



## RESOLUTION NO. U-11261

1 A RESOLUTION related to a Utility Construction Agreement between the  
2 Washington State Department of Transportation (WSDOT) and Tacoma  
3 Water.

4 WHEREAS the City of Tacoma, Water Division (dba "Tacoma Water")  
5 desires to enter an agreement with the Washington State Department of  
6 Transportation ("WSDOT") for the design and relocation of approximately three  
7 thousand feet of 48-inch water main and appurtenances to State Route 509 as  
8 part of WSDOT's SR167 Completion/SR509 New Expressway Project  
9 ("Project"), and

10 WHEREAS the location of a new SR509 ramp in the Project will require  
11 the relocation of the existing main to ensure the integrity of the main and to  
12 ensure that Tacoma Water has adequate access to the main in the future, and

13 WHEREAS this Project was not included in the Tacoma Water 2021/22  
14 capital budget and Tacoma Water's portion of the Advanced Payment of  
15 \$1,473,008, is expected to be paid in the current biennium as a shared cost  
16 with the Regional Water Supply System (RWSS) Participants, and

17 WHEREAS Tacoma Water's responsibility for this initial payment is  
18 \$613,950, and will be funded through deferral of certain capital projects that are  
19 currently included in the approved capital budget, and

20 WHEREAS these deferred projects may include the Water Operations  
21 Building Seismic Upgrade Project and Land Acquisition Projects, and

22 WHEREAS the remaining anticipated expenditures will be included in the  
23 2023/24 capital budget request and funded with existing reserves, loans, or  
24 revenue bonds, and

25 WHEREAS the total Project costs are estimated to be \$9,820,058 and  
26 Tacoma Water's total financial responsibility for the anticipated expenditures for



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the relocation of this section of water main is estimated to be \$4,093,000 with the remaining Project costs being covered by the other RWSS participants, and

WHEREAS Tacoma Water believes it is in the best interest of the utility and its customers to include the relocation of the water main in the WSDOT Project and project partnership will improve the project delivery, reduce project costs, improve system reliability, maintain system accessibility, and consolidate construction disturbances to local businesses and residents; Now, therefore,

BE IT RESOLVED BY THE PUBLIC UTILITY BOARD OF THE CITY OF TACOMA:

That the proposed Utility Construction Agreement with the Washington State Department of Transportation and Tacoma Water, with Tacoma Water's portion of the Project estimated in the amount of \$4,093,000, is hereby approved and the Director of Utilities is authorized to enter into said Agreement substantially in the same form as on file with the Clerk and as approved by the City Attorney.

Approved as to form:

\_\_\_\_\_  
/s/  
Chief Deputy City Attorney

\_\_\_\_\_  
Chair  
\_\_\_\_\_  
Secretary

\_\_\_\_\_  
Clerk

Adopted \_\_\_\_\_



## Board Action Memorandum

**TO:** Jackie Flowers, Director of Utilities  
**COPY:** Charleen Jacobs, Director and Board Offices  
**FROM:** Scott Dewhirst, Utilities Dir Dep Water Supt, Tacoma Water  
Carol Powers, Principal Engineer, Tacoma Water

**MEETING DATE:** June 30, 2021  
**DATE:** June 11, 2021

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### **STRATEGIC DIRECTIVE ALIGNMENT (select as many that apply):**

Please indicate which of the Public Utility Board's Strategic Directives is supported by this action.

- |  |   |
|--|---|
| <input type="checkbox"/> SD1 – Equity & Inclusion                  | <input type="checkbox"/> SD8 – Telecom                            |
| <input type="checkbox"/> SD2 – Financial Sustainability            | <input type="checkbox"/> SD9 – Economic Development               |
| <input type="checkbox"/> SD3 – Rates                               | <input type="checkbox"/> SD10 – Government Relations              |
| <input type="checkbox"/> SD4 – Stakeholder Engagement              | <input type="checkbox"/> SD11 – Decarbonization/Electric Vehicles |
| <input type="checkbox"/> SD5 – Environmental Leadership            | <input type="checkbox"/> SD12 – Employee Relations                |
| <input type="checkbox"/> SD6 – Innovation                          | <input type="checkbox"/> SD13 – Customer Service                  |
| <input checked="" type="checkbox"/> SD7 – Reliability & Resiliency | <input type="checkbox"/> SD14 – Resource Planning                 |

### **SUMMARY:**

Authorize Tacoma Water to enter into a Utility Construction Agreement between the Washington State Department of Transportation (WSDOT) for the design and relocation of approximately three thousand feet of 48-inch water main and appurtenances. This work is necessary for the proposed construction improvements to State Route 509 as part of WSDOT's SR167 Completion/SR509 New Expressway Project. Based on conceptual design, the total estimated project cost is \$9,820,058 which includes applicable taxes and a 4% percent contingency.

Tacoma Water believes it is in the best interest of the utility and its customers to include the relocation of the water main in the WSDOT project. Project partnership will improve project delivery, reduce project costs, improve system reliability, maintain system accessibility, and consolidate construction disturbance to local businesses and residents.

### **BACKGROUND:**

The WSDOT has a multi-year project to complete SR167 and connect to SR509 near Alexander Avenue. A new ramp connecting the two roadways will be located directly over Tacoma Water's 48-inch transmission main. The existing main is in WSDOT right-of-way and subject to Franchise Agreement 10358C Amendment 7 between Tacoma Water and WSDOT.

**ISSUE:** A new SR509 ramp will be constructed on an earthen foundation over Tacoma Water's 48-inch water main, creating excessive loading on the water main. A load of this nature is expected to cause settlement and significant pipe damage. Additionally, after the ramp is constructed the water main would be inaccessible by normal construction means.

To maintain reliability, resiliency, and accessibility of the 48-inch water main, the project will design and relocate the main from the north shoulder of SR509 southbound lanes to the south shoulder of SR509



## Board Action Memorandum

northbound lanes. The relocated main will be constructed in WSDOT right-of-way and will be accessible for maintenance by a shared used path that follows the new alignment of the main.

ALTERNATIVES: Taking no action to relocate the main is expected to result in significant damage to the main, and render it inaccessible. If Tacoma Water does not enter the construction agreement, the Utility would be required to work around the WSDOT project and relocate the main at the Utility's cost per the franchise amendment with WSDOT. Additional alignments for the relocation of the main were also evaluated and deemed cost prohibitive. Relocating the water main to the south side of SR509 ensures the reliability of the main and provides ease of access for future maintenance.

### **ARE THE EXPENDITURES AND REVENUES PLANNED AND BUDGETED? No**

#### **IF THE EXPENSE IS NOT BUDGETED, PLEASE EXPLAIN HOW IT IS TO BE COVERED.**

This project was not included in the Tacoma Water 2021/22 capital budget. The Advance Payment of \$1,473,008 is expected to be paid in the current biennium and will be shared with the Regional Water Supply System (RWSS) Participants. Tacoma Water's responsibility for this initial payment is \$613,950 and will be funded through deferral of certain capital projects that are currently included in the approved capital budget. These projects may include the Water Operations Building Seismic Upgrade Project and Land Acquisition Projects. The remaining anticipated expenditures will be included in the 2023/24 capital budget request and funded with existing reserves, loans or revenue bonds. Tacoma Water's total financial responsibility for the anticipated expenditures for the relocation of this section of water main are estimated to be \$4,093,000

#### **IF THE ACTION REQUESTED IS APPROVAL OF A CONTRACT, INCLUDE LANGUAGE IN RESOLUTION AUTHORIZING \$200,000 INCREASE IN ADMINISTRATIVE AUTHORITY TO DIRECTOR? No**

**ATTACHMENTS:** Utility Construction Agreement

#### **CONTACT:**

Primary Contact: Carol Powers, P.E., Principal Engineer

Supervisor's Name: Jessica Knickerbocker, P.E., Assistant Division Manager

Presenter (if different from primary contact):

Additional staff requiring a Zoom presentation link: Jesse Angel, Jodi Collins,



<b>Utility Construction Agreement Work by WSDOT – Utility Cost</b>		Utility Name & Address  Tacoma Public Utilities Water Division 3628 South 35th Street Tacoma, WA 98409-3192
Agreement Number <b>UTB 1454</b>	Region <b>Olympic</b>	Project Title/Location
State Route Number <b>SR 509</b>	Mileposts <b>From 2.94 to 3.5</b>	<b>SR 167 Completion / SR 509 to I-5 - New Expressway City of Tacoma, Pierce County, WA</b>
Estimated Agreement Amount <b>\$9,820,058</b>		Advance Payment Amount <b>\$1,473,008</b>

This Utility Construction Agreement is entered into between the State of Washington Department of Transportation, hereinafter "WSDOT" and the above named Utility, hereinafter the "Utility;" collectively the "Parties" and individually the "Party".

**Recitals**

1. WSDOT is planning the construction or improvement of the State Route as shown above for the listed WSDOT Project, and in connection therewith, it is necessary to remove and/or relocate and/or construct certain Utility facilities, herein the (Work).
2. The Utility is responsible for (1) the cost of the Work for Utility facilities located without a documented ownership of and/or interest in real property, such as being located pursuant to a franchise, a permit, or undocumented permission, (2) all betterments, and (3) new facilities.
3. The Work shall be defined as all materials, equipment, labor, contract administration and any other efforts required to perform the relocation, construction, and/or removal of the Utility's facilities.
4. The Work includes  Betterments;  Installation of New Facilities;  Relocation of Facilities without Property Rights;  Removal of Existing Facilities from WSDOT right of way; and/or  Protect in Place.
5. It is deemed to be in the best public interest for WSDOT to include the Work in WSDOT's Project.

Now, Therefore, pursuant to RCW 47.01.210 and chapter 47.44 RCW and in consideration of the terms, conditions, covenants, and performances contained herein, as well as the attached Exhibits which are incorporated and made a part hereof.

It Is Mutually Agreed As Follows:

**1. Plans, Specifications and Bids**

- 1.1 Program Guide: *Utility Relocation and Accommodation on Federal Aid Highway Projects* shall determine and establish the definitions and applicable standards and payments for this Agreement. By this reference this document is adopted and made a part of this Agreement as if fully contained herein.
- 1.2 Betterment: A betterment is any improvement to the Utility's facilities not required by code, regulation, standard industry practice, or any other applicable regulation. If any of the Work constitutes a betterment as defined in the Program Guide: *Utility Relocation and Accommodation on Federal Aid Highway Projects*, the Utility is solely responsible for the costs of such improvement.

- 1.3 WSDOT, acting on behalf of the Utility, agrees to perform the Utility facilities Work in accordance with Exhibit A, Special Provisions, and Exhibit C, Plans, where either:
  - (1) Utility supplied the Work plans and special provisions to WSDOT, or
  - (2) WSDOT developed the Work plans and special provisions from Utility-provided information. WSDOT will incorporate the Plans and Special Provisions into WSDOT Project in accordance with Utility requirements. The Utility agrees that it is solely responsible for insuring that all Special Provisions, Plans and Utility standards are met and that it has supplied WSDOT with all applicable standards, codes, regulations, or any other requirements the Utility is obligated to meet, unless otherwise noted.
- 1.4 The Utility has reviewed and approved the Work Special Provisions and Plans that will be incorporated into WSDOT Project. WSDOT will advertise the Work and Project for bids. WSDOT will be the Utility's representative during the Ad and award period. When requested by WSDOT, the Utility shall timely assist WSDOT in answering bid questions and resolving any design issues that may arise associated with the Work. All comments and clarifications must go through WSDOT. If the Utility supplied the Work plans and special provisions, the Utility agrees to provide WSDOT with any addenda required for the Work during the Ad period, to the Parties' mutual satisfaction.
- 1.5 WSDOT will provide the Utility with written notification of the bid price no later than five (5) days after award for all Work items for which the Utility is responsible for the cost. The Utility shall respond in writing to WSDOT, stating its Acceptance or Rejection of the Work items, within five (5) working days.
- 1.6 Should the Utility reject the bid Work items for which it has cost responsibility:
  - 1.6.1 WSDOT shall delete said items from the Project. The Utility agrees to reimburse WSDOT for engineering costs and direct and related indirect costs incurred by WSDOT associated with deleting the bid Work items from the Project, including any redesign, reengineering or re-estimating, if necessary, to delete the Work items, and the Utility agrees to pay such costs upon receipt of a WSDOT invoice.
  - 1.6.2 The Utility agrees that should it reject the bid Work items for which it has cost responsibility, it shall continue to be obligated to timely relocate its facilities as required by WSDOT Project. The Utility further agrees that should its actions delay or otherwise damage WSDOT Project, it shall be liable for such costs.

## **2. Construction, Inspection, and Acceptance**

- 2.1 WSDOT agrees to administer the Work on behalf of the Utility.
- 2.2 The Utility agrees to disconnect and/or reconnect its facilities as required by WSDOT when such disconnection or reconnection is required to be performed by the Utility. The Parties agree to define disconnect and/or reconnection requirements, including notification and response in Exhibit A. WSDOT agrees, as part of the Work, to remove disconnected and/or abandoned facilities at the Utility's cost. Utility facilities not removed pursuant to this Agreement shall remain the ownership, operation and maintenance responsibility of the Utility.
- 2.3 Salvage: All materials removed by WSDOT shall be reclaimed or disposed of by WSDOT and shall become the property of WSDOT. If the Utility desires to retain such materials and WSDOT agrees, the value of salvaged materials will be paid to WSDOT in an amount not less than that required by the Program Guide: *Utility Relocation and Accommodation on Federal Aid Highway Projects*.
- 2.4 The Utility may furnish an inspector for the Work. The Utility agrees that it is solely responsible for all such inspection costs. The Utility's inspector shall not directly contact WSDOT's contractor. All contact between the Utility's inspector and WSDOT's contractor shall be through WSDOT's representatives. WSDOT's Project Construction Engineer may require the removal and/or replacement of the Utility's inspector if the inspector interferes with WSDOT's Project, WSDOT's contractor and/or the Work.

- 2.5 WSDOT shall promptly notify the Utility in writing when the Work is completed
- 2.6 The Utility shall, within Thirty (30) working days of being notified that the Work is completed:
- (a) deliver a letter of acceptance to WSDOT which shall include a release and waiver of all future claims or demands of any nature resulting from the performance of the Work and WSDOT's administration thereof, or
  - (b) deliver to WSDOT written reasons why the Work does not comply with the previously approved Plans and Special Provisions. The Utility agrees to work diligently and in good faith with WSDOT to resolve any issues so as not to delay WSDOT's Project. If all issues are resolved, the Utility agrees to deliver to WSDOT a letter of acceptance as provided herein.
- 2.7 If the Utility does not respond within Thirty ( 30 ) working days as provided in section 2.6, the Work and the administration thereof will be deemed accepted by the Utility, and WSDOT shall be released from all future claims and demands.
- 2.8 Upon completion and acceptance of the Work pursuant to Sections 2.6 or 2.7, the Utility agrees that it shall be solely responsible for all future ownership, operation and maintenance costs of its facilities, without WSDOT liability or expense.
- 2.9 WSDOT will prepare the final construction documentation in general conformance with WSDOT's Construction Manual. WSDOT will maintain one set of plans as the official "as-built" set, then make notations in red of all plan revisions typically recorded per standard WSDOT practice, as directed by WSDOT's Construction Manual. Once the Utility has accepted the Work per Section 2.6 or 2.7, WSDOT upon request by the Utility will provide one reproducible set of contract as-builts to the Utility, and the Utility agrees to pay the cost of reproduction upon receipt of a WSDOT invoice

### 3. Payment

- 3.1 The Utility agrees that it shall be responsible for the actual direct and related indirect costs, including mobilization, construction engineering, contract administration and overhead costs, associated with the Work. The cost of this Work is estimated to be Nine Million Eight Hundred Twenty Thousand, Fifty Eight Dollars (\$9,820,058). An itemized estimate of Utility-responsible costs for Work to be performed by WSDOT on behalf of the Utility is included in Exhibit B, Cost Estimate.
- 3.2 The Utility agrees to pay WSDOT the "Advance Payment Amount" stated above within twenty (20) calendar days after WSDOT submits its first partial payment request to the Utility. The advance payment represents fifteen (15) percent of the estimate of cost for which the Utility is responsible. The advance payment will be carried throughout the life of the Work with final adjustment made in the final invoice.
- 3.3 The Parties acknowledge and agree that WSDOT does not have the legal authority to advance state funds for the Utility's Work under this Agreement. Should the Utility fail to make payment according to the terms of this Agreement, WSDOT shall have the right to terminate this Agreement, charging the Utility for all associated costs of termination, including non-cancellable items, as well as associated Project delay and contractor claims. Such termination shall not relieve the Utility's obligation to timely relocate its facilities as provided under section 1.6.2
- 3.4 The Utility, in consideration of the faithful performance of the Work to be done by WSDOT, agrees to pay WSDOT for the actual direct and related indirect cost of all Work for which the Utility is responsible, including mobilization, construction engineering, administration and overhead costs. WSDOT shall invoice the Utility and provide supporting documentation therefore, and the Utility agrees to pay WSDOT within thirty (30) calendar days of receipt of an invoice. A partial payment will not constitute agreement as to the appropriateness of any item and that, at the time of final invoice, the Parties will resolve any discrepancies.

#### **4. Change in Work or Cost Increase**

- 4.1 Increase in Cost: In the event unforeseen conditions require an increase in the cost of the Work for which the Utility is responsible, above the Exhibit B, Cost Estimate (including sales tax, engineering, and contingencies) by more than Twenty Five (25) percent, the Parties agree to modify Exhibit B to include such cost increase.
- 4.2 If WSDOT determines that additional Work or a change in the Work is required, prior written approval must be secured from the Utility; however, where the change is required to mitigate a Project emergency or safety threat to the traveling public, WSDOT will direct the change without the Utility's prior approval. WSDOT will notify the Utility of such change as soon as possible thereafter. The Utility agrees to respond to all WSDOT change order requests in writing and within five (5) working days. WSDOT notification shall not be required for Utility-requested changes. The Utility agrees to pay all costs associated with the changed Work, as well as the costs of Project or Work delays and/or subsequent contractor claims associated with the Utility's failure to timely respond as required.
- 4.3 The Utility may request additions to the Work through WSDOT in writing. WSDOT will implement the requested changes as elective changes, provided that a change does not negatively impact WSDOT's transportation system and complies with the Standard Specifications, Project permits, state and/or federal law, applicable rules and/or regulations, and/or WSDOT design policies, and does not unreasonably delay critically scheduled Project contract activities.
- 4.4 All elective changes to the Work shall be approved in writing by the Utility before WSDOT directs the contractor to implement the changes, even if an executed change order is not required by the Project contract. The Utility agrees to pay for the increases in cost, if any, for such elective changes in accordance with Section 3.
- 4.5 WSDOT will make available to the Utility all change order documentation related to the Work.

#### **5. Franchise or Permit**

- 5.1 The Utility shall apply for a permit, franchise or an amendment to its current franchise for those new or modified Utility facilities that will be located within WSDOT's right of way. After receiving the application, WSDOT will issue the Utility a permit or a new or amended franchise.

#### **6. Right of Entry**

- 6.1 The Utility agrees to arrange for rights of entry upon all privately owned lands upon which the Utility has a claimed property right and which are necessary to perform the Work. The Utility also agrees to obtain all necessary permissions for WSDOT to perform the Work on such lands, which may include reasonable use restrictions on those lands. The Utility agrees to provide the rights of entry and applicable permissions under this section to WSDOT within Thirty (30) calendar days of entering into this Agreement. Upon completion of the Work on such lands, the rights of entry and permissions shall terminate.

#### **7. General Provisions**

- 7.1 Indemnification: To the extent authorized by law, the Utility and WSDOT shall indemnify and hold harmless one another and their employees and/or officers from and shall process and defend at its own expense any and all claims, demands, suits at law or equity, actions, penalties, losses, damages (both to persons and/or property), or costs, of whatsoever kind or nature, brought against the one Party arising out of, in connection with, or incident to the other Party's performance or failure to perform any aspect of this Agreement, provided, however, that if such claims are caused by or result from the concurrent negligence of (a) the Utility and (b) WSDOT, their respective employees and/or officers, or involves those actions covered by RCW 4.24.115, this indemnity provision shall be valid and enforceable only to the extent of the negligence of the Utility or WSDOT, and provided further, that nothing herein shall require the Utility or WSDOT to hold harmless or defend the other or its employees and/or officers from any claims arising from that Party's sole negligence or that of its employees and/or officers. The terms of this section shall survive the termination of this Agreement.



- 7.2 Disputes: If a dispute occurs between the Utility and WSDOT at any time during the prosecution of the Work, the Parties agree to negotiate at the management level to resolve any issues. Should such negotiations fail to produce a satisfactory resolution, the Parties agree to enter into arbitration and/or mediation before proceeding to any other legal remedy. Each Party shall be responsible for its own fees and costs. The Parties agree to equally share the cost of a mediator or arbiter.
- 7.3 Venue: In the event that either Party deems it necessary to institute legal action or proceedings to enforce any right or obligation under this Agreement, the Parties hereto agree that any such action or proceedings shall be brought in the superior court situated in Pierce County, Washington. Each Party shall be responsible for its own attorney's fees and costs.
- 7.4 Termination:
- 7.4.1 Unless otherwise provided herein, the Utility may terminate this Agreement upon thirty (30) calendar days written notice to WSDOT. If this Agreement is terminated by the Utility prior to the fulfillment of the terms stated herein, the Utility shall reimburse WSDOT for all actual direct and related indirect expenses and costs, including mobilization, construction engineering, contract administration and overhead costs, incurred up to the date of termination associated with the Utility Work, as well as the cost of non-cancelable obligations, including any redesign, reengineering or re-estimating, if necessary, to delete the Work, and contractor claims, if any, payment in accordance with Section 3. Further, the Utility acknowledges and agrees that should it terminate this Agreement, such termination shall not relieve the Utility from its responsibility to design, remove, relocate and/or construct its facilities so as not to delay or conflict with WSDOT's Project. WSDOT agrees to provide to the Utility all Work-related documents upon final payment by the Utility.
- 7.4.2 Unless otherwise provided herein, WSDOT may terminate this Agreement upon thirty (30) calendar days written notice to the Utility. Should WSDOT terminate this Agreement, the Utility shall reimburse WSDOT for all actual direct and related indirect expenses and costs, including mobilization, construction engineering, contract administration and overhead costs, incurred by WSDOT up to the date of termination associated with the Utility Work. The Utility acknowledges and agrees that should WSDOT terminate this Agreement, such termination shall not relieve the Utility from its responsibility to design, remove, relocate and/or construct its facilities so as not to delay or conflict with WSDOT's Project. WSDOT agrees to provide to the Utility all Work-related documents upon final payment by the Utility.
- 7.5 Amendments: This Agreement may be amended by the mutual agreement of the Parties. Such amendments or modifications shall not be binding unless put in writing and signed by persons authorized to bind each of the Parties.
- 7.6 Independent Contractor: Both Parties shall be deemed independent contractors for all purposes, and the employees of each Party and any of its contractors, subcontractors, consultants, and the employees thereof, shall not in any manner be deemed to be the employees of the other Party.
- 7.7 Audit and Records: During the progress of the Work and for a period of not less than six (6) years from the date of final payment, both Parties shall maintain the records and accounts pertaining to the Work and shall make them available during normal business hours and as often as necessary, for inspection and audit by the other Party, Washington State, and/or Federal Government and copies of all records, accounts, documents or other data pertaining to the Work will be furnished upon request. The requesting Party shall pay the cost of copies produced. If any litigation, claim or audit is commenced, the record, accounts along with supporting documentation shall be retained until any litigation, claim or audit finding has been resolved even though such litigation, claim or audit continues past the six-year retention period.
- 7.8 Working Days: Working days for this Agreement are defined as Monday through Friday, excluding Washington State holidays per RCW 1.16.050.

In Witness Whereof, the parties hereto have executed this Agreement as of the day and year last written below.

<b>Requesting Party</b> <b>Tacoma Public Utilities Director</b>	<b>Washington State Department of Transportation</b>
Signature: _____	Signature: _____
By: _____ Print Name	By: _____ Print Name
Title: _____	Title: _____
Date: _____	Date: _____

<b>Requesting Party</b> <b>Tacoma Water Superintendent</b>	<b>Requesting Party</b> <b>Office of Attorney General</b>
Signature: _____	Signature: _____
By: _____ Print Name	By: _____ Print Name
Title: _____	Title: _____
Date: _____	Date: _____

<b>Requesting Party</b> <b>Tacoma City Attorney</b>
Signature: _____
By: _____ Print Name
Title: _____
Date: _____

**Requesting Party**  
**City of Tacoma**  
**Finance Director**

Signature: \_\_\_\_\_

By: \_\_\_\_\_  
Print Name

Title: \_\_\_\_\_

Date: \_\_\_\_\_

**UTB 1454  
EXHIBIT A**

**SPECIAL PROVISIONS**

**RECITALS**

1. WSDOT and the City of Tacoma are in the process of entering into a right of way turn back agreement or lease agreement for that portion of WSDOT limited access right of way to be utilized for a future shared use path. The proposed agreement will be finalized once construction is completed and final right of way is established.
2. As part of future phases of the Project, WSDOT will be replacing an existing stream culvert with a new bridge at the Wapato Creek crossing of North Frontage Road (SR 509) near Alexander Avenue East. This future project will impact the Utility's facilities and will require the relocation of the Utility's facilities. The Conceptual Design shall consider and accommodate these future impacts.

**SCOPE OF WORK**

The Work proposed in this agreement is for the preparation of final plans, specifications and estimate (PS&E) packages and for the construction of a water main along with the associated appurtenances to be performed during construction of the SR 167/I-5 to SR 509 - New Expressway project as described herein and in accordance with the Special and Technical Provisions (Exhibit D).

**WORK TO BE PERFORMED BY THE UTILITY**

Exhibit C, Sheet 1 through 4

Provide an inspector for the Work.

The Utility shall provide the shutdown of the water main as specified in Exhibit D.

Review and approve Request for Information (RFI) and any changes to the Released for Construction (RFC) plans and specifications.

**WORK TO BE PERFORMED BY WSDOT**

Exhibit C, Sheet 1 through 4

Furnish all labor, materials, and equipment for installation of the water main, and associated appurtenances.

Monitor the existing water main within SR 509 right of way for settlement from roadway fill material.

Deactivate or remove all decommissioned water pipe, chambers and appurtenances within the limits of the utility relocation.

Provide a minimum of 30 calendar days' notice to Utility prior to disconnection and/or reconnection of water main.

Provide Utility with Daily Inspection Reports (DIR), special inspection reports, material submittals and testing reports.

#### **PERMIT OR FRANCHISE**

The Utility shall apply for and the State shall convey the necessary statutory permit or franchise pursuant to chapter 47.44 RCW required for installation of such facilities that remain on or cross the WSDOT right of way.

#### **SALVAGE**

No credits for salvage of materials is included in the Work.

#### **BETTERMENTS**

No betterments are included in the Work.

#### **FINANCIAL RESPONSIBILITY**

The Utility is responsible for all design, construction and administration costs for utility facilities relocated pursuant to a utility franchise/permit as specified in this Agreement, and in accordance with Franchise Permit 10358C, Amendment #7.

The Utility is responsible for the design, construction and administration costs for all Betterment Work.

## EXHIBIT B

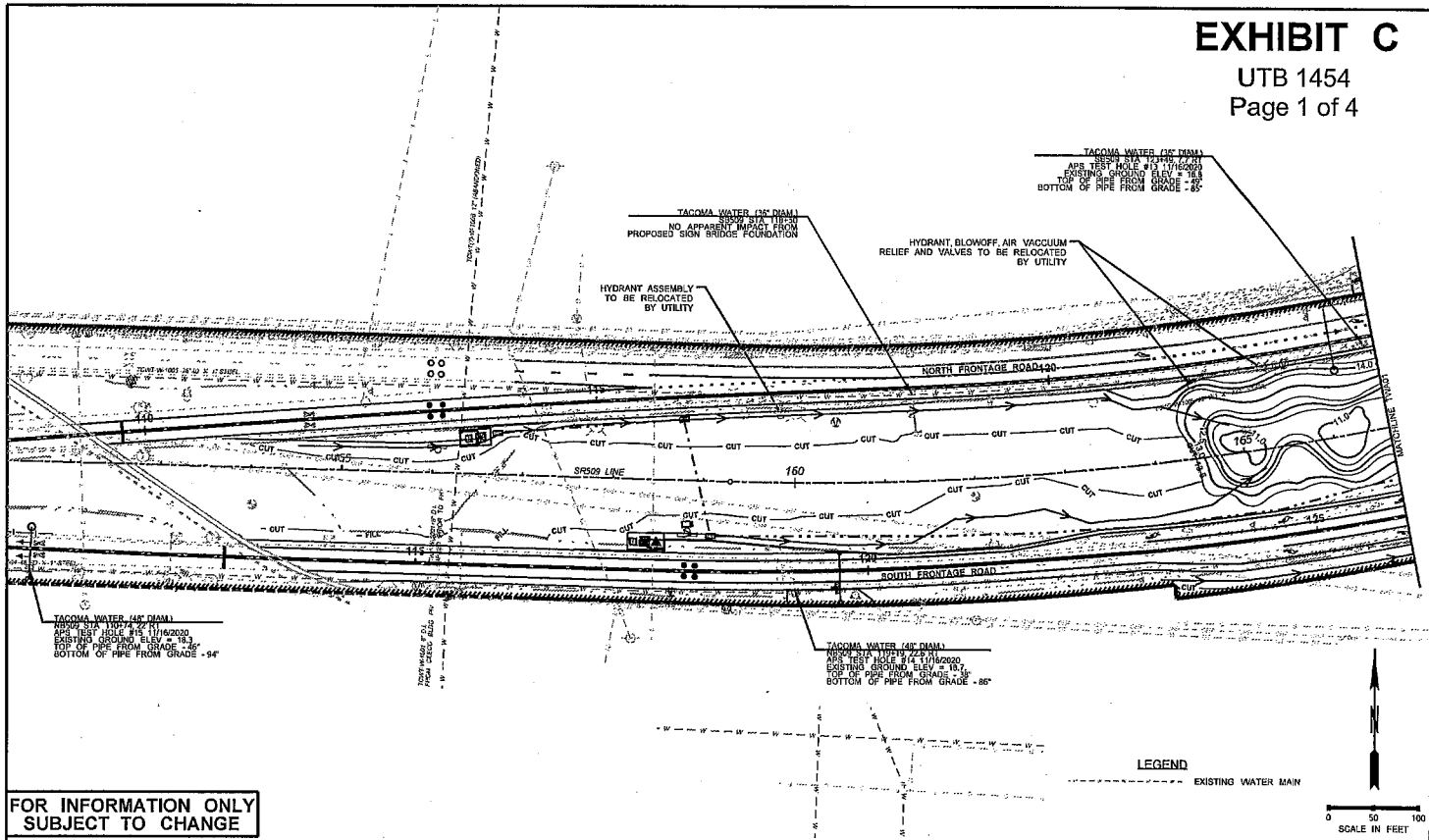
### SR 167 / I-5 TO SR 509 - NEW EXPRESSWAY UTILITY CONSTRUCTION AGREEMENT Conceptual Cost Estimate

Tacoma Public Utilities - Water Division

ITEM #	WSDOT STD. SECTION	WSDOT STD. ITEM #	ITEM	UNIT	ESTIMATED QUANTITY	UNIT PRICE	AMOUNT
<b>WATER LINES</b>							
1	1-10	6971	PROJECT TEMPORARY TRAFFIC CONTROL	L.S.	1	\$40,000.00	\$40,000
2	2-01		ABANDON WATER MAIN 48 IN. DIAM. STEEL	L.F.	2,710	\$50.00	\$135,500
3	2-01		REMOVE WATER MAIN VAULT	EACH	2	\$2,000.00	\$4,000
4	2-12	7530	CONSTRUCTION GEOTEXTILE FOR SEPARATION	S.Y.	4,073	\$20.00	\$81,467
5	7-09	3806	EXTRA TRENCH EXCAVATION	C.Y.	1,704	\$40.00	\$68,178
6	7-09	3810	REMOVAL AND REPLACEMENT OF UNSUITABLE MATERIAL	C.Y.	6,818	\$25.00	\$170,444
7	7-09	3815	BANK RUN GRAVEL FOR TRENCH BACKFILL	C.Y.	3,409	\$35.00	\$119,311
8	7-09		STEEL PIPE FOR WATER MAIN 48 IN. DIAM. (See Note 1)	L.F.	3,221	\$1,050.00	\$3,382,050
9	7-09		STEEL CASING 60 IN. DIAM.	L.F.	540	\$750.00	\$405,000
10	7-09		STEEL CASING 60 IN. DIAM. RAMMING	L.F.	150	\$1,000.00	\$150,000
11	7-09		STEEL CASING 60 IN. DIAM LAUNCHING AND RECEIVING PITS	EACH	2	\$260,000.00	\$520,000
12	7-09	7007	SHORING OR EXTRA EXCAVATION TRENCH	S.F.	32,100	\$3.00	\$96,300
13	7-09		WATER MAIN CONNECTION (See Note 2)	EACH	2	\$100,000.00	\$200,000
14	7-12	3837	COMB. AIR RELEASE/AIR VACUUM VALVE ASSEMBLY 2 IN.	EACH	2	\$5,000.00	\$10,000
15	7-12		WATER MAIN ACCESS MANHOLE/MANYWAY	EACH	2	\$15,000.00	\$30,000
16	SP		PAVEMENT RESTORATION AND TRENCH PATCHING	L.F.	100	\$200.00	\$20,000
17	SP		POTHOLING	L.S.	1	\$15,875.00	\$15,875
18	SP		DEWATERING	L.S.	1	\$20,000.00	\$20,000
19	8-01	6490	EROSION/WATER POLLUTION CONTROL	L.S.	1	\$25,000.00	\$25,000
20	8-15	1085	QUARRY SPALLS	C.Y.	1,343	\$50.00	\$67,167
<b>WATER MAIN SUBTOTAL</b>							<b>\$5,560,292</b>
Construction Mobilization (10%)							\$556,029
<b>SUBTOTAL 2</b>							<b>\$6,116,321</b>
DB Engineering and Quality (9%)							\$550,469
DB Contract Administration (5%)							\$305,816
DB Engineering Mobilization (10% DB Eng and Admin)							\$85,628
<b>SUBTOTAL 3</b>							<b>\$7,058,234</b>
Sales Tax - City of Tacoma (10.2%)							\$719,940
<b>CN SUBTOTAL</b>							<b>\$7,778,174</b>
CN Eng & Inspection (7.5%)							\$583,363
Project Contingency (4%)							\$311,127
<b>CN TOTAL</b>							<b>\$8,672,664</b>
<b>INDIRECT COSTS (13.23%)</b>							<b>\$1,147,393</b>
<b>TPU WATER MAIN RELOCATION TOTAL</b>							<b>\$9,820,058</b>
<p>1. THE UNIT PRICE FOR STEEL PIPE FOR WATER MAIN ____ IN. DIAM. INCLUDES ALL COSTS FOR WATER MAIN INSTALLATION IN ACCORDANCE WITH WSDOT STANDARD SPECIFICATIONS 7-09.5 AND THE TACOMA WATER SPECIAL PROVISIONS.</p> <p>2. TACOMA WATER TO PROVIDE THE SHUT DOWN AND DEWATERING OF EXISTING WATER MAIN PRIOR TO CONNECTIONS.</p>							

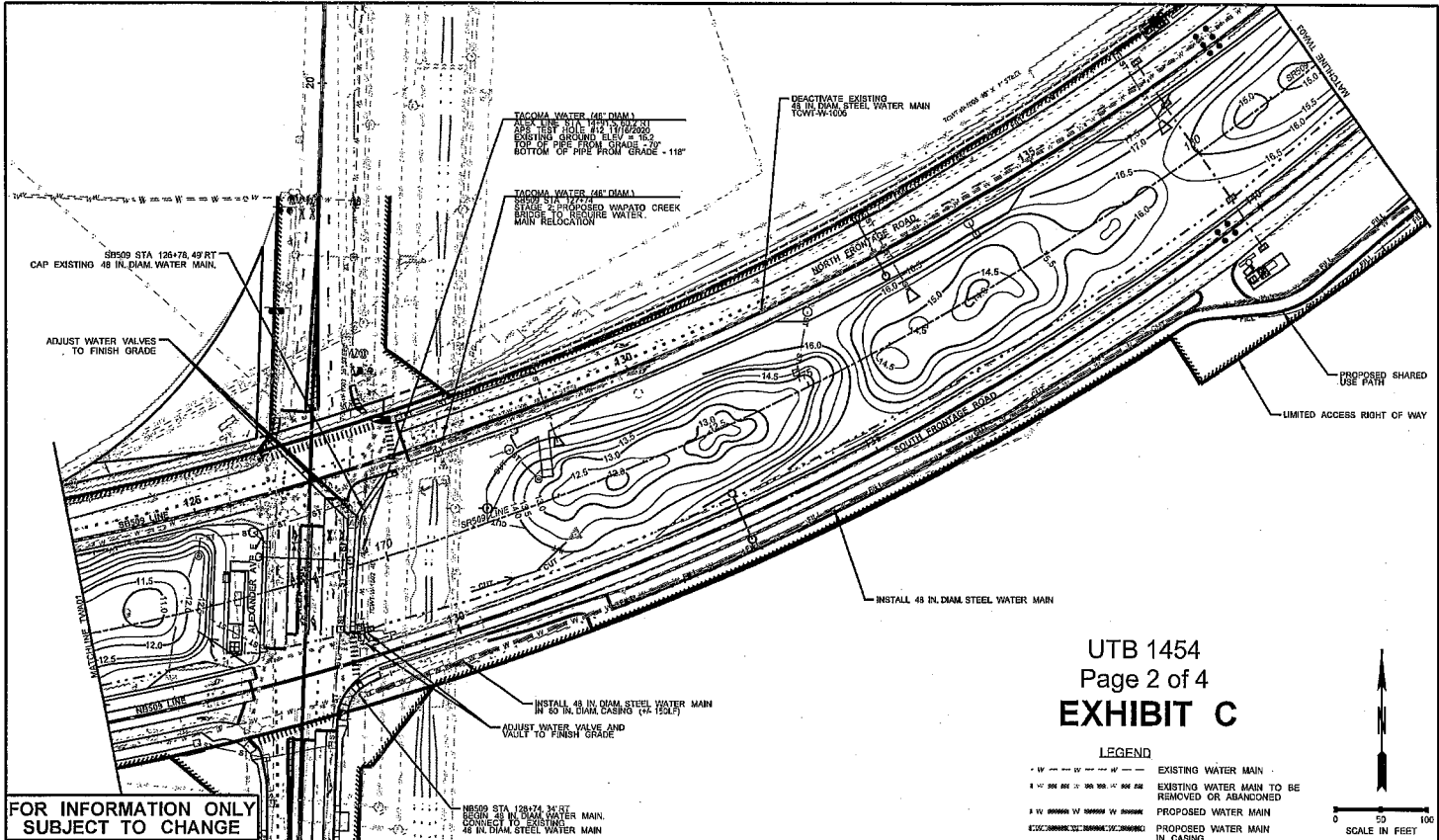
# EXHIBIT C

UTB 1454  
Page 1 of 4



**FOR INFORMATION ONLY  
SUBJECT TO CHANGE**

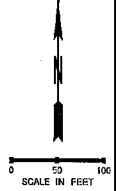
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TIME: 11:28:37 AM	RELEASE FOR CONSTRUCTION RECORD	10	WASH				
DATE: 4/19/2021							
DESIGNED BY: G. NELSON							
ENTERED BY: J. KIRKMAN							
CHECKED BY: A. FISHER							
PROJ. ENGR: G. RODERKURST							
REGIONAL ADM. J. WHITE							
DESCRIPTION:	DATE:	NO.	XL5466				



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Page 2 of 4  
**EXHIBIT C**

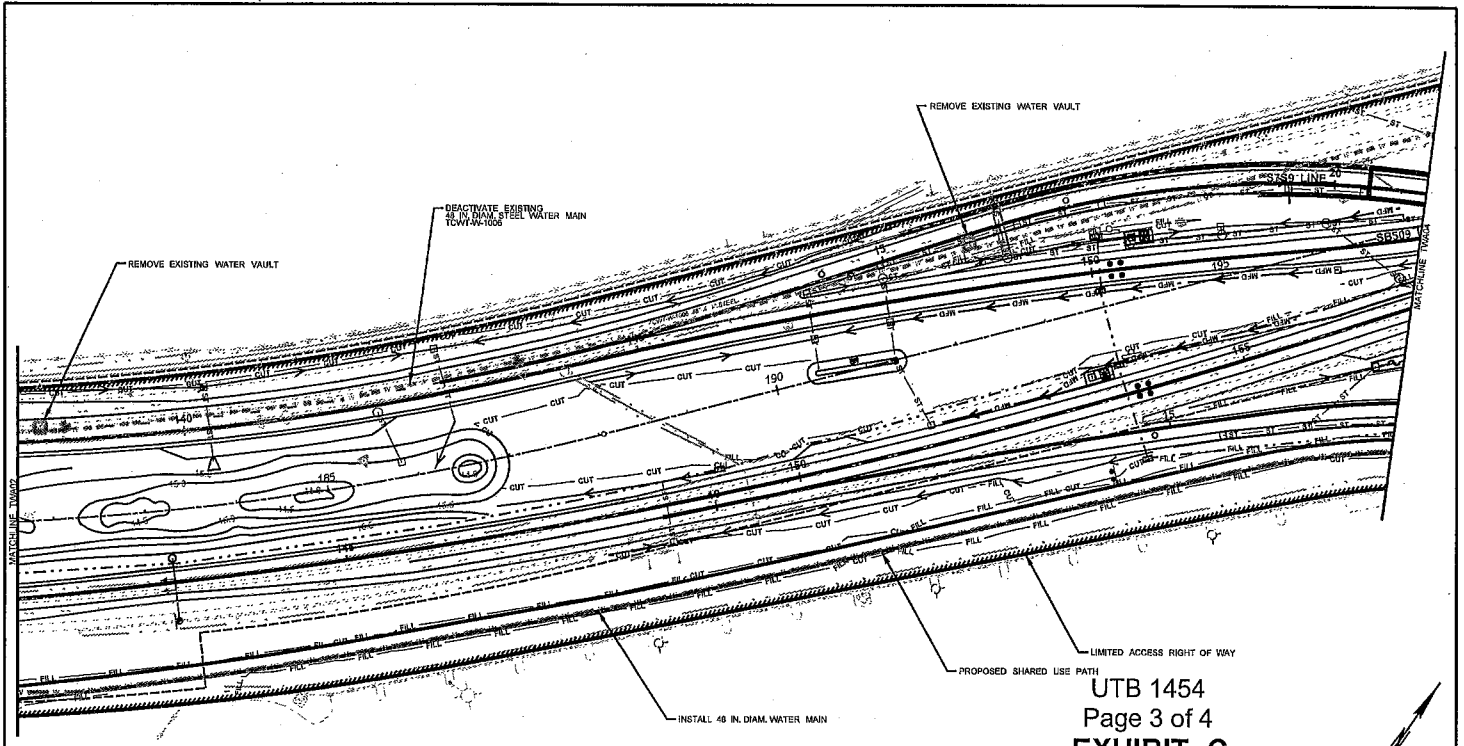
**FOR INFORMATION ONLY  
SUBJECT TO CHANGE**

**LEGEND**  
 - - - - - EXISTING WATER MAIN  
 - - - - - EXISTING WATER MAIN TO BE REMOVED OR ABANDONED  
 - - - - - PROPOSED WATER MAIN  
 - - - - - PROPOSED WATER MAIN IN CASING



FILE NAME: C:\pww\1454\1454.dwg TIME: 12:12:51 PM DATE: 4/12/2021 RELEASE FOR CONSTRUCTION RECORD		COUNTY: 10 STATE: WASH FEDERAL PROJ. NO.: CONTRACT NO.: XL5466 LOCATION NO.:		SR 167 I-5 TO SR 509 NEW EXPRESSWAY TACOMA WATER RELOCATION PLAN	PLAN REF NO: YWA02 SHEET 2 OF 4
PLOTTED BY: JMB DESIGNED BY: G. NELSON ENTERED BY: J. KIRKMAN CHECKED BY: A. FISHER PROJ. ENGR: C. RODERIGUS REGIONAL ADM: J. WHITE	DESCRIPTION DATE NO.				

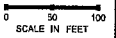




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Page 3 of 4  
**EXHIBIT C**

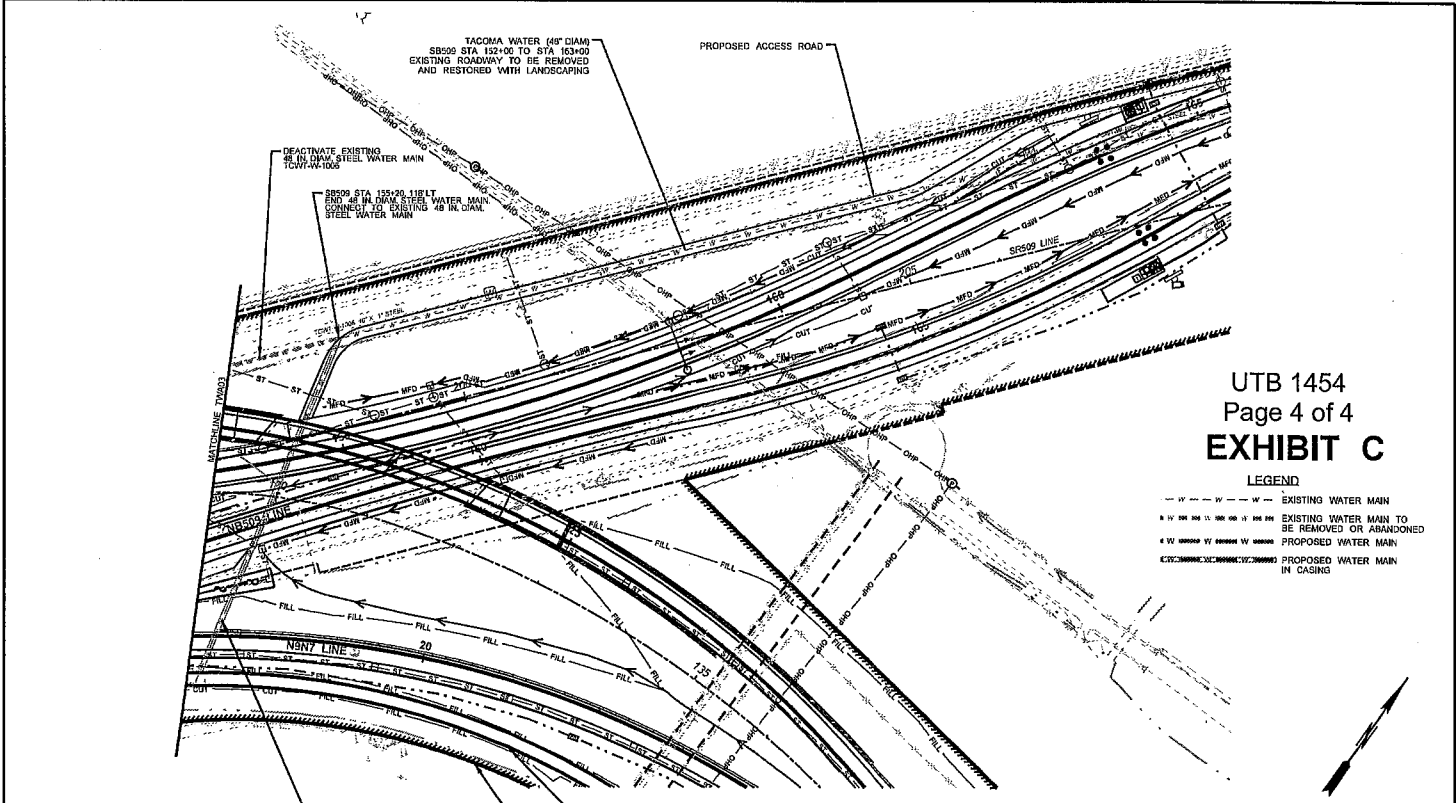
**LEGEND**

- EXISTING WATER MAIN
- EXISTING WATER MAIN TO BE REMOVED OR ABANDONED
- PROPOSED WATER MAIN



**FOR INFORMATION ONLY  
SUBJECT TO CHANGE**

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TIME: 1:48:56 PM		RELEASE FOR CONSTRUCTION RECORD	10	WAB3			
DESIGNED BY: G. NELSON	ENTERED BY: J. KIRKMAN	CHECKED BY: A. FISHER	PROJ. ENGR: C. RODERQUIST	REGIONAL ADM. J. WHITE	TACOMA WATER RELOCATION PLAN		
DESCRIPTION		DATE	NO.	XL5466	SHEET 3 of 4		



UTB 1454  
Page 4 of 4  
**EXHIBIT C**

**LEGEND**  
 --- EXISTING WATER MAIN  
 --- EXISTING WATER MAIN TO BE REMOVED OR ABANDONED  
 --- PROPOSED WATER MAIN  
 --- PROPOSED WATER MAIN IN CASING



**FOR INFORMATION ONLY  
SUBJECT TO CHANGE**

INSTALL 48 IN DIAM STEEL WATER MAIN IN 60 IN DIAM CASING (14-3600)  
 PROPOSED SHARED USE PATH  
 LIMITED ACCESS RIGHT OF WAY

FILE NAME	C:\PW\004002895\10221-04-17-167-15-16-UTB-CR\01\locam\WATER SR167\North\DISPUCrossing\TWAD4.dwg	DATE	4/12/2021	RELEASE FOR CONSTRUCTION RECORD	SCALE	10 WASH	PED. AID PROJ. NO.	---		SR 167 I-5 TO SR 509 NEW EXPRESSWAY	TACOMA WATER RELOCATION PLAN	PLACED BY NO.	TWA04			
TIME	2:45:17 PM	DESIGNED BY	O. NELSON	CHECKED BY	A. FIESER	PROJ. ENGR.	C. SODERQUIST	REGIONAL ADM.				J. WHITE	DATE	NO.	XL5466	4
DATE	4/12/2021	DESIGNED BY	O. NELSON	CHECKED BY	A. FIESER	PROJ. ENGR.	C. SODERQUIST	REGIONAL ADM.				J. WHITE	DATE	NO.	XL5466	4
DATE	4/12/2021	DESIGNED BY	O. NELSON	CHECKED BY	A. FIESER	PROJ. ENGR.	C. SODERQUIST	REGIONAL ADM.				J. WHITE	DATE	NO.	XL5466	4

# **EXHIBIT D**

## **SPECIAL AND TECHNICAL PROVISIONS**

**FOR**

**SR 509 Water Main Relocation**

**As part of the:**

**SR 167 / I-5 to SR 509 - New Expressway Project**

**CITY OF TACOMA  
DEPARTMENT OF PUBLIC UTILITIES  
TACOMA WATER**

**SPECIAL AND TECHNICAL PROVISIONS FOR  
SR 509 Water Main Relocation**

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## **1.0 General Overview**

### **1.1 SCOPE OF WORK**

The work to be performed under this contract includes the installation of approximately 3,300 linear feet of Tacoma Water's PL5 Transmission Main (PL5). This includes furnishing all labor, tools, and materials for removing sections of existing steel pipe as required, installing a new section of pipe (via buried and trenchless construction) and a new in-line butterfly valve, vault, and appurtenances and site restoration in accordance with the Plans, Scope of Work and these Specifications.

### **1.2 QUALIFICATIONS OF CONTRACTOR**

The experience and responsibility of the Contractor will be considered in authorizing the work on this contract. Contractors must present evidence ahead of the time of beginning work on this contract that they have had experience in the kind of work to be performed and have the necessary equipment, personnel, and capital to carry on the work expeditiously and in a satisfactory manner.

WSDOT & Tacoma Water will consider the qualifications of the Contractor, based upon their construction record, and may check references in determining the best and most responsible Contractor. The Contractor shall have performed work of a similar scope on steel pipelines greater than 24-inch diameter on at least two projects within the past ten (10) years. Inexperienced Contractors and those who have failed to properly perform other contracts may be rejected for such cause.

### **1.3 PLANNING THE WORK**

The Contractor shall submit, in writing, a plan and schedule of his/her work. The schedule shall include the construction sequence and hours of operation. The WSDOT & Tacoma Water must approve this plan and schedule. The Contractor shall give a minimum of seven (7) calendar days' written notice to the Tacoma Water prior to commencing work. Contractor delays resulting from work required to be completed by Tacoma Water forces, such as shutdowns or disinfection work, shall be considered by the Contractor in his/her schedule.

Tacoma Water anticipates the need for the Contractor to operate 24 hours each day while the excavation locations remain exposed during the removal of the steel pipe sections, lining operations, and the installation of steel pipe connection pieces. As required, the Contractor shall submit a request for permission to work beyond the normal straight time, eight hours per day, Monday through Friday, when the Contractor submits their project schedule.

If extreme weather conditions or other unforeseen circumstances are deemed by Tacoma Water to be unsuitable for proper installation of improvements in accordance with these specifications, then the work shall not start or shall be interrupted until conditions have improved sufficiently as to allow the work to progress without delay until completed. The Contractor shall not be responsible for those days. Tacoma Water's decision to suspend work due to unsuitable weather conditions shall be conclusive on the issue.

### **1.4 ALIGNMENT, GRADE, AND TOLERANCE**

The grade line shown on the drawing profile is the centerline or axis for the steel pipe. The pipe and appurtenances shall be assembled in the trench without material departure from the line, grade and stationing shown on the plan and profile.

## **1.5 SURVEYING**

Alignment and grade stakes will be provided by the Contractor. Alignment and grade shall be taken from the approved Tacoma Water plans, and stakes placed by a licensed professional surveyor or at his/her direction. Double stakes shall be placed at all fittings and water structures. Single stakes shall be placed at every half and full station, consistent with the surface grade elevation stationing shown on the approved Tacoma Water plans. Stakes shall be offset and shall have a lath guard stake showing the cut or fill to flow-line of the pipe and finished grade. The Tacoma Water Inspector will check and approve the staking at the pre construction meeting prior to any construction commencing.

A cut sheet shall be provided showing cuts to flow-line grade, finished grade and all other applicable information 3 days prior to the pre construction meeting.

The Contractor shall lay each length of pipe using a "scissor" level (scissor stick) and string line set on metal rods driven in the ground at each stake. The surveyor's stakes shall be used to set the string at the proper elevations.

Any other procedure shall have the approval of the Tacoma Water Inspector.

## **1.6 WORKMANSHIP**

Work shall be performed in a workmanlike manner, by craftsmen skilled in the particular trade, according to best method known for each craft. Work shall be performed in accordance with the Tacoma Water approved Plans, Specifications, manufacturers' recommendations, and following industry standards. Completed work shall present a neat and finished appearance.

Lay work to true lines, plumb, and level, except as otherwise noted.

## **1.7 MATERIALS**

All equipment and materials incorporated in the permanent work are to be new and unused, high quality, free from any defects, and suitable for the intended use and the space provided. Materials shall be approved by the latest Standards of American Society for Testing Materials (ASTM) and American Water Works Association (AWWA), wherever standards have been established by those organizations. All materials to be in contact with potable water shall comply with the requirements of National Sanitation Foundation (NSF) Standard 61.

Furnish and install all incidental items not specifically shown or specified, which are required by good practice to provide a complete and fully operational system. The components specified in this Specification (i.e. valves, dismantling joints, etc.) shall include all the accessories, gaskets, follower glands, nuts, bolts, etc., necessary to complete the project on the approved Plans. Where two or more units of the same class of material or equipment are required, provide products of a single manufacturer/supplier.

## **1.8 SUBMITTALS**



Before any material is fabricated or shipped, the Contractor shall electronically furnish to Tacoma Water a complete set of subcontractor documents, equipment brochures, technical data, full details, dimensions, catalog cuts, schematic (elementary) diagrams, material certifications, quality control testing reports, and other descriptive matter as required to fully describe the exact equipment proposed to be included in this contract. The names, addresses, and phone numbers for the representative of each item shall also be included. Some materials require additional submittals, as noted elsewhere in these Specifications.

Should any item which deviates from these Specifications be included, the deviation shall be clearly indicated and explained at the time of submittal.

Submittals shall be complete, neat, orderly, and indexed. The submittals shall be indexed to reference the Specification section for which the material/equipment is applicable. The Contractor shall check submittals for number of copies, adequate identification, correctness, and compliance with the Plans and Specifications. The Contractor shall revise and/or resubmit all submittal information until it is acceptable to the Tacoma Water.

The Tacoma Water will return prints of each submittal to the Contractor with comments noted thereon, within 21 calendar days following their receipt by the Tacoma Water. It is considered reasonable that the Contractor shall make a complete and acceptable submittal to the Tacoma Water by the second submission of a submittal item. The Tacoma Water's maximum review period for each submittal, including all resubmittals, will be 21 calendar days per submittal. In other words, for a submittal that requires two resubmittals before it is complete, the maximum review period for submittal could be 42 calendar days. No material shall be fabricated or shipped prior to acceptance of the submittal by the Tacoma Water.

Review of submittal information by the Tacoma Water shall not relieve the Contractor of responsibility for meeting the requirements of the Plans and Specifications, or for errors and omissions in submittals. Reviews by Tacoma Water do not constitute an undertaking on the part of Tacoma Water to assure or determine compliance with the Plans and Specifications.

The acceptance of submittals by electronic means shall be allowed upon receipt of prior approval from the Tacoma Water.

Submittal requirements, include, but are not necessarily limited to, the following:

<b>SPECIFICATION SECTION NUMBER</b>	<b>DESCRIPTION</b>
1.2	Contractor Qualifications
1.3	Project Schedule
2.1	Steel Pipe and Specials
2.2	Pipe Manufacturer Qualifications
2.4	Quality Certification Program Statement of Qualifications
2.5	Welding Procedures
2.8	Welding Certification
3.1	Pipe Lining and Coating
3.6	Heat Shrink Sleeve
4.7	Coarse Sand
4.7	Crushed Surfacing Top Course

<b>SPECIFICATION SECTION NUMBER</b>	<b>DESCRIPTION</b>
4.7	Granular Fill
5.1	Pre-Cast Concrete Vault
5.1	Crushed Surfacing Base Course
5.2	Manhole Frame and Cover
5.2	Steel Ladder
5.2	Gate Boxes and Covers
5.2	Valve Stem Extension
5.4	Gate Valve
5.5	Butterfly Valve
5.6	Combination Air Valve
5.7	Corporation Stop
5.8	Valve Boxes
5.9	Gaskets
5.10	Bolts and Nuts
5.11	Dismantling Joint

### **1.9 TACOMA WATER APPROVED EQUAL**

When the statement 'Engineer Approved Equal' or 'Equal' is made on the drawing or in the Specification, it shall mean a like product, of equal or better quality, suitability, reliability, performance, and dimension to the specified item or product.

If Tacoma Water does not consider the proposed substitute item or product an approved equal or better, it may be rejected. The decision of Tacoma Water is final.

### **1.10 CONFLICT WITH OTHER UTILITIES AND IMPROVEMENTS**

Surface and underground utilities and improvements, so far as known which may affect the work, are shown on the Drawings.

It shall be the Contractor's responsibility to comply with the one-call underground utility locate law, Chapter RCW 19.122, and to notify all utilities in the area prior to any excavation so that actual field locations of existing lines can be made.

It shall be the Contractor's responsibility to confirm or research depth of utilities.

Should the Contractor find any conflict between the proposed location of the pipe and the utilities or other improvements he/she shall immediately notify the Tacoma Water.

It shall be the responsibility of the Contractor to establish the location of any and all underground utilities in proximity to the site that may be affected by the Contractor's work and shall maintain markings indicating the location of such facilities until the completion of all work.

It shall be the Contractor's responsibility to maintain utility services through the duration of the project.

### **1.11 DAMAGE TO EXISTING IMPROVEMENTS**

The Contractor is responsible for all damages to existing improvements on, under or adjacent to the work site caused by his operation.

If the Contractor damages a utility which has been properly located, the Contractor shall be responsible for all costs associated with the repair. Should the Contractor accidentally damage an underground facility which is incorrectly located (as defined by Chapter 19.122 RCW) by Tacoma Water, then the damage shall be repaired at no cost to the Contractor. The Contractor shall have no claim for additional compensation or time against this contract due to improper location of utilities. Any damages will be the responsibility of the locating utility.

The risk of loss resulting from changed or differing site conditions as defined in RCW Section 19.122.040 is the responsibility of the Contractor or his successors in interest.

The Contractor shall protect from damage all private and public utilities along the pipeline alignment. If the Contractor needs to temporarily support or relocate any poles, pipes, cables, or other improvements, such work, including all coordination, shall be done at the expense of the Contractor in accordance with the requirements of the utility, agency, or owner involved. The Contractor is advised there may be long lead times associated with coordination, temporary support, or relocation of utilities, so these issues should be investigated as soon as possible. No additional compensation will be paid for such work involving other utility facilities; or for any associated delay.

#### **1.12 CLOSE-OUT PROCEDURES**

The Contractor shall notify the Tacoma Water in writing when all work or portions of the work are complete and ready for inspection. The Tacoma Water will process a final inspection document (punch list) of outstanding items and forward to the Contractor. The Contractor shall promptly correct any deficiencies noted.

The Contractor shall notify the Tacoma Water in writing when all punch list deficiencies have been completed. The Tacoma Water will set a time for final inspection, at which time the Tacoma Water, and the Contractor shall jointly inspect the work. The Contractor will promptly correct any further deficiencies noted.

#### **1.13 ADDITIONAL INFORMATION**

Any general information required on this contract may be obtained by calling the Tacoma Water, Jesse Angel, at 253-502-8280 or by e-mailing at [jangel@cityoftacoma.org](mailto:jangel@cityoftacoma.org).

## **2.0 Technical Provisions Furnishing and Fabricating Steel Pipe**

### **2.1 FURNISHING STEEL PIPE**

The Contractor shall furnish welded steel pipe complete with appurtenances as shown on the Drawings and hereafter specified. The term appurtenances is used in these Specifications to describe the furnishing of welded steel pipe complete with the bends, reducers, connection sections, sleeves, manholes, passholes, blowoff connections, air valve connections, service connections, flanges, fittings, drop holes, doubler plates, coatings and linings, and all other items unless specifically stated otherwise in these Specifications.

### **2.2 QUALIFICATION OF PIPE MANUFACTURER**

All steel pipe and fittings shall be furnished by a manufacturer who is fully experienced, reputable, and qualified in the manufacture of the products to be furnished. Pipe shall be the product of one manufacturer that has at least five (5) years' experience manufacturing pipe of the type and size indicated on the Drawings and specified herein. In lieu of 5 years' experience, the manufacturer shall have experience fabricating at least 100,000 linear feet of 42-inch diameter or larger steel pipe per *AWWA C200 – Standard for Steel Water Pipe 6 Inches and Larger*.

### **2.3 SHOP DRAWINGS**

It will be the Contractor's responsibility to electronically furnish the Tacoma Water a complete set of shop drawings of the pipe for review prior to fabrication. Tacoma Water shall be notified at least one week prior to starting fabrication so the Tacoma Water Construction Inspector may be present to witness all phases of fabrication.

Corrections or comments made on the shop drawings during review do not relieve the Contractor from compliance with the requirements of the Drawings and these Specifications. This check is only for review of 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 processes and techniques of construction, coordinating its work with that of all other Contractors and agencies, and performing the work in a safe and satisfactory manner.

Shop drawings shall clearly show the location and stationing where the connections to the existing PL5 Transmission Main will be made. The locations shall be based upon a survey made after excavating and exposing portions of the existing pipe and obtaining the Tacoma Water's approval regarding the location of the connection.

The shop drawings shall include details of all pipe and appurtenances including material lists for all pipes as shown on the Plans. Line layout and marking diagrams must clearly indicate the specific number of each pipe and appurtenance and the location of each pipe and the direction of each appurtenance in the completed pipeline. In addition, the line layouts shall include:

1. The station and centerline elevation at all changes in the grade or horizontal alignment
2. The station and centerline elevation to which the bell end of each pipe will be laid.
3. All elements of curves and bends, both in horizontal and vertical alignment.

The following design information shall also be submitted with the shop drawings:

1. Calculations for pipe design and fittings reinforcement and/or test data.
2. Details of joint bonding and field welded joint restraint calculations.

## **2.4 QUALITY ASSURANCE**

Welded steel pipe shall be fabricated, lined, coated, and shop tested by a fabricator following the same procedures required under the Quality Certification Program of the Steel Plate Fabricators Association certification program. If currently certified under the Quality Certification Program, submit statement of qualification. If not currently certified provide statement of General Management Policy as it pertains to assuring the manufacture of a product that meets specified quality requirements.

Except as otherwise indicated or approved by Tacoma Water, all materials and work shall be inspected and tested by the pipe manufacturer in accordance with *AWWA C200 – Standard for Steel Water Pipe 6 Inches and Larger*. All costs in connection with such inspection and testing shall be borne by the Contractor.

Copies of all test reports shall be submitted to Tacoma Water prior to final acceptance of the fabricated steel pipe.

The Contractor shall furnish a certified affidavit of compliance that meets or exceeds the requirements of these Specifications for all pipe and fittings furnished.

## **2.5 FABRICATION OF PIPE**

The pipe shall be fabricated as shown on the Drawings and in accordance with *AWWA C200 – Standard for Steel Water Pipe 6 Inches and Larger* and the following requirements:

1. The steel used in the pipe fabrication shall be in accordance with Table 1 of AWWA C200 and shall have a minimum yield strength of 36,000 psi. All steel used in the pipe fabrication shall be produced by the Continuous Casting Process.
2. All steel pipe shall be of the specified diameter and wall thickness shown on the drawings. The pipe may have weld bell and spigot joints or may be plain end as required for buttstraps, sleeves, or slip joints.
3. All materials used for the fabrication of the pipe and appurtenances shall be new.
4. The interior of the pipe shall be cleaned by chipping or grinding all projections resulting from welding which extend more than 3/32 inch from the surface of the plate unless a smoother finish is recommended by the lining supplier. The exterior of the pipe shall not have projections extending more than 1/8 inch from the surface of the plate unless a smoother finish is recommended by the coating supplier.
5. All joints in 1/4-inch or thicker plate shall not be less than two-pass butt welds for manual work. Automatic welding shall not be less than two passes, made from opposite sides of the plate, and all succeeding passes shall be fully fused into the plate and the preceding weld pass. Refer to welding details Standard Drawing 829-B.

6. Tacoma Water shall have the right at any time to call for and witness the making of test specimens by any welder and to observe the physical tests. All welding rod shall be approved by Tacoma Water.
7. The standard pipe lengths shall be 40 feet long (minimum) with shorter lengths where specials are required. Maximum pipe laying lengths shall be 60 feet. Contractor shall select lengths to accommodate the Contractor's operation, including coordination with traffic control, street, and utility crossing construction.
8. Flanges for connections, passholes, manhole outlets, and blind flanges shall be Class D, suitable for 150 psi working pressure. Flange faces shall be free of lining and coating materials.

## **2.6 MARKING**

The pipe manufacturer shall legibly mark all pipes and specials in accordance with the laying schedule and marking diagram. Each pipe shall be numbered in sequence and said number shall appear on the laying schedule and marking diagram in its proper location for installation. All special pipe sections and fittings shall be marked at each end with top field centerline. The word "top" or other suitable marking shall be painted or marked on the outside top spigot end of each pipe section.

The pipe manufacturer shall mark the standard lap and the maximum lap around the outside circumference of the spigot ends of all welded pipe to indicate the location at which the spigot end has reached standard penetration and maximum penetration into the bell.

## **2.7 HANDLING AND SHIPPING OF PIPE**

The pipe shall be handled by the use of wide nylon slings or of other suitable material designed to prevent damage to the pipe coating. The use of slings made of wire, cable, chains, rope or steel straps will not be permitted; nor the use of bridles and hooks in the ends of the pipe. All other pipe handling equipment and methods shall be approved by Tacoma Water.

Each length of pipe shall be sufficiently braced with timber spreaders at each end of the pipe to protect the pipe and coating in shipment. These spreaders and braces shall be placed as soon as the coating has been completed and passed by the Tacoma Water Construction Inspector.

Adequate strutting shall be provided on all straight pipe so as to avoid damage to the pipe during handling, storage, hauling, and installation. For all lined steel pipe, the following requirements shall apply:

1. The strutting shall be placed as soon as practicable after the lining has been applied and shall remain in place while the pipe is loaded, transported, unloaded, installed, and backfilled at the job site.
2. The strutting materials, size, and spacing shall be adequate to support the earth backfill plus any greater loads which may be imposed by the backfilling and compaction equipment.
3. Any pipe damaged during handling, hauling, storage, or installation due to improper strutting shall be repaired or replaced.

4. Strutting shall be placed a minimum of 48 inches from the ends of the pipe, except as required for all special fabrications such as elbows, wyes, tees, outlets, connections, end caps, test bulkheads, and nozzles or other specials.

For shipping, pipe supports shall be cut to fit the diameter of the pipe and be placed at the ends of the pipe lengths in such a manner as to prevent injury to the coating. Alternatively, the pipe may rest on two inch dense foam and carpet covered lumber during transit, provided the pipe and coating remain undamaged. All binding and lifting straps shall be in the form of flat belting or approved equal and shall not be so tight as to distort the pipe. When delivered to the site, the pipe shall be carefully unloaded and landed on sand bags or on two by ten skids approximately four feet long; one for each end of the pipe section, set to clear the coating. Wedge shaped blocks shall be used to hold the pipe on the skids.

Bends may require used tires or sacks filled with straw as additional supports to prevent damage to the coating. Any abrasions or other injuries to the coating shall be fully repaired by the Contractor to the satisfaction of Tacoma Water. Cost of repairing damaged or abraded coatings shall be at the Contractor's expense.

Ends of the pipe shall be covered during transit to protect the pipe lining from exhaust entering the pipe during shipping. The pipe end covering shall be installed shortly after lining and coating is completed and shall consist of 6 mil polyethylene sheeting tightly attached to each pipe end with plastic banding.

## **2.8 CERTIFIED WELDING INSPECTOR**

The Contractor shall provide a certified welding inspector(s) (CWI) for all shop welding as specified in *AWWA C200*. The CWI(s) shall 100 percent visually inspect all welds, verify proper procedures are being followed using qualified welders, supervise Contractor's non-destructive testing. The CWI(s) shall submit written certification that all welds were performed in conformance with these documents. All shop weld tests shall be reviewed and signed by the CWI(s).

All welds shall be in accordance with *AWS D1.1 Structural Welding Code-Steel*, latest edition.

### 3.0 Technical Provisions Coatings and Linings for Steel Pipe

#### 3.1 INTERIOR LINING SYSTEMS

Pipe and fittings, including both new pipe and existing pipe at connection point, shall be lined using a 100 percent solids, two-component, almond colored polyurethane with a minimum 25-mil dry thickness in accordance with the following requirements:

#### 3.2 MATERIALS FOR INTERIOR LINING SYSTEMS

##### A. Shop-Applied Lining

The composition, handling, and application characteristics of the materials to be used for the interior lining of steel pipe and fittings are as follows:

1. The lining material shall consist of a solvent-less aromatic polyurethane, chemical cure, ASTM Type V.
2. The polyurethane shall contain no volatile organic compounds (VOC), solvents, or extending fillers.
3. The polyurethane materials shall have a mix ratio of two parts resin to one part activator.
4. At 75° F, the cure time to be dry to touch shall not exceed eight minutes, to immersion shall not exceed 72 hours, and to normal use shall not exceed 12 hours.
5. The lining shall be able to achieve an application thickness of 25 mils in one application, completely encapsulating welds, rivets, and edges.
6. No primers are to be required by the polyurethane lining to achieve proper performance.

The lining materials to be used on the interior of the pipe and fittings shall meet all of the performance requirements shown below as determined by laboratory testing in accordance with ASTM procedures.

<u>TEST</u>	<u>REQUIREMENT</u>
Adhesion to Steel (ASTM D4541; A.2)	2950 psi
Adhesion to Steel (ASTM D6677)	Rating – 10
Tensile Strength (ASTM D412)	3030 psi
Elongation (ASTM D412)	10%
Flexibility (ASTM D522)	No cracking or delam – one inch Mandrel
Cathodic Disbondment (ASTM G95, mtd A)	0 mm
Water Absorption (ASTM D570)	0.464%
Impact Resistance (ASTM G14)	180 in-lbs



Hardness, Shore D (ASTM D2240)	74±3
Abrasion Resistance (ASTM D4060, CS17)	69.4 mg
Dielectric Strength (ASTM D149)	470 V/mil
Chemical Resistance (ASTM D543)	10% H <sub>2</sub> SO <sub>4</sub> < 1%; 30% NaCl < 1%; 30%NaOH < 2%; #2 Diesel 2% weight, <2% length/width
Health Approvals	NSF 61 listed for pipe size and service temperature

The lining materials shall have a documented history of successful application and performance on water piping greater than five years.

Acceptable products for shop-applied lining systems, or equal:

- LifeLast, Inc. Durashield 210-61

### **B. Field-Applied Lining**

The composition, handling, and application characteristics of the materials to be used for the interior field-applied lining of steel pipe and fittings are as follows:

1. The lining material shall consist of a solventless elastomeric aromatic polyurethane, chemical cure, ASTM Type V.
2. The polyurethane shall contain no volatile organic compounds (VOC) or solvents.
3. The polyurethane materials shall have a mix ratio of three parts resin to one part activator.
4. At 75° F, the cure time to be dry to touch shall not exceed 150 minutes, to immersion shall not exceed 72 hours, and to normal use shall not exceed 24 hours.
5. The lining shall be able to achieve application thicknesses of 25 mils by hand or by spray in one application, completely encapsulating welds, rivets, and edges.
6. No primers are to be required by the polyurethane lining to achieve proper performance.

The lining materials to be used on the interior of the pipe and fittings for use with potable water shall meet all of the performance requirements shown below as determined by laboratory testing in accordance with ASTM procedures.

<u>TEST</u>	<u>REQUIREMENT</u>
Adhesion to Steel, Abrasive Blasted (ASTM D4541)	2680 psi
Adhesion to Steel, Power Tooled (ASTM D4541)	2940 psi

Adhesion to Steel, Abrasive Blasted (ASTM D6677)	10
Adhesion to Steel, Power Tooled (ASTM D6677)	10
Tensile Strength (ASTM D412)	2776 psi
Elongation at Break (ASTM D412)	41%
Flexibility, 75 mils (ASTM D522)	No cracking or delamination – ¾" Mandrel
Water Absorption (ASTM D570)	0.49%
Cathodic Disbondment (ASTM G95, mthd A)	0 mm
Water Absorption (ASTM D570)	0.49%
Hardness, Shore D (ASTM D2240)	72±3
Impact Resistance (ASTM G14)	200 in-lbs
Dielectric Strength (ASTM D149)	527 V/mil
Chemical Resistance (ASTM D543)	10% H <sub>2</sub> SO <sub>4</sub> < 1%; 30% NaCl < 1%; 30% NaOH < 2%;
Health Approvals	NSF 61 listed for pipe size and service temperature

The lining materials shall have a documented history of successful application and performance in potable water piping greater than five years.

Acceptable products for field-applied lining systems, or equal:

- LifeLast, Inc. Durashield 310-61 Joint & Repair System

### 3.3 APPLICATION OF INTERIOR LINING SYSTEMS

#### A. Shop-Applied Lining Systems

Shop-applied lining systems shall be applied in accordance with the manufacturer's instructions and as specified below:

##### i. Minimum surface preparation

Prior to abrasive blasting, the entire area to receive the lining shall be inspected for oil, grease, rust, dust, or any other deleterious substances. Any areas where such deleterious substances are present shall be cleaned. The use of solvents or other commercial cleaners and degreasers is recommended. Hand wiping is acceptable if the surface is not very dirty, however if the surface is extremely contaminated, vapor degreasing or steam cleaning must be used.

The next step is the removal of all mill scale, rust, paint, oxides, corrosion products, or other foreign matter. This can be accomplished by abrasive blasting or hand grinding where blasting is not permitted. The surface shall have minimum cleanliness of SSPC-SP10. The surface to be lined shall have a profile of no less than three mils.

The substrate shall be abrasive blasted to provide a surface that is clean and free of any loose materials. Dry blasting techniques are preferred, but care shall be taken not to remove any more material than is necessary. Blasting shall remove rust, mill scale, and other debris. Sharp edges shall be rounded by wire brushing or grinding. An anchor pattern similar to coarse sandpaper is the type of surface to achieve.

The preferred surface preparation methods for creating a profile are as follows: (in order of preference)

- Aggregate blasting (not including silica sand)
- Shot blasting
- Silica sand blasting

The cleaned interior surfaces of the pipe and fittings shall be inspected for adequate surface preparation. Surface imperfections such as burrs and weld splatter shall be removed by hand filing or grinding to prevent holidays in the applied lining.

Blasting does not remove all the oil on the surface and can often add to the problem by introducing oil from the air used to blast. Therefore, the substrate shall be cleaned and degreased after blasting. Make certain that the surface is completely dry.

After all substrates are prepared, surfaces adjacent to the work area shall be cleaned of dirt, blasting residue, and other debris to prevent wind-blown contamination of the prepared substrate or freshly applied linings.

Just prior to primer or lining application, surfaces to be lined are to be power vacuumed to remove all dust, dirt, blasting residue, and debris. Transitions into adjacent areas not to be lined shall be neatly taped off or protected.

All blasted steel is to be lined within eight hours of blasting. Any blasted steel that is not lined during that time period shall be reblasted. If the steel suffers from flash rusting or any other contamination before lining, it must be decontaminated and reblasted.

## **ii. Application of lining materials**

The lining shall be applied according to the manufacturer's application instructions. The lining shall be applied by a two component, heated airless spray unit approved for such use by the lining manufacturer. Pipe and fittings to be sprayed manually shall use a one coat/multiple pass spray technique. Pipe to be lined using automatic spray equipment may use a single or multiple pass coat to achieve the desired lining thickness. The thickness of the lining shall be measured according to SSPC PA2.

The lining applicator shall have all the necessary equipment available to convey, lift, and move pipe safely and efficiently.

The lining applicator shall be approved by the material manufacturer for the application of the specific lining being applied during the entire project. The lining application shall have

personnel that have been trained by the linings manufacturer within the past twelve months of starting the project. At least one of these trained personnel shall be on site at all times during the lining application.

The temperature of the substrate surface must be at least 5° F above the dew point temperature after blasting and before the application of the lining material. High humidity may cause surface condensation which will affect the bonding of the lining. Therefore, the applicator shall exercise caution if the relative humidity exceeds 85 percent. Heating of pipe surfaces may be required to meet the requirements of the above dew point temperature.

The surface temperature range during lining application shall be between 45° F and 120° F, and within -10° F of the ambient temperature.

### **iii. Relining**

Relining over new lining of the same formulation shall be permitted provided the lining has cured less than the recoat window time specified by the lining manufacturer.

Relining over new lining of the same formulation that has cured for more than the recoat time specified by the lining manufacturer shall be permitted. The existing lining shall be brush-blasted or thoroughly sanded, followed by blow-off cleaning using clean, dry, high pressure compressed air. All surfaces to be relined must show a surface profile of greater than three mils to provide adequate mechanical bonding.

Relining over existing linings of a different type or formulation such as a primer or epoxy shall not be permitted without the approval of both the Tacoma Water Engineer and the lining manufacturer.

### **iv. Holdbacks for field joints**

Where the pipe sections are to be joined together by field welding, a band of six inches shall be left unlined. This band is to receive the same surface preparation as the rest of the pipe.

### **v. Inspection**

The entire lining work is to be inspected to verify that the surface preparation and lining application has been completed as specified.

The lining applicator shall utilize a quality assurance program to ensure that the quality controls herein specified are followed. Complete records of all inspection work must be kept and made available to Tacoma Water at any time.

At Tacoma Water's option, the entire lining procedure shall be inspected from the time of surface preparation to the completion of the lining by Tacoma Water. Such inspection shall not relieve the lining applicator of its quality assurance requirements.

If it is found that the procedures for applying the lining are not in accordance with this Specification, any pipe or fittings that was lined during that time period may be rejected.

### **vi. Surface Preparation**

**Profile and Appearance:** The depth of profile shall be determined by using replica tape. Color of blast shall be determined with the visual comparative standards SSPC VIS 1. The profile shall be greater than 2.5 mils and the color shall be SSPC SP10 (near white).

**Dust:** Amount of dust on the pipe or fittings after blasting is to be determined by placing a one inch by six inch piece of scotch tape on the pipe or fitting (sticky side toward the steel). The tape is removed and a visual estimate of the amount of dust on the tape is made. The amount of dust shall be less than ten percent.

**Environmental Conditions:** Humidity and dew point shall be measured using a standard sling psychrometer. Surface temperature shall be measured with a thermometer. The steel temperature shall be greater than 5° F above the dew point.

**Frequency of Measurements:** The profile, color, and percent dust measurements shall be made on the first and last pipe or fitting of each shift. The humidity and dew point shall be calculated at the same time the first and last pipe or fitting of each shift are blasted. It is the option of the lining applicator to make more frequent measurements during the shift if desired.

**Rejection:** If the last measurement of the shift shows inadequate profile or blast color all of the pipe or fittings blasted and lined after the last acceptable tests for that day shall be rejected.

#### vii. Primary Lining

**Test Spray.** The lining applicator shall apply a small section of lining on cardboard (or other surface) approximately 5 square feet at the beginning of each shift to determine that the spray equipment is working properly. The applicator shall confirm that the spray pressures, material temperatures, lining setting time and lining appearance meet the manufacturer's requirements. The applicator shall not spray any steel until these requirements are met. The results of this test spray are to be recorded for inspection purposes.

**Lining Appearance:** The finished lining shall be generally smooth and free of sharp protrusions. A minor amount of sags, dimpling, and curtaining which does not exceed five percent of the surface shall not be considered cause for rejection. The lining shall not have any blisters, bubbles, pinholes, off-ratio discoloring, off-ratio of any kind due to spray application triggering on target, sticky spots, pigment separation, and any other defects due to improper application. There shall be no goeey or sticky areas in the lining. All lined pipe and fittings are to be visually inspected.

**Dry Film Thickness.** Dry film thickness is to be measured according to SSPC PA2 with a magnetic thickness gauge. The lining thickness of every tenth pipe or fitting lined shall be measured as well as the first and last pipe or fitting lined on each shift. If the thickness is found to be less than specified, all the pipe and fittings lined since the last thickness test shall be checked and relined if necessary.

**Adhesion:** Select two pipe or fittings each day at random that have cured for at least one hour and perform an "X" cut adhesion test. Make a small "X" cut through the lining down to the steel with a sharp knife. Each of the two arms of the "X" should be approximately 1 inch long. With the point of the knife, attempt to remove the lining at the center of the "X" by sliding/poking the knife point under the lining. If lining is removed easily in large sections greater than two square inches, the pipe or fitting shall be rejected and the lining application stopped. Begin a systematic check on all pipe and fittings lined that day and reject all pipe and fittings that do not pass this test. Continue to check every pipe and fitting until ten consecutive acceptable tests are made. Then return to checking two pipe or fittings at random each day.

Complete only one test per pipe or fitting. Note that some qualitative judgment is necessary and that the longer the lining has cured, the greater the adhesion. Repair damaged areas of pipe passing test.

**Holiday Testing:** Holiday inspection shall be conducted on all pipe and fittings in accordance with NACE RP-0188 using a minimum 100 volts per mil any time after the lining has reached sufficient cure according to the manufacturer. Each holiday found shall be marked and repaired as specified. If more than four holidays per 100 square feet are found, the pipe is to be rejected and relined.

#### viii. Repair and touchup

Areas requiring repair shall be determined by the inspection and testing procedures.

**Removal of Old Lining:** Completely remove all damaged or improperly applied lining by power tool or abrasive blasting. Uncured lining that is sticky or goeey may have to be removed by solvent washing. Ensure that the area around section to be repaired is well adhered. Remove additional surrounding lining if necessary until good, proper, sound well adhered lining is reached. Note it is not necessary to remove lining that is well adhered.

**Repair of Thin Lining:** To increase the lining thickness for areas that do not meet the minimum thickness requirements, recoat as specified. Note that it is not necessary to remove well adhered, properly applied existing lining.

**Surface Preparation:** Ensure that the substrate is clean, dry, and uncontaminated. Solvent wash using clean rags and solvent if necessary. For small areas less than 5 square feet that have been previously abrasive blasted, use coarse sandpaper, wire wheel or grinder to return surface to SSPC-SP10 condition. For larger areas, use abrasive blasting to return surface to SSPC-SP10 condition.

Roughen approximately 2 inches of the existing lining surrounding the repair area using the same surface preparation tools so that it has a greater than 2-mil profile as well.

**Repair Material Selection.** Use only repair materials recommended by the linings manufacturer. For small areas less than five square feet, use either the originally applied lining or a manually applied repair material specifically made for that purpose. For larger areas, use only the originally applied material.

**Repair Material Application.** Apply the repair lining as per the manufacturer's instructions. Coat entire metal surface and 1 inch onto the existing lining that has been previously prepared. Note that approximately 1 inch of the existing (but roughened) lining is to be left unlined to provide evidence of surface preparation.

**Repair Material Thickness.** Apply repair materials to the same thickness or greater as originally specified for the lining being repaired.

#### B. Field-Applied Lining Systems

Field-applied lining systems shall be applied in accordance with the manufacturer's instructions, as specified for shop-applied lining, and as specified herein. Preparation and application of field lining will not proceed until pipe installation.

The lining manufacturer shall provide a factory-trained, qualified representative onsite at the start of pipe installation for three days, minimum, to inspect surface preparation and field lining application.

During the welding process, the lining shall be protected from welding sparks and splatter by means of protective barriers. The following steps are to be completed after the welding operation is complete, the welds tested and accepted by the Tacoma Water Construction Inspector.

**i. Minimum surface preparation**

Remove water, mud, dirt, grease, weld splatter, loose factory over lining, and any deleterious substances from the holdback area to be lined. Using a suitable blasting media, abrasive blast the steel surface (weld and holdback area) to a SSPC-SP10 finish with a minimum 3.0 mil (76 micron) angular profile. Caution shall be taken to ensure that the abrasive blasting surface preparation is creating the required surface profile and not damaging or removing the factory-applied lining. Use a power tool to clean and remove lining gloss along approximately three inches of the existing polyurethane until smooth and uniform. Sand blast pit-free taper on either side of the holdback to produce a 2.5 mil profile in the secure lining surface. Power tool cleaning of the adjacent polyurethane is required after abrasive blasting of the steel joint. Caution shall be taken to ensure that the angular profile is not removed during the power tool process. All factory spiral welds within the adjacent polyurethane tie-in area must be hand sanded to prevent the removal of the lining on the weld apex and ensure that the weld area is completely free of lining gloss.

**ii. Environmental conditions**

In order to avoid moisture contamination of the steel, the Contractor shall provide dehumidification equipment such that the substrate surface temperature will remain at least 5° F above the dew point temperature. Such dehumidification equipment shall be operated continuously from time of starting surface preparation until the field lining is applied and cured.

High humidity may cause surface condensation in the form of dew or frost, which will affect bonding of the lining. Therefore, the applicator shall ensure that the relative humidity does not exceed 85 percent. Heating of pipe surfaces may be required to meet the requirements of the above dew point temperature.

The lining shall be applied to the steel between 40° F and 160° F with the minimum ambient air temperature steady at 35° F and/or rising.

**iii. Material selection**

Use either the primary lining material that has been used on the main sections of the pipe or materials recommended by the manufacturer for field lining.

**iv. Application of the field lining**

Apply the field lining as per the manufacturer's instructions. Coat the entire metal surface and 1 inch onto the existing (but roughened) lining that has been previously prepared. Note that approximately 1 inch of existing (but roughened) lining is left unlined to provide evidence of surface preparation.

**v. Field lining thickness**

Apply joint linings to the same thickness as the primary lining.

**vi. Inspection**

Prior to application of the field lining, the surface preparation shall be visually inspected for color of blast using comparative standard SSPC VIS 1. The profile shall be checked using replica tape.

After the lining is applied and sufficiently cured it shall be checked for dry film thickness according to SSPC PA2 using a magnetic gauge. The lining shall also be tested with a holiday detector in accordance with NACE RP-0188 using a minimum of 100 volts per mil.

Adhesion shall be checked on at least one joint per day in accordance with the procedures specified for shop-linings.

Measure dew point and humidity as specified for shop-lining at the start of each lining day.

#### **vii. Repairs**

All lining defects shall be repaired in accordance with the manufacturer's recommendations and as specified for shop-applied lining.

### **3.4 EXTERIOR COATING SYSTEMS**

Pipe and fittings, including both new pipe and existing pipe at connection points, shall be coated using a 100 percent solids, two-component polyurethane with a minimum 25-mil dry thickness in accordance with the following requirements:

### **3.5 MATERIALS FOR EXTERIOR COATING SYSTEMS**

#### **A. Shop-Applied Coating**

The composition, handling, and application characteristics of the materials to be used for the exterior coating of steel pipe and fittings are as follows:

1. The coating material shall consist of a solventless aromatic polyurethane, chemical cure, ASTM Type V.
2. The polyurethane shall contain no volatile organic compounds (VOC), solvents, or extending fillers.
3. The polyurethane materials shall have a mix ratio of two parts resin to one part activator.
4. At 75° F, the cure time to be dry to touch shall not exceed three minutes, to immersion shall not exceed four hours, and to normal use shall not exceed 12 hours.
5. The coating shall be able to achieve an application thickness of 25 mils in one application, completely encapsulating welds, rivets, and edges.
6. No primers are to be required by the polyurethane coating to achieve proper performance.

The coating materials to be used on the exterior of the pipe and fittings shall meet all of the performance requirements shown below as determined by laboratory testing in accordance with ASTM procedures.

TEST

REQUIREMENT



Adhesion to Steel (ASTM D4541; A.2)	2950 psi
Adhesion to Steel (ASTM D6677)	Rating – 10
Tensile Strength (ASTM D412)	3030 psi
Elongation (ASTM D412)	10%
Flexibility (ASTM D522)	No cracking or delam – 1" Mandrel
Cathodic Disbondment (ASTM G95, mtd A)	0 mm
Water Absorption (ASTM D570)	0.464%
Impact Resistance (ASTM G14)	180 in-lbs
Hardness, Shore D (ASTM D2240)	74 +/-3
Abrasion Resistance (ASTM D4060, CS17)	69.4 mg
Dielectric Strength (ASTM D149)	470 V/mil
Chemical Resistance (ASTM D543)	10% H <sub>2</sub> SO <sub>4</sub> < 1%; 30% NaCl < 1%; 30%NaOH < 2%; #2 Diesel 2% weight, <2% length/width

The coating materials shall have a documented history of successful application and performance on water piping greater than 5 years.

Acceptable products for shop-applied coating systems, or equal:

- LifeLast, Inc. Durashield 210

### **B. Field-Applied Coating**

Field-applied coating at the joints shall be a heat shrink sleeve with high impact resistance conforming to *AWWA C216*. Material shall be Canusa Aqua-Shield or approved equal.

Mastic for use at step down details created by bell and spigot or buttstrap joints shall be Aqua-Seal or approved equal.

## **3.6 APPLICATION OF EXTERIOR COATING SYSTEM**

### **A. Shop-Applied Coating Systems**

The application of shop-applied coating systems shall be the same as specified for the application of shop-applied lining systems.

## **B. Field-Applied Coating Systems**

Field-applied coating systems shall be applied in accordance with the manufacturer's instructions and as specified herein.

During the welding process, the coating shall be protected from welding sparks and splatter by means of protective barriers. The following steps are to be completed after the welding operation is complete, the welds tested and accepted by the Tacoma Water Engineer.

The sleeve manufacturer shall provide a factory-trained, qualified representative onsite at the start of pipe installation for three days, minimum, to inspect surface preparation and sleeve application procedures. The coating manufacturer shall also provide a factory-trained, qualified representative onsite in the field as may be required during surface preparation and application of the sleeve to resolve any problems that may arise in association with the sleeve products.

### **i. Minimum surface preparation**

Remove water, mud, dirt, grease, weld splatter, and any deleterious substances from the holdback area to be coated. Clean and prepare pipe surface in accordance with AWWA C216. Roughen approximately three inches of the existing coating surrounding the field coating area.

Other methods of surface preparation are acceptable as long as they provide the same resulting surface. Ensure that the entire area to be coated is clean, dry and uncontaminated.

### **ii. Material selection**

Heat shrink sleeve shall conform to the latest version of AWWA C216 and shall be Canusa Aqua-Shield or approved equal.

### **iii. Application of the field coating**

Apply the field coating and filler mastic as per the manufacturer's instructions. Cover the entire metal surface and two inches onto the existing (but roughened) coating that has been previously prepared. Note that approximately 1 inch of existing (but roughened) coating is left uncoated to provide evidence of surface preparation.

### **iv. Field coating thickness**

Minimum thickness of sleeve shall be 110 mils.

### **v. Inspection**

Prior to application of the field coating, the surface preparation shall be visually inspected.

### **vi. Repairs**

All coating defects shall be repaired in accordance with the manufacturer's recommendations.

## **3.7 DELIVERY, STORAGE AND HANDLING OF MATERIAL**

### **A. Packaging and Labeling**

All lining and coating components shall be packaged in standard closed containers. Each container of separately packaged component shall be clearly and durably labeled to indicate the date of manufacture, manufacturer's batch number, quantify, color, component identification and

designated name or formula Specification number of the coating together with any special instructions.

### **B. Delivery, Storage and Handling**

The lining and coating material shall be delivered to the site in sealed containers that plainly show the designated name, batch number, color, date of manufacture, and the name of the manufacturer. Store the material on site in enclosures, out of direct sunlight in a warm, ventilated, and dry area at or above room temperature. Care shall be taken in the handling of the lining containers to prevent puncture, inappropriate opening, or other action which may lead to product contamination. No materials that are past the manufacturer's recommended shelf life shall be used without the approval of the manufacturer.

### **3.8 CERTIFICATION**

The manufacturer of the lining and coating systems shall certify that the materials supplied conform to the composition and requirements of these Specifications. The performance properties of any materials that are proposed as substitutes or alternates to the materials originally accepted by the Tacoma Water Engineer shall be documented by independent third party test results. The tests shall be completed using the ASTMs indicated in these Specifications.

### **3.9 HANDLING OF PIPE AND FITTINGS**

Store, handle, and place lined and coated pipe and fittings in a manner that will minimize damage to the linings and coatings and will not reduce its effective protective value. Handle lined and coated work which is flexible in a manner that will prevent flexing sufficient to crack linings or coatings, especially when the temperatures are below freezing.

### **3.10 SAFETY**

The applicator shall secure, from the coating manufacturer, the Material Safety Data Sheet (MSDS) for the polyurethane coating resins. Copies of these MSDSs shall be submitted to the Tacoma Water Engineer.

All safety requirements stated in this Specification and its component parts apply in addition to any applicable federal, state, and local rules and regulations. Instructions of the coating manufacturer and the requirements of insurance under writers must be considered.

Proper safety precautions shall be observed to protect against the potential toxicity or flammability of polyurethane coatings. Safe handling and application practices are required and should include, but not be limited to, the provisions of:

- SSPC-PA3 - Guide to Safety in Paint Application
- SSPC-PS17.00 - Section -Safety
- Coating Manufacturer's Material Safety Data Sheet

## **4.0 Technical Provisions Steel Pipe Installation**

### **4.1 INSTALLATION OF PIPE**

All pipe and fittings shall be carefully handled and protected against damage to lining and coating/interior and exterior surfaces, impact shocks, and free fall. All pipe handling equipment shall be acceptable to the Tacoma Water Construction Inspector.

Pipe shall not be placed directly on rough ground but shall be supported in a manner which will protect the pipe against injury whenever stored at the site or elsewhere. Stockpiled pipe shall be supported on sand or earth berms free of rock exceeding three inches in diameter. The pipe shall not be rolled and shall be secured to prevent accidental rolling.

No pipe shall be installed where the lining or coating/interior or exterior surfaces show cracks that may be harmful as determined by the Tacoma Water Engineer. Such damaged lining and coating/interior and exterior surfaces, shall be repaired or a new undamaged pipe shall be provided.

Prepare exterior surfaces and apply coating patches per manufacturer's instructions. Acceptable product is CRP-O as manufactured by CANUSA, the Woodlands, TX; or equal.

All pipe damaged prior to Substantial Completion shall be repaired or replaced by the Contractor.

The Contractor shall inspect each pipe and fitting to insure that there are no damaged portions of the pipe. The Contractor shall remove or smooth out any burrs, gouges, weld splatter, or other small defects prior to laying the pipe.

Before placement of pipe in the trench, each pipe or fitting shall be thoroughly cleaned of any foreign substance which may have collected thereon and shall be kept clean at all times thereafter.

Contractor shall be responsible for selecting lifting points that when used, do not result in damage to the pipe.

Pipe shall be laid directly on the bedding material. No blocking will be permitted, and the bedding shall be such that it forms a continuous, solid bearing for the full length of the pipe. Excavations shall be made as needed to facilitate removal of handling devices after the pipe is laid. Excavation shall also be made as needed outside the normal trench section at field joints to permit adequate access to the joints for field connection operations and for application of coating on field joints.

Take precautions at all times to avoid floatation of pipe. Install weights as required to keep pipe in place prior to completion of backfilling. Contractor assumes full responsibility for any damage caused by floatation or flooding of pipe. Remedy of such damages may include re-laying pipe to grade, cleaning of pipe interior, and repairing physical damage to the pipe and appurtenances.

No pipe shall be installed upon a foundation into which frost has penetrated or at any time that there is a danger of the formation of ice or penetration of frost at the bottom of the excavation. No pipe shall be laid unless it can be established that the trench will be backfilled before the formation of ice and frost occurs.

Allow sufficient time between laying the pipe in the trench and lining the joints to allow Tacoma Water to inspect the pipe, coatings, linings, and all appurtenances.

Leave stulling (struts) in the pipe at all times until at least 72 hours after trench backfilling operations have been fully completed. The stulling may be temporarily removed for access, but it must be put back in place immediately and prior to any backfilling. Prior to filling the pipe with water, the stulling shall be removed and shall remain the property of the Contractor.

The openings of all pipe (including both new and existing) and specials (including passholes) where the pipe and specials have been lined in the shop shall be protected with suitable bulkheads to prevent unauthorized access by persons, animals, water, or any undesirable substance. Temporary shoring to provide access to passholes shall be ADS or other such plastic material and shall not be placed directly against the coating on the pipe.

#### **4.2 TRENCH EXCAVATION**

The trench shall be excavated in accordance with the Drawings and the requirements of the *Standard Specifications* for structure excavation class B incl. haul, including but not necessarily limited to Section 2-09. All excavated material shall be removed from the site. Make all arrangements for the disposal of the excavated material and conform to the requirements of the local agency having jurisdiction.

Unstable material below the bottom of the trench shall be removed and disposed of at the direction of the Tacoma Water Engineer. The excavated area shall then be backfilled with gravel borrow incl. haul, as directed by the Tacoma Water Engineer, to the bottom of the trench and compacted.

#### **4.3 FINISH GRADE, ALIGNMENT AND BELL HOLES**

The pipe and appurtenances shall be assembled in the trench without material departure from the line, grade, and stationing shown on the Plan and Profile of the Drawings. Trimming and fitting of the connections shall be conducted in the field for final assembly by the Contractor and at their own expense. Bell holes for the steel pipe shall be dug to have a clearance under the pipe and around the sides of not less than two feet and shall be not less than 36 inches in length. Bell holes shall be dug so that the pipe joints will fall in the middle of the hole. The Contractor shall keep bell holes open until after the air or hydrostatic test and the coating of the field joints have been completed and accepted.

#### **4.4 PIPE ASSEMBLY AND INSTALLATION**

Field welded joints shall be in accordance with *ANSI/AWWA C206 – Field Welding of Steel Water Pipe* and *AWS D1.1 Structural Welding Code-Steel*. In the event of conflict, *AWS D1.1* shall govern, except as modified herein. All welders shall be ANSI/AWS D1.1 certified.

Where exterior welds are performed, adequate space shall be provided for welding and inspection of the joints.

When fitting up the ends of pipe to be welded or when fitting buttstrap pieces, minor jacking or clamping will be allowed. Cold working the metal with sledges or localized application of heat and working the metal with sledges will not be allowed. If field displacement of joints does not allow

proper fit up with the tolerances indicated, special closure buttstraps or mitered pieces shall be shop fabricated and installed.

During installation of welded steel pipe, the pipe shall be laid so that at any point around the circumference of the joint there is at least a minimum lap as shown on the Drawings. The toe of the weld shall also be held back from the nearest point of tangency of the bell radius as shown on the Drawings. Prior to welding, the pipe shall be shimmed at the joints to equalize the gap between the bell and the spigot around the joint circumference. The welding shall be performed in a manner that will maintain the equalized fit-up.

Buttstraps, where used or required, shall be as indicated on the Drawings.

A heat-resistant shield shall be draped over at least 24 inches of lining and coating beyond the holdback on both sides of the weld during welding to avoid damage to the lining and coating by hot weld splatter. Welding grounds shall not be attached to the coated part of the pipe. Repair all damage to lining and coating.

After the pipe and pipe joint are properly positioned in the trench, the length of pipe between joints shall be backfilled to at least one foot above the top of the pipe. Care shall be exercised during the initial backfilling to prevent movement of the pipe and to prevent any backfill material from being deposited on the joint.

To control temperature stresses, the unfilled joint areas of the pipe shall be shaded from the direct rays of the sun by the use of properly supported awnings, umbrellas, tarpaulins, or other suitable materials for a minimum period of two hours prior to the beginning of the welding operation and until the weld has been completed. Shading materials at the joint area shall not rest directly on the pipe but shall be supported to allow air circulation around the pipe. Shading of the pipe joints need not be performed when the ambient air temperature is below 45° F.

At intervals not exceeding 500 feet along welded reaches of the pipeline and at the first regular lap-welded field joints outside concrete encasements and structures, the pipe shall be laid with an initial lap of not less than 1 inch greater than the minimum lap dimension. The welding of each slip joint shall be performed when the temperature is approximately the lowest during the 24-hour day, after at least 500 feet of pipe have been laid and the joints have been welded ahead of and in back of the slip joint, and after backfill has been completed to at least 1 foot above the top of the pipe ahead of and in back of the slip joint. Slip joints shall not be welded when the air temperature exceeds 65° F.

Only joints in trenches in or continuous to the river alignment (between the levees) may be made in wet trenches. Joints made in wet trenches shall be single fillet welded buttstrap. The annular space between the inside of the coupling and the outside of the pipe shall be filled with grout. Provide grout ports on the buttstrap. Use grout sequence to ensure the annular space is completely filled. Plug grout ports after grouting is complete.

Any tack welds or joint stops used to position the pipe during laying shall be removed, prior to the beginning of the welding procedure. Annular space between the laying surfaces of the bell and spigot shall be equally distributed around the circumference of the joint by shimming, jacking, or other suitable means. The weld shall then be made in accordance with *ANSI/AWWA C206*. Where more than one pass is required, each pass except the first and final one shall be peened to relieve shrinkage stresses; and all dirt, slag, and flux shall be removed before the succeeding bead is applied.

Prior to butt welding, the pipe and pipe joint shall be properly positioned in the trench using line up clamps so that, in the finished joint, the abutting pipe sections shall not be misaligned by more than 1/16 inch.

Unless otherwise shown on the drawings, field welded joints shall be double fillet welded lap joints, except for slip joints.

#### 4.5 INSPECTION OF FIELD WELDED JOINTS

The Tacoma Water Construction Inspector shall inspect the joints. Inspection shall be as soon as practicable after the welds are completed. All double fillet welds on lap welded joints and buttstrap joints shall be tested by the soap solution method using approximately 40 psi air pressure introduced between the plates through a threaded hole as indicated. Test holes shall be plug welded following successful testing. Fillet welds will be visually inspected and may be tested by the Magnetic Particle Inspection Method in accordance with ASME Section VIII, Division 1, Appendix VI.

All welds that are defective shall be repaired by the Contractor to meet the requirements of the applicable sections of these Specifications. The weld repairs shall conform to the Contractor's approved written weld repair procedure. Defects in welds or defective welds shall be removed, and that section of the joint shall then be re-welded. Only sufficient removal of defective material that is necessary to correct the defect is required. After the repair is made, the joint shall be checked by repeating the original test procedure. Welds deficient in size shall be repaired by adding weld metal.

#### 4.6 INSTALLATION OF FLANGED JOINTS

Before the joint is assembled, the flange faces shall be thoroughly cleaned of all foreign material with a power wire brush. The gasket shall be centered and the connecting flanges drawn up watertight without unnecessarily stressing the flanges. All bolts shall be tightened in a progressive diametrically opposite sequence and torqued with a suitable, approved, and calibrated torque wrench. All clamping torque shall be applied to the nuts only.

#### 4.7 TRENCH BACKFILLING

Steel pipe bedding and pipe zone backfill shall form an envelope of screened sand around the pipe as depicted in the project drawings. Sand used to form the envelope of screened sand shall meet the requirements of coarse sand described below.

**Coarse Sand:** Coarse sand shall be sound, screened, washed, naturally occurring material, free from humus, clay, or deleterious material as defined in Section 9-03.1(2)A of the *Standard Specifications* and meeting the following gradation:

<u>Standard Sieve Size</u>	<u>Percent Passing</u>
3/8"	100
1/4"	80-100
No. 4	30-95
No. 8	0-35
No. 16	0-20
No. 30	0-6

**Crushed Surfacing Top Course:** Crushed Surfacing Top Course conforming to the requirements of the *Standard Specifications*, including but not necessarily limited to Section 9-03.9(3).

**Gravel Borrow Incl. Haul:** Trench backfill shall meet the requirements of the *Standard Specifications*, including but not necessarily limited to Sections 2-03.3(14)J and 9-03.14(1). Gravel Borrow Incl. Haul "shall be used wherever the Drawings call for "gravel borrow", "granular fill", or "4" minus pit run gravel".

**Native Backfill:** Excavated material from the trench shall be used to backfill the trench as shown on the Drawings. Particles larger than six inches diameter and roots, debris and organic material shall be removed. The trench shall be backfilled to the limit shown in the Plans.

Excess backfill material shall be removed from the site and disposed of by the Contractor in a manner consistent with state, county and local codes and regulations.

Following backfilling of the trench, all disturbed areas above the ordinary high water mark shall be cleaned of debris, rocks, and excess excavated material, and graded to their original condition.

#### **4.8 COMPACTION**

All trench backfill shall be compacted to 95 percent of the maximum density as determined by the Washington Densometer Method outline in the *Washington State Department of Transportation Construction Manual* or as designed by Tacoma Water. Backfill for mechanical compaction shall be placed in successive horizontal layers of loose material not more than 6 inches in depth prior to compaction.

The sand bedding around the pipe shall be compacted by water settling and/or mechanical equipment. The remaining trench section shall be compacted with mechanical equipment, and if the fill material contains less moisture than required for proper compaction, the Contractor shall add sufficient water not to exceed the maximum water content in accordance with WSDOT Standard Specifications.

All compaction equipment shall be in good working condition and approved by Tacoma Water prior to use. If the equipment does not achieve the necessary compaction results for the particular type of soil the Contractor shall furnish other equipment that will achieve satisfactory compaction.

The different types of compaction are as follows:

##### **Type I – Water Settling**

Type I compaction shall be used on pipe zone sand. Approved jet pipes shall be used so that each backfill layer is saturated and consolidated to its full depth before the next layer is placed. The first lift of pipe zone sand shall not be above 1/3 the height of the pipe (that is, above the invert but significantly below the centerline of the pipe). Jetting of pipe zone sand shall not be done in such a manner that the pipe or nearby utilities are damaged, in areas of poorly draining or expansive soils, or where use of the procedure is prohibited by any agency having jurisdiction over the street or right-of-way. Water shall be safely and promptly removed from the trench. Jet



pipes shall be kept at least six inches away from the pipe where the backfill is being consolidated and two feet away from other pipes or utilities. This method of compaction shall include a water source under pressure either from a water tank with a pump or pumping from hydrants, a suitable hose with a 1-inch minimum jet pipe, and an operator. Jetting will be at the direction of the Tacoma Water Engineer. In areas where Type I compaction is not feasible, Type II compaction shall be used.

### **Type II – Hand Tampers**

Type II compaction shall be used around chambers, utility crossings, or other areas where mobile compaction equipment cannot be operated. Equipment shall be hand-operated mechanical tampers, with gas or air power. Backfill material shall be placed in six inch loose lifts and compacted to the relative compaction specified herein.

### **Type III – Vibratory Rollers**

Type III compaction shall be used from a point at least one foot above the pipe to the underside of surface restoration materials. Equipment shall be Hoe-pac or small self-propelled or towed vibratory rollers or sheepsfoot rollers. Backfill material shall be placed in maximum 24-inch loose lifts and compacted to the relative compaction specified herein.

## **4.9 SLINGS FOR LAYING STEEL PIPE**

Pipe slings shall be used for laying pipe. They shall be made of nylon or other material satisfactory to Tacoma Water. Slings shall be designed so as to have a safety factor of not less than four and be of sufficient width so as not to exceed a pressure of 15 pounds per square inch of bearing; providing that single belt slings used for handling the pipe shall be a minimum of 12 inches wide or two slings 8 inches wide may be used.

The use of slings made of wire, cable, chains, rope, or steel straps will not be permitted; nor the use of bridles and hooks in the ends of the pipe.

## **4.10 LAYING STEEL PIPE**

A suitable crane or backhoe with ample capacity shall be used for laying the pipe sections.

Prior to lowering any pipe into the trench the Contractor shall remove any foreign matter or coating of any nature from the surfaces that have metal to metal contact at joints to be welded.

The inside of the pipes shall be cleaned out by sweeping or other approved method before laying. No pipe known to be defective in any way shall be laid or lowered into the trench. The exterior coating shall be inspected for damage and any required repairs made prior to lowering the pipe into the trench.

Any pipe known to be contaminated with sewage, decaying organic matter, or other infectious material shall be thoroughly cleaned and given an approved antiseptic wash before being placed in the pipeline.

If it should become necessary to move a pipe longitudinally along the trench, the manner of moving shall be such as not to injure the pipe coating. Pipe shall not be rolled or dragged on the ground. Any pipe becoming damaged shall be repaired as directed by Tacoma Water if, in his/her

opinion, a satisfactory repair can be made, otherwise the pipe shall be replaced by an undamaged section. All expense for labor, material and equipment necessary to make such repairs shall be borne by the Contractor.

Each pipe section shall have a firm bearing for its entire length in the trench except at bell holes where field joints are to be made. In addition shallow holes shall be provided under the pipe slings to permit their removal without damage to the pipe coating. If any blocking is necessary to support the pipe laterally during the laying, it shall be placed at the ends where the pipe sections have not been coated. Such lateral bracing shall be removed after the pipe has been cradled.

#### **4.11 Requirements for Laying Steel Pipe in Dry Trenches**

Open ends of the pipe laid shall be securely closed at the end of each day's work. Manholes and other openings such as blowoff and air valve connections and drop holes shall be kept closed while not in use. Watertight pipe plugs will be required when necessary to prevent trench water from entering the pipe.

When laying the pipe not less than six inches of screened sand bedding shall be provided below the bottom of the pipe. An additional six inches of sand shall be carefully screened by means of a template shaped to the outside radius of the pipe to provide firm bearing for the full length of each pipe section except at bell holes. A string and/or laser beam must be used to guide the template. The Contractor shall keep the bell holes open until after the testing and coating of the field joints have been completed and accepted by Tacoma Water.

After the pipe has been laid and adjusted to specified line and grade, it shall be carefully cradled before welding. Cradling shall be carried on, on both sides of the pipe simultaneously and thoroughly tamped under and around the pipe or water settled to secure a uniform bedding for the lower one-half of the pipe. Great care shall be exercised not to damage the protective coating. Backfilling shall be continued when necessary to prevent movement and/or flotation of the pipe.

After the pipe in the trench has been welded and tested, and the field joints coated and accepted, the Contractor shall backfill all bell holes in the same manner as specified for cradling pipe. The Contractor shall place a protective covering of sand bedding not less than 6 inches in thickness to cover the entire upper half of the pipe before the trench is backfilled by mechanical equipment. See Standard Drawing No. 940-A showing Typical Trench Sections.

#### **4.12 PROTECTION OF PIPE**

No person employed on the job shall step or walk upon the inside of the pipe for any purpose, unless equipped with rubber heel and sole foot gear. The Contractor shall furnish mats, rags or other means of cleaning foot gear which must be used before entering or walking on coated pipe. The Contractor shall wipe out any dirt or debris deposited inside the pipe.

Crews working on the inside of the pipe shall carry all tools and miscellaneous equipment. No dragging, throwing or dropping will be permitted. The Contractor shall provide a container for leftover electrode ends when welding inside of the pipe. Coatings and linings shall be protected at all times from abrasion and hot spatter from the welding. The Contractor shall also provide mats to protect the interior lining each side of field joints from damage when welding inside the pipe. Utmost care will be insisted upon on the part of the Contractor and all employees to protect the coating and lining of the pipe and appurtenances from abrasions or damage and any such abrasion or damage shall be repaired at the Contractor's expense as directed by Tacoma Water.

## 5.0 Technical Provisions Valves and Chambers

### 5.1 VAULTS AND CHAMBERS

The Contractor shall furnish complete shop drawings for precast vaults and chambers, cast iron frames and covers, and appurtenances.

Vaults and chambers shall be precast concrete, of the dimensions shown on the Drawings, and in general conformance with ASTM C478. Base shall be precast with integral riser. Entry riser shall be made of 24-inch diameter grade rings, as shown on the Drawings. The top slab shall be designed to carry an HS-20 load transmitted through the entry riser.

If the vault or chamber has more than one section, the joint shall be of tongue-and-groove construction, and shall be sealed with a double amount of flexible butyl sealant – ConSeal CS-101, or equal. The mastic sealant shall be placed on the two shoulders of the groove. Areas that mastic is placed on shall be clean and free of debris prior to placement.

All precast concrete vaults and chambers shall be installed in strict conformance with the manufacturer's written instruction, on a well compacted foundation of crushed surfacing base course. Vaults and chambers shall be installed plumb.

**Crushed Surfacing Base Course:** Crushed Surfacing Base Course conforming to the requirements of the *Standard Specifications*, including but not necessarily limited to Section 9-03.9(3).

Crushed Surfacing shall be compacted by methods approved by the Tacoma Water Engineer to 95 percent relative compaction as measured in accordance with ASTM D1557. Moisture content shall be within plus or minus two percent of optimum.

Exterior of vaults and chambers shall be coated with two coats of polyamide epoxy. Polyamide epoxy shall be Tnemec Hi-Build Epoxoline, Series 66 or equal. Thickness of each coat shall be a minimum of five mils DFT. Prepare surface and apply coating in accordance with manufacturer's instructions.

### 5.2 CASTINGS, LADDERS, AND VALVE STEM EXTENSIONS

Castings for manhole frames and covers shall be non-rocking and shall conform to the requirements stated on the drawings.

Ladders shall be constructed of galvanized steel to the dimensions shown on the drawings. Anchor bolts for attachment to manhole and vault walls shall be adhesive anchors. Adhesive anchors for attaching ladders to walls shall be installed in accordance with the anchor manufacturer's written instruction.

Valve stem extensions shall extend from the operating nut of each valve to within the gate box cast in the lid of the chamber or placed in the asphalt. Valve stem extensions shall be fabricated as shown on the drawings.

### 5.3 GENERAL VALVE REQUIREMENTS

The Contractor shall provide valves, including appurtenances, complete and operable. All valves shall be designed for minimum 150 psi water-working pressure, and shall be installed in accordance with the Manufacturer's printed recommendations. References to valves in this section refer to combination air valves, gate valves, butterfly valves, corporation stops, and all appurtenances.

When two or more valves of the same type or size are required, the valves shall be furnished by the same manufacturer.

The Contractor shall furnish complete submittals for the valves, including shop drawings (with pressure rating and flange drilling), owner's manual, spare parts list, and factory test data.

#### **5.4 GATE VALVES**

All gate valves shall conform to AWWA Standard C509, latest edition, Resilient-Seated Gate Valves for Water Supply Service, as manufactured by Kennedy, M&H, Mueller, American Flow Control, or approved equal, and the following modifications:

All gate valves shall be of the double disc parallel seat type, non-rising stem and opening left (counterclockwise).

All gate valves shall be furnished with O-ring stem seals. Number, size, and design shall conform to AWWA Standard C509.

Valve body shall be Ductile Iron.

The operating mechanism shall be a standard two-inch square nut.

A Protective Lining shall be applied to all internal waterway surfaces which are subject to corrosion. Protective Lining shall be factory applied and cured epoxy paint or fusion bonded epoxy. Protective Lining shall be applied in accordance with the manufacturer's instructions, including surface preparation.

Protective Lining shall be certified for use in potable water by the NSF International.

The exterior of the valves shall be coated with high-build polyamide epoxy conforming to AWWA C210. Do not coat flange faces.

Install the valves and couplings in accordance with the manufacturer's instructions.

Flanges shall be flat-faced. Flange drilling shall match AWWA Class D Flanges.

#### **5.5 BUTTERFLY VALVES**

The Contractor shall furnish rubber seated butterfly valves, by Mueller, Pratt, or approved equal. Valves must be suitable for buried service or for service in submerged chambers filled with brackish water.

The butterfly valves and operators shall be manufactured in accordance with the latest AWWA Specifications C504 Standard for Rubber Seated Butterfly Valves. The valves shall be flanged, short bodied, Class 150.

All parts of the valves herein specified shall be designed to withstand safely and without permanent distortion both stresses resulting from the internal test pressure specified and the combined stress resulting from the full internal working pressure specified coincident with the opening or closing the valves under full unbalance working pressure from the point of opening to its fully closed position.

The butterfly valves shall be designed to operate with a maximum 16 feet per second line velocity. All valves will be mounted with the shaft horizontal.

The valve bodies shall be ASTM A126-Class B cast iron or ASTM A536, Grade 64-45-12 ductile iron. Castings shall be sound, clean, and free from porosity, cold shuts, blisters, holes, and defects of any nature which might render them unfit for the use intended.

The valve shafts shall be turned, ground, and polished. Valve shafts shall be constructed of 18-8 type 304 stainless steel. Two true unions for shaft bearings shall be integral with each valve body. Bearings shall be corrosion resistant and self-lubricated. In addition to the shaft bearings, each valve shall be equipped with an adjustable thrust bearing which is totally enclosed and protected and which is set and locked to hold the valve disc and shaft assembly securely in the center of the valve seat.

The valve discs shall be constructed of ASTM A536, Grade 65-45-12 ductile iron or cast iron conforming to ASTM A48 Class 40. The valve seats shall be of natural rubber or a Buna N compound. The mating seat surfaces shall be stainless steel 18-8. Seat replacement for the valves shall be affected without removing the valve from the line or without removing the valve operator, disc, or shaft.

Flange dimensions and drilling shall conform to ASA Standard B 16.1 matching AWWA Class D companion flanges. All flanges shall have a serrated finish obtained by using a V-shaped tool. Serrations shall be spiral with grooves 1/64" in depth and 1/32" apart. Bolt holes in flanges shall straddle the vertical centerline. The back of the flanges shall be spot faced or full faced.

Markings shall be cast on the valve body showing the manufacturer, size, class, and year casting was poured.

The rated operator torque capability shall be sufficient to seat, unseat, and rigidly hold the valve disc in any position between full open and full closed without creeping or fluttering.

Mechanical operators may either be traveling nut or worm gear type, but shall be self-locking and designed to transmit twice the required torque without damage to the gearing or operating mechanism.

All gearing shall be totally enclosed.

The manual operators for the butterfly valves shall be geared to require a minimum of 90 turns of the handwheel or operating nut to open or close the valves.

A shear pin easily accessible from the outside of the valve shall be provided for the valve that will fully protect the operator mechanism from excessive stresses. Stop-limiting devices shall be provided in the operator for the open and closed position, and all operating components between the input and these stops shall be designed to withstand without damage a pull of 200 pounds for

the handwheel and an input torque of 300 foot-pounds for the operating nut. The operators shall be equipped with submersible housings. The operating mechanism shall be totally enclosed and fitted with grease seals to allow complete filling with grease or oil. The housing shall be designed to prevent any leakage or buildup of pressure in the mechanism housing.

The operating nut and handwheel for operating the valve shall be so geared as to turn clockwise to close the valve. The handwheel shall have permanent indicators cast thereon showing the open and closing directions. The handwheel shall be mounted horizontal.

A valve position indicator, which extends from the valve stem, shall be furnished for valves installed in chambers showing the exact position of the valve disc at all times.

An operating nut shall be furnished for all valves installed in chambers in addition to the handwheel. The operating nut shall be 1-15/16" square at the top and 2 inches square at the base.

## **5.6 AIR VALVES**

Air valves shall be a combination air and vacuum type. The valve shall be manufactured in accordance with ANSI/AWWA C512. The valve shall operate by sealing a Buna-N rubber outlet seat with a peripheral float as the liquid enters the valve chamber to raise the float. All valves shall be hydrostatically tested at 150% of their maximum working pressure. 4" air valves shall be constructed with a cast iron body, and top flange with stainless steel trim. 4" air valves shall have a 4" ANSI Class 125 flanged inlet with NPT screwed outlet. The peripheral guided float shall be stainless steel.

Air valve shall be a APCO Model 149C, or approved equal.

## **5.7 CORPORATION STOPS**

Unless otherwise indicated, corporation stops shall be made of solid brass for key operation, with screwed ends with corporation thread or iron pipe thread, as required.

### **Manufacturers, or equal:**

- Ford Meter Box Company, Inc.
- James Jones Company (Watts, ACV)
- Mueller Company (Grinnell Corporation)

## **5.8 VALVE BOXES**

All valves will have standard ductile iron water valve box set to grade. If valves are not set in a paved area, a 3-foot by 3-foot by 4-inch concrete pad will be set around each valve box at finished grade. In areas where the valve box falls in the road shoulder, the ditch and shoulder will be graded before placing asphalt or concrete pad. Valve box lids will be ductile iron and marked water.

## **5.9 GASKETS**

Gaskets for the valve and manway flanges shall be full face synthetic fiber with a nitrile binder type Garlock Blue-Gard 3000 or equal.

## **5.10 BOLTS AND NUTS**

All bolts, studs, and nuts shall be American Standard, and, except as otherwise specified, shall be made of steel conforming to the latest ASTM Specifications Designation A307 for Low Carbon Steel Externally and Internally Threaded Standard Fasteners Grade A or B. Nut and bolt heads shall be American Standard Heavy. Studs and bolts shall be of such length when installed that they shall extend between one and two threads beyond the nut. Bolts, studs, and nuts shall be "semi-finished." Nuts, bolt heads, and cap screw heads shall be hexagonal.

## **5.11 DISMANTLING JOINT**

Dismantling Joint shall be used as indicated on the drawings to allow easy installation and removal of piping and fittings.

The dismantling joint shall be Romac Model DJ400, or equal.

## **6.0 Technical Provisions Hydrostatic Testing and Disinfection**

### **6.1 HYDROSTATIC TESTING**

In laying, care shall be taken to insure that the interior of the pipe is kept free of foreign matter or trench water. Prior to filling the pipeline for hydrostatic testing, clean the pipe by sweeping any loose material from the invert of the pipe, and wiping the pipe interior with a damp cloth as required to remove all foreign material.

Upon completion of construction, the line shall be filled slowly under the direction of Tacoma Water and a pressure test conducted. The Contractor shall furnish the necessary pumps, shutoff valves, check valves, hose, plumbing, meter, pressure gages, and other equipment necessary to complete the hydrostatic testing.

The pipeline shall be hydrostatically tested to a pressure of 150 psig. Furnish and install a Tacoma Water-approved apparatus such as a double check valve assembly or a backflow preventer at the source of supply to protect against the backflow of water from the new line into the existing line. The rate of flow shall be determined by metering. Furnish and install temporary hoses and valves as required to fill the new pipe. Provide sufficient temporary air taps and air release valves in the pipeline to allow for evacuation of all entrapped air in the pipeline to be tested.

Maintain the pressure for a period of four hours by continuous pumping if necessary. There shall not be an appreciable or abrupt loss in pressure during the test period. Provide a Tacoma Water-approved method of measuring the amount of make-up water. The amount of make-up water shall not exceed 0.5 gallons per four hours per foot of diameter per mile of welded steel pipeline. Leakage in excess of the allowable shall be cause for rejection.

Any exposed pipe, fittings, valves, and joints shall be examined carefully during the test. Bolted joints shall be left uncovered until the hydro test is complete. In addition, the entire length of the pipeline shall be examined for movement, defects, and leaks that may appear at the surface.

Defects resulting in any visible leakage shall be repaired. Defective material furnished by the Contractor shall be replaced by the Contractor at his own expense. If it is necessary to replace defective material, the pressure test shall be rerun after such replacement.

Testing will only be accomplished with the approval and in the presence of the Tacoma Water Construction Inspector. The Tacoma Water Construction Inspector shall provide his/her own set of pressure gauges.

### **6.2 DISINFECTION OF POTABLE WATER SYSTEM**

All piping connecting to, and forming a part of, a potable water system shall be disinfected in a manner conforming to *AWWA C651 – Standard for Disinfecting Water Mains* and as modified by this Specification.

The Contractor shall provide Tacoma Water four weeks advance notice of the date when the new pipeline will be ready for chlorination. Following successful completion of the hydrostatic test, Tacoma Water crews shall be allowed seven (7) calendar days to drain, chlorinate, sample, flush, dechlorinate, refill, sample, dechlorinate, and drain the newly installed welded steel water mains



(as described in more detail in the following paragraphs). During this time, the Contractor shall only perform work that does not interfere with the work by Tacoma Water.

After the new line has successfully passed the hydrostatic test, Tacoma Water crews will fill the pipe with heavily chlorinated water. After a minimum retention period of 24 hours, samples will be taken to verify the chlorine residual at the pipe extremities and at other representative points is sufficient for disinfection. Next, the heavily chlorinated water will be dechlorinated as it is drained and pumped from the pipeline, and potable water will be used to thoroughly flush and refill the line. Tacoma Water will take initial bacterial test samples of water flowing in the line upon completion of the flushing.

A second set of bacterial test samples will be taken after a 24-hour retention period of the water remaining in the pipe after the initial flushing. Should the samples not test free of E coli and register other than zero coliform bacteria, the line shall be re-disinfected and re-flushed, until two successive satisfactory samples are obtained. Finally, Tacoma Water will dechlorinate and drain the line again.

48 hours is the minimum time required by the bacteriological laboratory to process samples.

### **6.3 CONNECTIONS TO EXISTING MAINS**

The plan and schedule shall include a detailed description of the proposed work associated with the final connections to existing portions of PL5 Transmission Main. The connection of the new pipe to the existing main shall be accomplished during a shutdown of the existing main. PL5 may be shut down for a maximum of ten (10) calendar days. Any disconnection and/or reconnection of water main shall be made during the months of October, November, December, January, February, March, April, or May. Tacoma Water will require two days at the beginning of the shutdown to drain the pipeline. The Contractor will be provided five days to complete the connections of the new pipe to the existing main. The time available to the Contractor includes the 72 hours required to fully cure the pipe lining material prior to refilling the pipeline. Disinfection of the connection pieces must also be accomplished during the time available to the Contractor.

Because the shutdown will affect delivery of potable water to Tacoma Water customers, minimizing the duration of the shutdown is critical to Tacoma Water. Additionally, high system demands due to warmer than usual weather or other causes may require a delay of the shutdown. And, the shutdown of the existing main shall not occur during the months of June through September without the express permission of the Tacoma Water.

Provide a detailed hourly schedule identifying the sequence of work activities to be accomplished, the anticipated time for each activity, the equipment to be used, the number of workers required for each activity, the number of workers available for each activity, and a contingency plan if the work falls behind schedule. The contingency plan shall also identify actions to be taken if there is an equipment breakdown, lack of workers, or other unforeseen difficulty.

The detailed hourly schedule shall be submitted to Tacoma Water for approval at least four weeks prior to the anticipated date of constructing the final connections. Work on the connections shall not begin until Tacoma Water provides written approval of the detailed hourly schedule.

If any additional shutdowns are required, the Contractor will coordinate and schedule with the Tacoma Water to insure two weeks notification. Cancellations of the shutdown by the Contractor after notification is made may result in a charge to the Contractor for re-notification.

The Contractor is advised that existing valves used to shut down mains for connections are subject to leakage due to age and condition. The Contractor shall be prepared to deal with up to five gallons per minute of water from leaking valves encountered.

The Contractor is advised that only Tacoma Water crews may operate system valves.

Coordination is an important part of this project so proper notification for shutdowns is necessary, such that they can be scheduled without causing delays to the Contractor or unanticipated interruption of service to Tacoma Water customers.

#### **6.4 DISINFECTION OF CONNECTION PIECES**

After the connection pieces are welded in place and the lining at the joints has been applied, clean the connection pieces by wiping with a damp cloth. The pieces shall then be disinfected by spraying or swabbing with a one percent hypochlorite solution in conformance with AWWA C651. Personnel performing the spraying or swabbing shall wear suitable footwear, as approved by Tacoma Water, to prevent contamination of the pipe. Provide a tray filled with water and bleach at each entrance to serve as a boot wash for all workers entering the pipe.

After swabbing is completed, install the manhole covers and inform Tacoma Water that the pipeline is ready for service. Tacoma Water will open the necessary valves to refill the pipeline.

## 7.0 Technical Provisions Cathodic Protection

### 7.1 GENERAL INSTRUCTIONS FOR CATHODIC PROTECTION

Provide cathodic protection test stations, new wire and conduit from pipe, complete and operable, in accordance with the contract documents. Construct connecting wires, test stations, and insulators for buried steel pipe and appurtenances.

**Special Instructions – Before any construction activity occurs, the existing cathodic protection system shall be turned off by Tacoma Water personnel.**

Any part of the work not specifically covered by these Specifications shall comply with applicable sections of the latest ANSI, ASTM, NEMA, NFPA, and UL standards. Specific references include, but are not necessarily limited to:

ANSI C 80.1 Rigid Steel Conduit-Zinc Coated

ASTM D 1785 Poly Vinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120

UL 6 Rigid Metal Electrical Conduit

NEMA WC 3 Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy

NEMA LI1 Industrial Laminate Thermosetting Products

NEMA WC 5 Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy

NEMA WC 7 Cross-Linked-Thermosetting-Polyethylene-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy

NFPA 70 National Electrical Code (NEC)

### 7.2 DEFINITIONS

**Ferrous Metal Pipe:** Pipe made of steel or iron and pipe containing steel or iron as a principle structural material, except reinforced concrete.

**Lead, Lead Wires, Joint Bonds, Cable:** Insulated copper conductor; the same as wire.

**Foreign-Owned:** Buried pipe or cable not specifically owned or operated by Tacoma Water.

**Electrical Isolation:** The condition of being electrically isolated from other metallic structures (including, but not limited to, piping, reinforcement, casings) and the environment as defined in NACE Recommended Practice RP0169.

### 7.3 SUBMITTALS

The Contractor shall furnish the following:

**A. Shop Drawings:**

1. Catalog cuts and other information for products to be used.
2. Overall System Wiring Diagram: Identify location of connections, label markings, wire size, color, and products.

**B. Quality Assurance Submittals:**

1. NACE International Cathodic Protection Specialist credentials.
2. Field Test and Inspection Reports.

**7.4 QUALITY ASSURANCE**

The Contractor shall provide the services of a NACE International certified Cathodic Protection Specialist. The Cathodic Protection Specialist shall provide periodic field observation and testing services during modifications to existing cathodic protection systems and installation of other cathodic protection system components. Additional site visits to the job site shall be made by the Cathodic Protection Specialist at intervals required to:

1. Verify proper installation of wiring, insulating joints, and test stations, and provide test readings to confirm the correct installation of these components.
2. Determine compliance with these Specifications.
3. Provide cathodic protection testing as specified herein.
4. Resolve field problems.

**7.5 WIRES**

**General:** Conform to applicable requirements of NEMA WC 5 and WC 7. All wires shall be single conductor, unless otherwise specified, wires colors codes cannot be substituted.

**Test Station:** No. 10 and No. 8 AWG stranded copper with 600-volt XHHW insulation.

**Insulation Colors:** As indicated in the following table:

<b>Wire Identification Label Requirements</b>		
Wire Connection	Wire Color and Size	Label Marking
Pipe	White No. 8 and No. 10	PIPE
Reference Electrode	Yellow No. 10	REF

**7.6 WIRE INSULATION REPAIR**

Wires shall be handled with care. Splices for damage to the wire insulation shall be required by spirally wrapping (50 percent overlap, minimum) with two layers of high-voltage rubber splicing tape and two layers of vinyl electrical tape. Make wire splices with suitable sized compression connectors or mechanically secure and solder with rosin cored 50/50 solder. Splices shall be approved by Tacoma Water.

## **7.7 POLE MOUNTED CATHODIC PROTECTION TEST STATION PRODUCTS**

**Test Box:** Plastic body, with dimensions of 8 inch inside width and 12 inches inside length.

**Test Board:** Plastic or glass-reinforced, 1/4-inch thick laminate terminal board with minimum dimensions of ten inches by six inches, trimmed as required for mounting in the Test Wire Enclosure. Provide terminal block with eight brass studs, washers, and lock washers.

**Conduit:** PVC conduit as specified herein.

**Structural Channel:** Steel C-channel, with dimensions of 10 inches inside width and 6 feet length.

## **7.8 TEST STATION INSTALLATION**

Determine the location of the test stations based on actual site conditions and as approved by Tacoma Water.

Install test stations outside the driving surface, near the connections to the pipe.

Attach test wires to the pipe at joints and prior to coating joints. Connections to existing pipe will require the Contractor to remove existing coating and apply new coating.

Bury test and reference electrode wires a minimum of 36 inches below finished grade. Install all test wires and reference electrode wires between the buried structures and test stations in conduit.

Make wire connections to test station terminals with crimp-on spade lug terminals.

Install wire labels on all conductors in boxes. All materials used shall be suitable for permanent identification. Plastic, paper, or cloth markers will not be permitted. Position all markers in boxes so that they do not interfere with operation and maintenance.

Install marker post at each test station location. Locate marker post at the ends of the right-of-way or where designated by Tacoma Water.

## **7.9 PREPACKAGED ZINC REFERENCE ELECTRODE**

**Material:** ASTM B418, Type II.

**Dimensions:** 1.4 inches by 1.4 inches by 9 inches.

**Wire:** 10 AWG stranded copper wire with yellow, 600-volt XHHW insulation. Wire shall be 25 feet long minimum and attached to electrode core by manufacturer's standard connection. Connection shall be stronger than the wire.

**Backfill:** 50 percent gypsum, 50 percent bentonite, in a permeable cloth bag. Backfill outside the cloth bag shall be native material.

**Packaging:** Furnish electrode packaged in a plastic or heavy paper bag of sufficient thickness to protect electrode, backfill, and cloth bag during normal shipping and handling.

#### **7.10 ANCILLARY MATERIALS**

**Compression Connectors:** Wrought copper "C" taps, sized to fit the wires being spliced. Burndy Type "YC", or equal. Provide manufacturer's recommended compression tool and die for installation of compression connectors.

**Electrical Tape:** Liner-less rubber high-voltage splicing tape and vinyl electrical tape suitable for moist and wet environments. Use Scotch 130C and Scotch 88 as manufactured by 3M Products, or equal.

**Wire Connectors:** One-piece, tin-plated crimp-on lug connector as manufactured by Burndy Co., Thomas and Betts, or equal.

**Epoxy Coating:** Polyamide cured epoxy, Koppers A788 Splash Zone Compound, or equal.

**Insulating Resin:** Same as epoxy coating specified above. At Contractor's option, bitumastic coating (Koppers 50 or equal) may be used if allowed to dry completely before covering.

**Wire Labels:** Embossed aluminum or stainless steel tape and ties designed for permanent identification of insulated conductor; Type MEHT marker with Type GS4MT installation device as manufactured by Panduit, or equal.

#### **7.11 MARKING TAPE**

**Material:** Inert polyethylene, impervious to known alkalis, acids, chemical reagents, and solvents likely to be encountered in soil.

**Thickness:** Minimum four mils.

**Width:** 12 inches.

**Identifying Lettering:** Minimum 1-inch high, permanent black lettering imprinted continuously over entire length.

**Manufacturers, or equal:**

- Reef Industries; Terra Tape.
- Allen; Markline.

**Color:** Red with black lettering as follows: "ELECTRICAL WIRES BURIED BELOW".

Install marking tape along the centerline of horizontal runs of the wire.

#### **7.12 THERMITE WELD MATERIALS**

**General:** Wire sleeves, welders, and weld cartridges according to the weld manufacturer's recommendations for each wire size and pipe or fitting size and material. Welding materials and equipment shall be the product of a single manufacturer. Interchanging materials of different manufacturers will not be acceptable.

**Molds:** Graphite. Ceramic "One-Shot" molds are not acceptable.

Adapter Sleeves:

1. As required to match welder size to wire size.
2. Prefabricated factory sleeve joint bonds or bond wires with formed sleeves made in the field are acceptable. Attach field-formed sleeves with the appropriate size and type of hammer die furnished by the thermite weld manufacturer.
3. Extend wire conductor ¼ inch beyond the end of the sleeve.

**Welders and Cartridges:** For attaching copper wire to pipe material:

Pipe Material	Welded Type	Cartridge Size, Max.
No. 4 AWG Wire & Smaller:		
Steel	HA, VS, HC	25 gm
Notes: HA = Horizontal Tap Weld HC = Horizontal Through Conductor Weld FS = Formed Sleeve VS = Vertical Surface		

**Manufacturers, or equal:**

- Erico Products Inc. (Cadweld), Cleveland, OH.
- Continental Industries, Inc. (Thermo-Weld), Tulsa, OK.

### 7.13 THERMITE WELD WIRE CONNECTIONS

Use thermite weld method for electrical connection of copper wire to steel surfaces. Observe proper safety precautions, welding procedures, thermite weld material selection, and surface preparation recommended by the welder manufacturer. Assure that the pipe or fitting wall thickness is of sufficient thickness that the thermite weld process will not damage the integrity of the pipe or fitting wall or protective lining.

After the weld connection has cooled, remove slag, visually inspect, and physically test wire connection by tapping with a hammer; remove and replace defective connections.

For thermite weld connections to pipe, apply insulating resin, then specified joint coating over each completed connection. Repair exposed metal surfaces not covered by the resin and mortar in accordance with the coating manufacturer's recommendations.

## **7.14 CONDUCTOR INSTALLATION**

Install and pull conductors in accordance with applicable codes.

Arrange conductors neatly in junction box and test box. Cut to proper length, remove surplus wire, and attach to appropriate terminal as indicated.

Seal below-ground conduit to prevent intrusion of foreign material after wire is in place.

Galvanic anode wires shall be 36 inches deep, minimum, below finished grade. Wires shall be free of splices, except those approved by the Tacoma Water Engineer.

Bury warning tape approximately 12 inches above conductors and conduits. Align parallel to and within 2 inches of the centerline of the conduit or conductor run.

## **7.15 CONDUITS**

Use PVC conduit for buried applications. Provide 1/4-inch minus well-graded sandy gravel, hard, durable, and free from vegetation or other deleterious material for pipe zone of buried conduit. Use galvanized rigid steel conduit for all other applications, including, but not limited to, wire from existing junction box to 24 inches below grade.

Secure conduits entering boxes with double locknuts, one on the outside and one on the inside.

Install insulated bushings and insulated throat connectors on the ends of rigid metallic conduit.

Use watertight couplings and connections. Install and equip boxes and fittings to prevent water from entering the conduit or box. Seal unused openings.

## **7.16 ENGINEER'S TESTS**

Tacoma Water will test selected components of each system installed to confirm the accuracy of the Contractor's testing, prior to acceptance by Tacoma Water.