIGN INTENT CONVEYED IN CONTRACT DOCUMENTS
E SOILS RADE SHALL CHORT TERM		C. SHOP DRAWINGS ARE NOT A PART OF CONTRACT DOCUMENTS. THEREFORE, ARCHITECT'S (STRUCTURAL ENGINEER'S) REVIEW DOES NOT CONSTITUTE AN AUTHORIZATION TO DEVIATE FROM TERMS AND CONDITIONS OF THE CONTRACT.
1 EITHER		D. SHOP DRAWINGS WILL BE REJECTED FOR INCOMPLETENESS, LACK OF COORDINATION WITH OTHER PORTIONS OF CONTRACT DOCUMENTS, LACK OF
CRIBBING		INDICATED WITHOUT PRIOR REVIEW PER PARAGRAPH ABOVE.
ISIBLE FOR ROTECTION CCORDANCE		WHEN SPECIFICALLY INDICATED OR REQUESTED. F. MAINTAIN A COPY OF ALL SHOP DRAWINGS ACCEPTED BY ARCHITECT (STRUCTURAL ENGINEER) AT SITE DURING CONSTRUCTION PERIOD.
PECTOR OR SOILS CONTRACTOR TO	12.	SEE ARCHITECTURAL DRAWINGS FOR THE FOLLOWING: SIZE AND LOCATION OF ALL NEW INTERIOR AND EXTERIOR NON-BEARING
95% FILL.		SIZE AND LOCATION OF ALL NEW CONCRETE CURBS, EQUIPMENT PADS, PITS, FLOOR DRAINS, SLOPES, DEPRESSED AREAS, CHANGE IN LEVEL, CHAMFERS,
		SIZE AND LOCATION OF ALL NEW FLOOR OPENINGS EXCEPT AS SHOWN. NEW FLOOR FINISHES. DIMENSIONS NOT SHOWN ON STRUCTURAL DRAWINGS.
TACOMA	1	RAIL MAINTENANCE CONTRACT NO
FACIL	IT` 01 \$	Y IMPROVEMENTS SR 509 N. FRONTAGE RD. TACOMA, WA 98421
		$13 \cup 13$

SCALE

NONE

GENERAL NOTES

ATTACHMENT 3 Cone Penetration Test (CPT) Results (Completed by ConeTec)

PRESENTATION OF SITE INVESTIGATION RESULTS

Tacoma Rail

Prepared for:

Hart Crowser

ConeTec Job No: 19-59025

Project Start Date: July 11, 2019 Project End Date: July 11, 2019 Report Date: July 16, 2019



Prepared by:

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Tel: (253) 397-4861

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Introduction

The enclosed report presents the results of the site investigation program conducted by ConeTec Inc. for Hart Crowser at the Tacoma Rail yard. The program consisted of two (2) cone penetration tests (CPT).

Project Information

Project	
Client	Hart Crowser
Project	Tacoma Rail
ConeTec project number	19-59025

A map from Cesium including the CPT test locations is presented below.



Rig Description	Deployment System	Test Type
M7	Integrated Ramset	СРТ



Coordinates			
Test Type	Collection Method	EPSG Number	
СРТ	Handheld GPS	4326	

Cone Penetration Test (CPT)				
Depth reference	Depths are referenced to the existing ground surface at the time of			
'	each test.			
Tin and sleeve data offset	0.1 meter			
	This has been accounted for in the CPT data files.			
Additional plots	Plots with reduced scales have been provided for each plot series			
	• Default tip (qt) values of 1.0tsf have been applied for values			
Additional comments	below the minimum threshold of the cone			
Additional comments	• Default sleeve (fs) values of 0.01tsf have been applied for values			
	below the minimum threshold of the cone			

Cone Penetrometers Used for this Project						
Cone Description	Cone Number	Cross Sectional Area (cm ²)	Sleeve Area (cm²)	Tip Capacity (bar)	Sleeve Capacity (bar)	Pore Pressure Capacity (psi)
536:T1500F15U500	536	15	225	1500	15	500
Cone 536 was used for all CPT soundings						

Interpretation Tables	
Additional information	The Normalized Soil Behavior Type using Qtn (SBT Qtn) Chart (Robertson 2009) was used to classify the soil for this project. A detailed set of CPT interpretations were generated and are provided in Excel format files in the release folder. The CPT interpretations are based on values of corrected tip (q_t) , sleeve friction (f_s) and pore pressure (u_2) at each data point. Soils were classified as either drained or undrained based on the Normalized Soil Behavior Type using Qtn (SBT Qtn) Chart (Robertson 2009).



Limitations

This report has been prepared for the exclusive use of Hart Crowser (Client) for the project titled "Tacoma Rail". The report's contents may not be relied upon by any other party without the express written permission of ConeTec Inc. (ConeTec). ConeTec has provided site investigation services, prepared the factual data reporting, and provided geotechnical parameter calculations consistent with current best practices. No other warranty, expressed or implied, is made.

The information presented in the report document and the accompanying data set pertain to the specific project, site conditions and objectives described to ConeTec by the Client. In order to properly understand the factual data, assumptions and calculations, reference must be made to the documents provided and their accompanying data sets, in their entirety.



The cone penetration tests (CPTu) are conducted using an integrated electronic piezocone penetrometer and data acquisition system manufactured by Adara Systems Ltd. of Richmond, British Columbia, Canada.

ConeTec's piezocone penetrometers are compression type designs in which the tip and friction sleeve load cells are independent and have separate load capacities. The piezocones use strain gauged load cells for tip and sleeve friction and a strain gauged diaphragm type transducer for recording pore pressure. The piezocones also have a platinum resistive temperature device (RTD) for monitoring the temperature of the sensors, an accelerometer type dual axis inclinometer and a geophone sensor for recording seismic signals. All signals are amplified down hole within the cone body and the analog signals are sent to the surface through a shielded cable.

ConeTec penetrometers are manufactured with various tip, friction and pore pressure capacities in both 10 cm² and 15 cm² tip base area configurations in order to maximize signal resolution for various soil conditions. The specific piezocone used for each test is described in the CPT summary table presented in the first Appendix. The 15 cm² penetrometers do not require friction reducers as they have a diameter larger than the deployment rods. The 10 cm² piezocones use a friction reducer consisting of a rod adapter extension behind the main cone body with an enlarged cross sectional area (typically 44 mm diameter over a length of 32 mm with tapered leading and trailing edges) located at a distance of 585 mm above the cone tip.

The penetrometers are designed with equal end area friction sleeves, a net end area ratio of 0.8 and cone tips with a 60 degree apex angle.

All ConeTec piezocones can record pore pressure at various locations. Unless otherwise noted, the pore pressure filter is located directly behind the cone tip in the " u_2 " position (ASTM Type 2). The filter is 6 mm thick, made of porous plastic (polyethylene) having an average pore size of 125 microns (90-160 microns). The function of the filter is to allow rapid movements of extremely small volumes of water needed to activate the pressure transducer while preventing soil ingress or blockage.

The piezocone penetrometers are manufactured with dimensions, tolerances and sensor characteristics that are in general accordance with the current ASTM D5778 standard. ConeTec's calibration criteria also meet or exceed those of the current ASTM D5778 standard. An illustration of the piezocone penetrometer is presented in Figure CPTu.





Figure CPTu. Piezocone Penetrometer (15 cm²)

The ConeTec data acquisition systems consist of a Windows based computer and a signal conditioner and power supply interface box with a 16 bit (or greater) analog to digital (A/D) converter. The data is recorded at fixed depth increments using a depth wheel attached to the push cylinders or by using a spring loaded rubber depth wheel that is held against the cone rods. The typical recording intervals are either 2.5 cm or 5.0 cm depending on project requirements; custom recording intervals are possible. The system displays the CPTu data in real time and records the following parameters to a storage media during penetration:

- Depth
- Uncorrected tip resistance (q_c)
- Sleeve friction (f_s)
- Dynamic pore pressure (u)
- Additional sensors such as resistivity, passive gamma, ultra violet induced fluorescence, if applicable

All testing is performed in accordance to ConeTec's CPT operating procedures which are in general accordance with the current ASTM D5778 standard.



Prior to the start of a CPTu sounding a suitable cone is selected, the cone and data acquisition system are powered on, the pore pressure system is saturated with either glycerin or silicone oil and the baseline readings are recorded with the cone hanging freely in a vertical position.

The CPTu is conducted at a steady rate of 2 cm/s, within acceptable tolerances. Typically one meter length rods with an outer diameter of 1.5 inches are added to advance the cone to the sounding termination depth. After cone retraction final baselines are recorded.

Additional information pertaining to ConeTec's cone penetration testing procedures:

- Each filter is saturated in silicone oil or glycerin under vacuum pressure prior to use
- Recorded baselines are checked with an independent multi-meter
- Baseline readings are compared to previous readings
- Soundings are terminated at the client's target depth or at a depth where an obstruction is encountered, excessive rod flex occurs, excessive inclination occurs, equipment damage is likely to take place, or a dangerous working environment arises
- Differences between initial and final baselines are calculated to ensure zero load offsets have not occurred and to ensure compliance with ASTM standards

The interpretation of piezocone data for this report is based on the corrected tip resistance (q_t) , sleeve friction (f_s) and pore water pressure (u). The interpretation of soil type is based on the correlations developed by Robertson (1990) and Robertson (2009). It should be noted that it is not always possible to accurately identify a soil type based on these parameters. In these situations, experience, judgment and an assessment of other parameters may be used to infer soil behavior type.

The recorded tip resistance (q_c) is the total force acting on the piezocone tip divided by its base area. The tip resistance is corrected for pore pressure effects and termed corrected tip resistance (q_t) according to the following expression presented in Robertson et al, 1986:

$$q_t = q_c + (1-a) \cdot u_2$$

where: q_t is the corrected tip resistance

q_c is the recorded tip resistance

u₂ is the recorded dynamic pore pressure behind the tip (u₂ position)

a is the Net Area Ratio for the piezocone (0.8 for ConeTec probes)

The sleeve friction (f_s) is the frictional force on the sleeve divided by its surface area. As all ConeTec piezocones have equal end area friction sleeves, pore pressure corrections to the sleeve data are not required.

The dynamic pore pressure (u) is a measure of the pore pressures generated during cone penetration. To record equilibrium pore pressure, the penetration must be stopped to allow the dynamic pore pressures to stabilize. The rate at which this occurs is predominantly a function of the permeability of the soil and the diameter of the cone.

The friction ratio (Rf) is a calculated parameter. It is defined as the ratio of sleeve friction to the tip resistance expressed as a percentage. Generally, saturated cohesive soils have low tip resistance, high



friction ratios and generate large excess pore water pressures. Cohesionless soils have higher tip resistances, lower friction ratios and do not generate significant excess pore water pressure.

A summary of the CPTu soundings along with test details and individual plots are provided in the appendices. A set of interpretation files were generated for each sounding based on published correlations and are provided in Excel format in the data release folder. Information regarding the interpretation methods used is also included in the data release folder.

For additional information on CPTu interpretations, refer to Robertson et al. (1986), Lunne et al. (1997), Robertson (2009), Mayne (2013, 2014) and Mayne and Peuchen (2012).


The cone penetration test is halted at specific depths to carry out pore pressure dissipation (PPD) tests, shown in Figure PPD-1. For each dissipation test the cone and rods are decoupled from the rig and the data acquisition system measures and records the variation of the pore pressure (u) with time (t).



Figure PPD-1. Pore pressure dissipation test setup

Pore pressure dissipation data can be interpreted to provide estimates of ground water conditions, permeability, consolidation characteristics and soil behavior.

The typical shapes of dissipation curves shown in Figure PPD-2 are very useful in assessing soil type, drainage, in situ pore pressure and soil properties. A flat curve that stabilizes quickly is typical of a freely draining sand. Undrained soils such as clays will typically show positive excess pore pressure and have long dissipation times. Dilative soils will often exhibit dynamic pore pressures below equilibrium that then rise over time. Overconsolidated fine-grained soils will often exhibit an initial dilatory response where there is an initial rise in pore pressure before reaching a peak and dissipating.





Figure PPD-2. Pore pressure dissipation curve examples

In order to interpret the equilibrium pore pressure (u_{eq}) and the apparent phreatic surface, the pore pressure should be monitored until such time as there is no variation in pore pressure with time as shown for each curve of Figure PPD-2.

In fine grained deposits the point at which 100% of the excess pore pressure has dissipated is known as t_{100} . In some cases this can take an excessive amount of time and it may be impractical to take the dissipation to t_{100} . A theoretical analysis of pore pressure dissipations by Teh and Houlsby (1991) showed that a single curve relating degree of dissipation versus theoretical time factor (T*) may be used to calculate the coefficient of consolidation (c_h) at various degrees of dissipation resulting in the expression for c_h shown below.

$$c_h = \frac{T^* \cdot a^2 \cdot \sqrt{I_r}}{t}$$

Where:

- T* is the dimensionless time factor (Table Time Factor)
- a is the radius of the cone
- I_r is the rigidity index
- t is the time at the degree of consolidation

Table Time Factor. T*	* versus degree of dissipation	(Teh and Houlsby, 1991)
-----------------------	--------------------------------	-------------------------

Degree of Dissipation (%)	20	30	40	50	60	70	80
T* (u ₂)	0.038	0.078	0.142	0.245	0.439	0.804	1.60

The coefficient of consolidation is typically analyzed using the time (t_{50}) corresponding to a degree of dissipation of 50% (u_{50}). In order to determine t_{50} , dissipation tests must be taken to a pressure less than u_{50} . The u_{50} value is half way between the initial maximum pore pressure and the equilibrium pore pressure value, known as u_{100} . To estimate u_{50} , both the initial maximum pore pressure and u_{100} must be known or estimated. Other degrees of dissipations may be considered, particularly for extremely long dissipations.

At any specific degree of dissipation the equilibrium pore pressure (u at t_{100}) must be estimated at the depth of interest. The equilibrium value may be determined from one or more sources such as measuring the value directly (u_{100}), estimating it from other dissipations in the same profile, estimating the phreatic surface and assuming hydrostatic conditions, from nearby soundings, from client provided information, from site observations and/or past experience, or from other site instrumentation.



For calculations of c_h (Teh and Houlsby, 1991), t_{50} values are estimated from the corresponding pore pressure dissipation curve and a rigidity index (I_r) is assumed. For curves having an initial dilatory response in which an initial rise in pore pressure occurs before reaching a peak, the relative time from the peak value is used in determining t_{50} . In cases where the time to peak is excessive, t_{50} values are not calculated.

Due to possible inherent uncertainties in estimating I_r , the equilibrium pore pressure and the effect of an initial dilatory response on calculating t_{50} , other methods should be applied to confirm the results for c_h .

Additional published methods for estimating the coefficient of consolidation from a piezocone test are described in Burns and Mayne (1998, 2002), Jones and Van Zyl (1981), Robertson et al. (1992) and Sully et al. (1999).

A summary of the pore pressure dissipation tests and dissipation plots are presented in the relevant appendix.



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Sully, J.P., Robertson, P.K., Campanella, R.G. and Woeller, D.J., 1999, "An approach to evaluation of field CPTU dissipation data in overconsolidated fine-grained soils", Canadian Geotechnical Journal, 36(2): 369-381.

Teh, C.I., and Houlsby, G.T., 1991, "An analytical study of the cone penetration test in clay", Geotechnique, 41(1): 17-34.



The appendices listed below are included in the report:

- Cone Penetration Test Summary and Standard Cone Penetration Test Plots
- Cone Penetration Test Advanced Plots
- Cone Penetration Test Soil Behavior Type Scatter Plots
- Pore Pressure Dissipation Summary and Pore Pressure Dissipation Plots



Cone Penetration Test Summary and Standard Cone Penetration Test Plots





Job No:19-59025Client:Hart CrowserProject:Tacoma RailStart Date:11-Jul-2019End Date:11-Jul-2019

CONE PENETRATION TEST SUMMARY								
Sounding ID	File Name	Date	Cone	Assumed Phreatic Surface (ft)	Final Depth (ft)	Latitude ² (Deg)	Longitude ² (Deg)	Refer to Notation Number
CPT-01	19-59025_CP01	11-Jul-2019	536:T1500F15U500	8.8	71.4	47.24786	-122.39314	
CPT-02	19-59025_CP02	11-Jul-2019	536:T1500F15U500	8.4	32.2	47.24781	-122.39285	
Totals	2 soundings				103.6			

1. Phreatic surface based on pore pressure dissipation test unless otherwise noted. Hydrostatic profile applied to interpretation tables

2. Coordinates were collected using a handheld GPS - WGS 84 Lat/Long









Cone Penetration Test Advanced Plots







The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.





The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Cone Penetration Test Soil Behavior Type Plots



CONETECJob No: 19-59025Sounding: CPT-01Hart CrowserDate: 2019-07-11 09:49Cone: 536:T1500F15U500Site: Tacoma RailSite: Tacoma Rail



CONETEC Hart Crowser Job No: 19 Date: 2019 Site: Taco

Job No: 19-59025 Date: 2019-07-11 09:00 Site: Tacoma Rail

Sounding: CPT-02 Cone: 536:T1500F15U500



Pore Pressure Dissipation Summary and Pore Pressure Dissipation Plots





Job No: Client: Project: Start Date: End Date: 19-59025 Hart Crowser Tacoma Rail 11-Jul-19 11-Jul-19

CPTu PORE PRESSURE DISSIPATION SUMMARY								
Sounding ID					Estimated	Calculated		
	File Name	Cone Area	Duration	Test Depth	Equilibrium Pore	Phreatic		
		(cm ²)	(s)	(ft)	Pressure U _{eq}	Surface		
					(ft)	(ft)		
CPT-01	19-59025_CP01.PPD	15.0	300	42.7	33.8	8.8		
CPT-01	19-59025_CP01.PPD	15.0	455	50.6	40.5	10.1		
CPT-01	19-59025_CP01.PPD	15.0	250	52.0	41.9	10.1		
CPT-02	19-59025_CP02.PPD	15.0	300	19.7	11.2	8.5		
Totals			21.8					



Job No: 19-59025 Date: 07/11/2019 09:49 Site: Tacoma Rail Sounding: CPT-01 Cone: 536:T1500F15U500 Area=15 cm²





Job No: 19-59025 Date: 07/11/2019 09:49 Site: Tacoma Rail Sounding: CPT-01 Cone: 536:T1500F15U500 Area=15 cm²





Job No: 19-59025 Date: 07/11/2019 09:49 Site: Tacoma Rail
 Sounding:
 CPT-01

 Cone:
 536:T1500F15U500
 Area=15 cm²





Job No: 19-59025 Date: 07/11/2019 09:00 Site: Tacoma Rail Sounding: CPT-02 Cone: 536:T1500F15U500 Area=15 cm²

